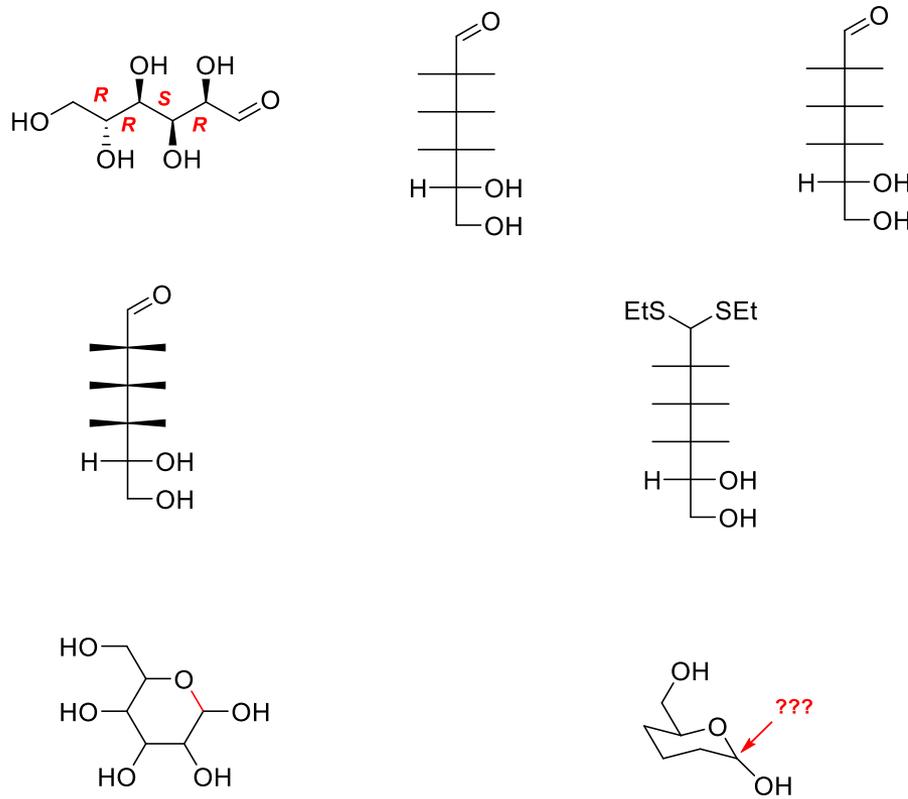
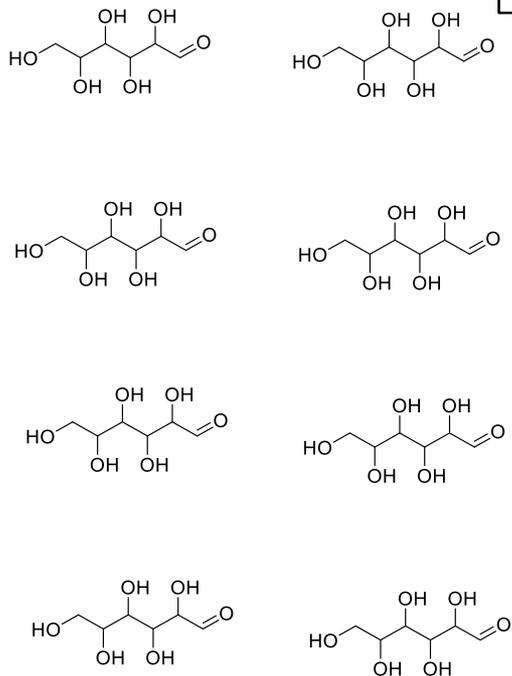
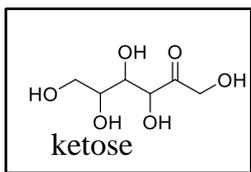


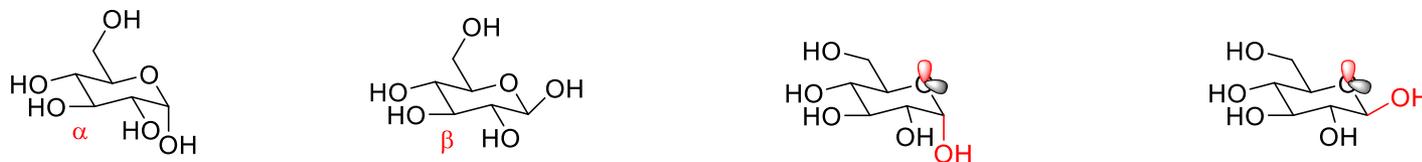
# How to convert the zig-zag to Fischer cross ???



