

Chem 241

Lecture 35



Announcement

Grading

.

Mistake we have class on the 3rd not 4th
May 3rd no lecture, review session

APRIL/MAY

M	T	W	T	F	S	S
19	20	21	22	23	24	25
26	27	28	29	30	1	2
3	4	5	6	7	8	9
10	11	12	13			



Recap

Bioinorganic

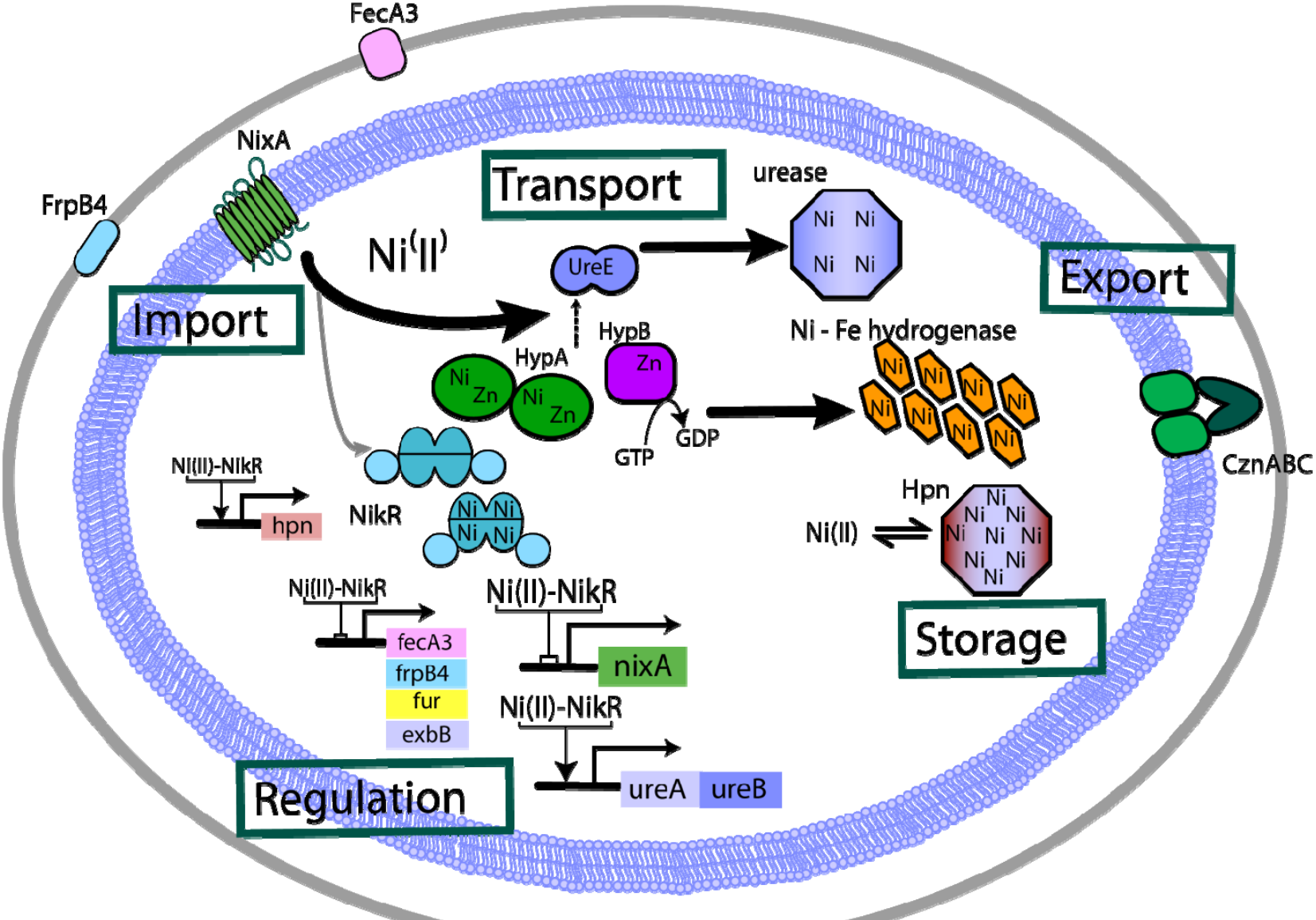
Porphyrins

Helicobacter pylori

Urease



Traffic



NikR function is Ni-specific

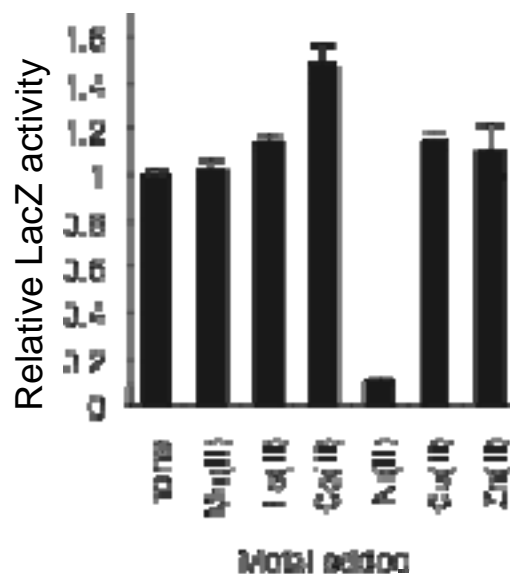
NikR can be activated for DNA-binding *in vitro* by other first row transition metals

Meta l	$K_{d, M(II)}$	$K_{d, DNA}$
Co(II)	2 nM	11 nM
Ni(II)	1 pM	5 nM
Cu(II)	14 aM	3 nM
Zn(II)	1 pM	270 nM

