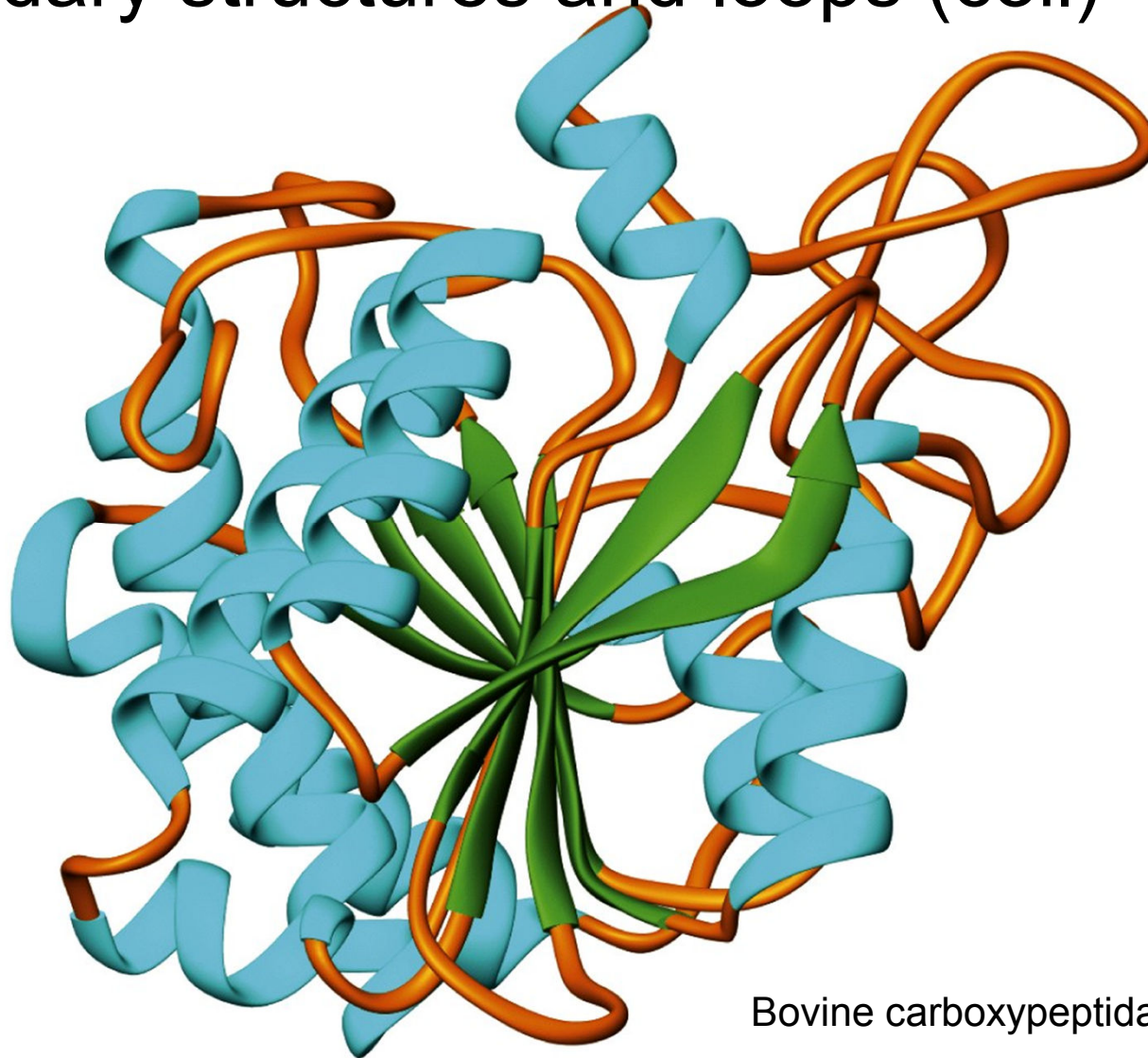
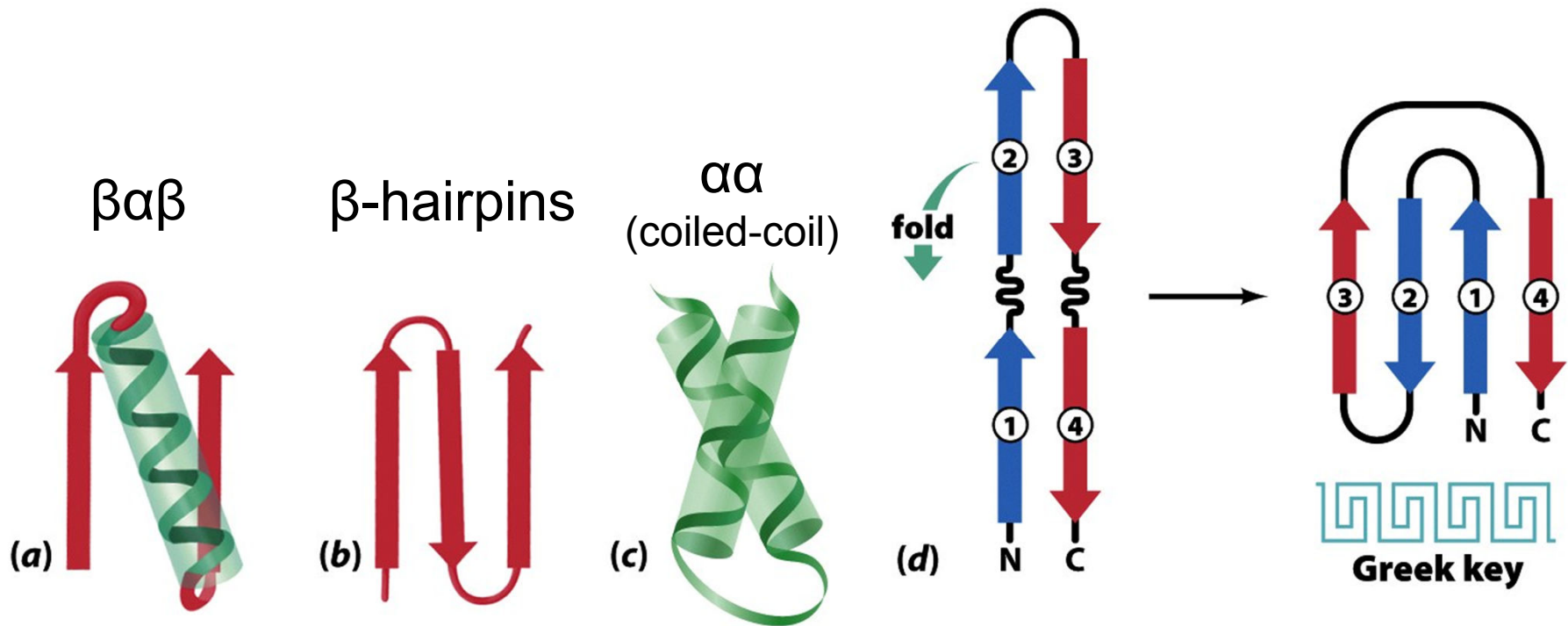


