Elastin

Three factors make it stretchy and elastic

1- Tropoelastin molecules, the subunits of elastin

2- The amino acid composition is 33% Gly, 10% pro, 23% Ala and 13% Val.
Hence 79% come from 4 amino acids.
Large hydrophobic peptides rich in Ala,-Val,-Ile-Leu.
So no H- bonding, so it is separate fibers and stretchy.

3- 2ry structure is α-helix with repeated β-turns based on Val-Pro-Gly-Val, it looks like β-spiral.

Elastin

- Source of elasticity in tissues
- Prominent in large arteries (like aorta), lung, skin and ligaments.
- It can stretch several times, (5 times), then return to the original starting size
- It is clinically relevant in cardiovascular disease and emphysema

Elastin

Abundant in ligaments, lungs, artery walls, skin.

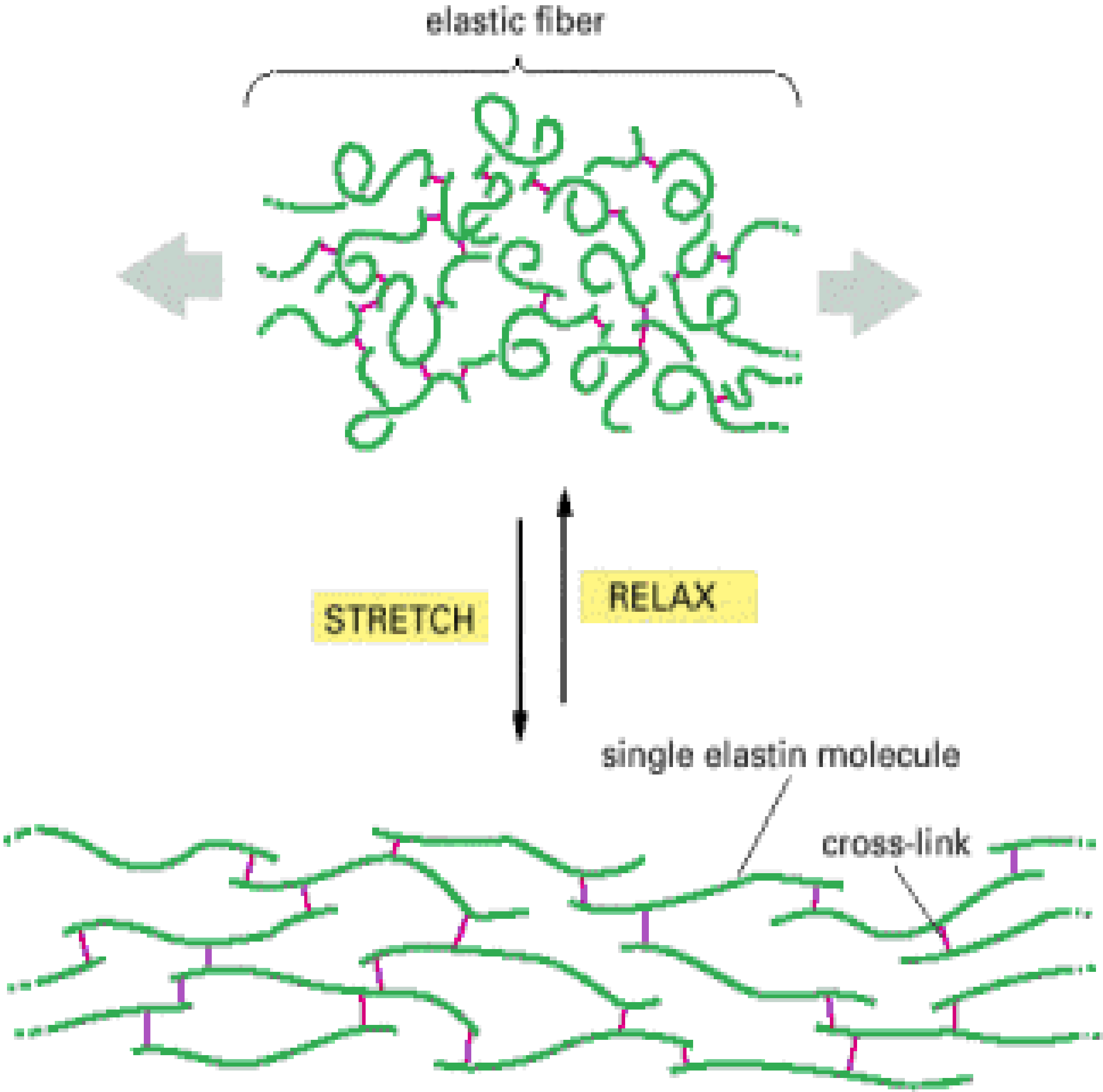
Provides tissues with ability to stretch in all directions without tearing.

