

Fotosintesi

Fasi alla luce

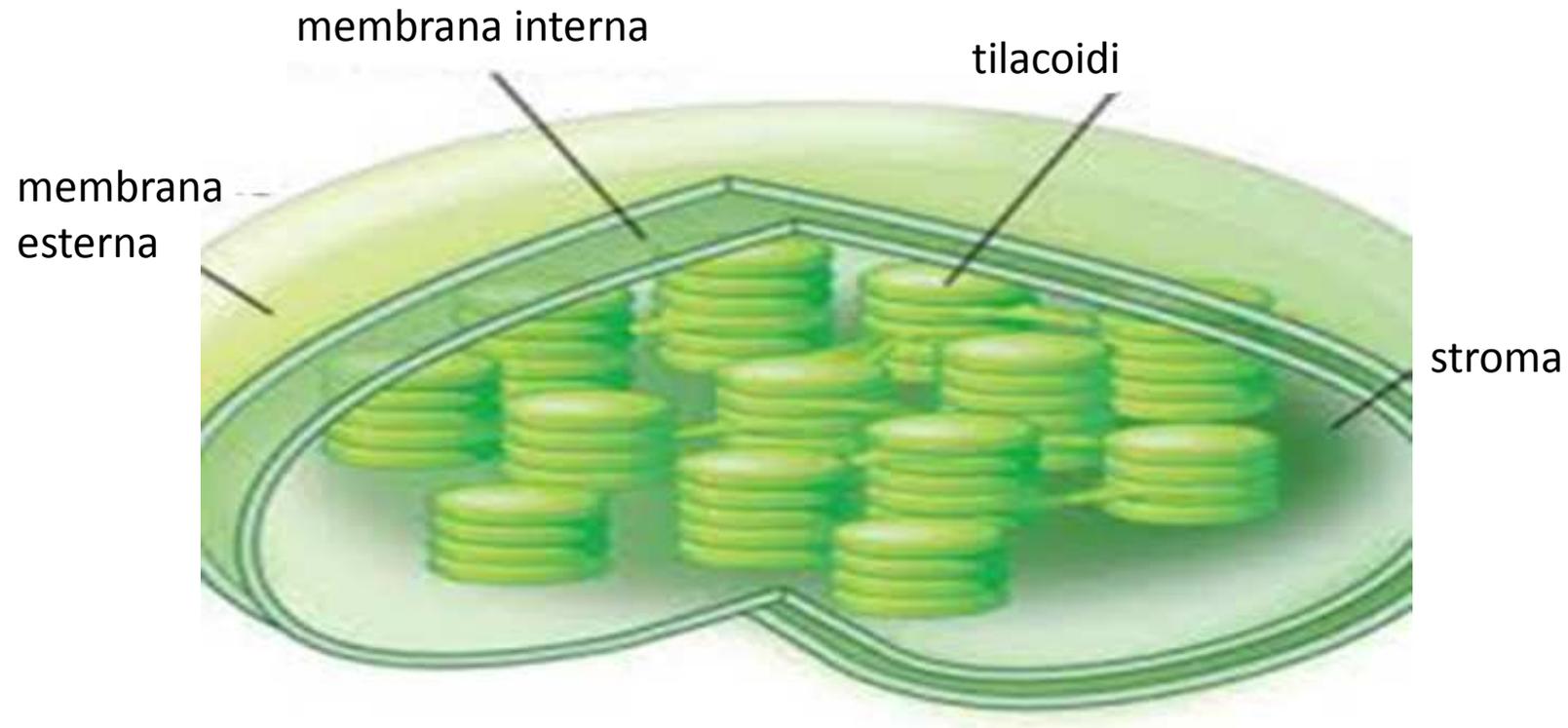
Il processo



accettore artificiale: diclorofenolindofenolo (Hill, 1937)

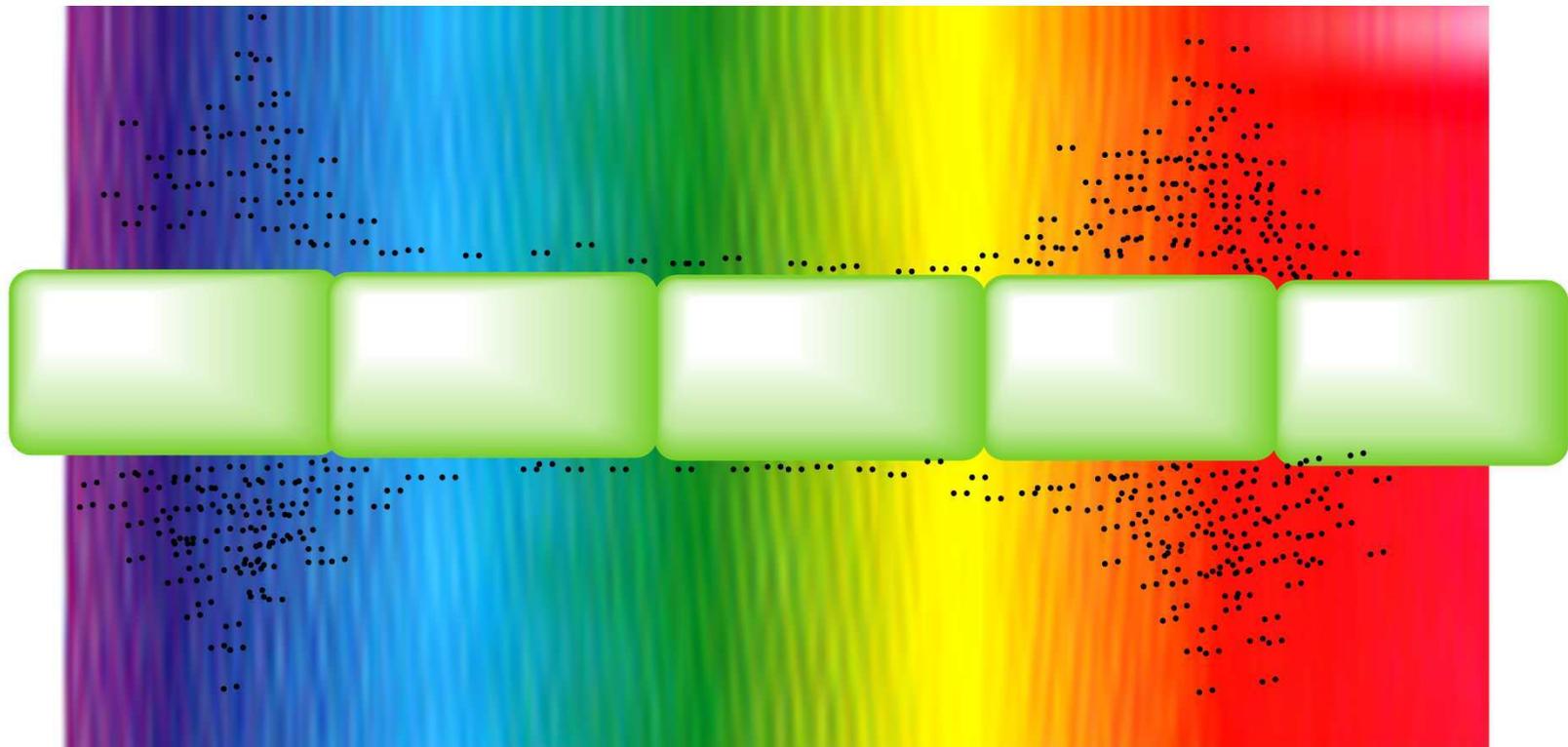
accettore fisiologico: NADP+ (Ochoa, 1951)

