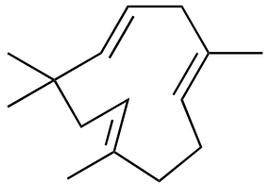
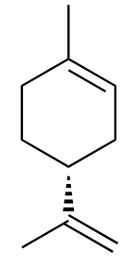
Terpenes

Examples of terpenes

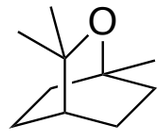
β-Pinene



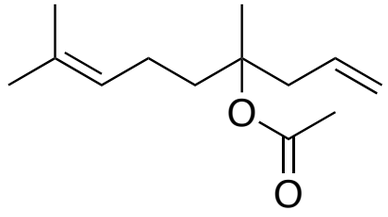
Humulene
(α-caryophyllene)



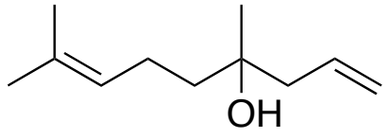
Limonene



Eucalyptol

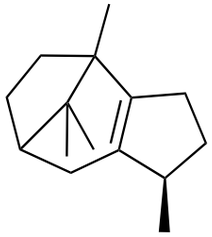


Linalyl acetate

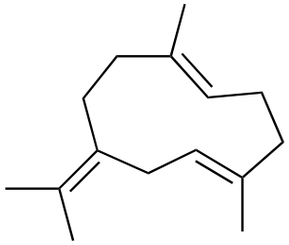


Linalool

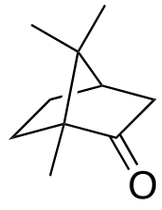
α-Pinene



Patchoulene



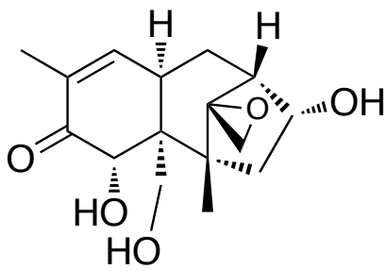
Germacrene-B



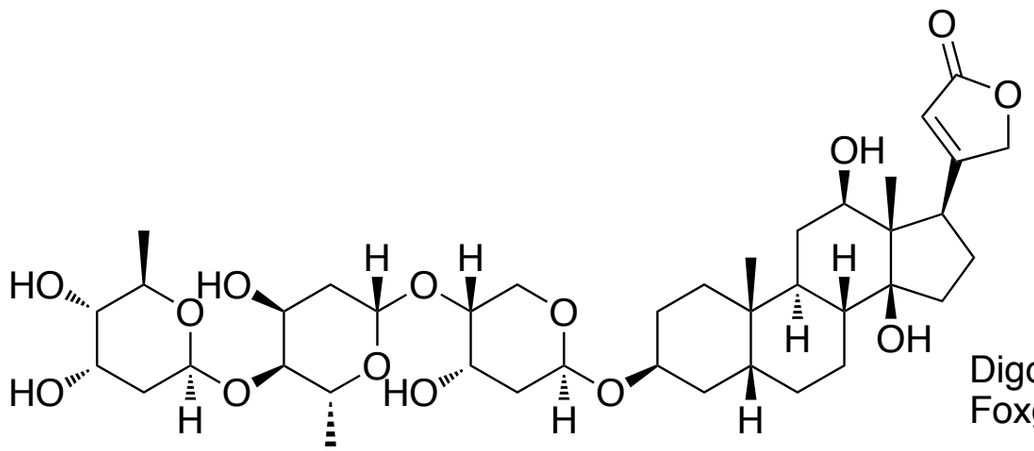
Camphor

Orange oil - 90% limonene
Lavender - 50% linalool, 26% eucalyptol, 13% camphor
Patchouli oil - patchoulene and germacrene B

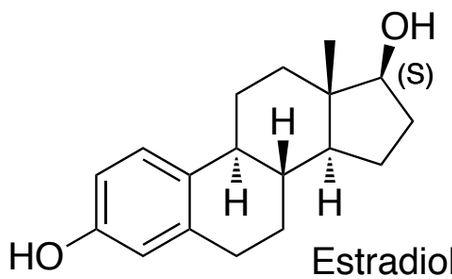
most plants produce complex mixtures of terpenes
especially the pine family and many herbs