Contains predominantly small hydrophobic residues: 33% Gly, 33% Ala + Val, many Pro but no hydroxyPro or hydroxyLys.

Lacks regular secondary structure.

Has unordered coil structure that is highly cross-linked into 3-dimensional network of fibers to provide rubber-like elasticity.

- Some proteoglycans are seen in association with elastin including
  - Decorin
  - Hyaluronic acid
  - Dermatan sulfate
- Proteoglycans may provide hydration necessary for elastic recoil or prevent spontaneous aggregation of tropoelastin in extracellular space allowing fibrillogenesis to occur


elastic fiber
STRETCH
RELAX
single elastin molecule
cross-link

	Collagen	Elastin
1	Many different genetic types	One genetic type
2	Triple helix	Single chain, random coil conformation permitting stretching
3	(G-X-Y)n repeating structure	No (G-X-Y)n repeating structure
4	Presence of hydroxylysine	No hydroxylysine
5	Contains carbohydrate (hydroxylysine glycosylation)	No glycosylation
6	Intramolecular aldol crosslinks	Intramolecular desmosine crossliks
7	Presense of extension during biosynthesis	No extension peptides present during synthesis

Keratin

Keratin

α- Keratins are found in mammals

α- Keratins are found as a left-handed super helix

β- Keratins are found in birds and reptiles

β- Keratins are analogs to the silk fibroin structures produced by spiders and silkworms

α- Keratin

Two reasons why this is
a tough protective fibrous protein

Alpha Keratin

α- keratin is found in hair, outer layer of skin, fingernails, claws, horns and beaks

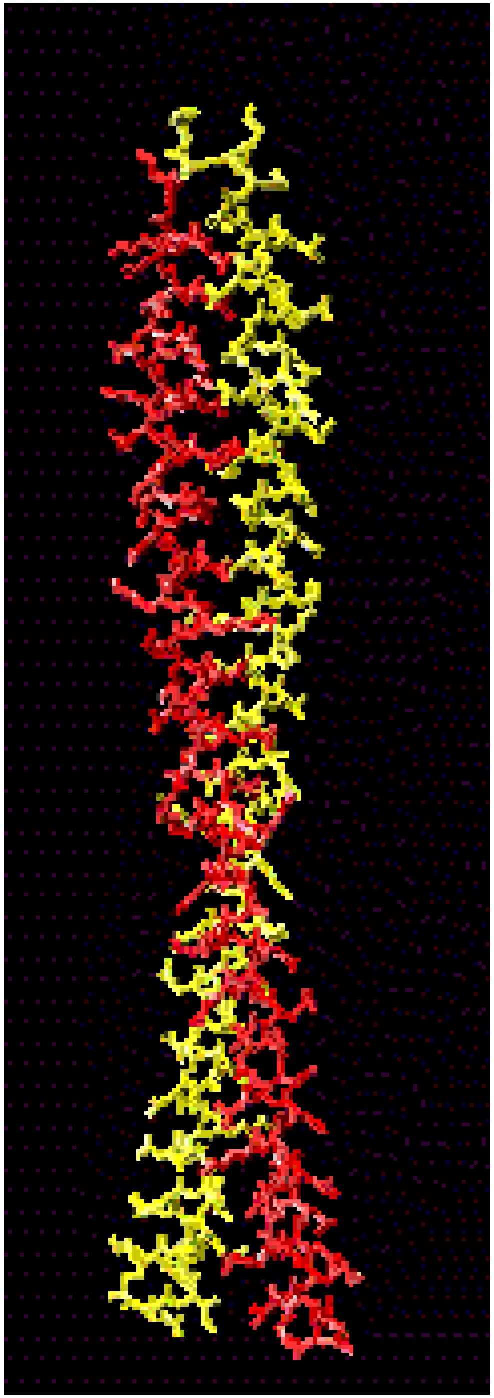
The 2ry structure is a dimer of two α- helices.

