Domains, defined in terms of contained motifs

**Structural Domain** (the unit of tertiary-structure description, or “fold”)
- Local region in 3D with presumption of (or better score for) contiguous sequence
  - (beware alternate definitions: 3D & sequence, or just sequence)
- Independently stable; may move as a rigid body
- Analogous structure to other entire protein (or plausible as such)

**Major categories** of tertiary structures (many “folds” in each category)
- **I. All-α** (chap. 3)
- **II. α/β** (chap. 4)
- **III. All-β** (chap. 5)
- **+. Small irregular; mixtures; miscellaneous**

Alternative scheme: “Superfolds”
- Commonest “folds” with same topology & shape in “core” part,
- Found in >= 3 unrelated protein families

**α – motifs**: helix-helix contacts; Hphobic patches; pack spiral ridges of sidechains
- **Helix hairpin**: adjacent, ↑↓ pair of α; +15-20°; form helix bundles
- **EF hands, helix-turn-helix**: adjacent pair ~90°; Ca++ binding, DNA binding

**Small irregular motifs**:
- **Zn finger** in metal-rich (several kinds; bind DNA)
- **SS β cross** in SS-rich: 2 crossed SS’s, from β hairpin

**α/β motifs**: righthanded crossover, or βαβ unit
- Its alternation of β & α, and its handedness, dominates α/β folds

**α/β superfolds**:
- **singly-wound β-barrel**, = TIM barrel, or = (βα)₈ barrel
- **α/β horseshoe**
- **doubly-wound β-sheet**, = twisted open sheet, or = nucleotide-binding domain
  - The commonest protein fold, esp. for enzymes
  - Active or binding site at “switch point”

**β motifs**:
- **β hairpin** (2 ↑↓ strands)
- **Greek key** +1, -3; long β-hairpin coiled around,
  - Handed (ccw from outside)
  - Twist of double ribbon (belt) becomes loops around "barrel" ends
  - Axis of barrel along strand direction,
  - Barrel closed by H-bonds of edge strands
  - Some quite round, some flattened:
    - Described as 2-layer "sandwich"
β superfolds:
- up & down β-barrel (& β-trefoils)
- Greek key β-barrel: 6 or 8 strands, & “jellyroll” >8 strands
- open-face sheet
- β-propeller
- parallel β-helix

**Coloring Book**

In the Protein Structure Coloring Book (class hand-out), pick one α/β protein and one All-β protein to color, using any system that interests you and that makes sense relative to the 3D structure; hand in those two. [Note that the coloring book includes All-α and Small Irregular proteins as well.]

Graphics: Coloring Book Slides (shown in class) [slide archive/ribbons _etc/_]
- 11.GammaCrystallinJane.jpg: barrel fold
- 12.GammaCrystallinCyrus.jpg: sheet sandwich
- 22.BPTISSluminated.jpg: β sidedness, SS
- 31.SODpastel.jpg: depth
- 32.TIMpastel.jpg: depth and sec. str.
- 41.IggVLcolorBkice.jpg: simple topol.: connections: GK vs hairpin
- 43.CAPgreekKeyPair.jpg: simple: GK pair
- 45.CPAspider_Duncan.jpg: complex: sec. str., sided, ~H-bonds, etc.