Sede del processo: il cloroplasto



oppure: batteri rossi e solfobatteri

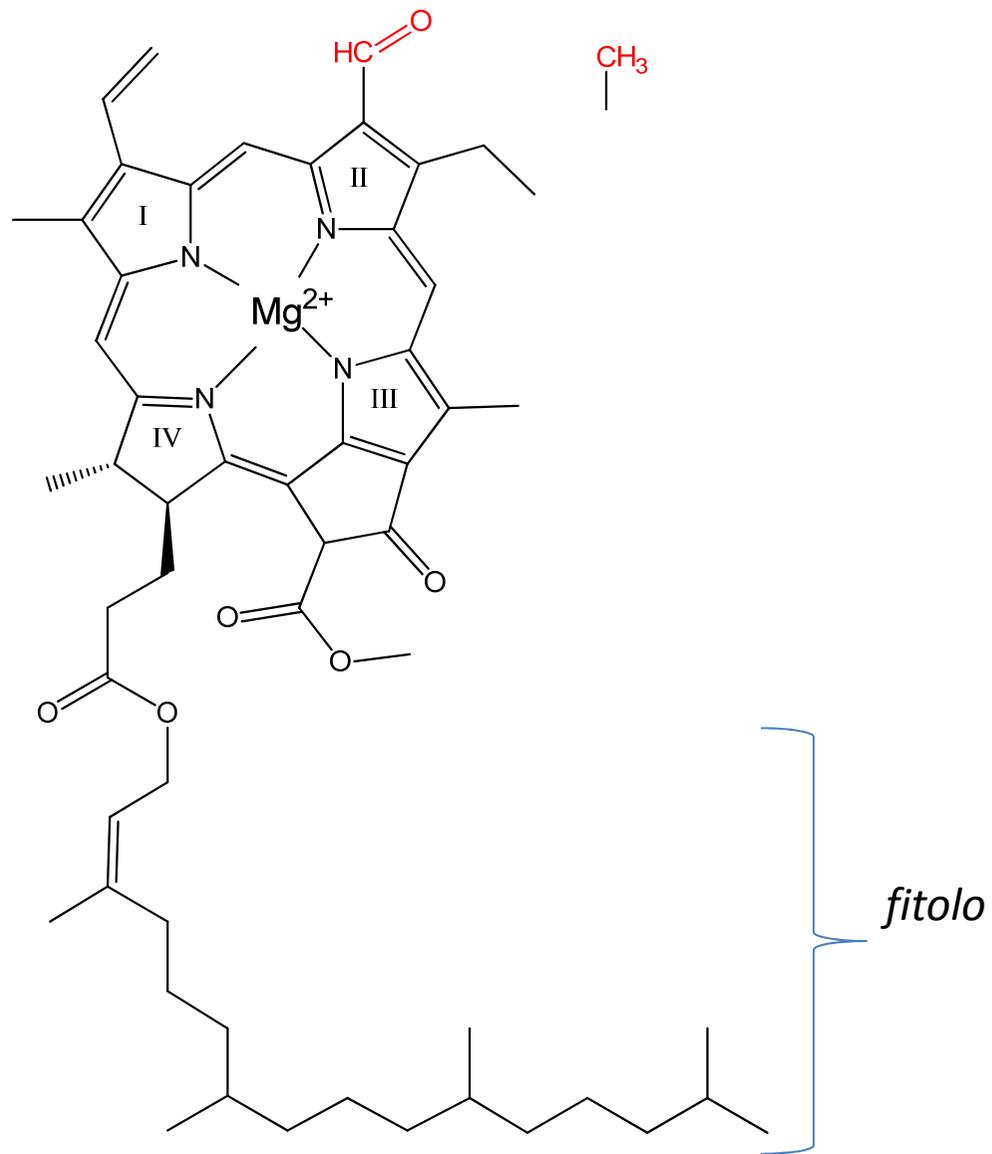
Eigenmann (1882)