It is rich of (Phe, Ile, Val, Met, Ala) whose favour α-helix formation.

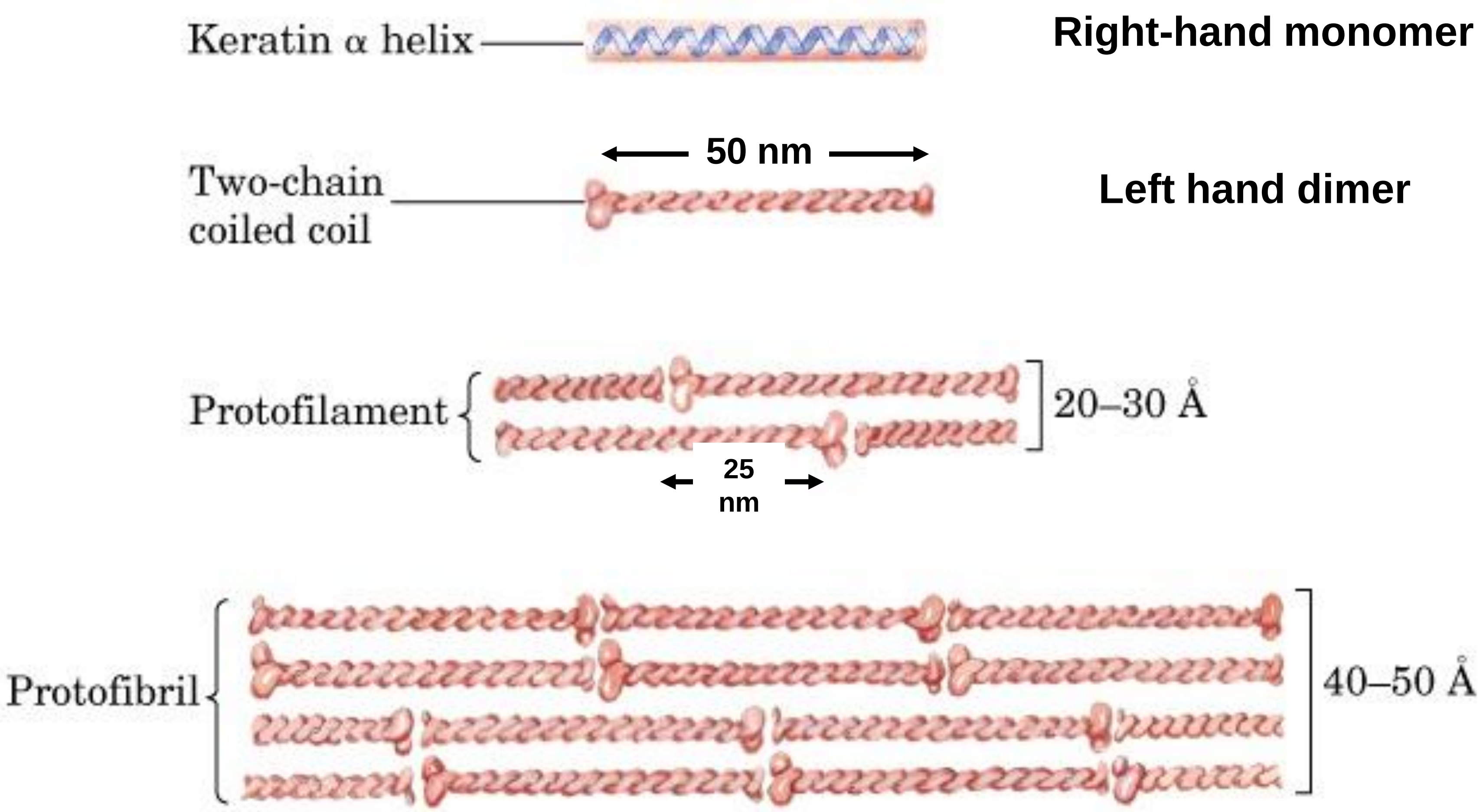
These hydrophobic amino acids make it insoluble.