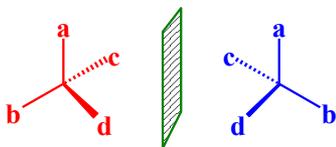
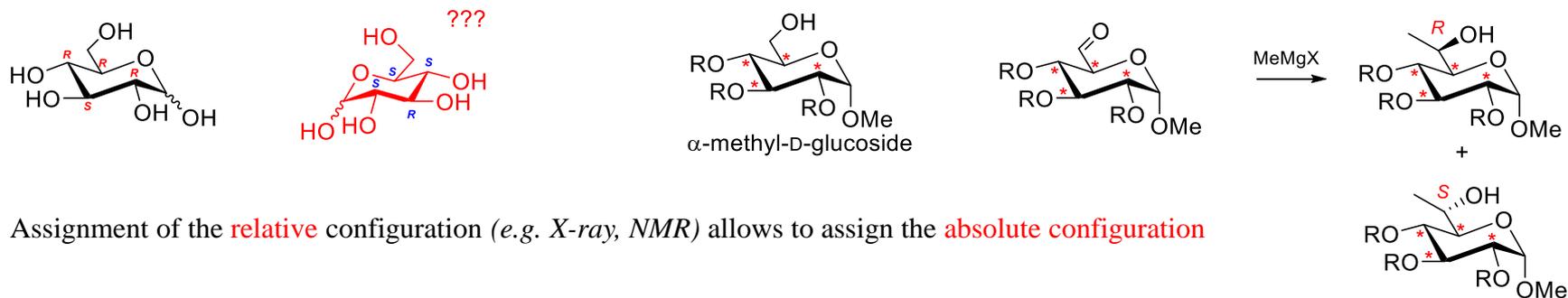
## hexoses



## Anomeric effect - pyranoses



## Cyclohexane



In 1874 van't Hoff and Le Bell concluded, that models **A** and **B** are not superposable;  
 one turns the plane of polarized light to the left while the opposite to the right by the same value.

**There are only two reliable methods for the determination of the absolute configuration**

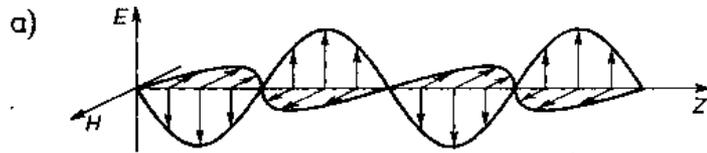
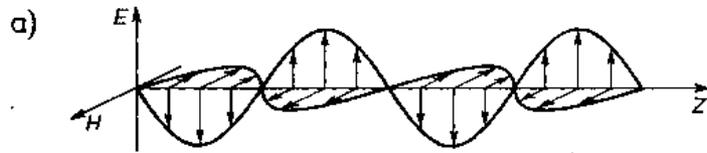
1. Quantum mechanics calculations; 2. The X-ray measurements

# Determination of the ABSOLUTE configuration by X-ray

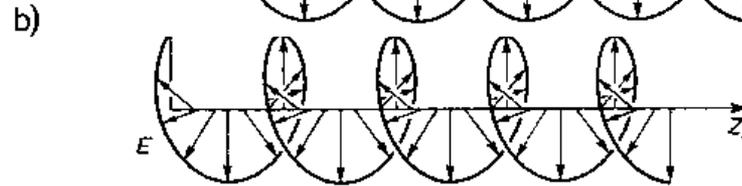
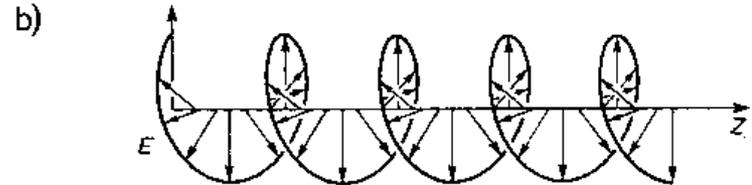
Diffraction of the X-ray on the *light* nuclei (H, C) provides a picture which is **dependent ONLY on the location**

