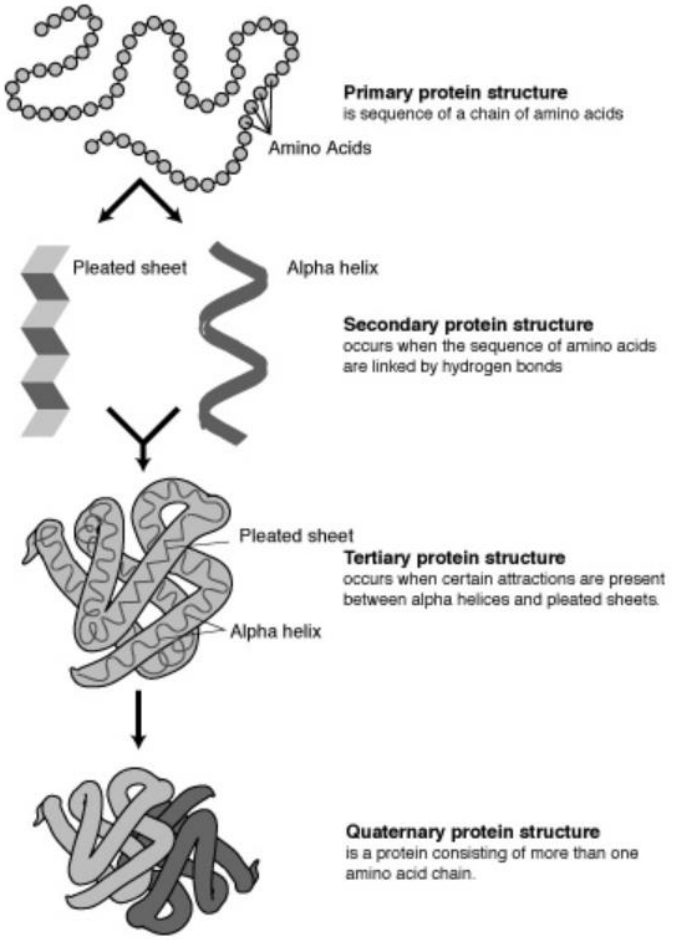
Proteínas 1

Mauricio S. Baptista, bloco 12 superior, sala 1262

baptista@iq.usp.br



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A Structural View of Biology

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The RCSB PDB builds upon the data by creating tools and resources for research and education in molecular biology, structural biology, computational biology, and beyond.

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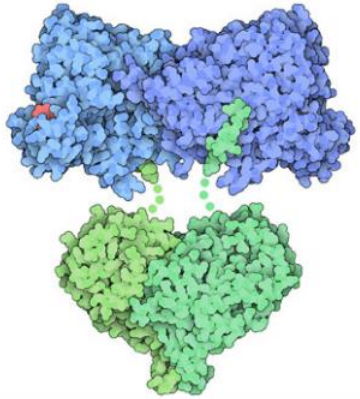
October **Molecule of the Month**