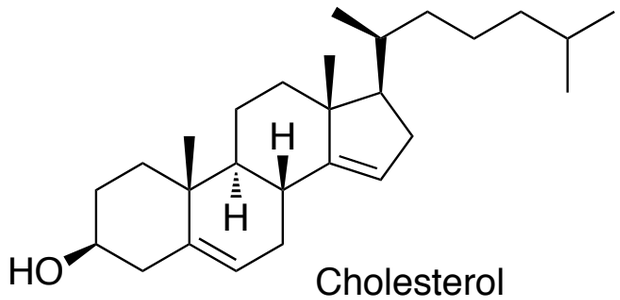
vomitoxin
Fusarium species



Digoxin
Foxglove (*Digitalis lanata*)



Estradiol



Cholesterol

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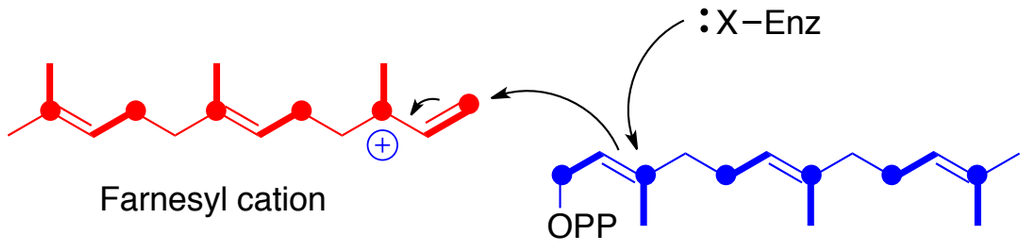
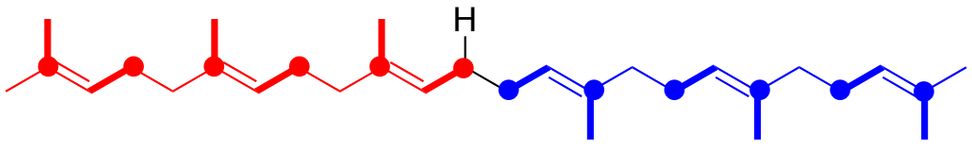
Terpenes