Tertiary structure combines regular secondary structures and loops (coil)



Bovine carboxypeptidase A

Tertiary structures may contain common patterns, or motifs, of secondary structures (= supersecondary structures)



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Figure 6-28

Some 'folds' are built up from smaller motifs

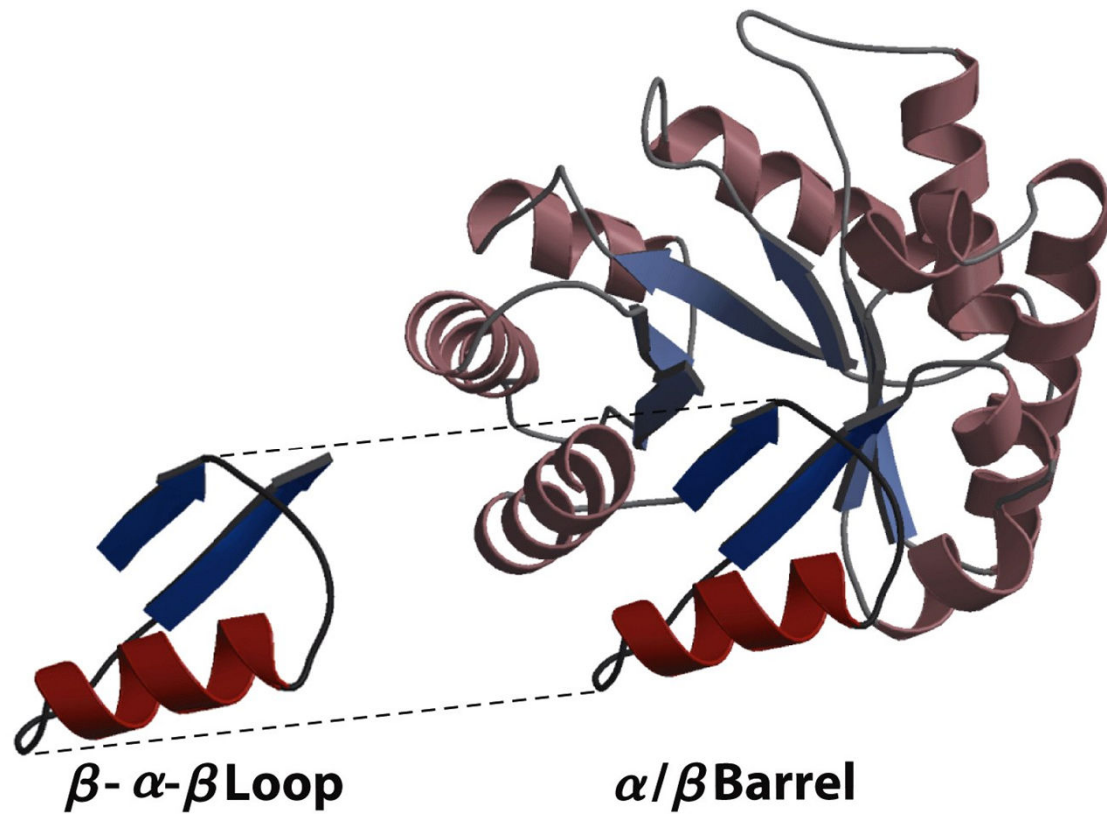


Figure 4-20
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Figure 4-17b
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Other folds are not built up from smaller motifs