Ribonucleotide Reductase

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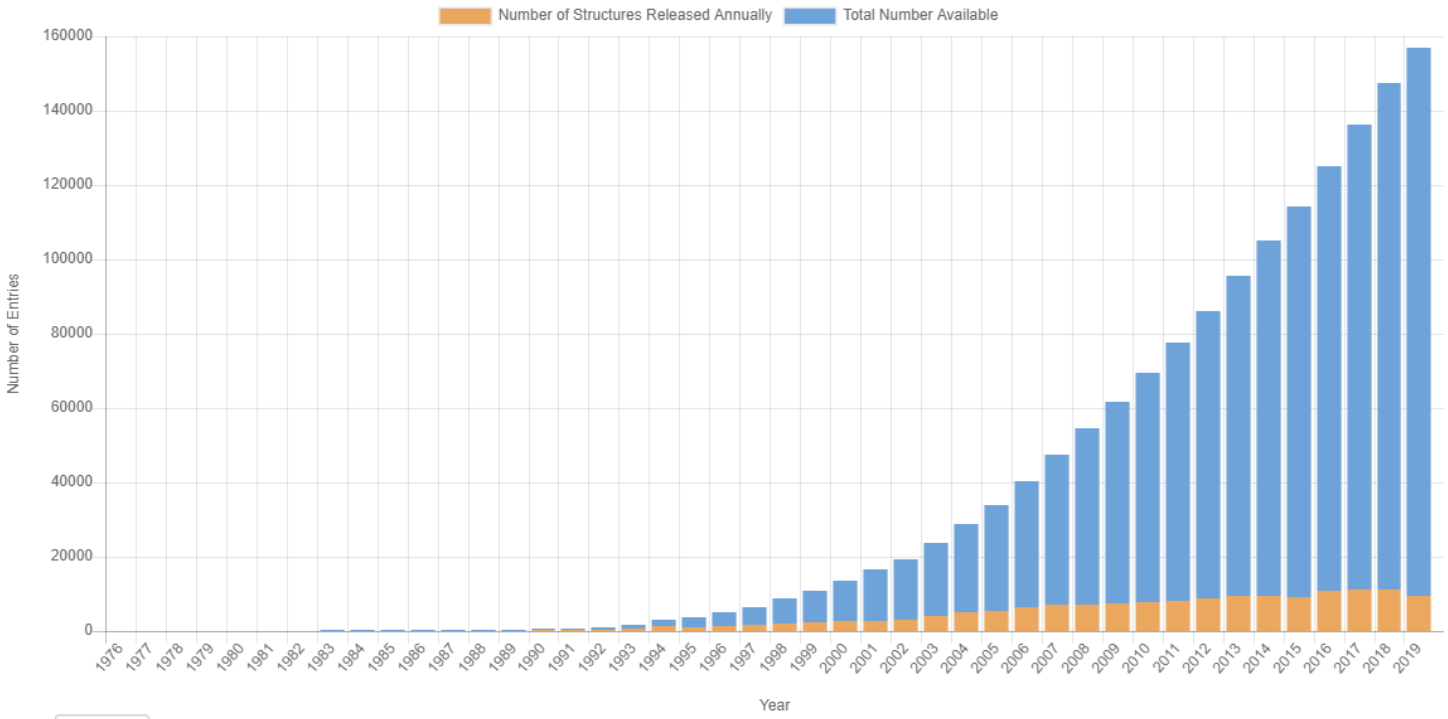
PDB Statistics: Overall Growth of Released Structures Per Year