Biosynthesis of C_{30} by squalene synthase **Note head-to-head arrangement.**

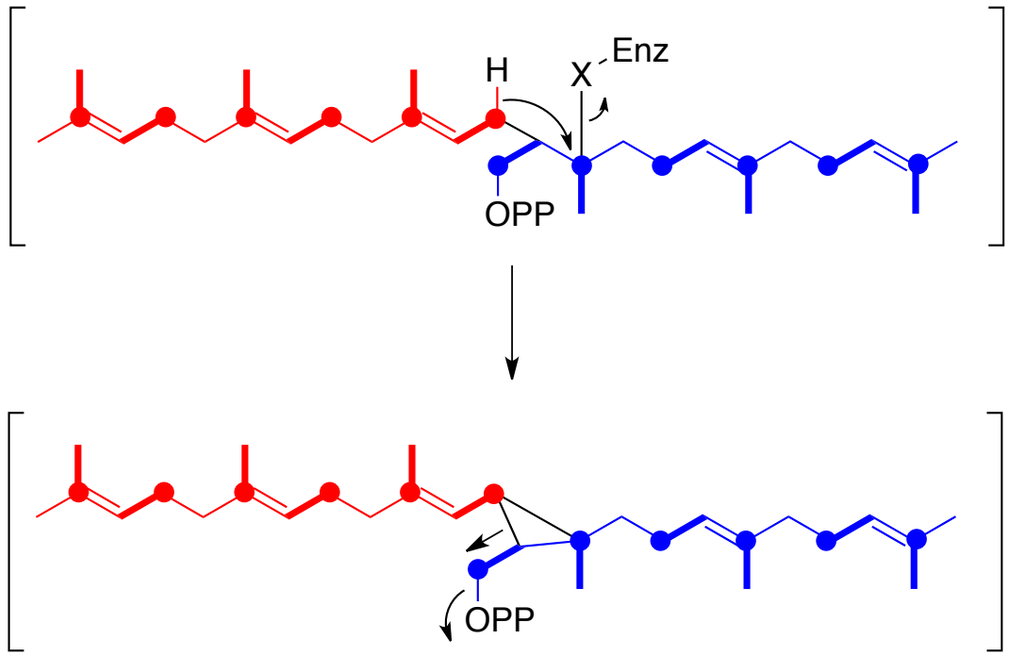


Squalene is produced by all higher organisms. It is particualrly prevalent in shark liver oil and human ear-wax.

It find uses in cosmetics, and medicines - especially as an adjuvant in vaccines used for influenza.