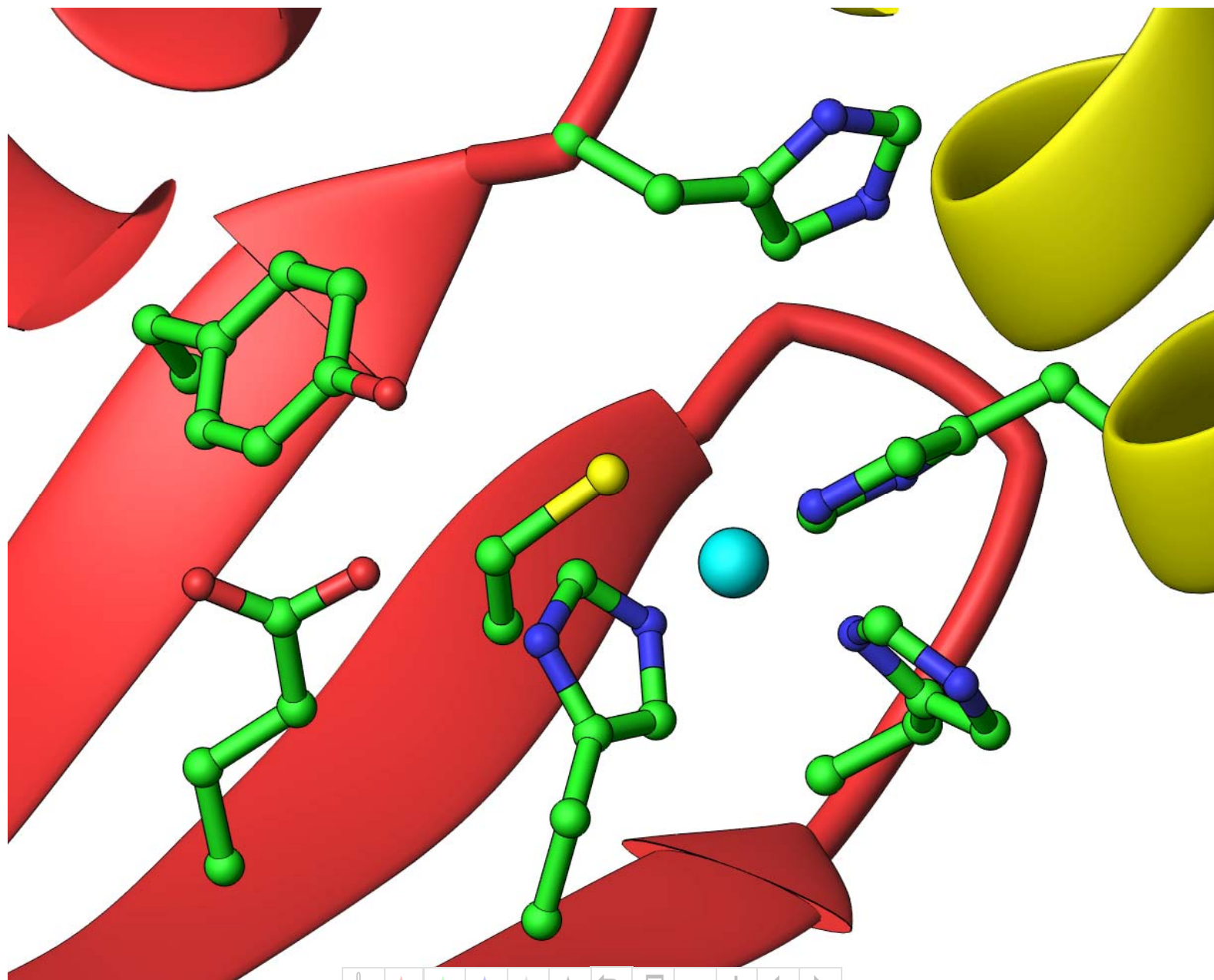
Zamble and co-workers
Biochemistry (2004)

But the biological response (repression of P_{nik}) is completely Ni-specific.