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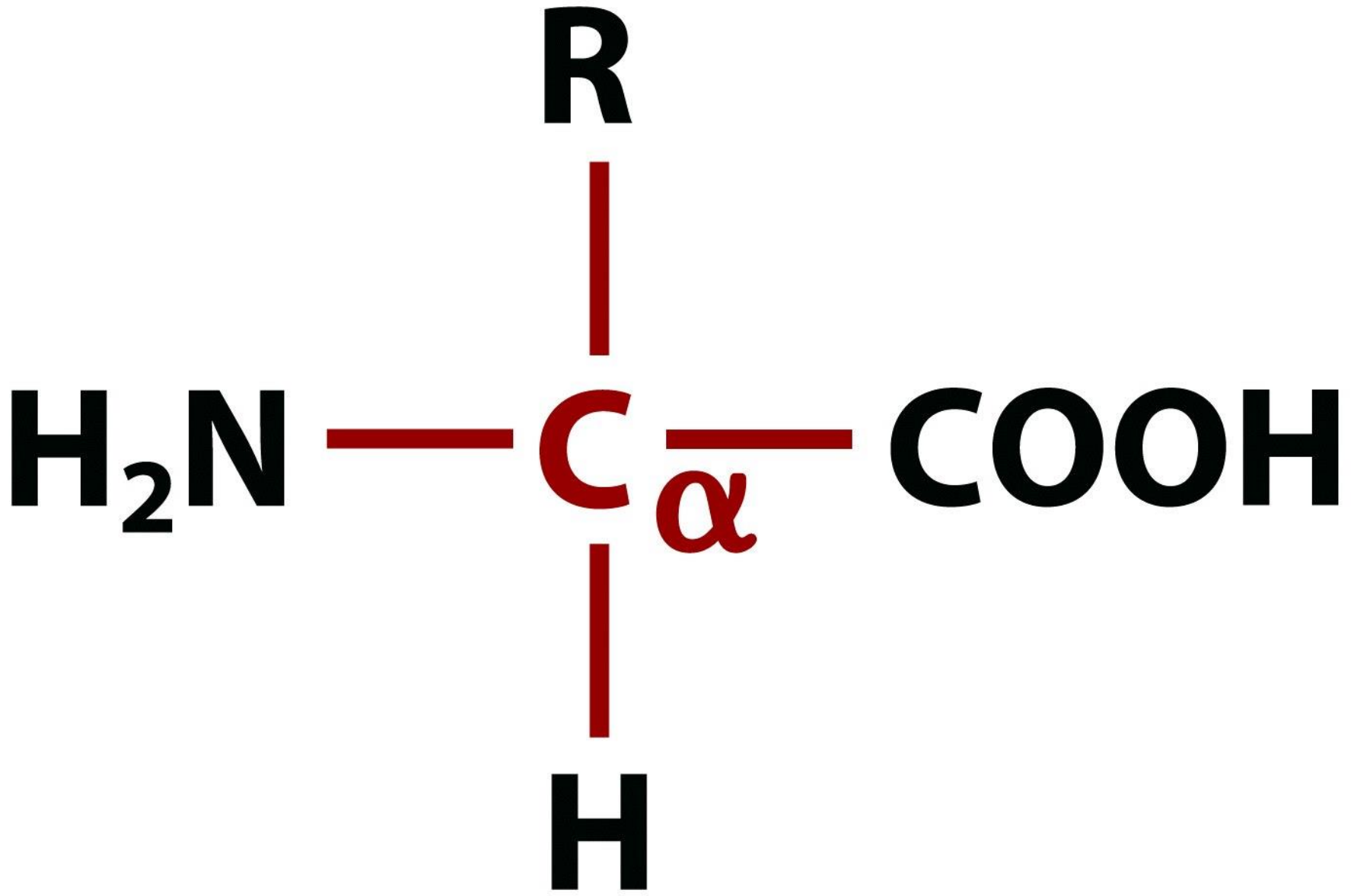
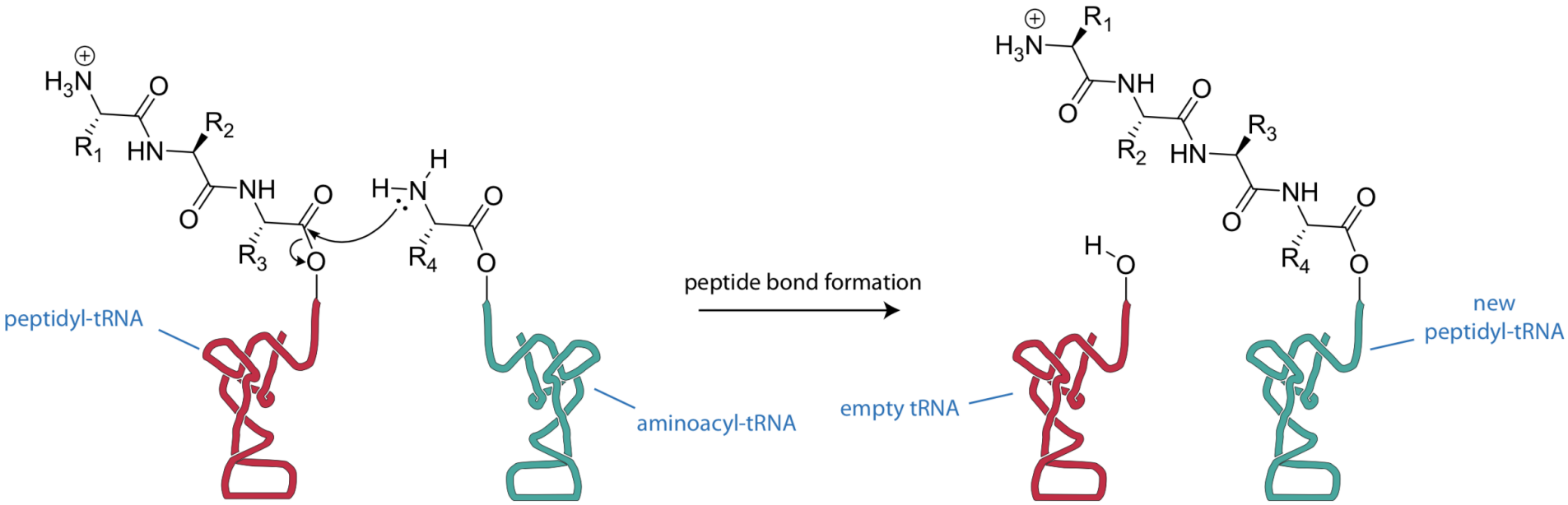