It is rich in cystein.

Structure of dimer of two α-helices.



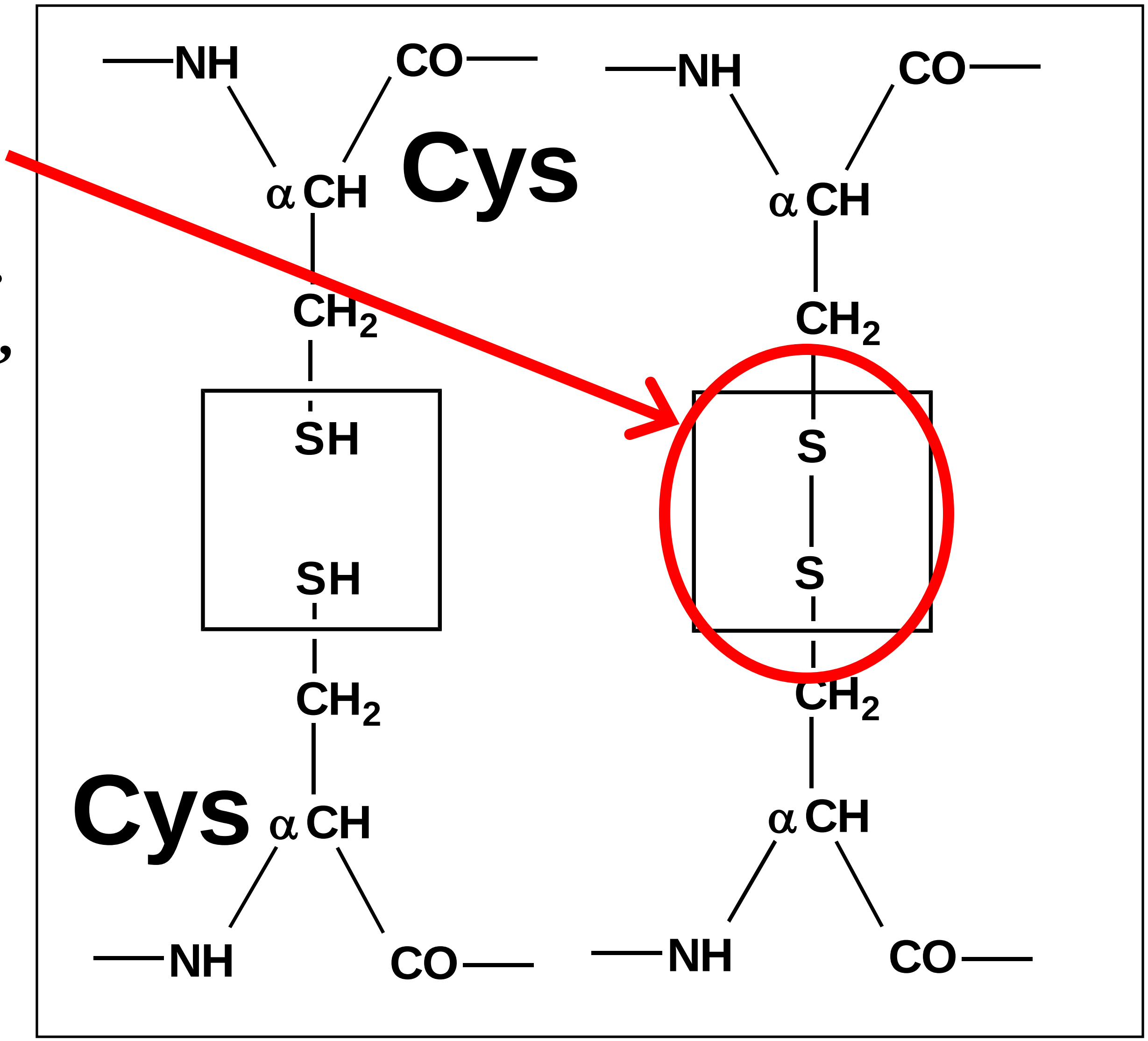
Proposed structure for α–keratin intermediate filaments