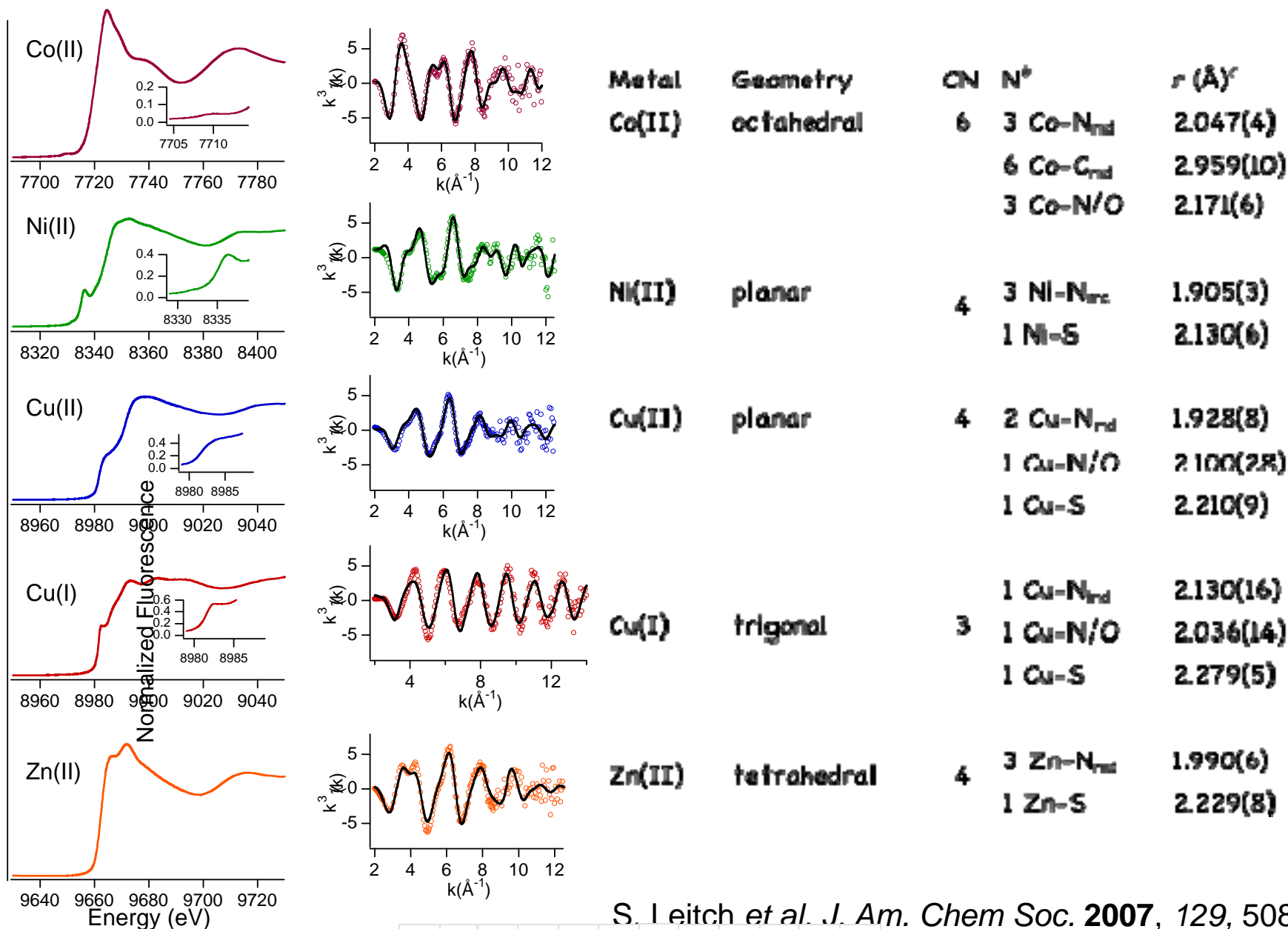
P_{nik} -lacZ expression



High-Affinity Nickel Site Structure



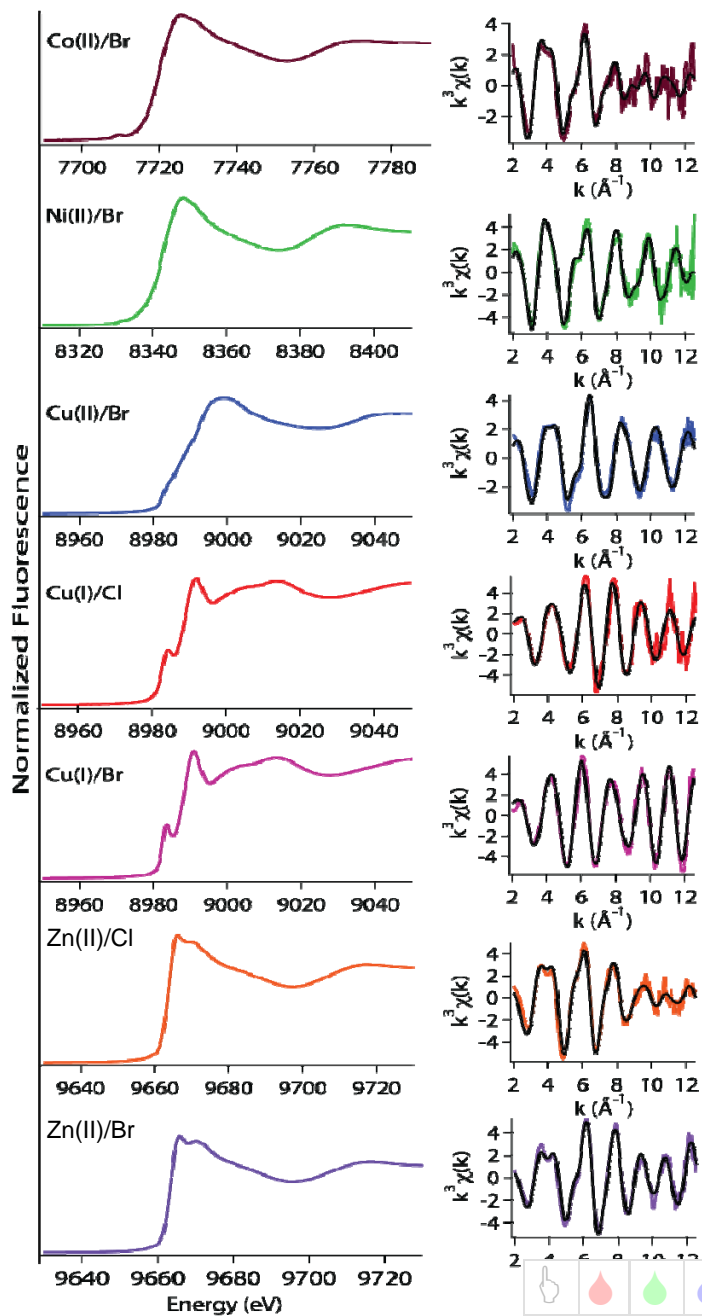
Metals bound to NikR have distinct structures