Figure 4-1 Fundamentals of Biochemistry, 2/e

Mecanismo simplificado da formação da ligação peptídica nos ribossomos

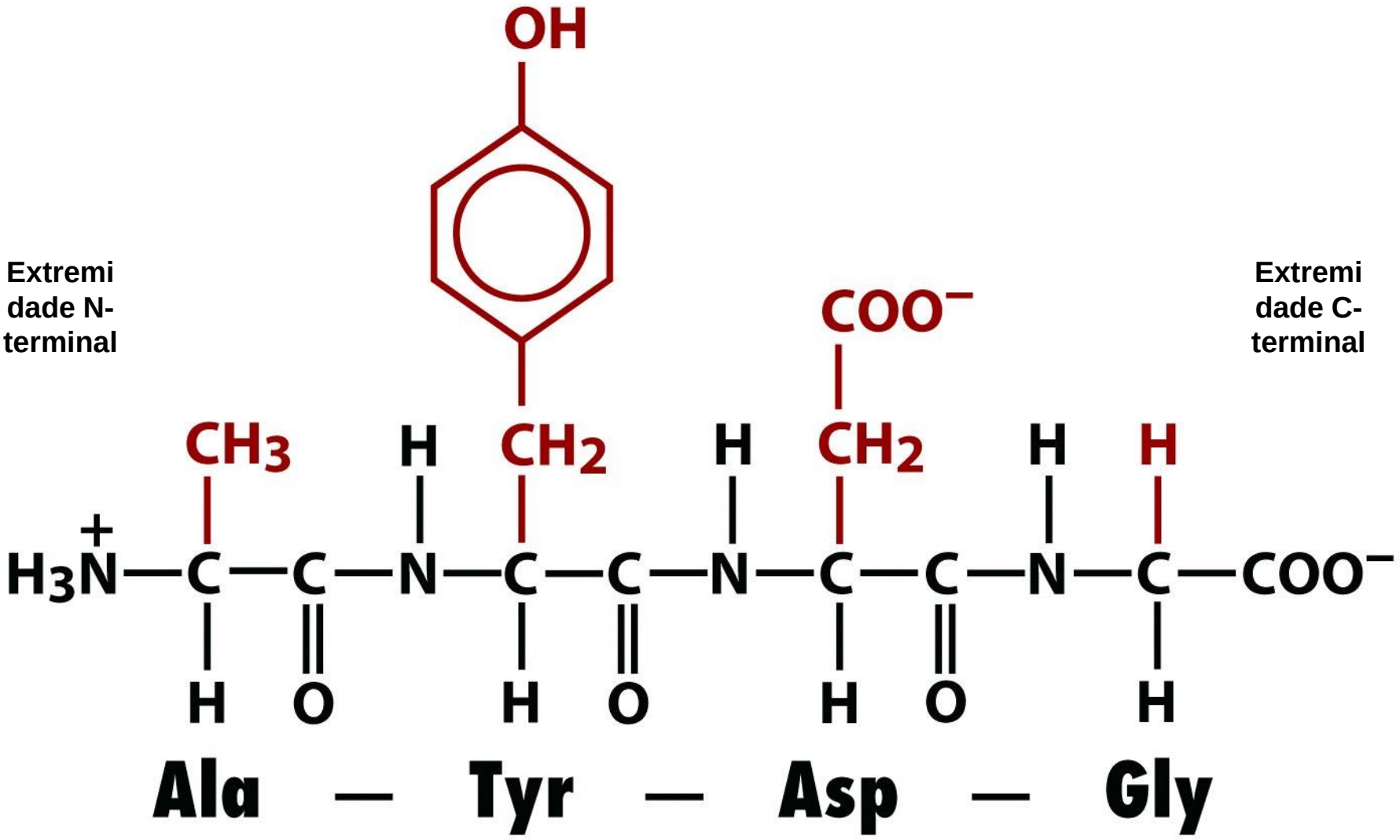


O grupo amino livre no aminoácido ligado ao aminoacil-tRNA atua como um nucleófilo que ataca o carbono carbonílico no terminal COOH do polipeptídeo ligado ao peptidil-tRNA. A ligação acila que conecta o polipeptídeo em crescimento ao peptidil-tRNA é quebrada. Como consequência, um novo peptidil-tRNA é gerado a partir do aminoacil-tRNA anterior.

Estrutura Primária

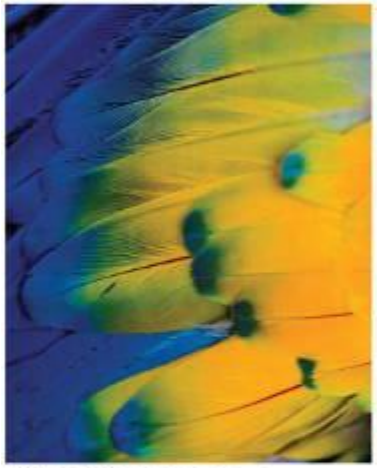