Nuclei of the heavy atoms absorb the X-ray in certain domain of the absorption curve. When  $\lambda$  is equal to absorption threshold of the heavy atom we can observe so-called anomalous absorption

## Quantum mechanics calculations



a. Światło płasko spolaryzowane



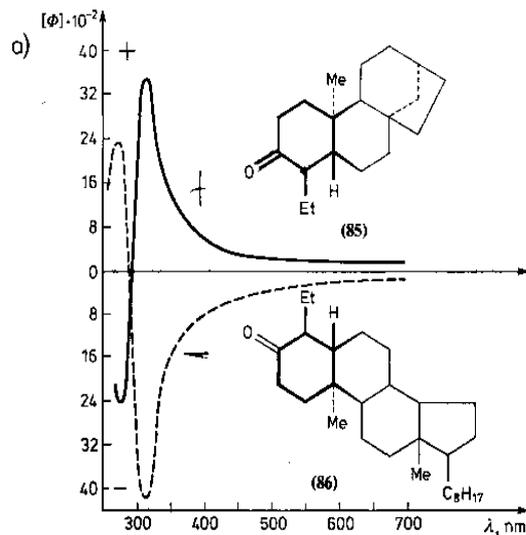
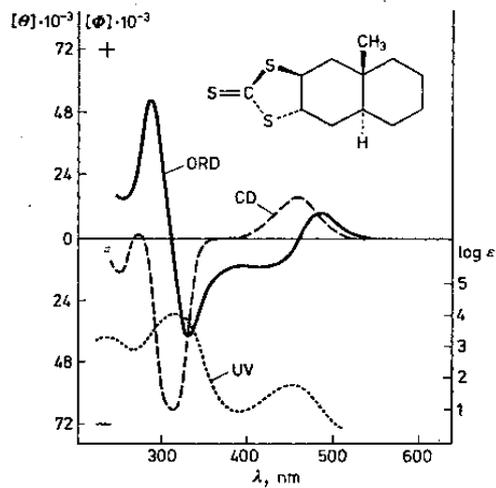
b. Światło kołowo spolaryzowane w prawo

Zróżnicowane opóźnienie lewo- i prawoskrętnie spolaryzowanego światła wytwarza **dwójłomność kołową**

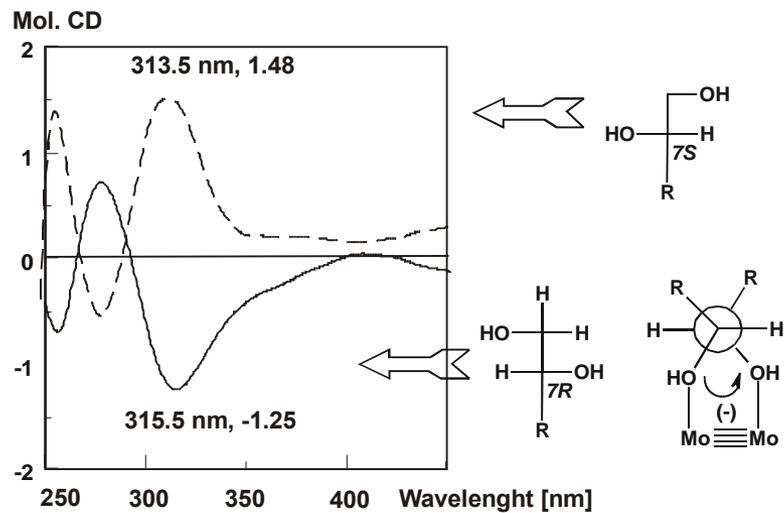
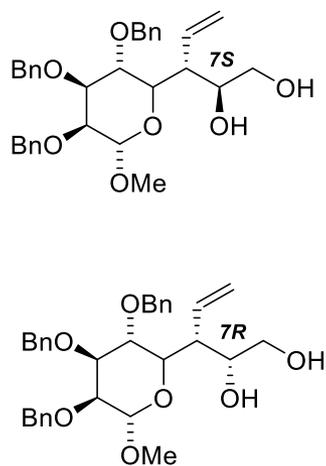
$[\alpha] = \pi/\lambda (n_M - n_P)$ .  $n$  wsp. refrakcji      Zróżnicowana absorpcja prowadzi do **dichroizmu kołowego**