S. Leitch *et al.* *J. Am. Chem. Soc.* **2007**, *129*, 5085,

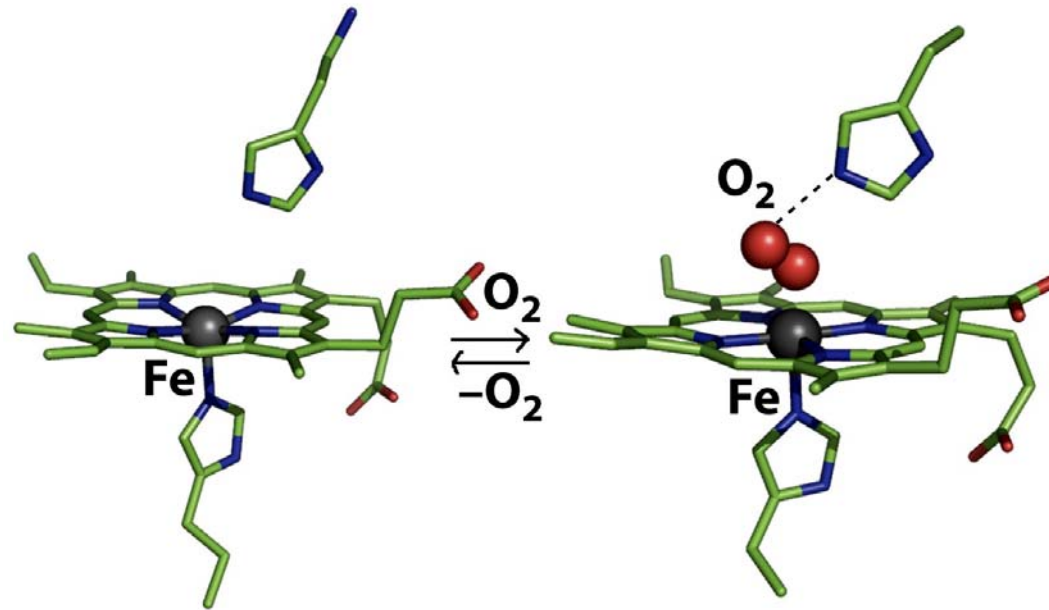


EXAFS Analysis of WT RcnR complexes

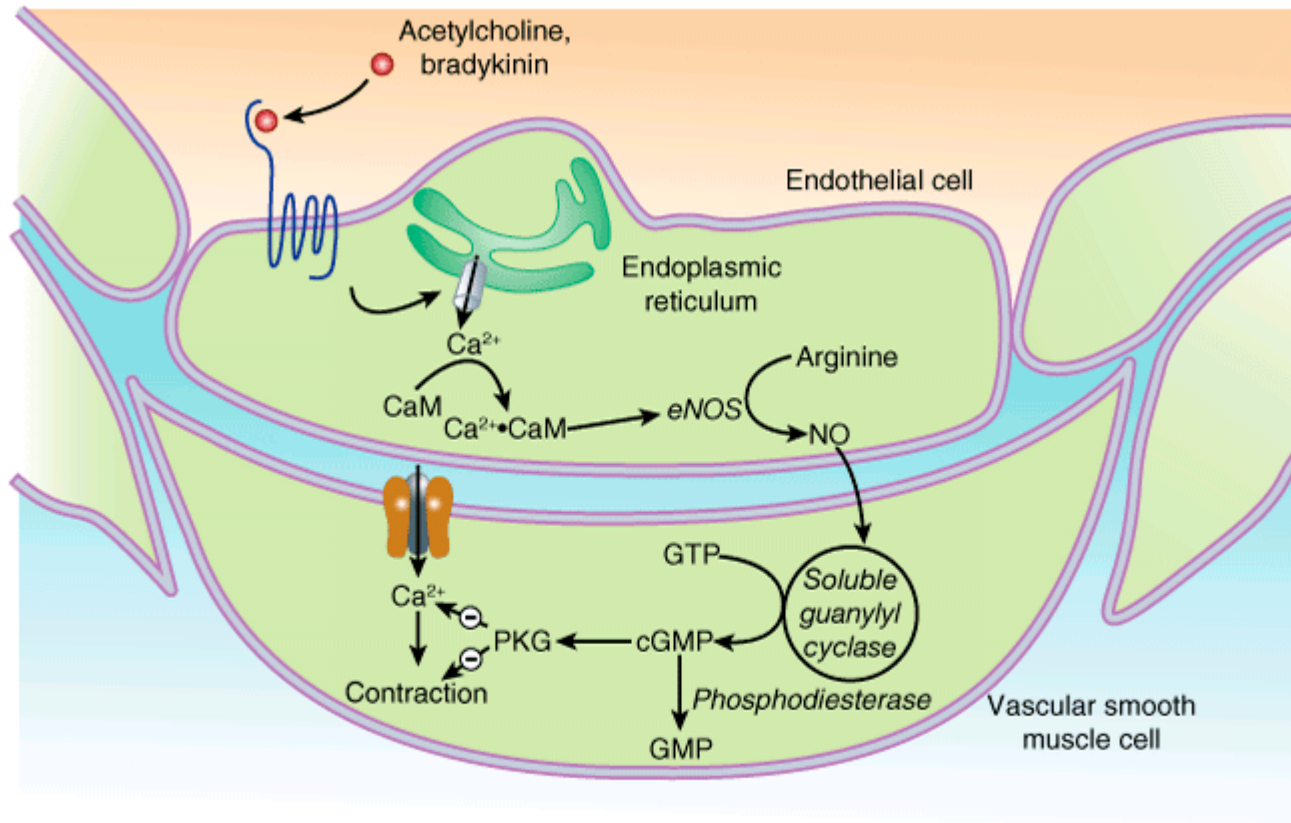


Sample	N	R(Å)	Geometry	CN
Co(II)NaBr	5 N/O (1 His)	2.05(1)	Octahedral	6
	1 S (Cys)	2.39(3)		
Ni(II)NaCl	5 N/O (1 His)	2.078(9)	Octahedral	6
	1 S (Cys)	2.62(3)		
Cu(II)NaBr	2N/O	1.971(9)	Planar	4
	1N/O (1 His)	1.89(2)		
	1 S (Cys)	2.18(2)		
Cu(I)NaCl	2 N/O	2.12(2)	Tetrahedral	4
	1 S (Cys)	2.31(1)		
	1 Cl-	2.74(2)		
Cu(I)NaBr	2 N/O	2.11(1)	Tetrahedral	4
	1 S (Cys)	2.30(6)		
	1 Br-	2.628(8)		
Zn(II)NaCl	2 N/O (1 His)	2.01(4)	Tetrahedral	4
	2 S (Cys + Cl-)	2.27(3)		
Zn(II)NaBr	2 N/O (1 His)	1.99(1)	Tetrahedral	4
	1 S (Cys)	2.31(5)		
	1Br-	2.371(8)		

Hemoglobin



Endothelium-derived relaxing factor (EDRF)

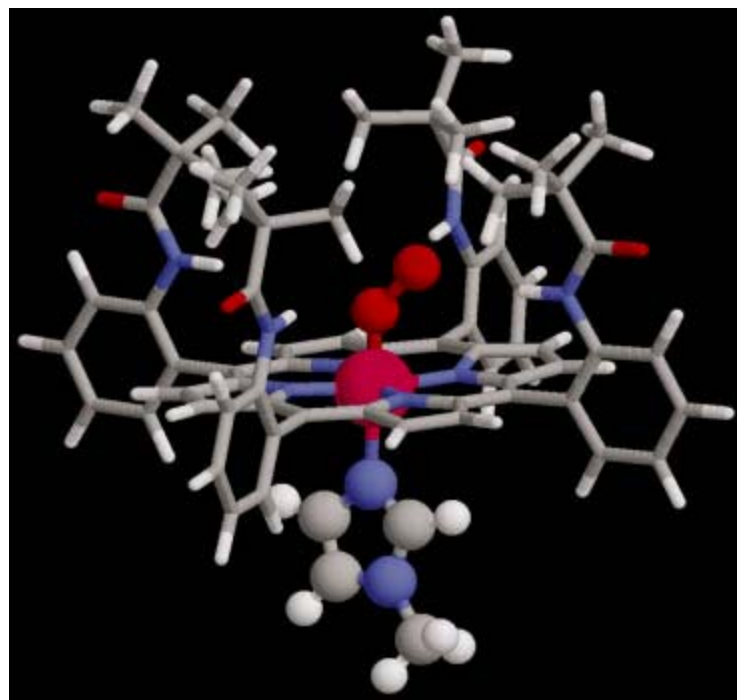


Source: Katzung BG, Masters SB, Trevor AJ: *Basic & Clinical Pharmacology*, 11th Edition: <http://www.accessmedicine.com>