Sperm whale myoglobin, the first protein structure to be determined

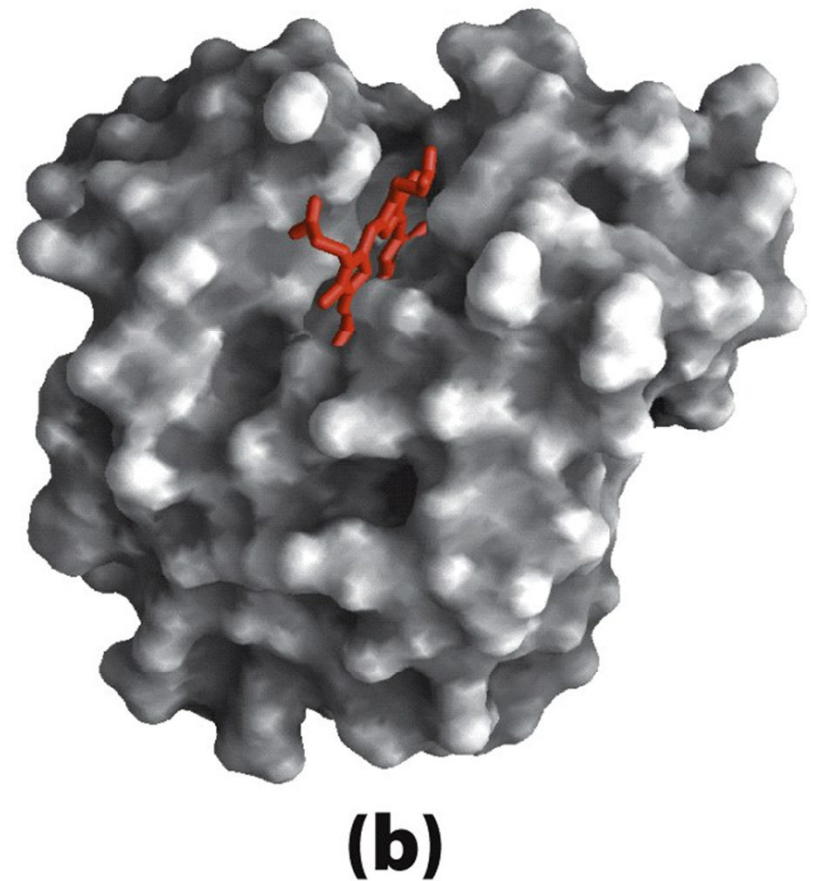