Extremidade N-terminal

Extremidade C-terminal



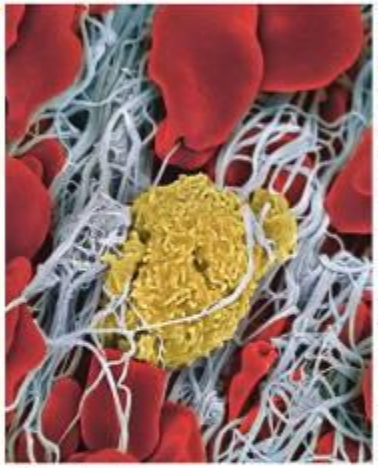
PROTEIN DIVERSITY

Proteins perform a variety of different functions. They all, however, are built the same way and from the same raw materials in organisms.



Wing feathers on a Scarlet Macaw

STRUCTURE
Hair, fingernails, feathers, horns, cartilage, tendons

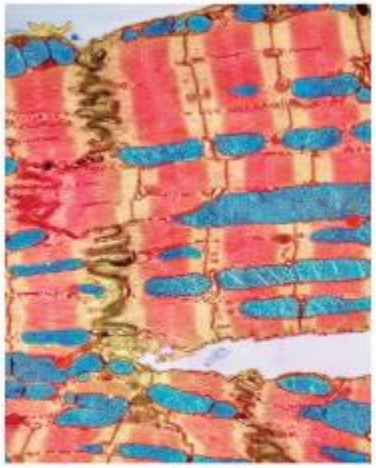


Blood clot

PROTECTION
Help fight invading microorganisms, coagulate blood

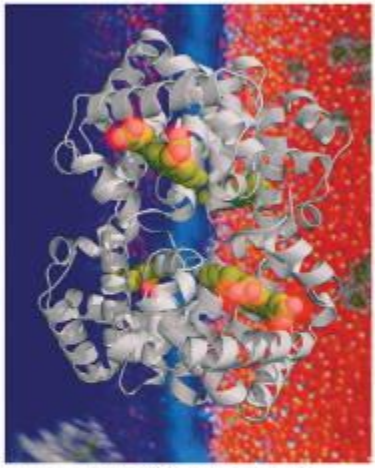
Goblet cell (pink and blue) in the mucosal lining of the small intestine