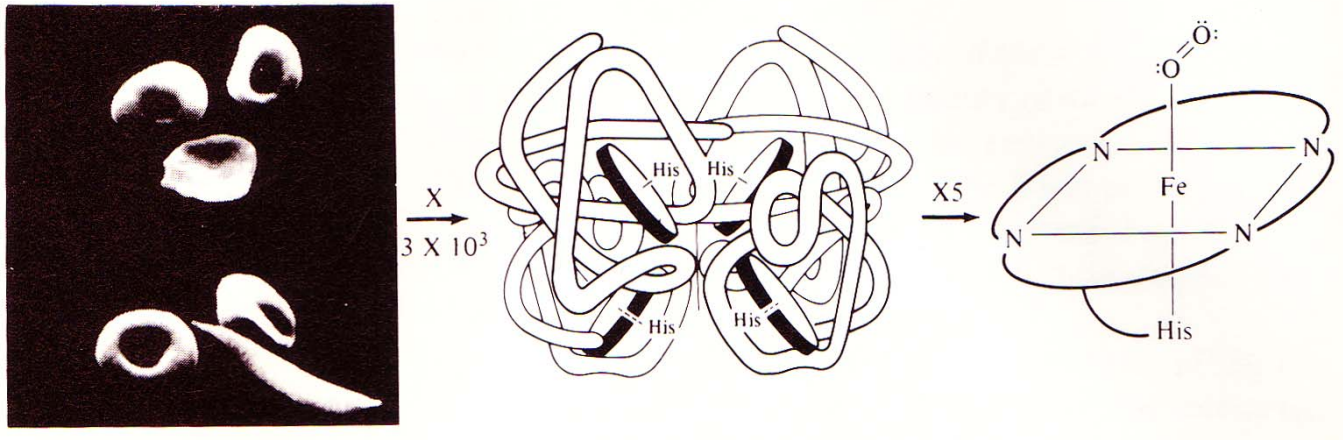
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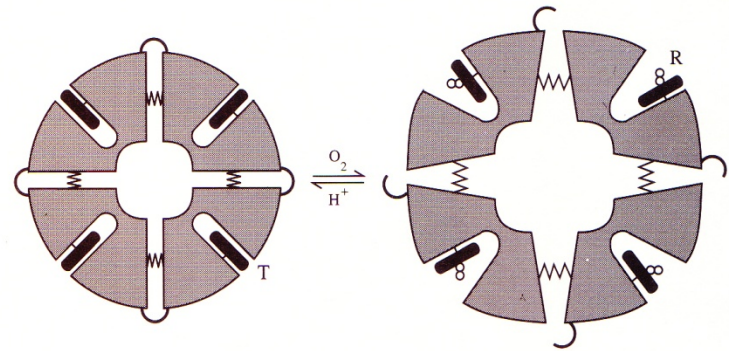