$\varphi = \pi/\lambda (k_M - k_P)$        $k$  wsp. absorpcji światła kołowo spolaryzowanego

Skręcalność właściwa       $[\alpha]_\lambda = 100 \alpha / l c$

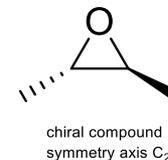


CD is not sensitive on the configuration of the stereogenic centers distant from chromophore



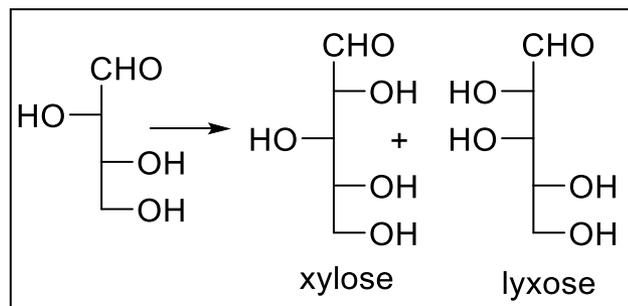
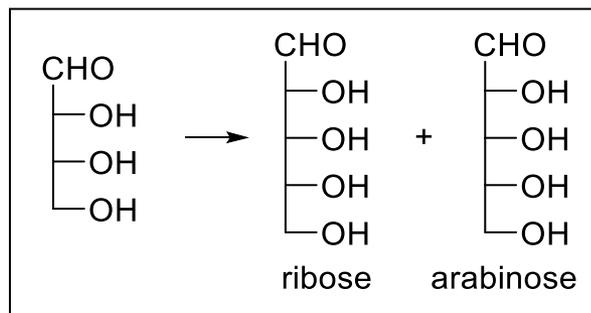
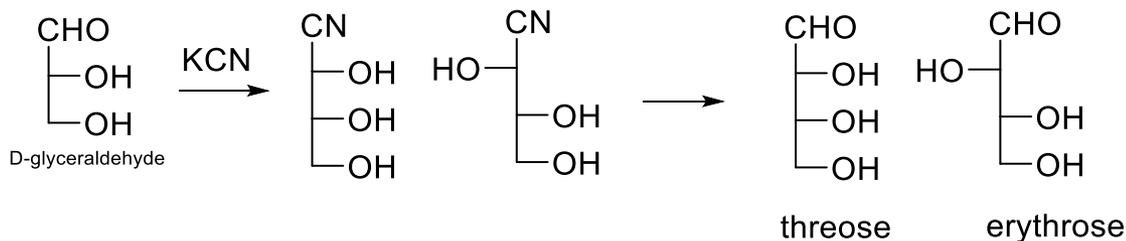
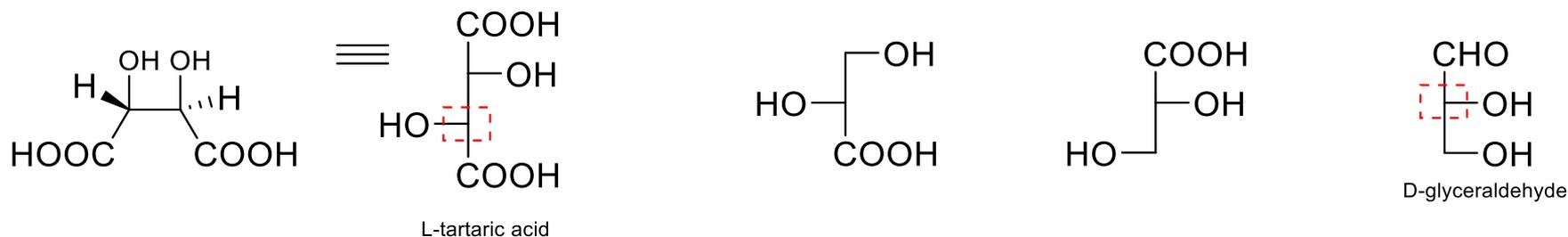
## Assignment of the absolute configuration. Quantum mechanic calculation

In 1934 W. Kuhn succeeded to correlate polarization of the bond with specific rotation  
Due to the very low sophistication of calculation methods, the first data which correlated the optical rotation with the configuration of *trans*-2,3-epoxybutane were published in 1952.