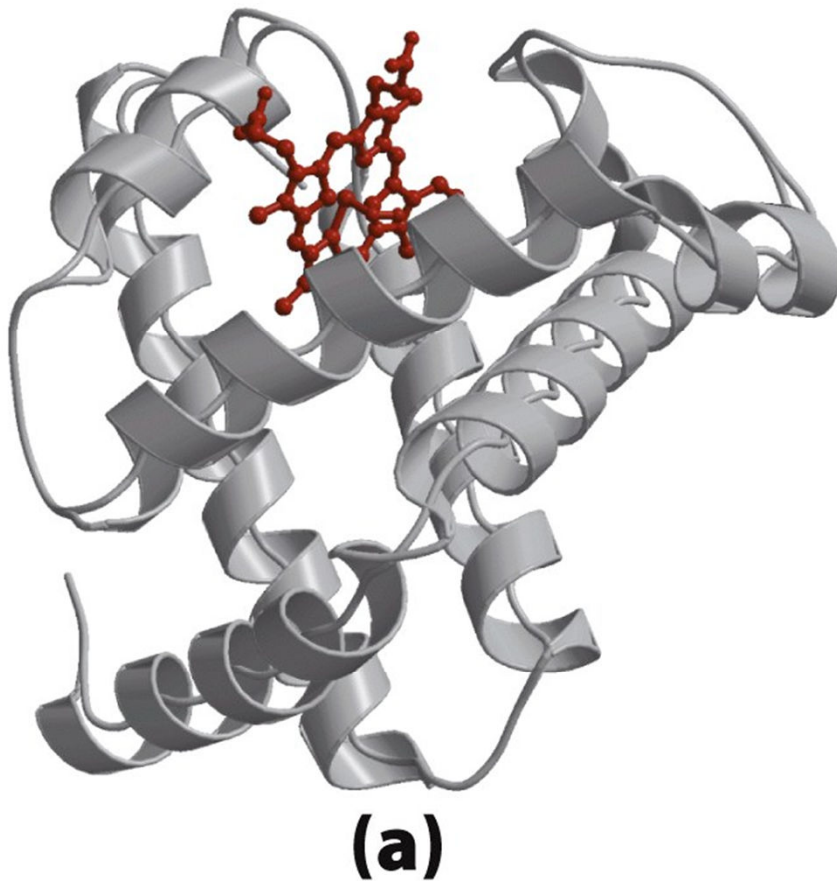
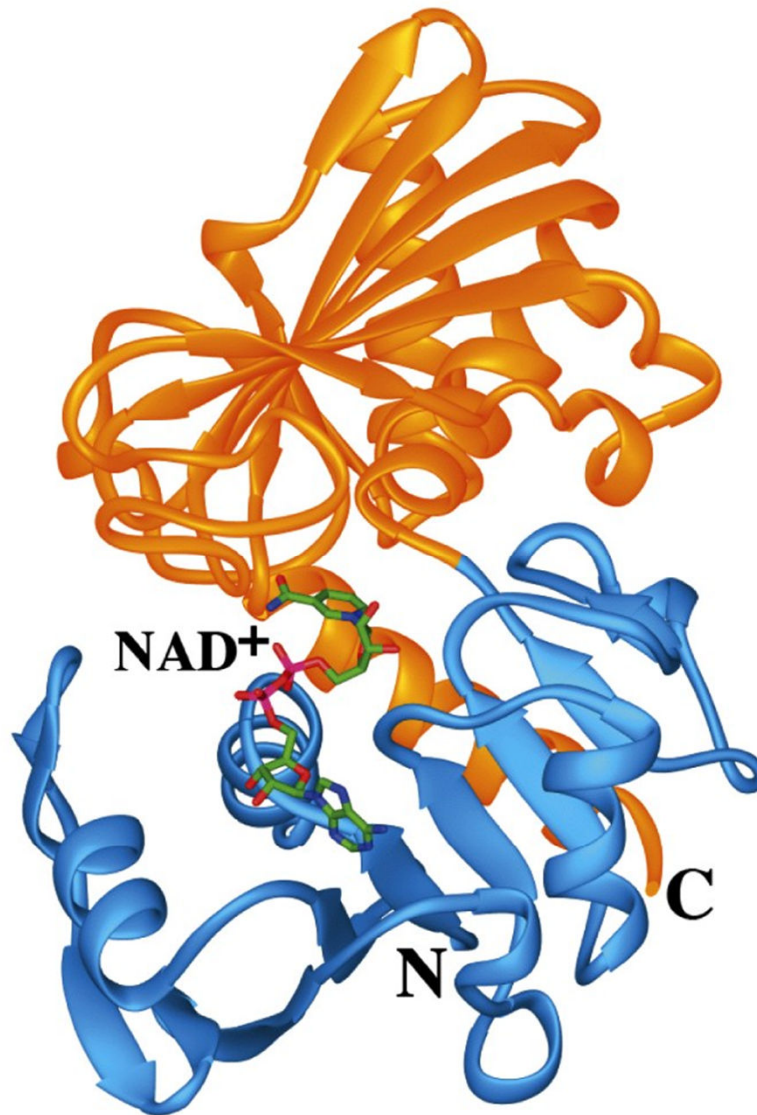