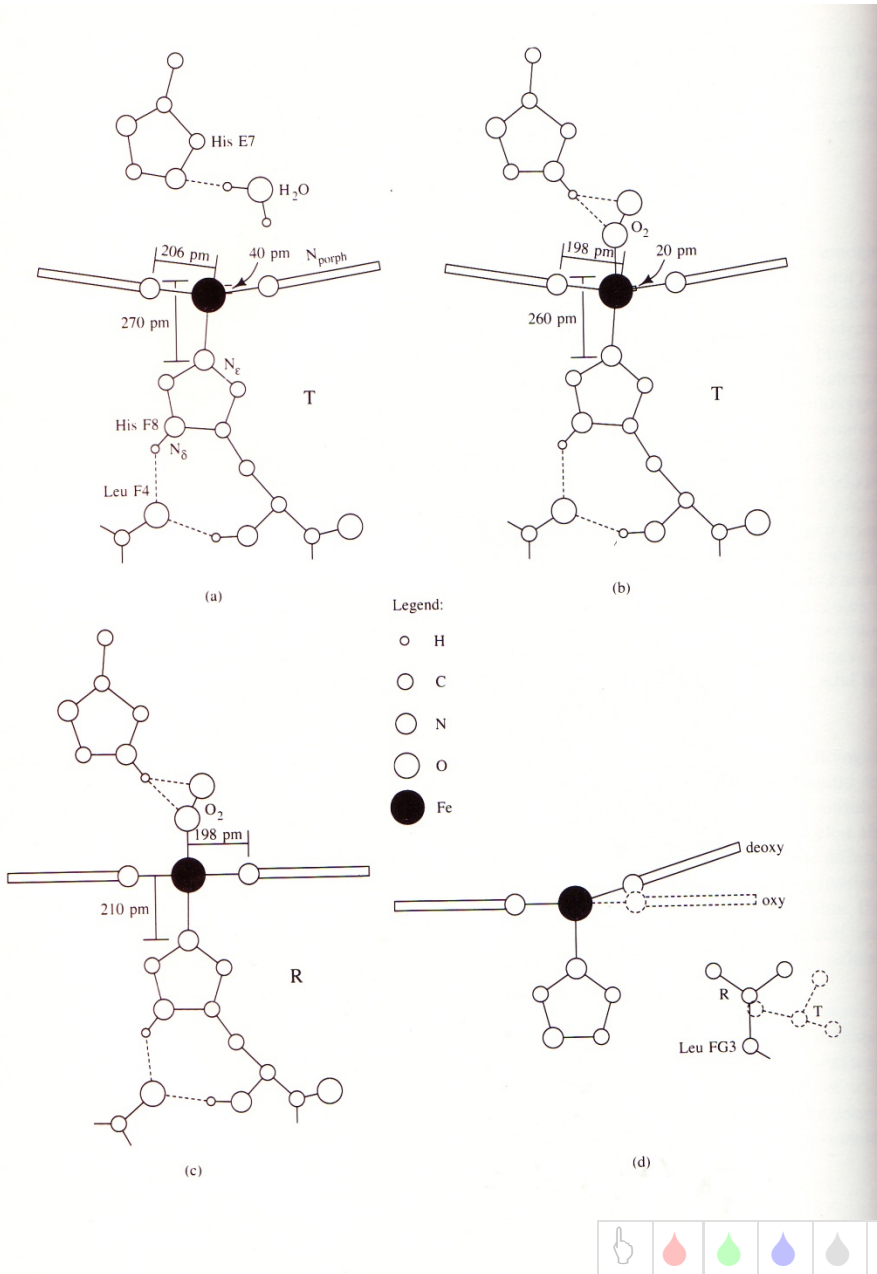
Picket fence



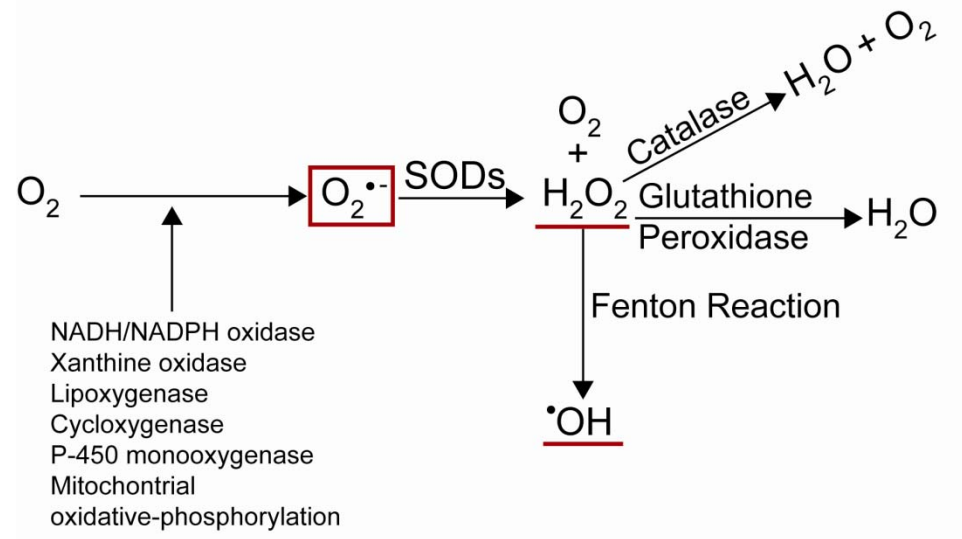
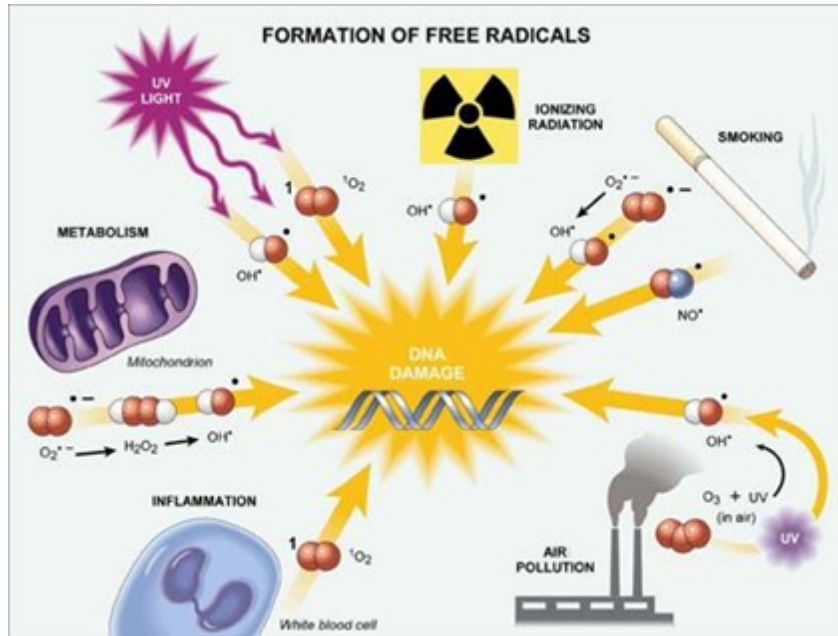
Picture representation