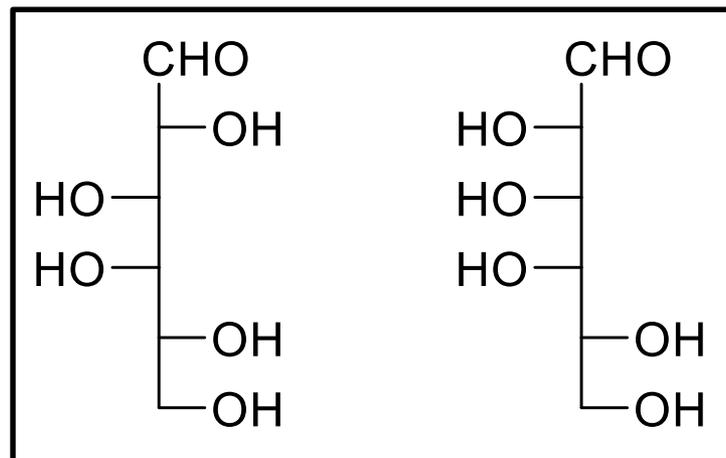
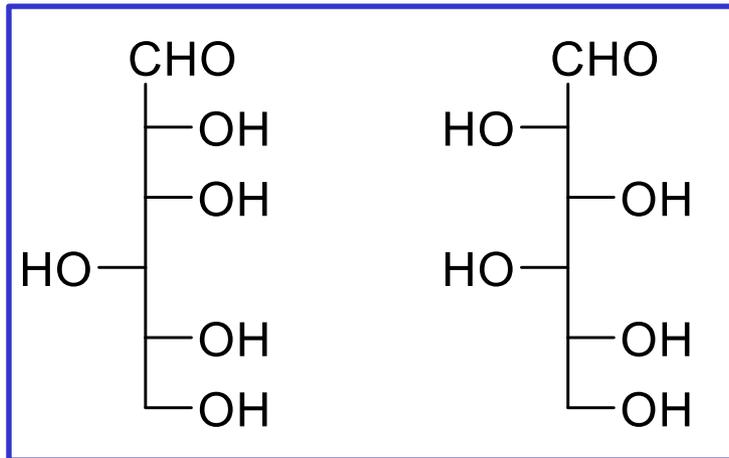
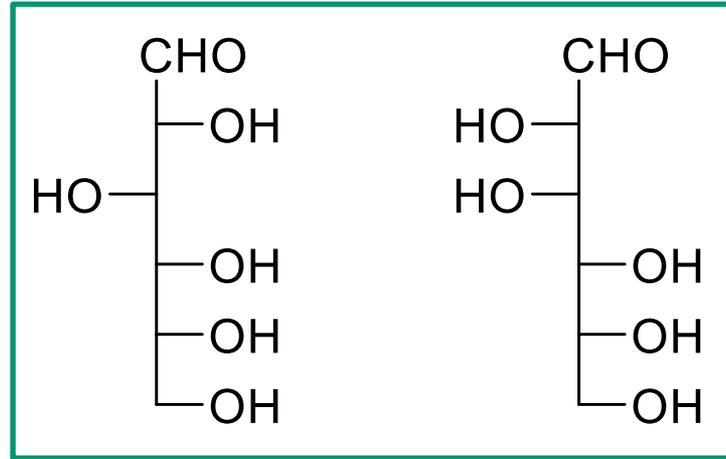
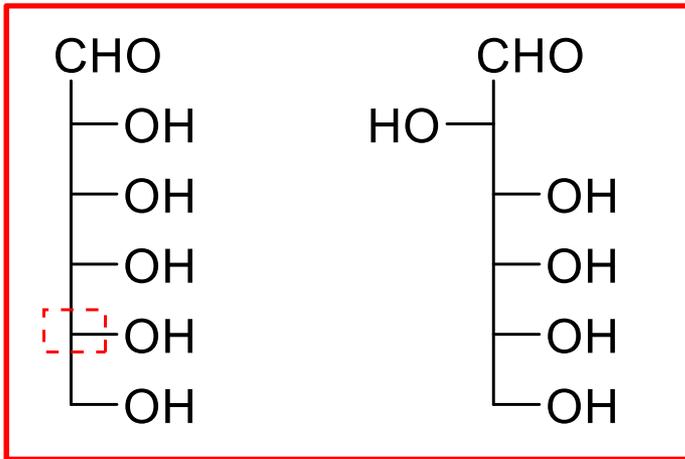


the absolute configuration  
was assigned  
based on the calculations

This compound can be correlated with tartaric acid and, hence, with **glyceraldehyde**