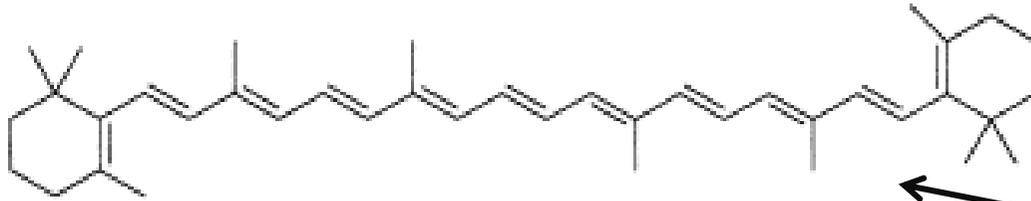
La clorofilla

Clorofilla b

Clorofilla a



Pigmenti secondari o pigmenti antenna

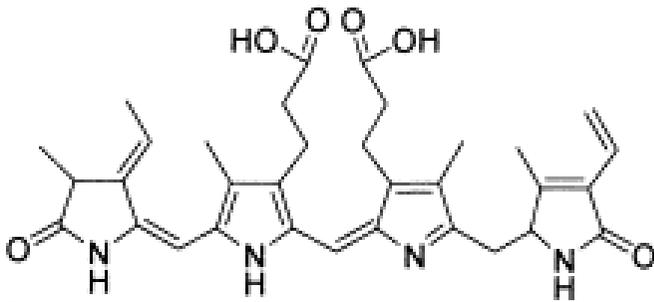


beta carotene

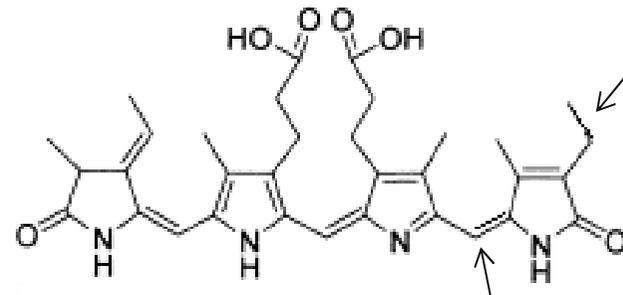
Piante



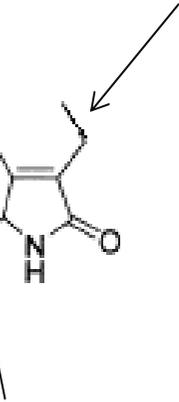
*Cianobatteri e
alghe*



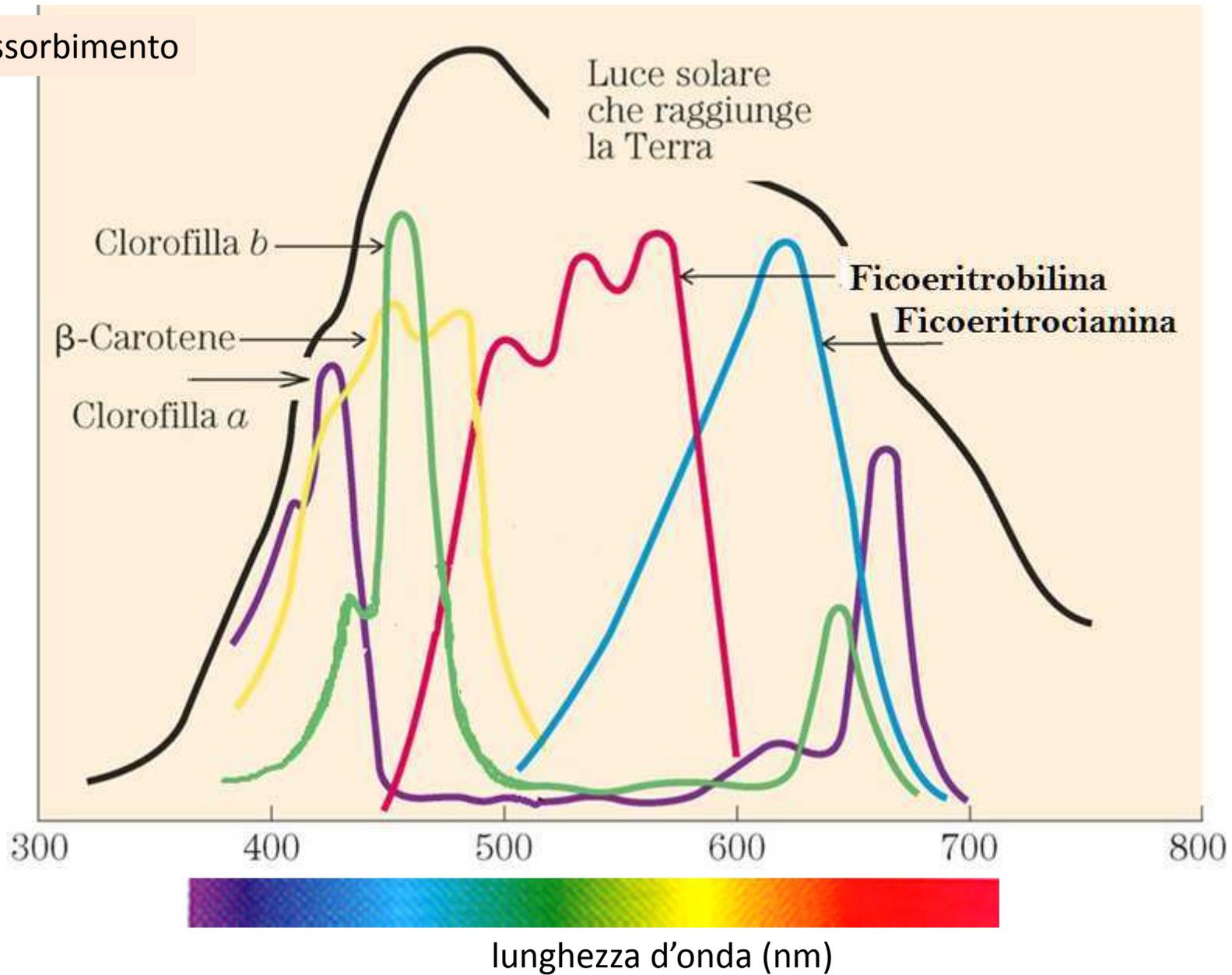
Ficoeritrobilina



Ficocianobilina



Assorbimento



Absorbed color	Complementary color
red	blue-green
orange	greenish blue
yellow-green	purple
green	red-purple
bluish green	red
greenish blue	orange
blue	yellow
violet	yellow-green



Esperimenti di sbiancamento

= temporanea incapacità di assorbire la luce

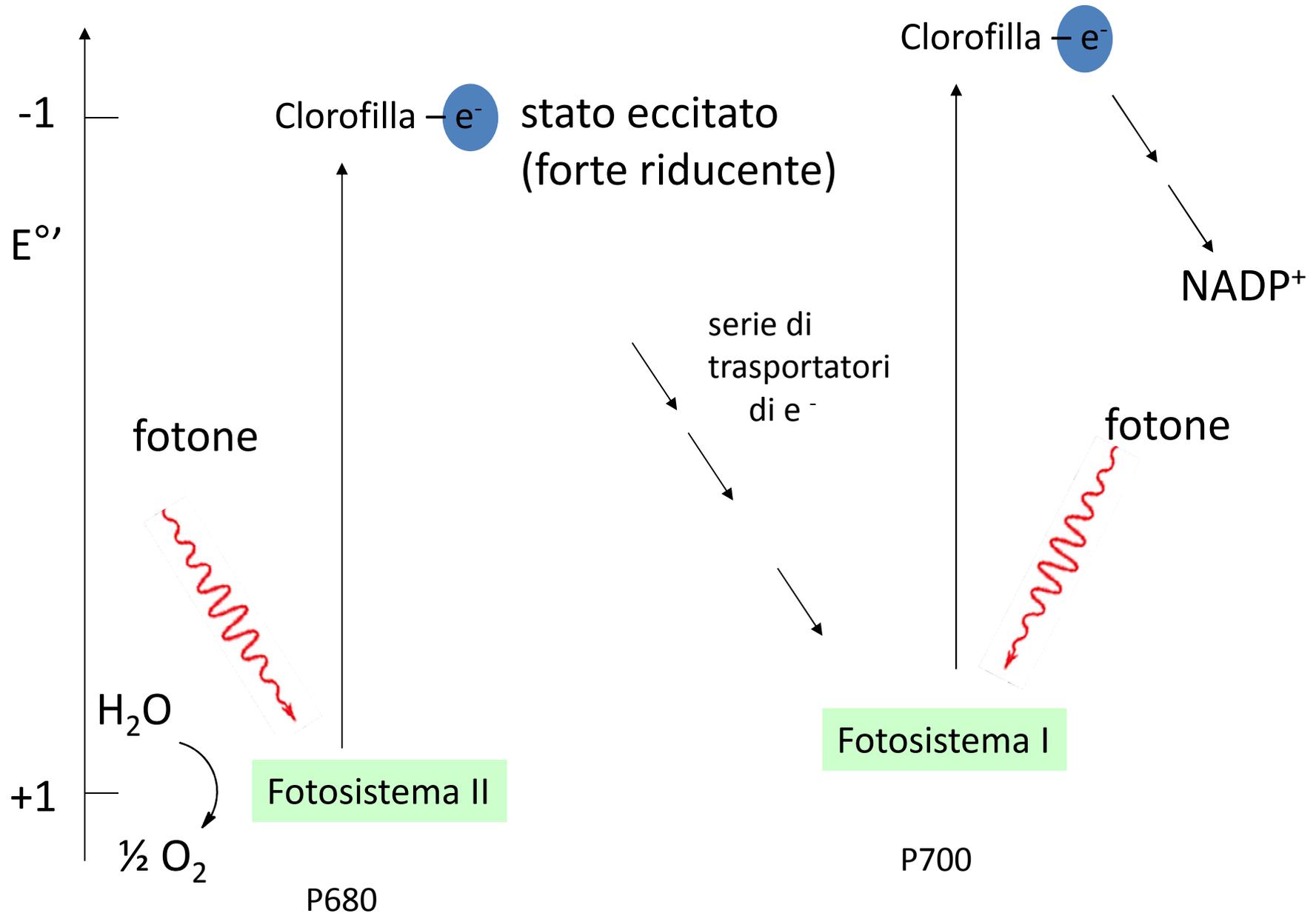
1952 Dysens

irradiazione a 870 nm di batteri rossi = P870

Kok e Witt su cloroplasti

680 e 700 nm su cloroplasti

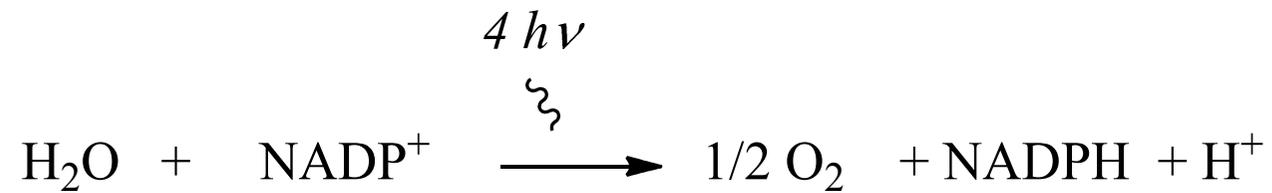
Fase luminosa delle fotosintesi (schematico)