Cooperative effect



Antioxidant Defense



DNA damage

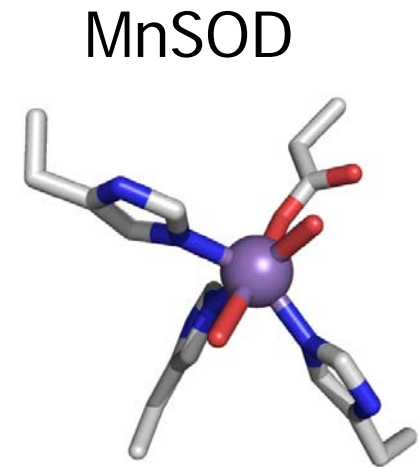
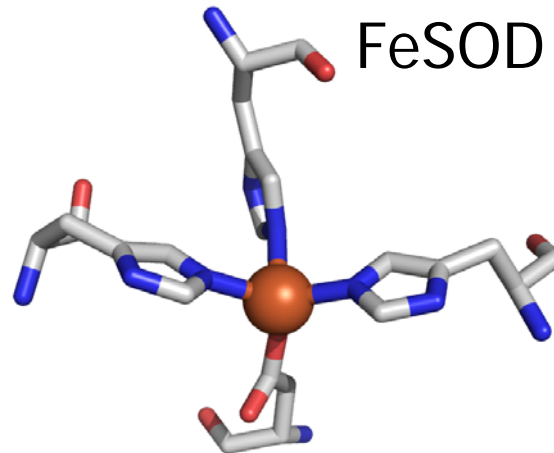
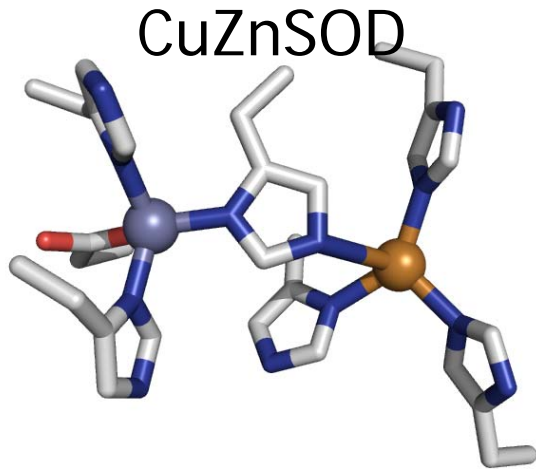
Protein damage

Lipid damage

Cell death

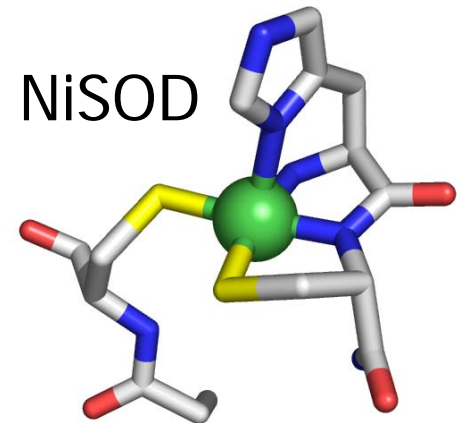
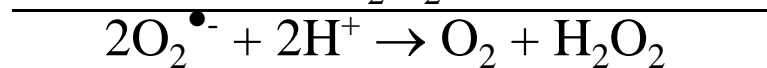
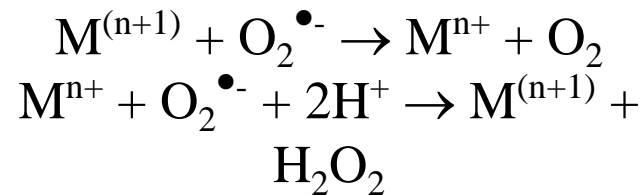