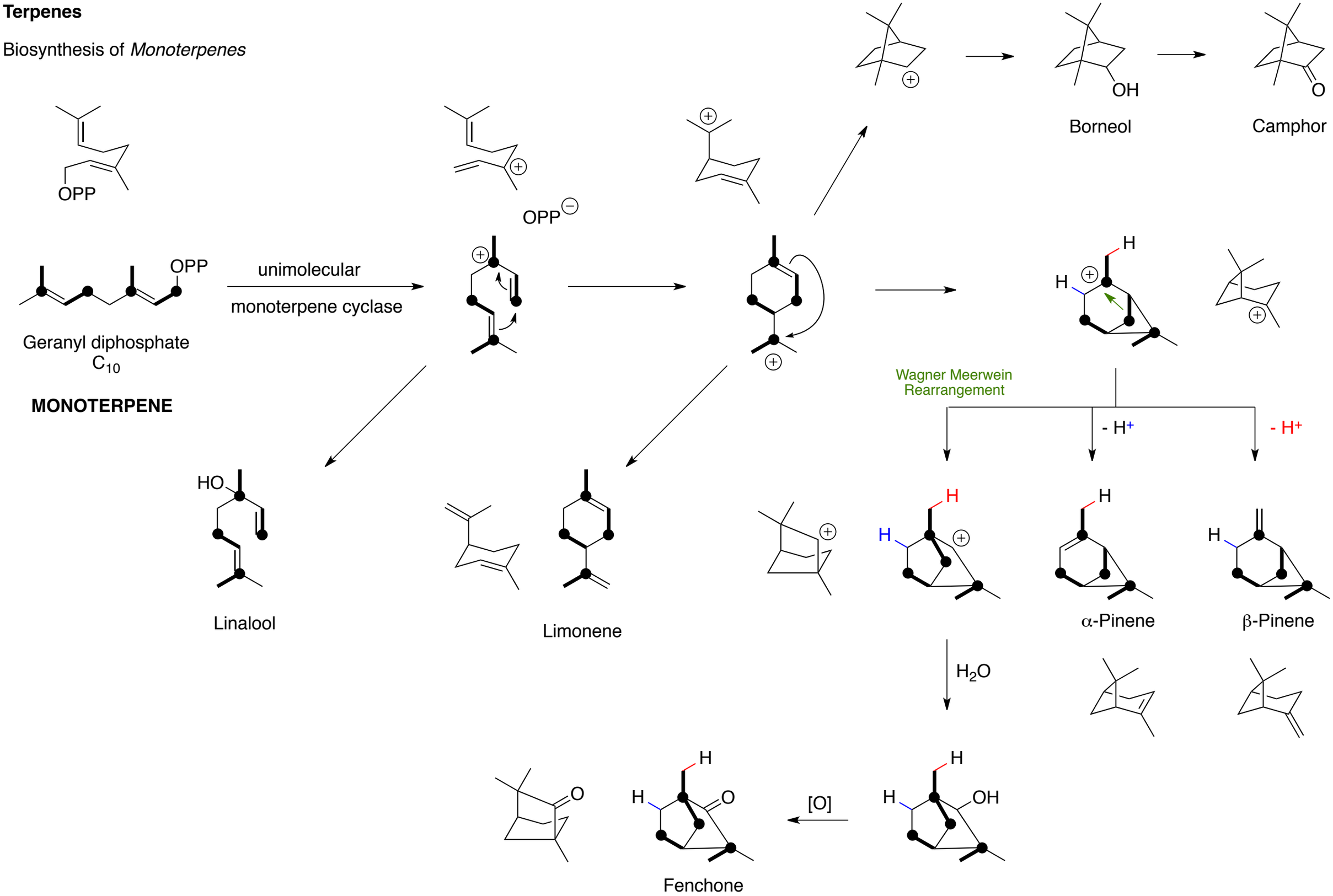


Squalene
C_{30}
TRITERPENE



Terpenes

Biosynthesis of *Monoterpenes*



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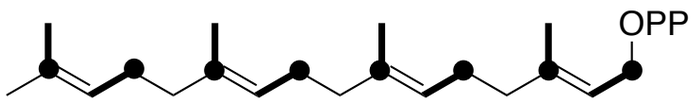
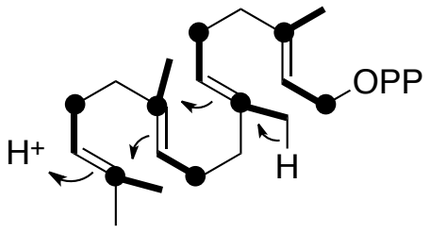
Terpenes

Biosynthesis of *diterpenes*