Reazione complessiva

2 fotoni ($h\nu$) per portare un elettrone sul NADP⁺

Pertanto:



$$\Delta G^{\circ'} = 230 \text{ kJ/mol}$$

energia di 1 mole di fotoni = 300 kJ (violetto) - 170 (rosso)

Aspetti generali del processo (Alghe, cianobatteri e piante)

I 2 centri di reazione sono entro 2 complessi fotosistemi che lavorano in tandem

In ogni fotosistema una coppia di clorofille (*coppia speciale*) si ionizza;

L'elettrone passa ad un serie di trasportatori che fanno parte del fotosistema stesso

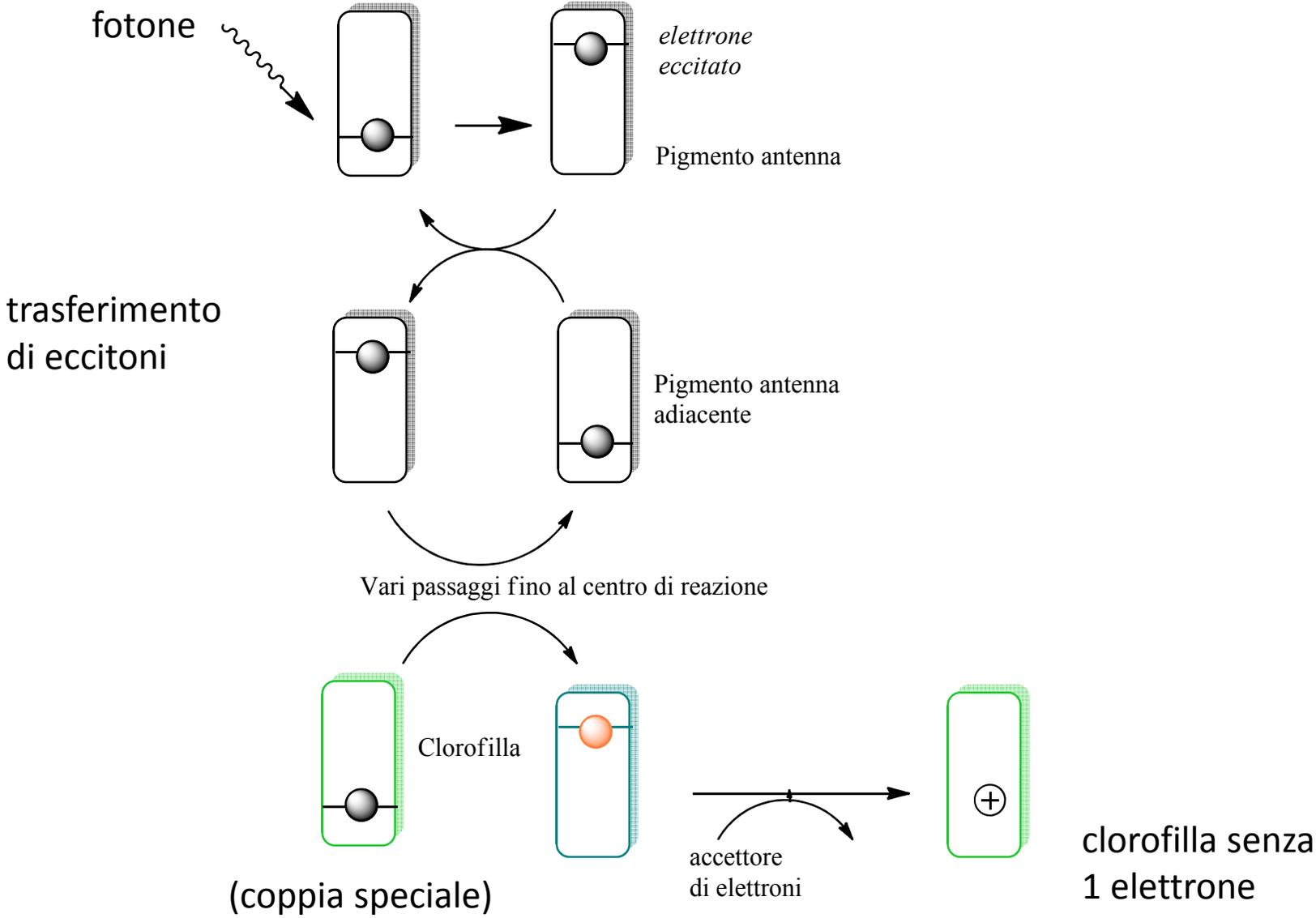
Trasportatori mobili di e^- trasferiscono e^- dal fotosistema II al fotosistema I