Superoxide Dismutases



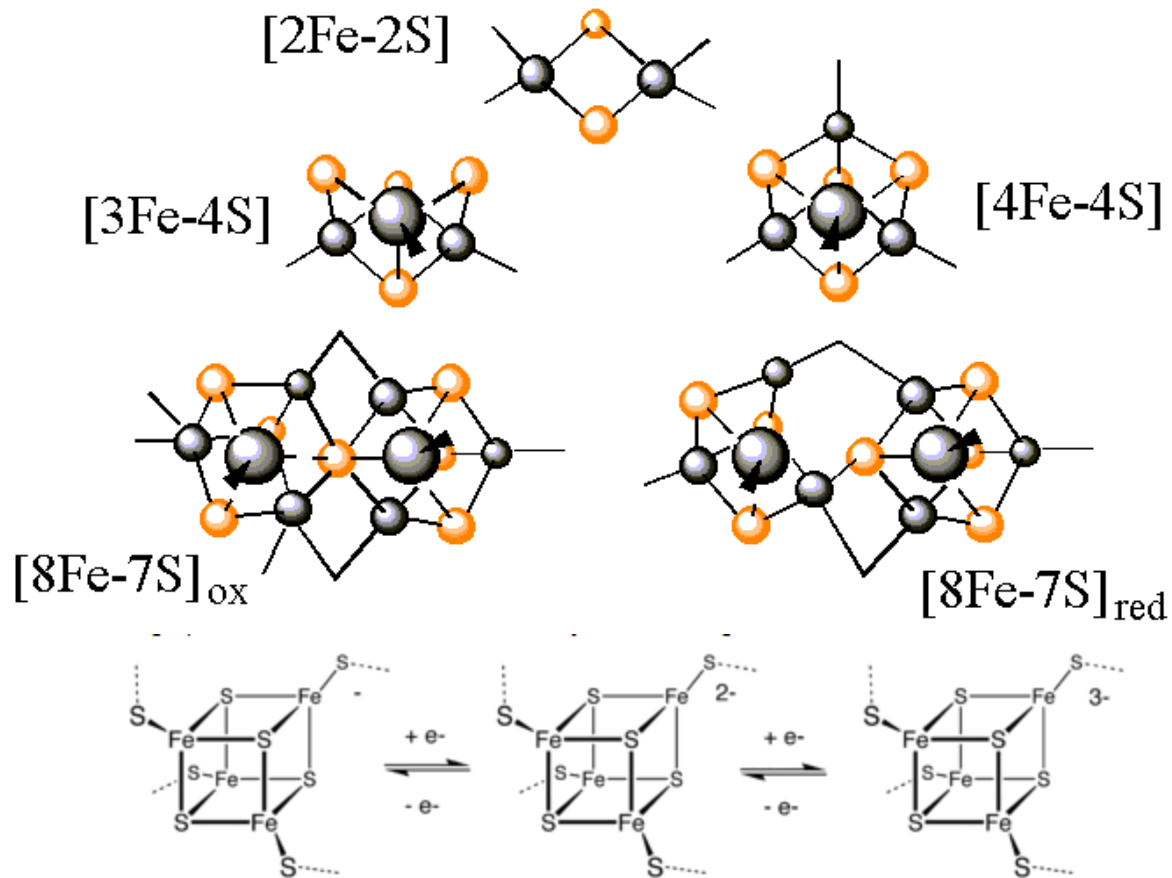
- Cu/Zn, Fe, and Mn
 - His, Asp, and H₂O
 - Fe and MnSOD in most cases not cambialistic
 - E_{1/2} = 320, 260, 310 mV respectively

- NiSOD
 - Three types of nitrogen and two Cys residues
 - E_{1/2} = 286(10) mV



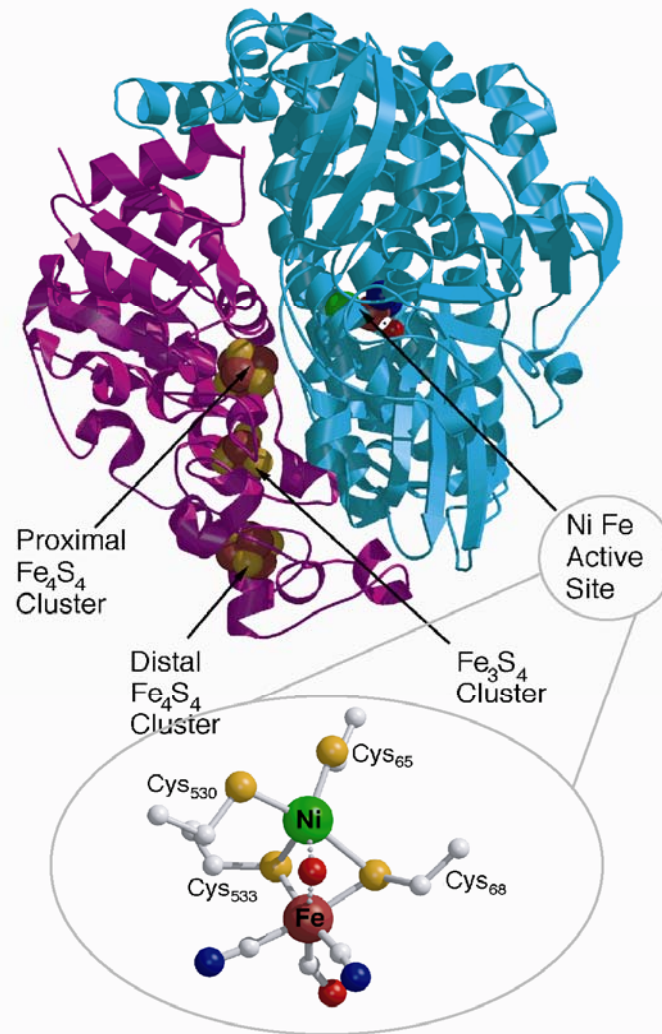
Iron Sulfur Clusters

Some FeS clusters



H₂ase

Structure of *Desulfovibrio gigas* NiFe H₂ase



Photosystem