REGULATION
Control cell activity, constitute some hormones



Heart muscle cells

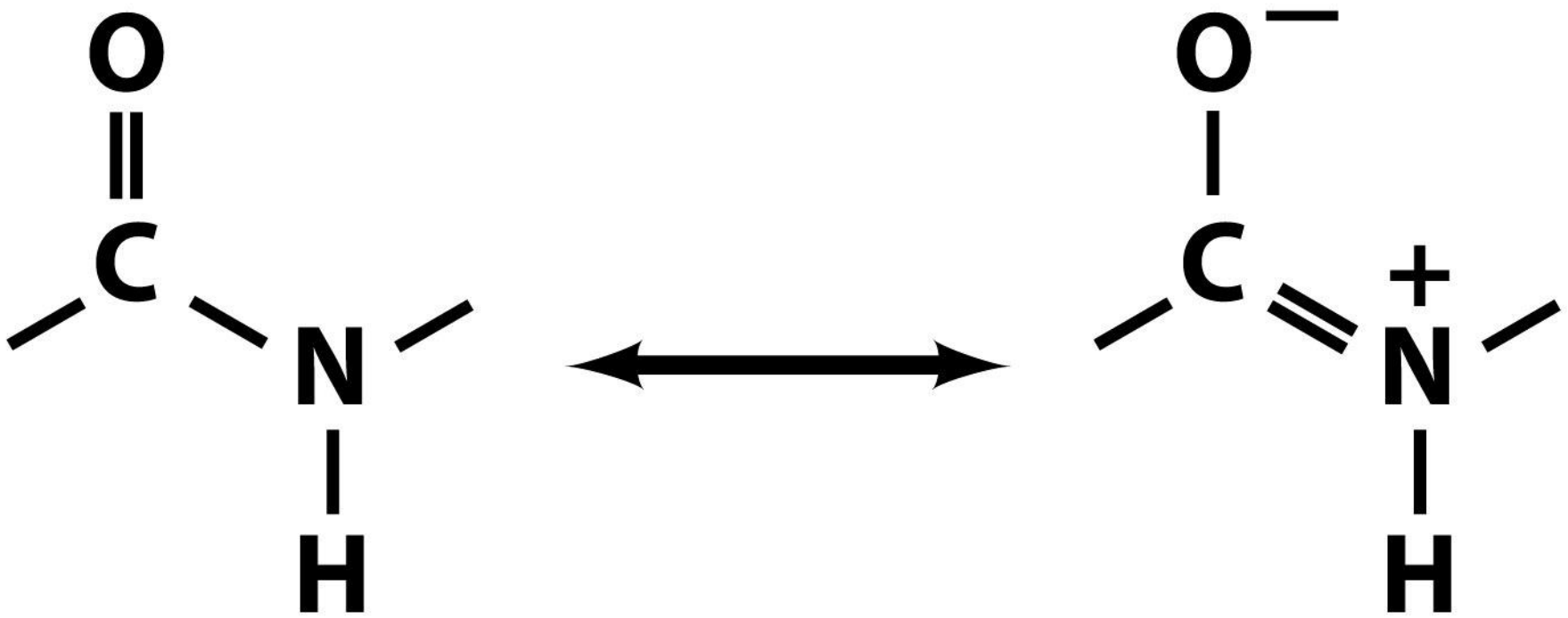
CONTRACTION
Allow muscles to contract, heart to pump, sperm to swim



A model of hemoglobin molecules carrying oxygen

TRANSPORTATION
Carry molecules such as oxygen around your body

forma ⟶ função



Unnumbered figure pg 131 Fundamentals of Biochemistry, 2/e

Uma boa parte da informação estrutural está presente na ligação peptídica e na relação desta com as cadeias laterais dos aminoácidos