Gli elettroni persi dai fotosistemi vengono donati dall'acqua

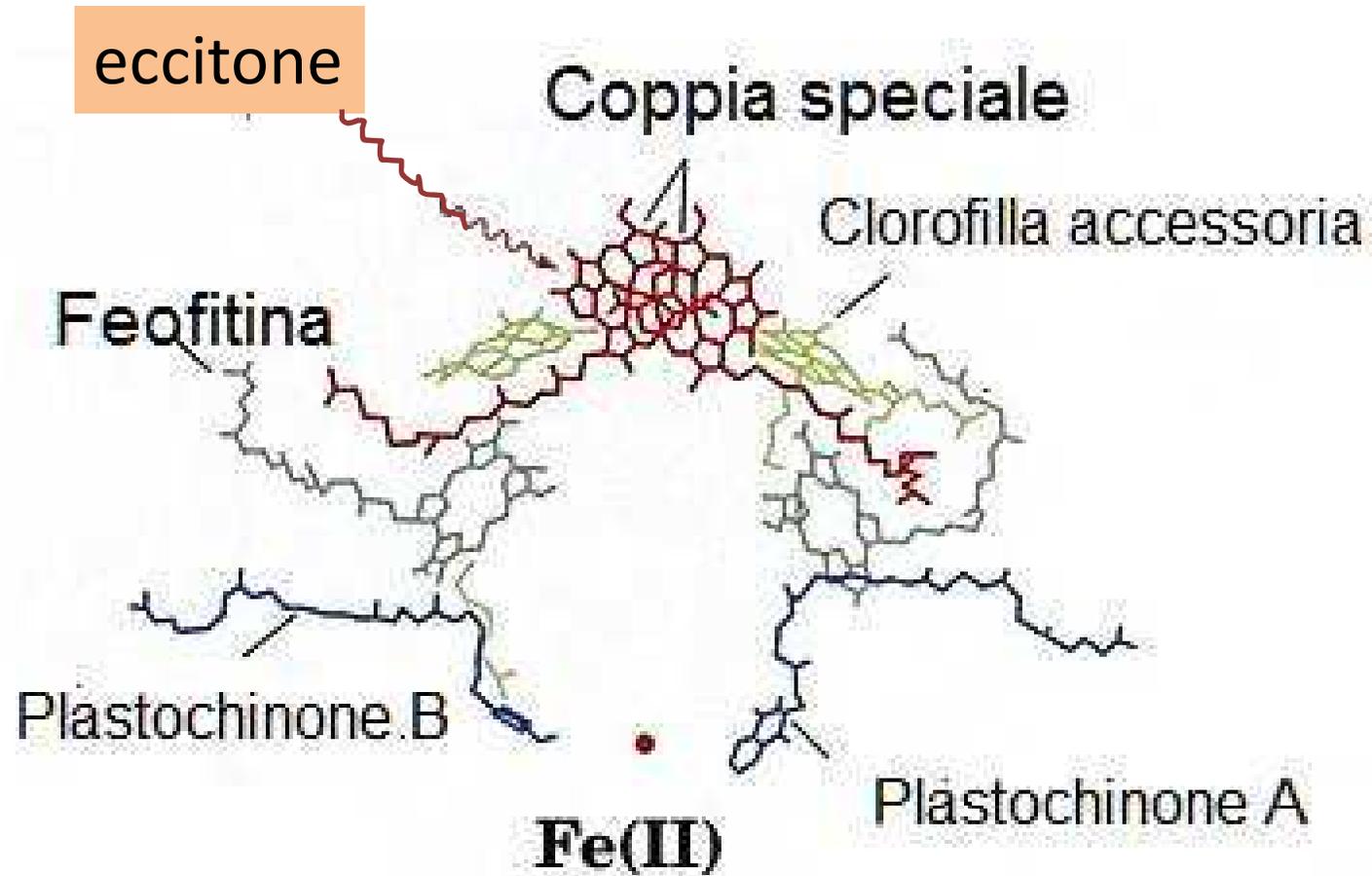
Fotosistema II (P680) da cianobatteri

- 2 monomeri ognuno composto da:
 - 16 proteine integrali
 - 36 clorofille a
 - 8 beta-carotene
 - 1 WOC (*water oxidizing complex*) anche noto come OEC, *oxygen evolving complex*
 - 1 eme c e 1 eme b
 - 2 plastochinoni
 - 2 feofitine
 - 1 Fe non eme

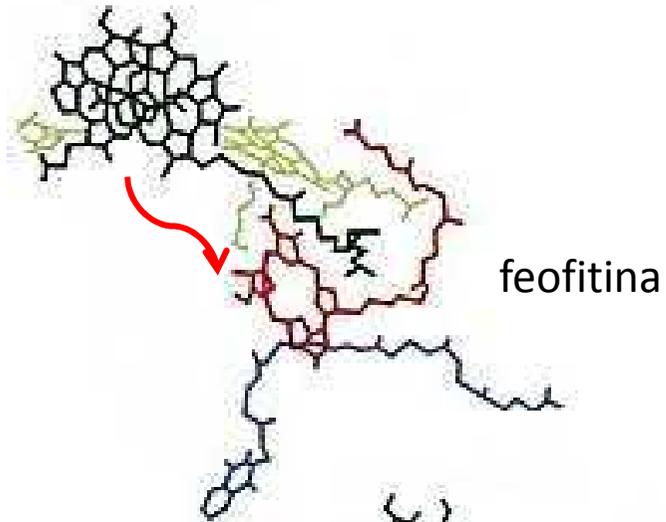
Trasferimento di energia nel fotosistema