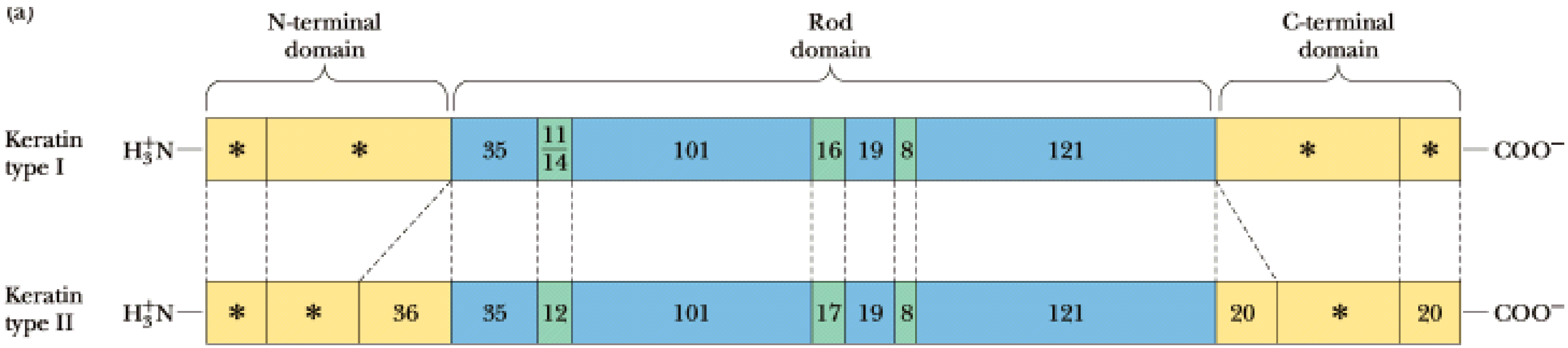


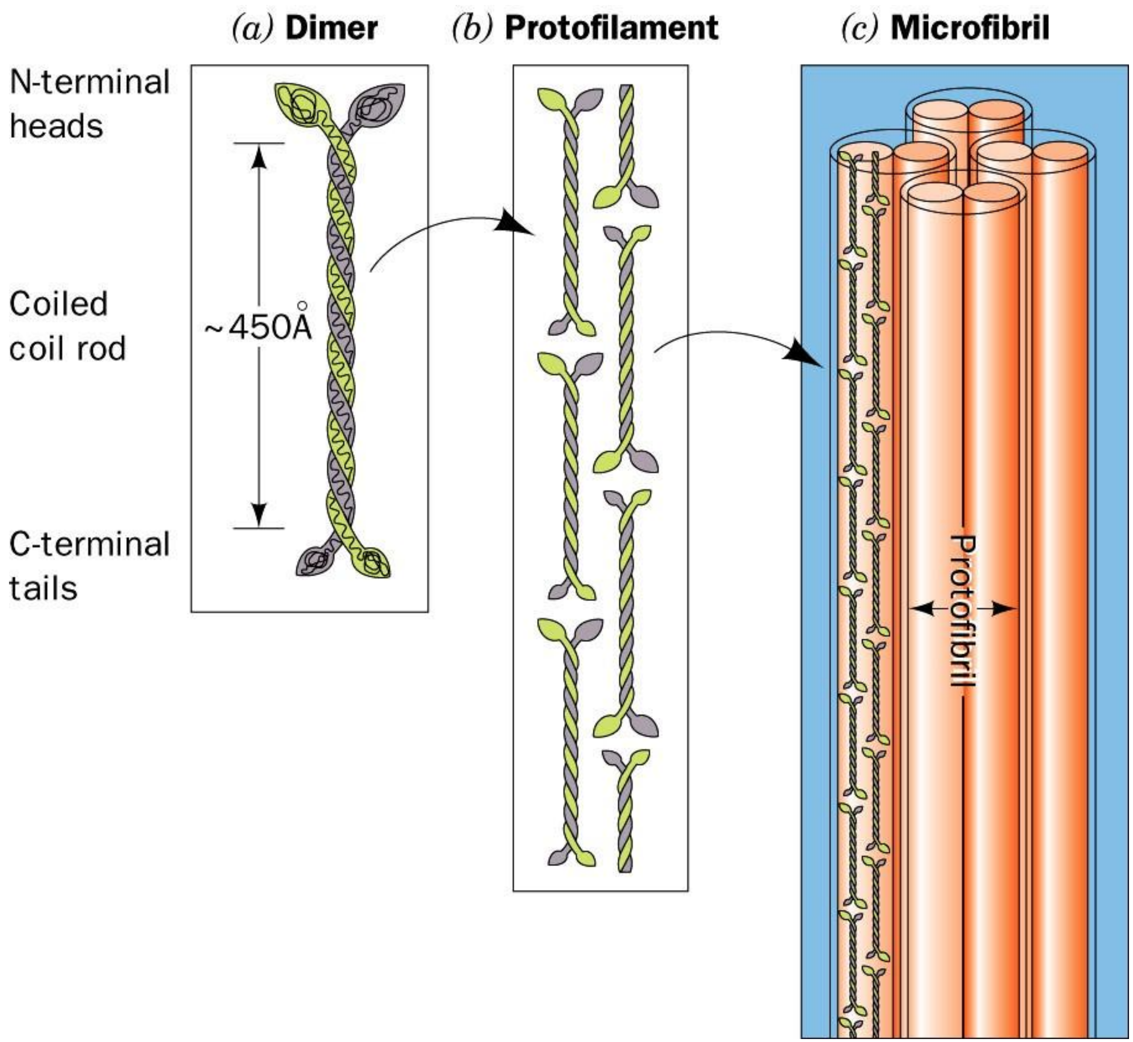
Disulphide bridges and toughness in α-keratin

(2) Cys residues form disulphide bridges in α-keratin, and link the α-helices together. The more disulphides, the stronger the α-keratin.

Disulphide bridges are also frequently used to stabilize the interior of a globular protein.







Keratin Structure

Fibroin

- Fibroins are the silk proteins. They also form the spider webs
- Made with a β-sheet structures with Gly on one face and Ala/Ser on the other
- Fibroins contain repeats of [Gly-Ala-Gly-Ala-Gly-Ser-Gly-Ala-Ala-Gly-(Ser-Gly-Ala-Gly-Ala-Gly)8]
- The β-sheet structures stack on top of each other
- Bulky regions with valine and tyrosine interrupt the β-sheet and allow the stretchiness

Structure of silk fibroin

- (a)Three dimension view of the stacked β-sheets
- (b) Interdigitation of Al or Ser and Gly side chain
- The plane of the section is perpendicular to the folded sheets