Figure 4-15ab
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Multiple folds may combine as domains of a tertiary structure

Domains:
independently
folding units
(often with distinct
functions)

Protein:
Glyceraldehyde-3-phosphate
dehydrogenase (GAPDH),
an enzyme of glycolysis

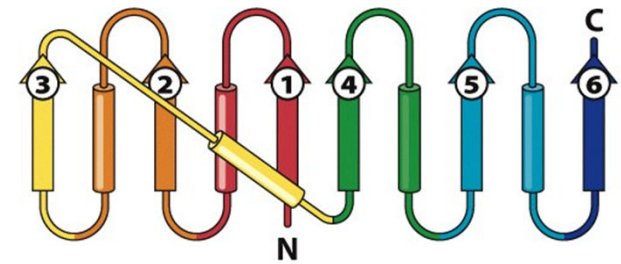
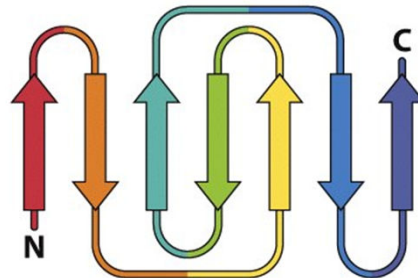
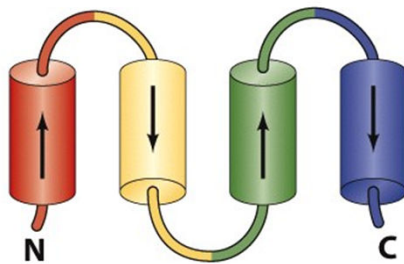
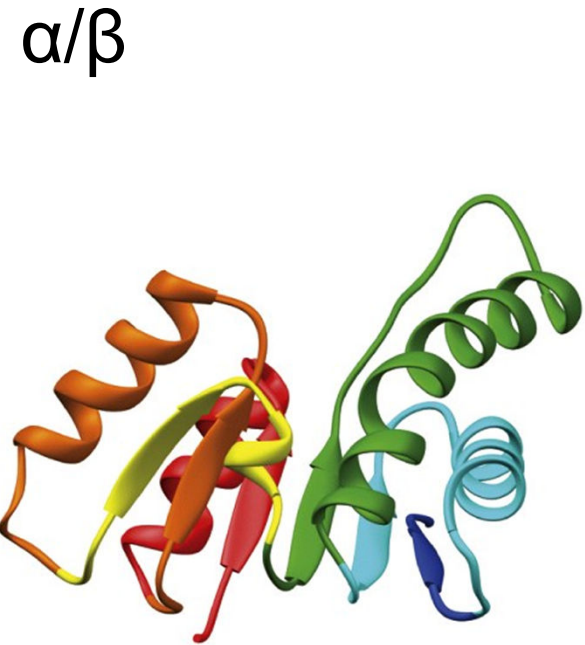
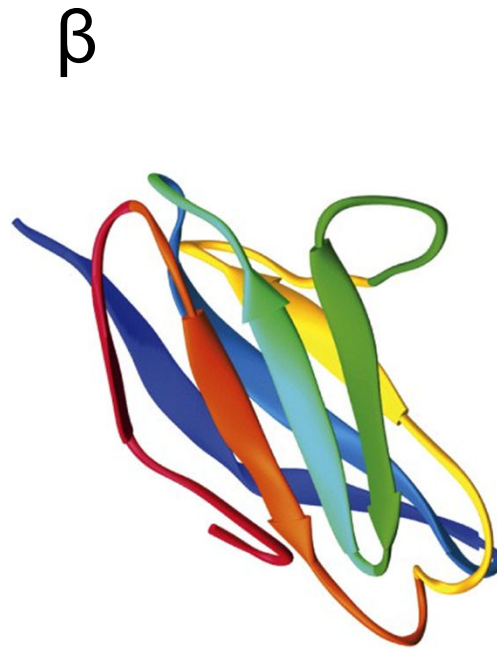
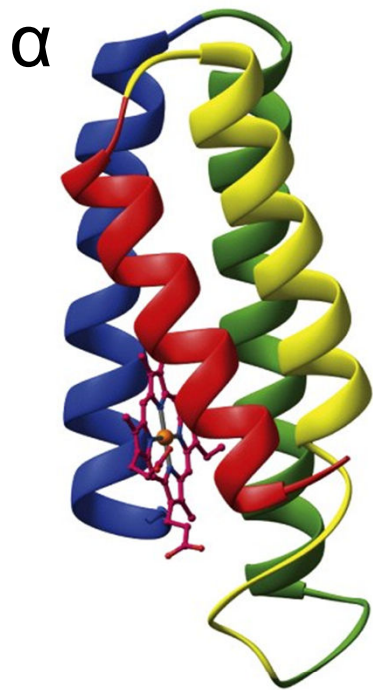


There are ~1,000 different protein folds, which can be classified by structure and homology

For example: **CATH – a system for categorizing protein folds (at the level of domains)**

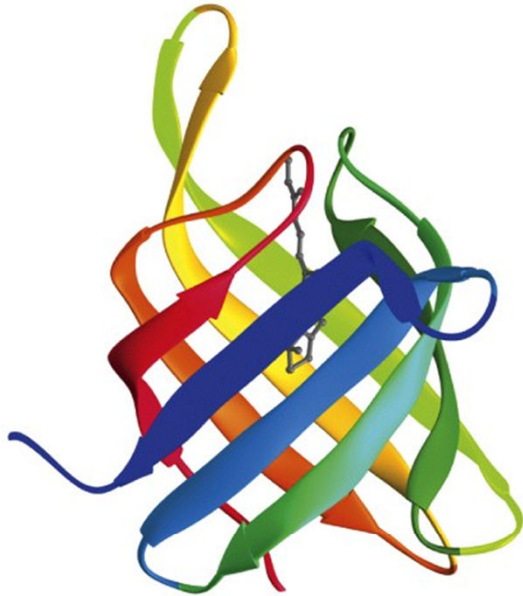
- Class – general description of predominant secondary structures (α , β , α/β)
- Architecture – arrangement of secondary structure elements
- Topology – connectivity of secondary structure elements
- Homologous superfamily – evolutionary relationship

Class: folds can be grouped by predominant secondary structure(s)

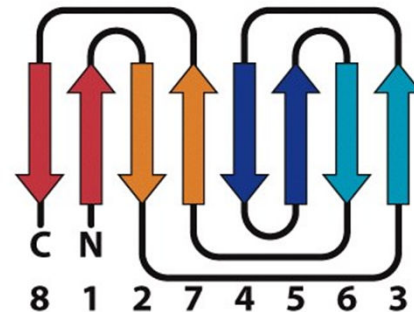
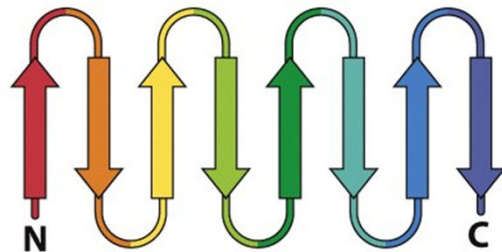