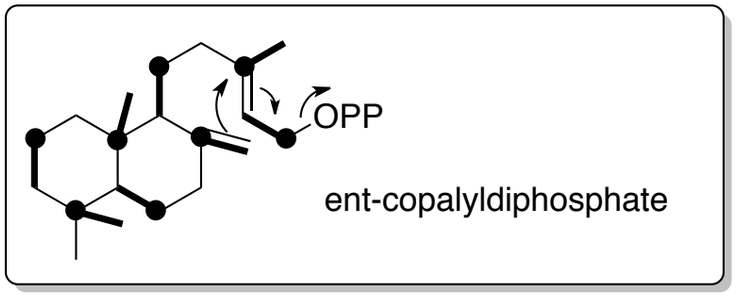


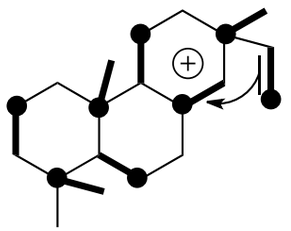
Geranylgeranyl diphosphate
C_{20}

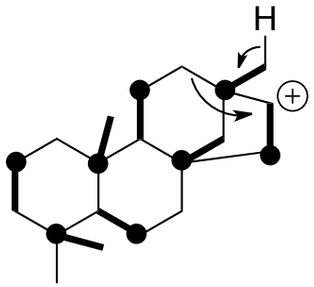
DITERPENE



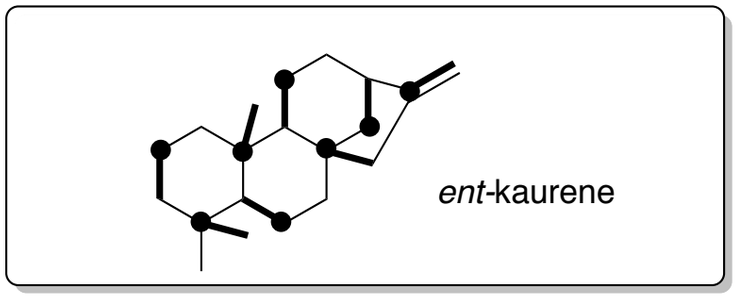
acid catalysed cyclization
(ent-copalyldiphosphate
synthase)