Fotosistema I: la coppia speciale

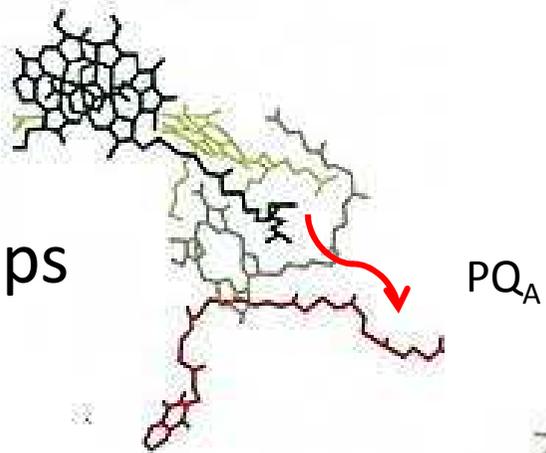


3 ps



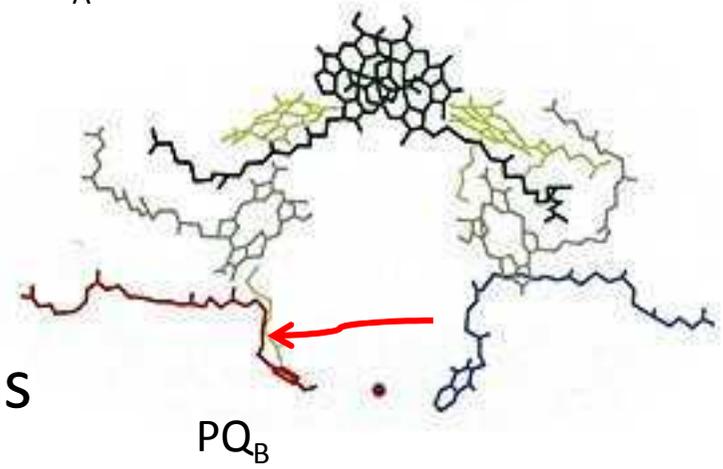
feofitina

200 ps



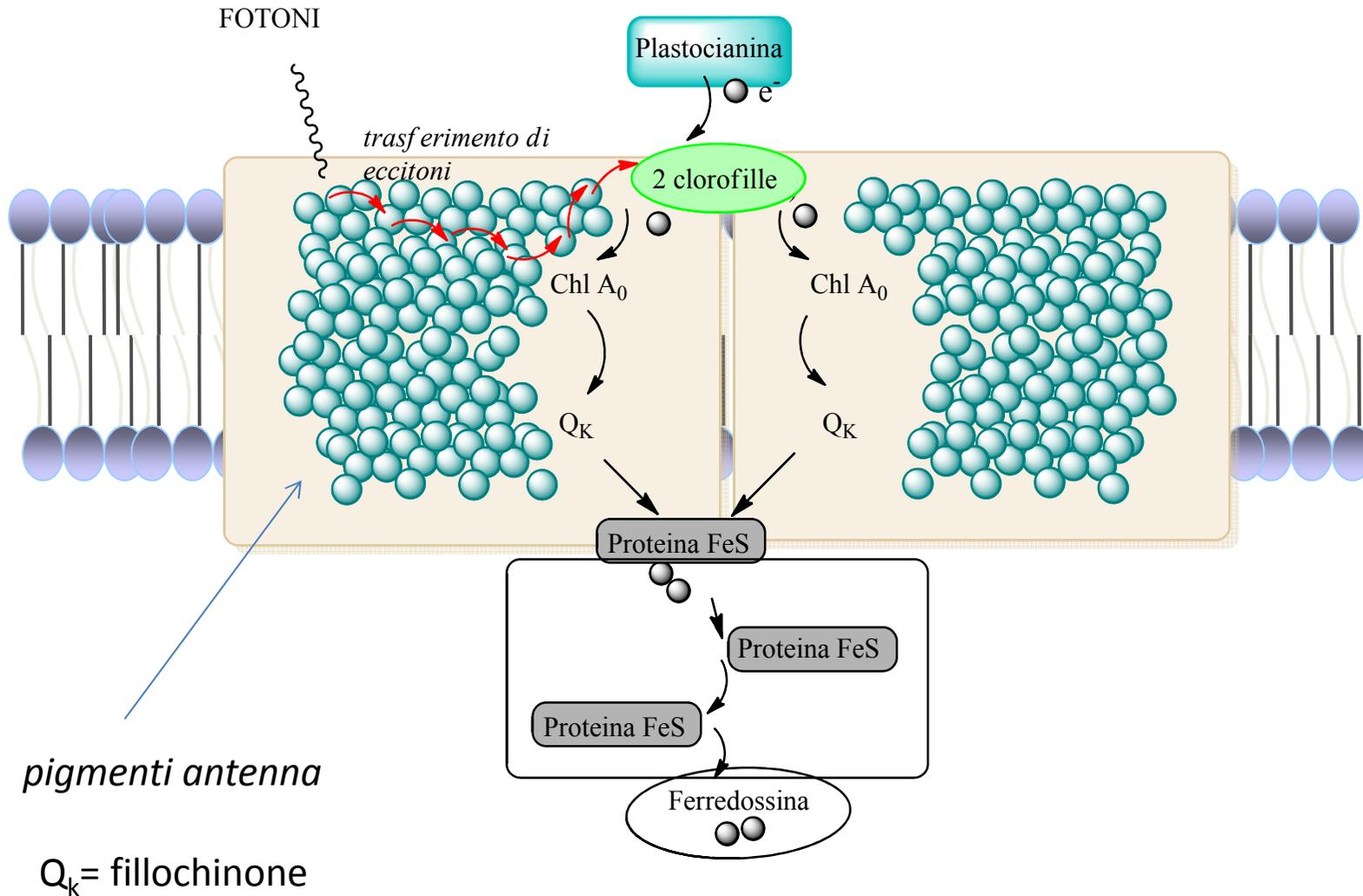