Architecture: arrangement of 2° structures

Topology: connectivity of 2° structures



These β -barrels
have similar
architecture...



but different topology

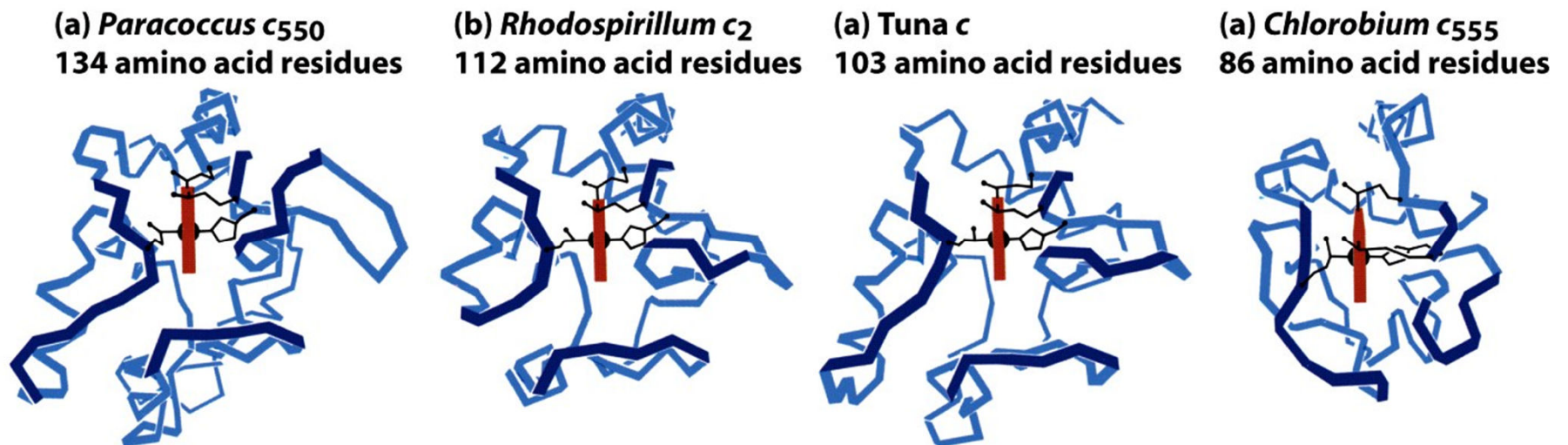
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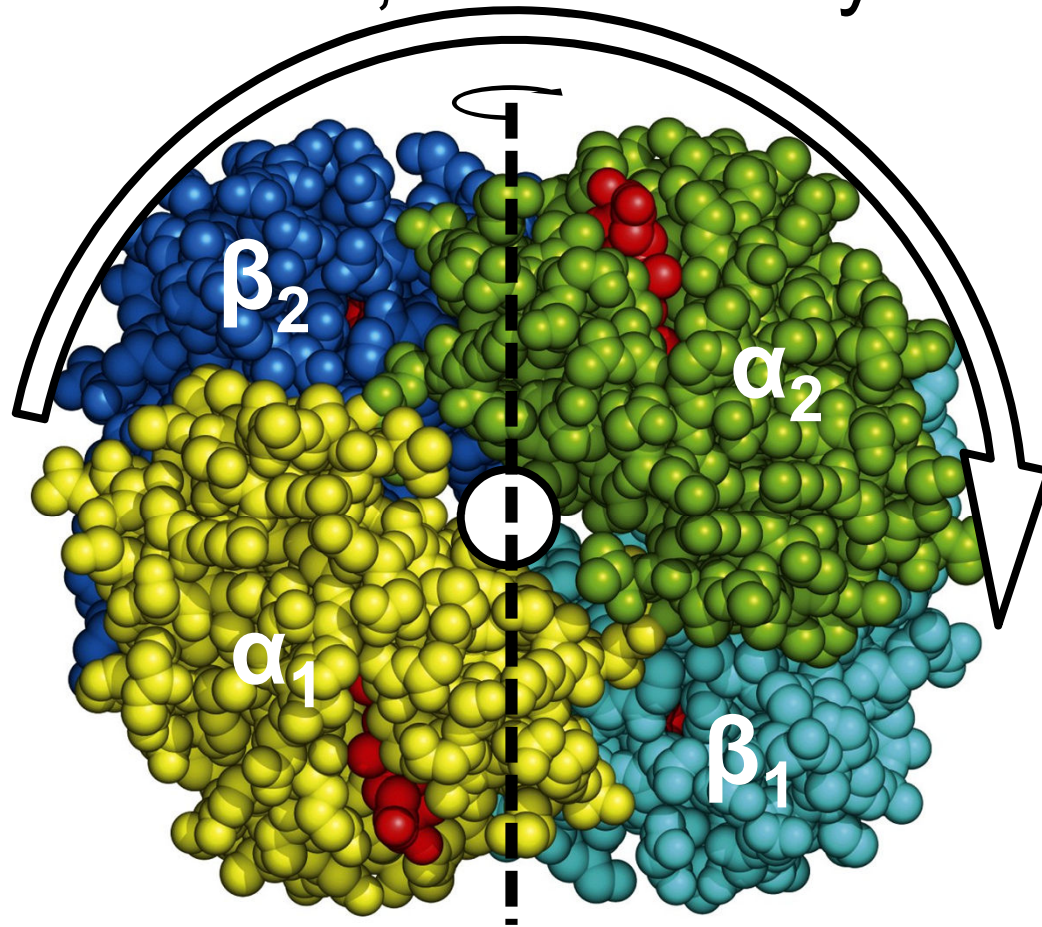
Protein structure is conserved more than sequence