# Ribose, Arabinose, Xylose, Lyxose



**Allose** **Altrose** **Glucose** **Mannose** **Gulose** **Idose** **Galactose** **Talose**

**All** **Alt**ruists **Gl**adly **Ma**nnose **Gum** **I**n **Gal**actose **Tal**ose

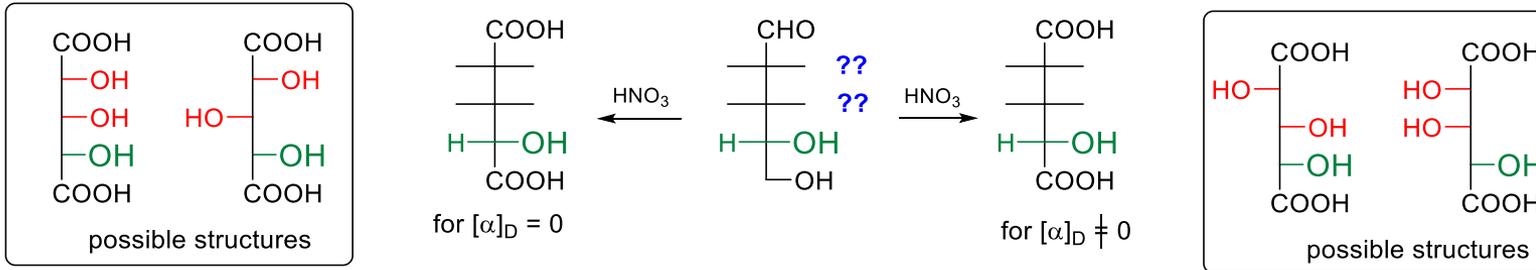
# How the configuration of ALL sugars was determined ??

**PROOF: Emil Fischer 1891 !!!! Nobel Prize 1902**

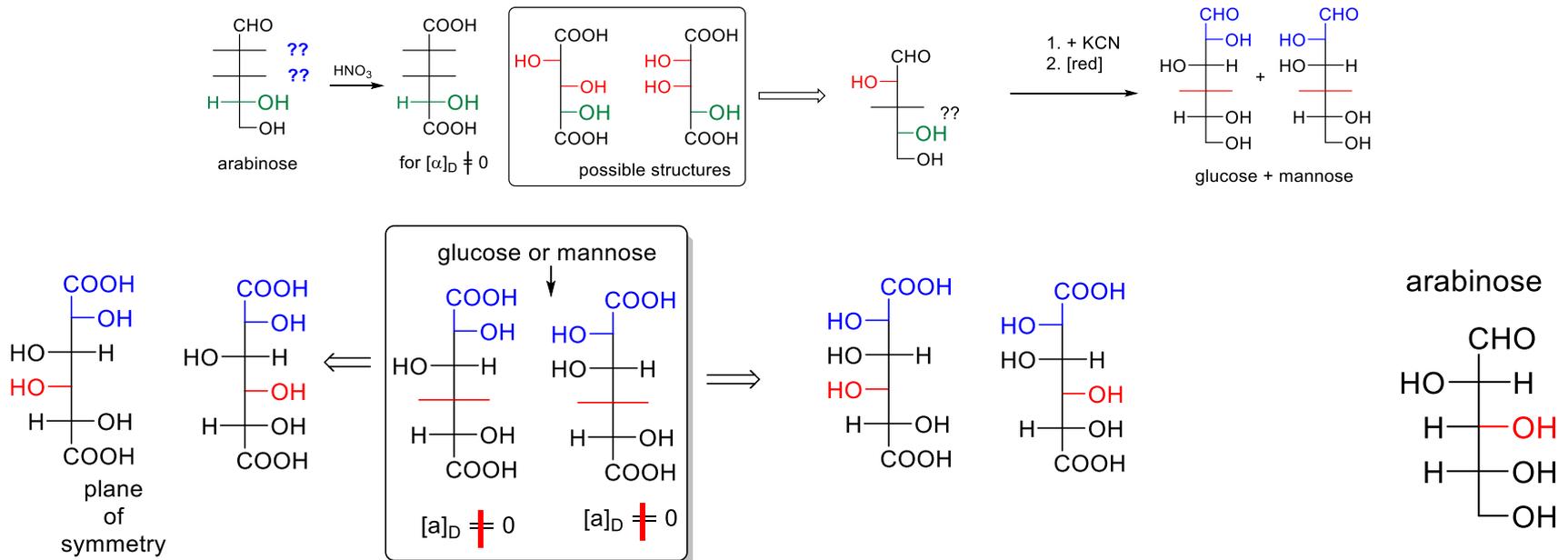
Sugars are optically active; ( $[\alpha]_D$  different than 0