PQ_A

0.1 ms

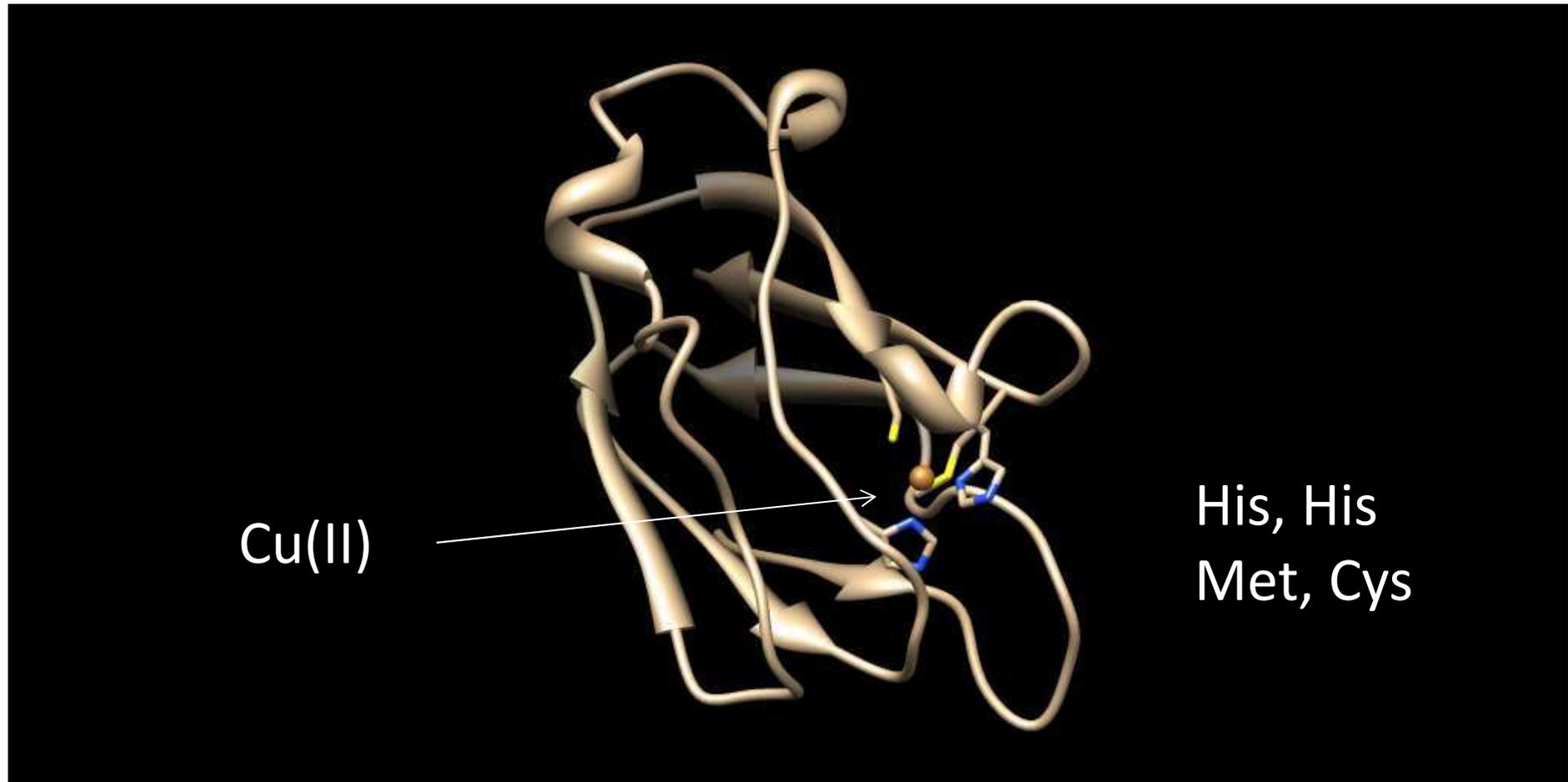


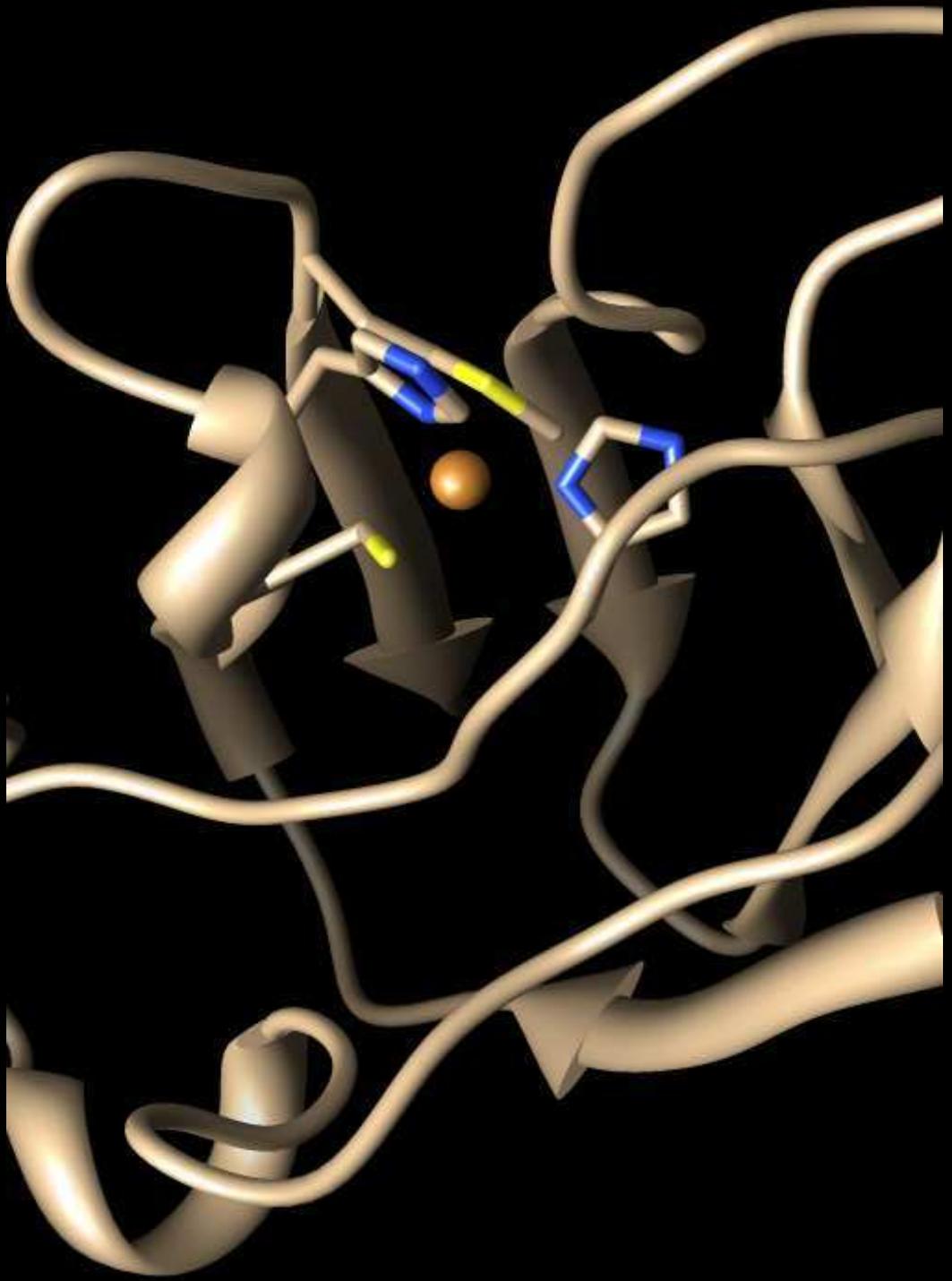
PQ_B

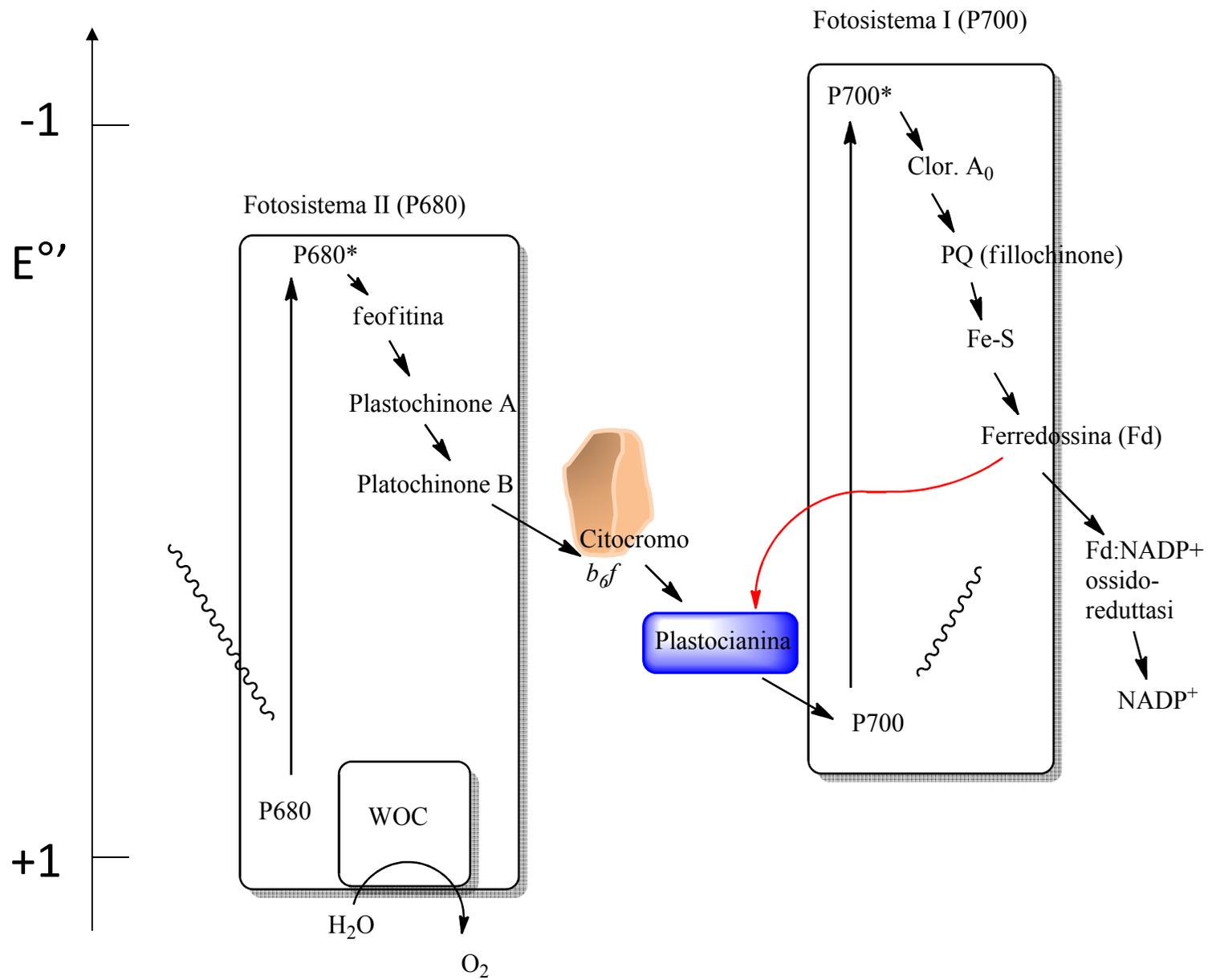
Fotosistema I. Struttura sopramolecolare