c-type cytochromes from different species have little sequence similarity



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Quaternary structure combines multiple subunits, often in a symmetric arrangement



Hemoglobin tetramer (dimer of dimers)
Rotational symmetry: 2-fold cyclic (C_2)
(Pseudosymmetry: 2-fold dihedral, D_2)

Oligomeric protein, multimeric protein, oligomer, multimer (if large, protein complex):

Protein composed of multiple polypeptide chains

Ex: hemoglobin tetramer

Subunit:

One polypeptide chain of an oligomer

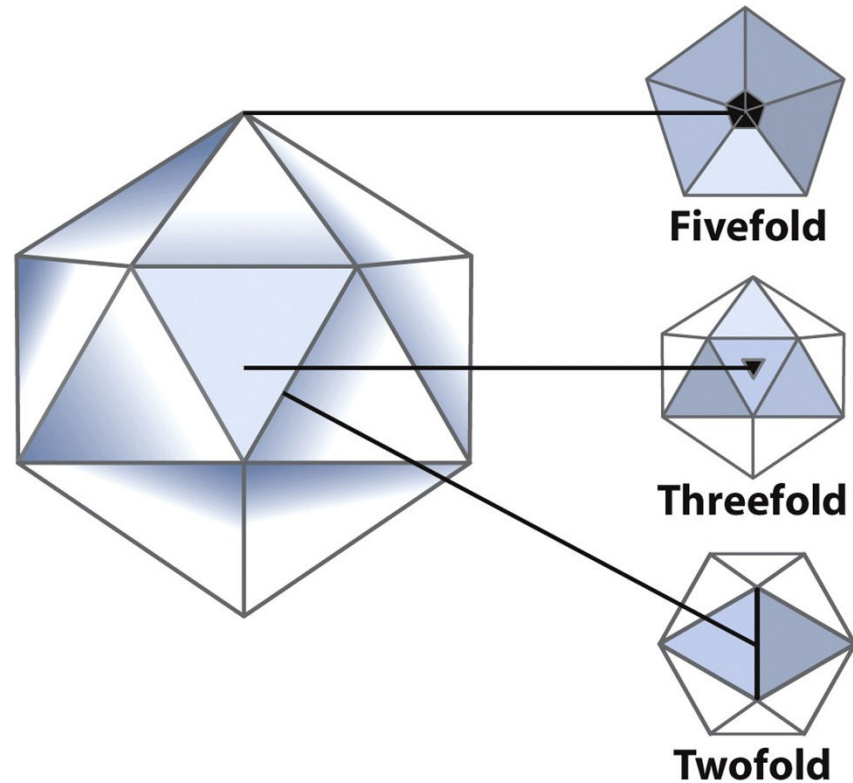
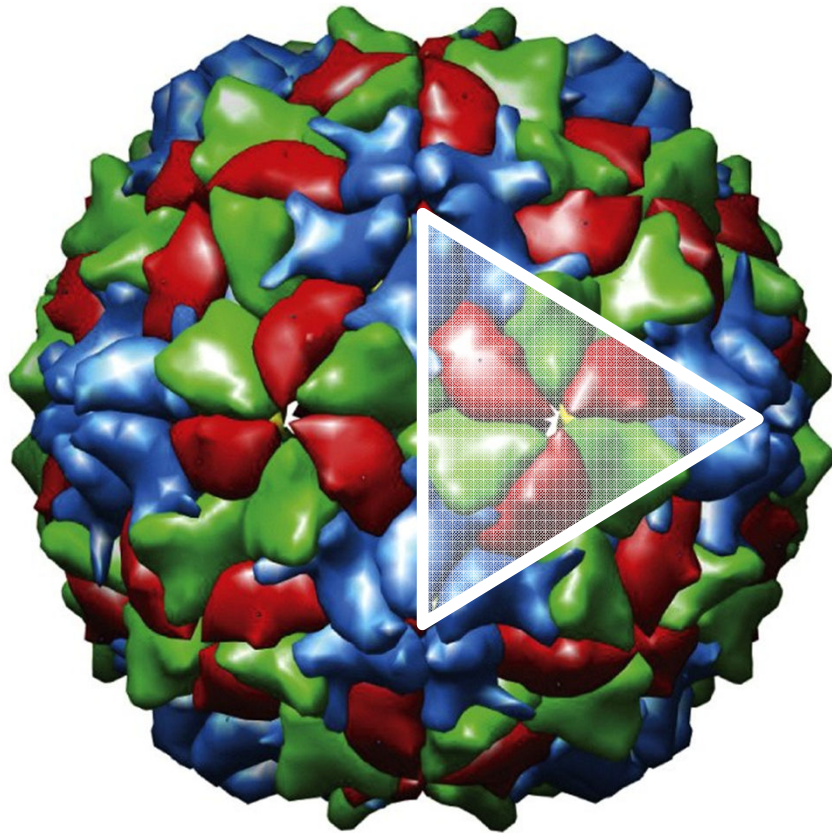
Ex: α_1 subunit