Fischer **arbitrarily** postulated, that – if at the last **chiral** center the OH group is directed to the right – this compound has the **D** configuration (specific rotation dextrarotatory)

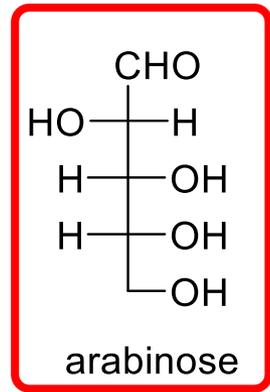
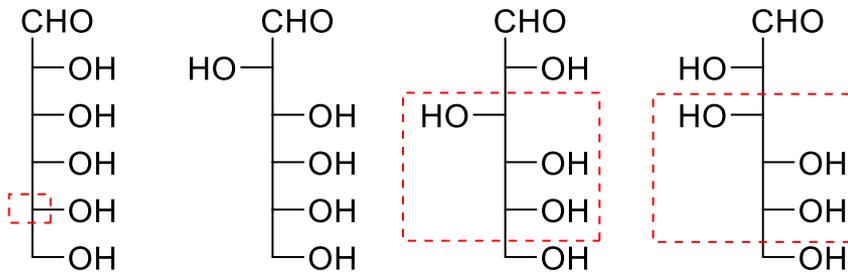
The structure was verified by X-ray in 1952



## What is the configuration of arabinose???

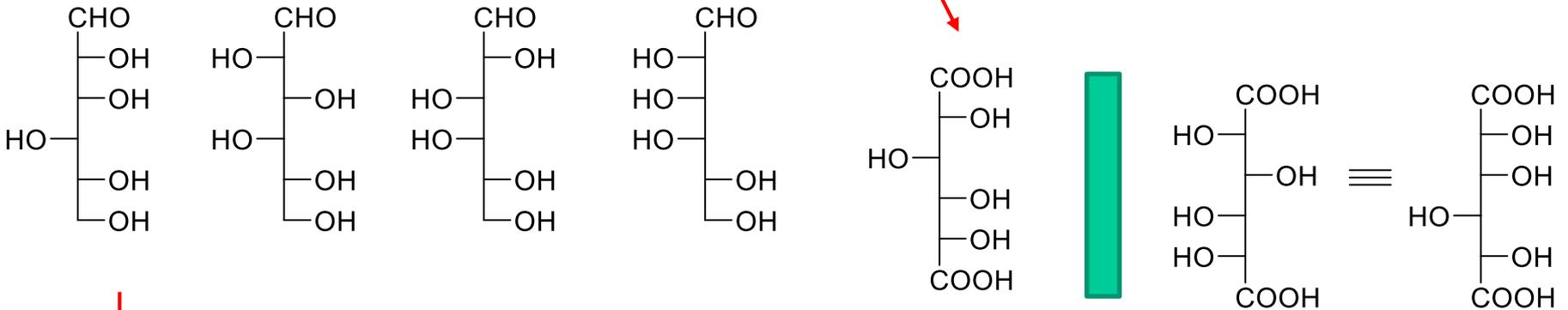


# What is the structure of glucose and mannose ??



**oxidation of glucose**

**Identical with oxidation of ent-gulose**



**All Altruists Gladly Mannose Gum In Galactose Talose**