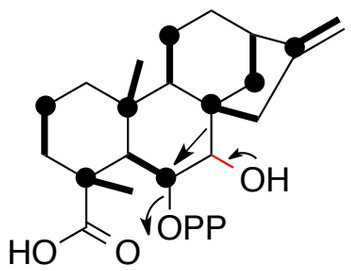




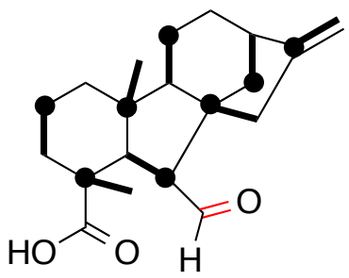
skeletal
rearrangement



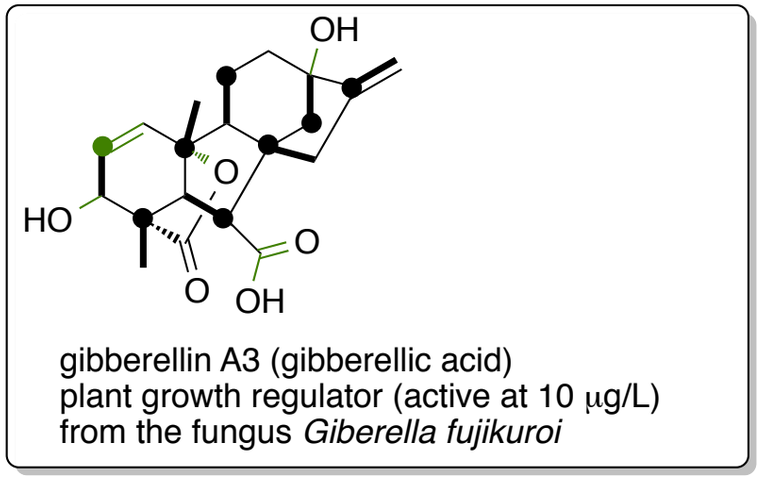
Oxidative steps
(P450)



skeletal
rearrangement



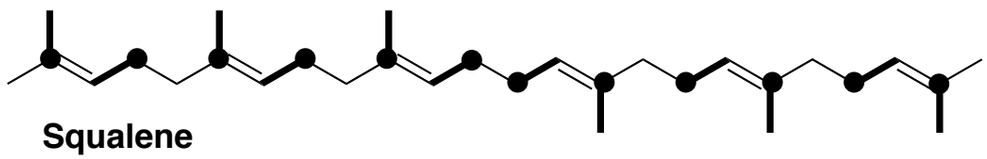
Oxidative steps
(P450)



gibberellin A3 (gibberellic acid)
plant growth regulator (active at 10 μg/L)
from the fungus *Giberella fujikuroi*

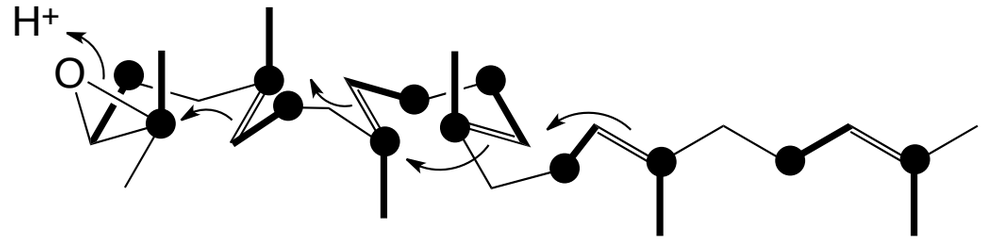
Terpenes

Biosynthesis of *triterpenes*



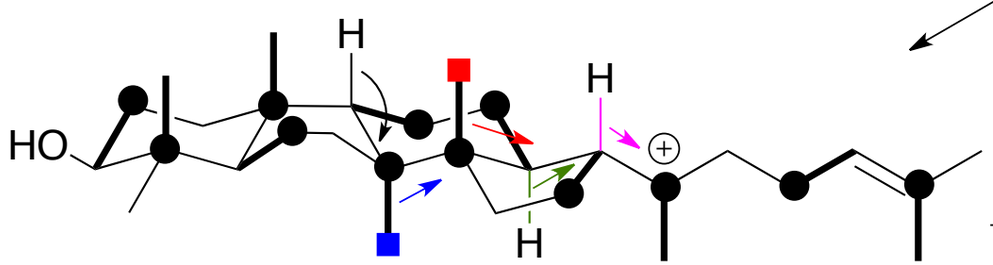
Squalene
C_{30}
TRITERPENE

[O] (P450)