Protomer:

Repeating structural unit

Ex: one $\alpha\beta$ dimer

Virus capsids are generally highly symmetric



Icosahedral symmetry
(rotational symmetry)

Virus capsids are generally highly symmetric

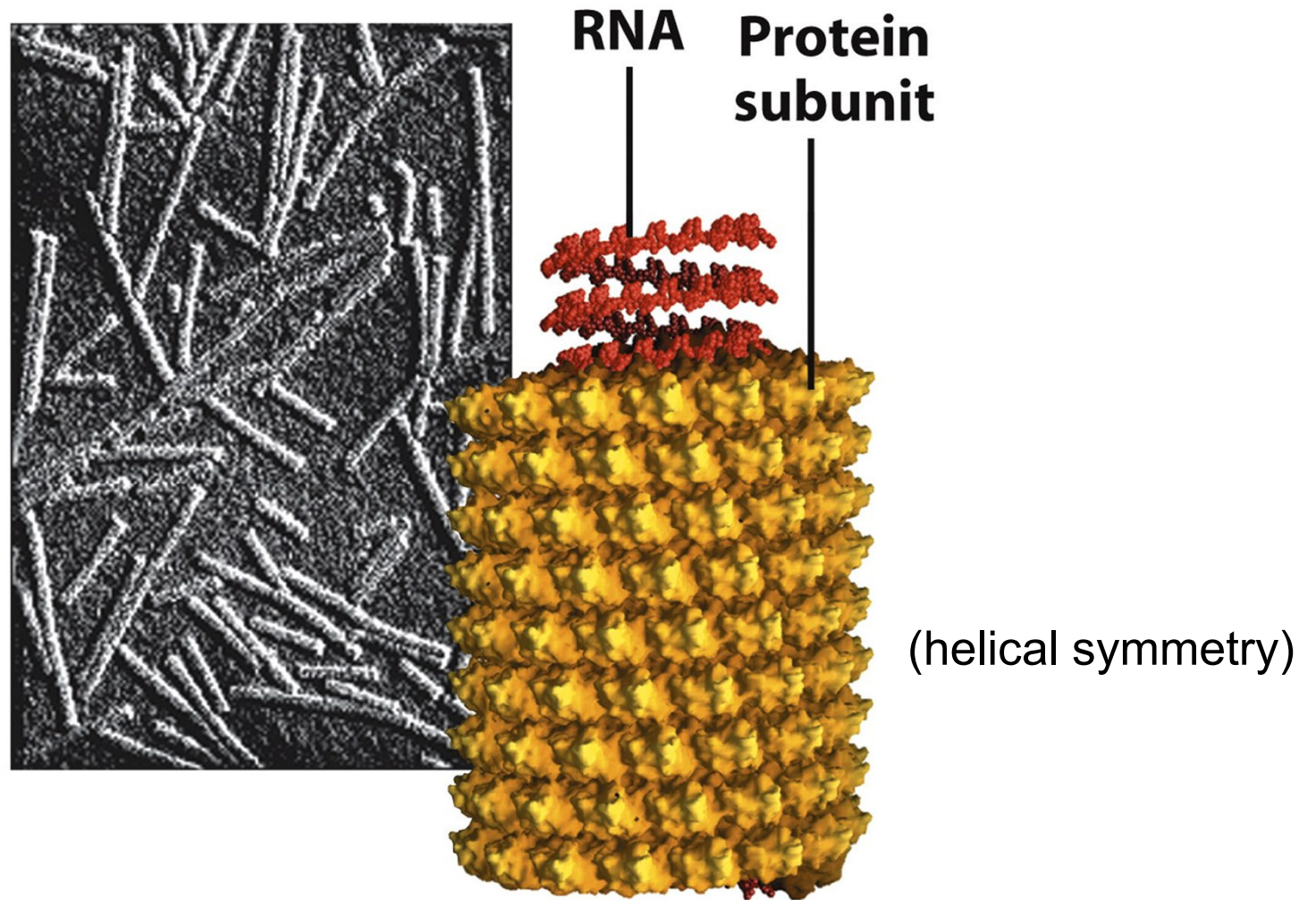


Figure 4-24b
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