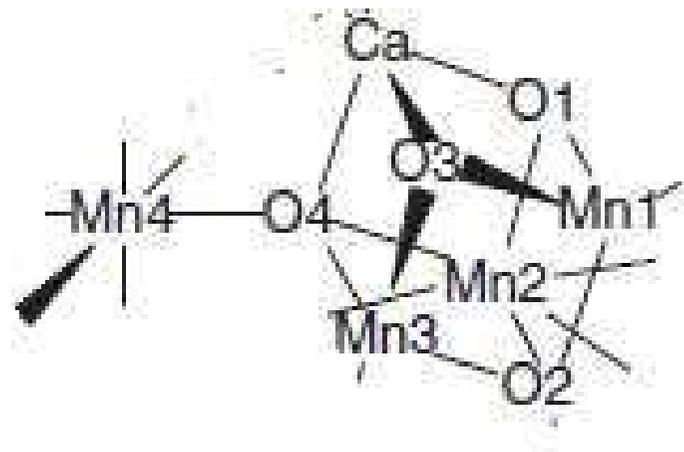
Plastocianina







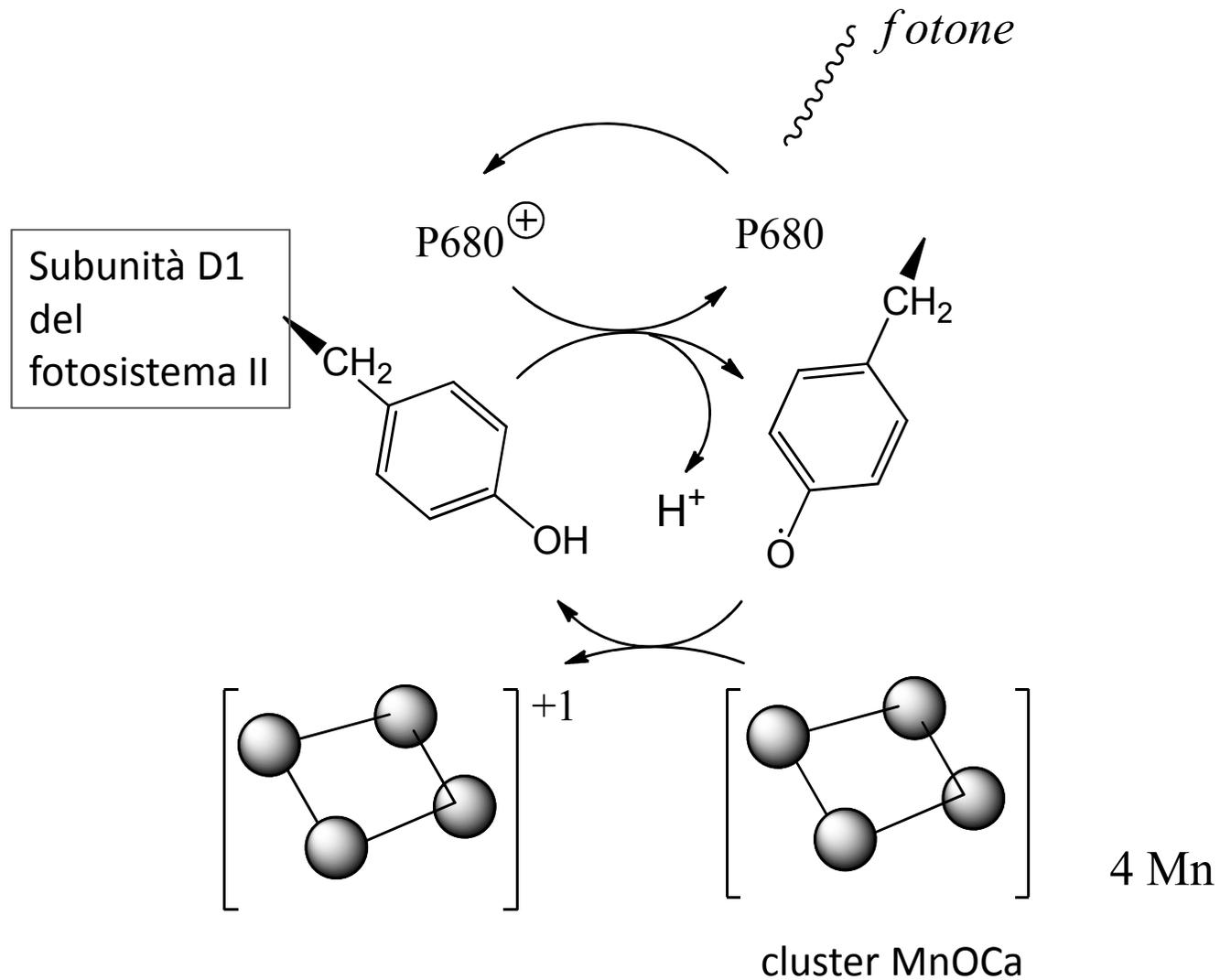
WOC (Mn cluster)

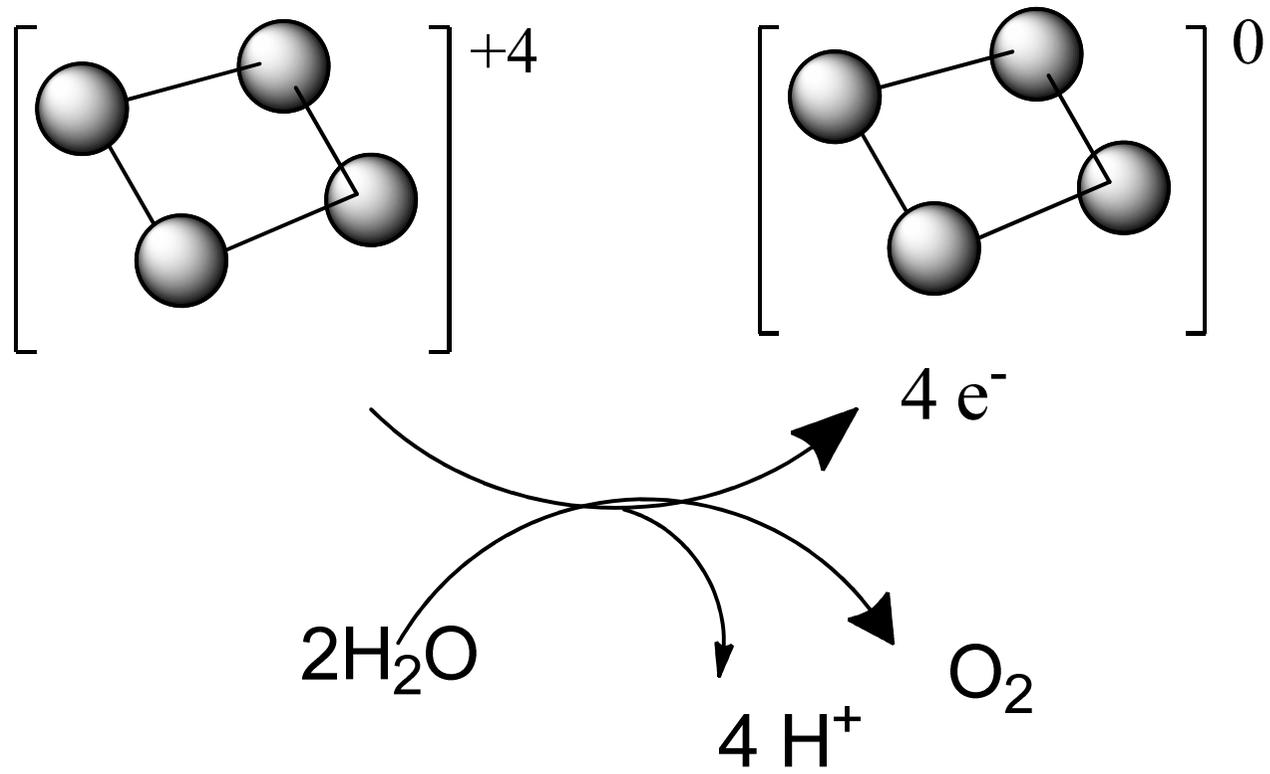


n, non noto, probabilmente: +6 o +8

In parte Mn(III) e Mn(IV)

Cluster WOC (per semplicità si assume carica iniziale 0)





Quando il cluster Mn ha perso 4 elettroni è in grado di prelevarne altrettanti da 2 molecole d'acqua (meccanismo ignoto)