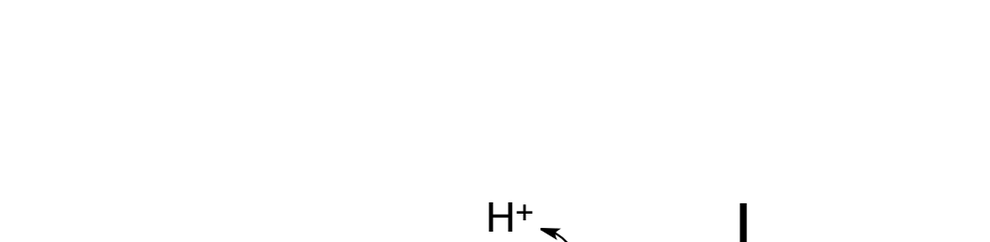
squalene epoxide

acid catalysed
cyclisation to form 4 rings

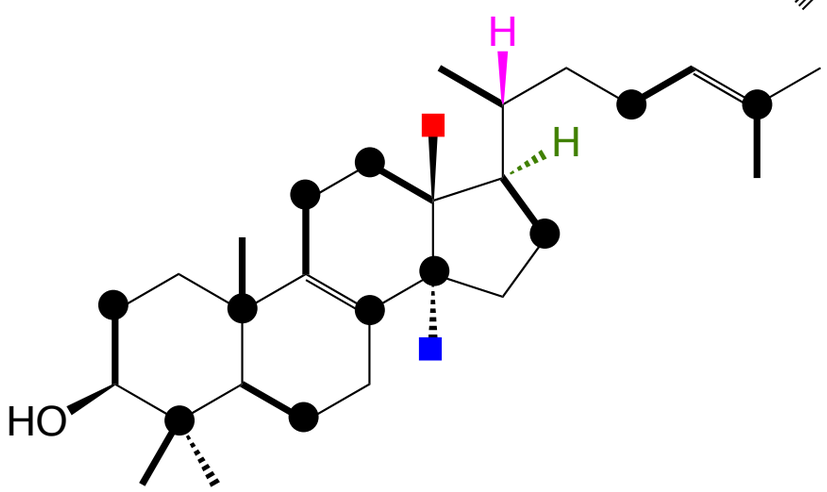


chair-boat-chair conformation

series of 1,2 hydride and
methyl shifts



Lanosterol

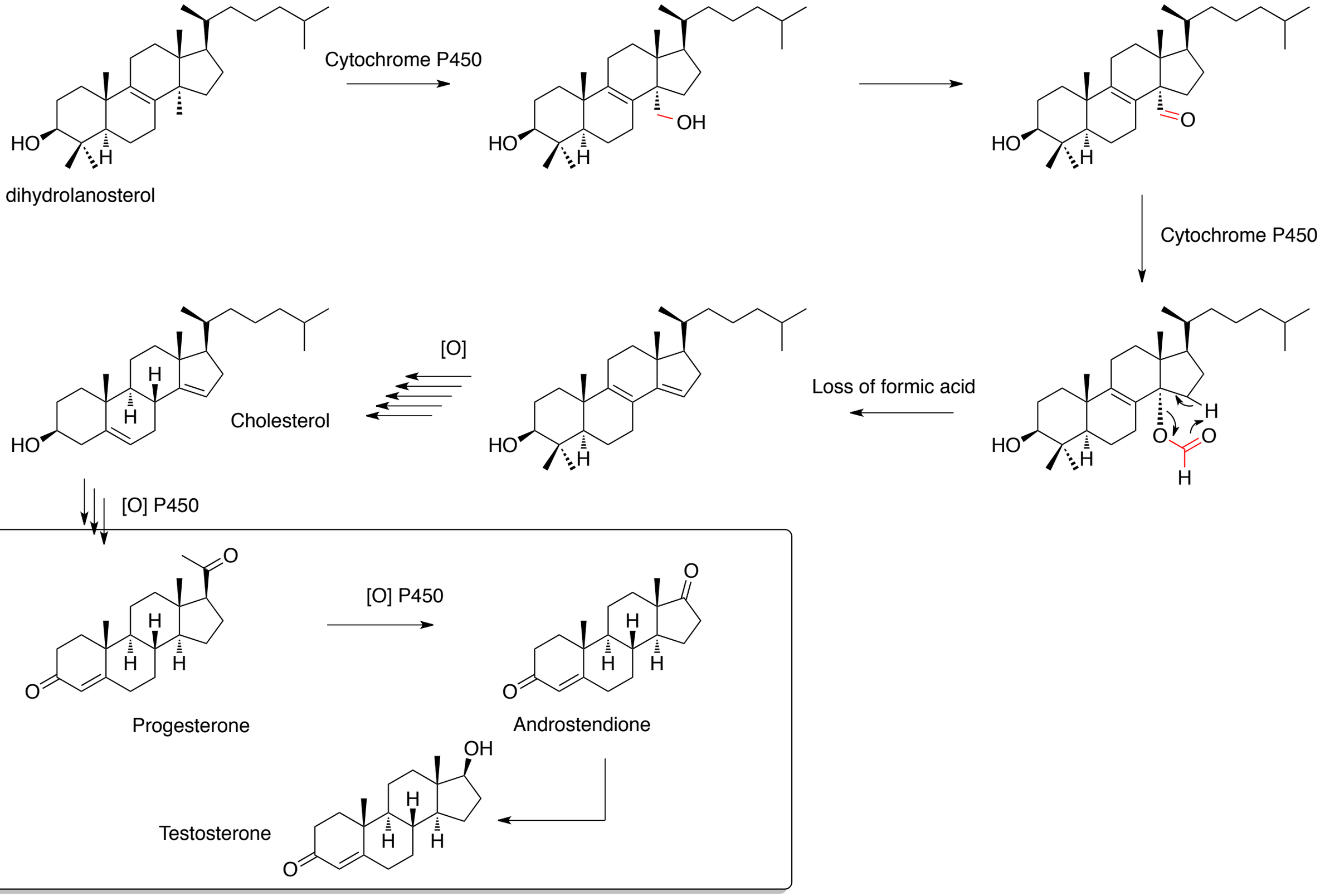


Lanosterol is the first sterol intermediate
it is the precursor of sterols such as
cholesterol, progesterone, testosterone
and bile acids in humans.

See "Chemical Aspects of Biosynthesis" by J. Mann
Chapter 4,

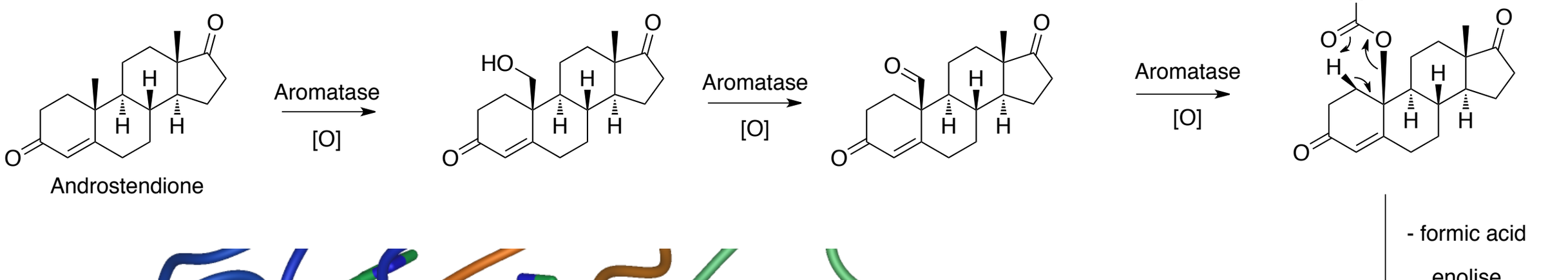
Terpenes

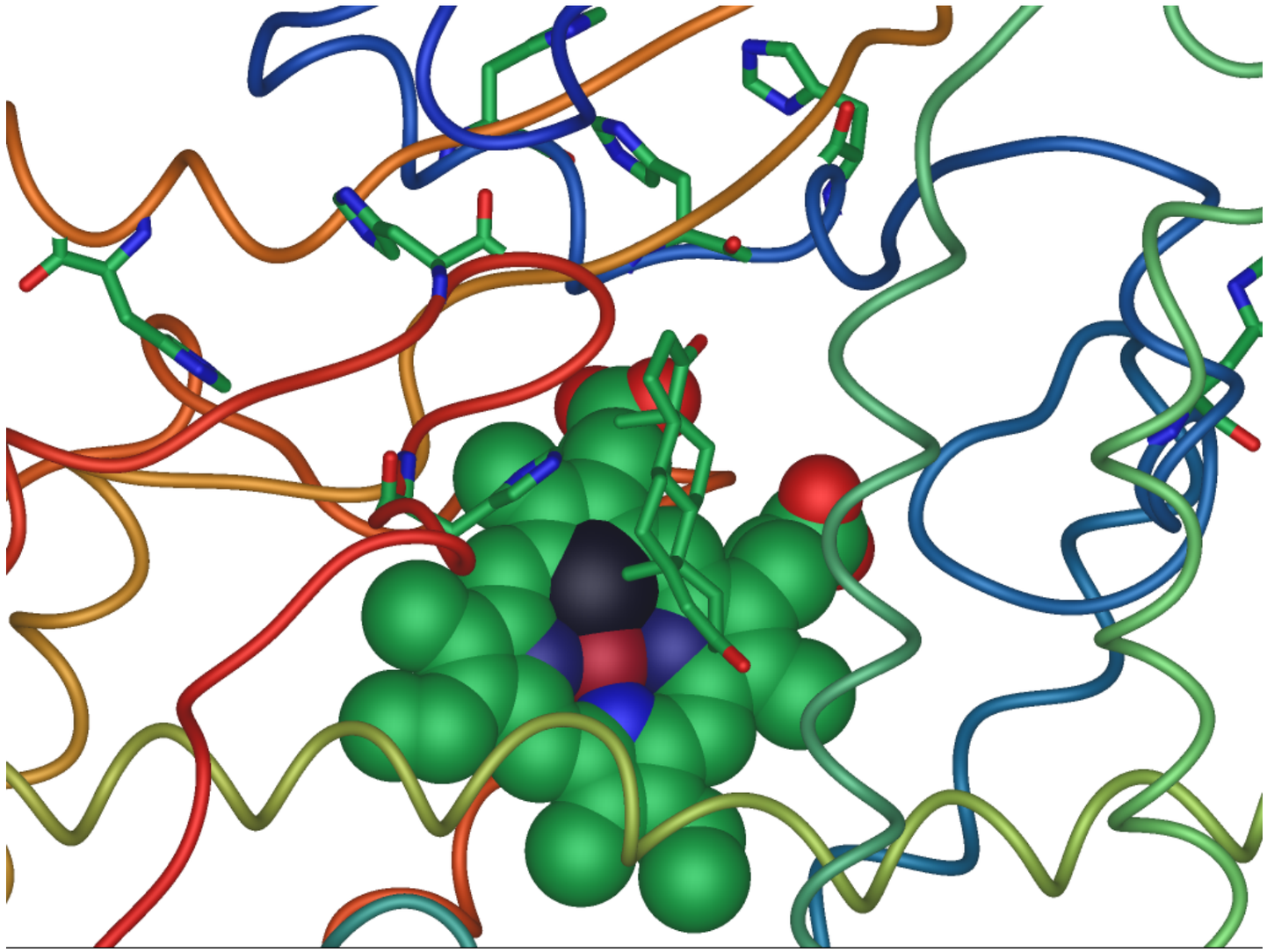
Oxidative Demethylation



Terpenes

Human Aromatase





See D. Ghosh, J. Griswold, M. Erman & W. Pangborn, *Nature*, 2009, **457**, 219.

Androstendione bound in the active site of human aromatase