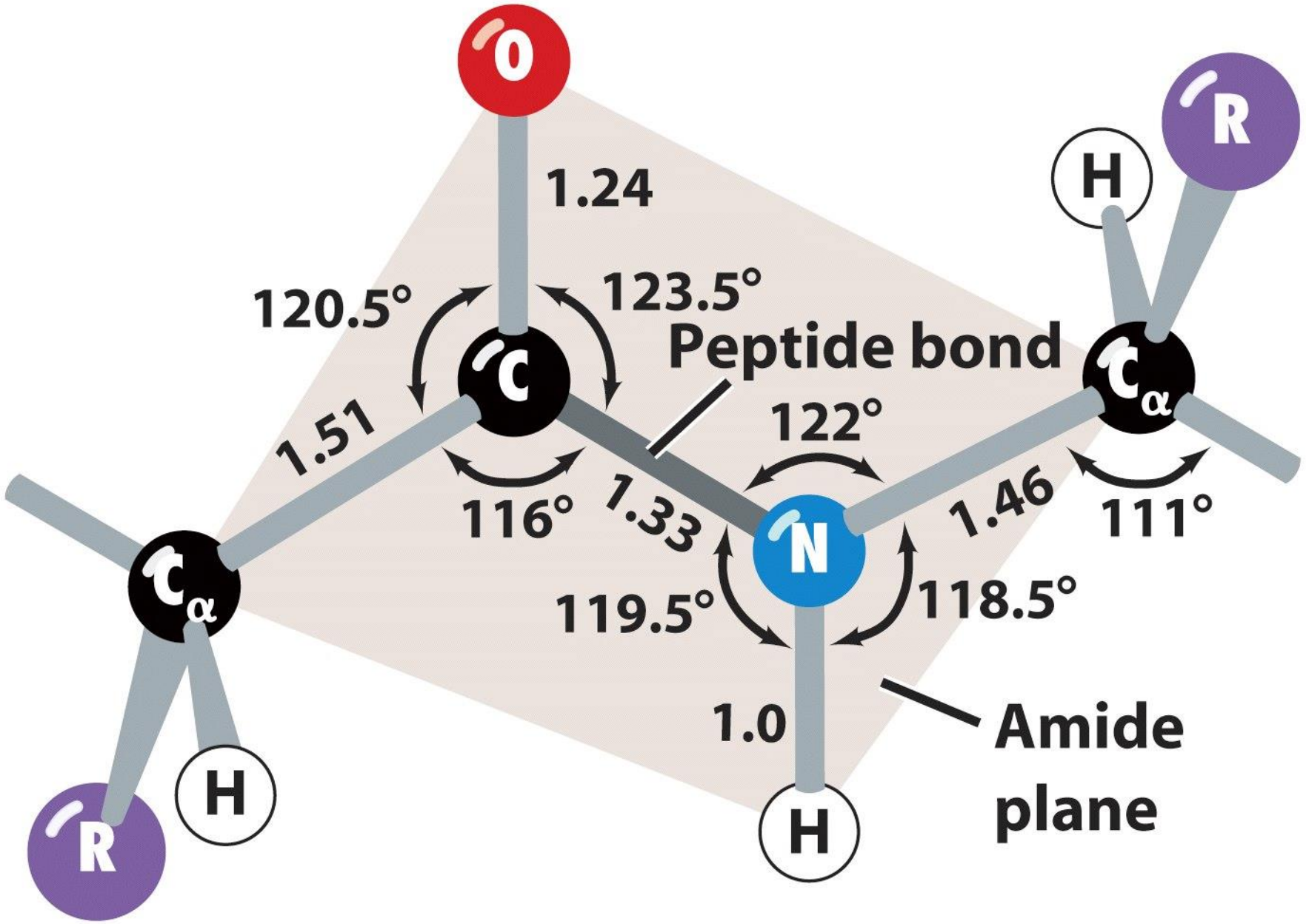


Figure 6-2 Fundamentals of Biochemistry, 2/e

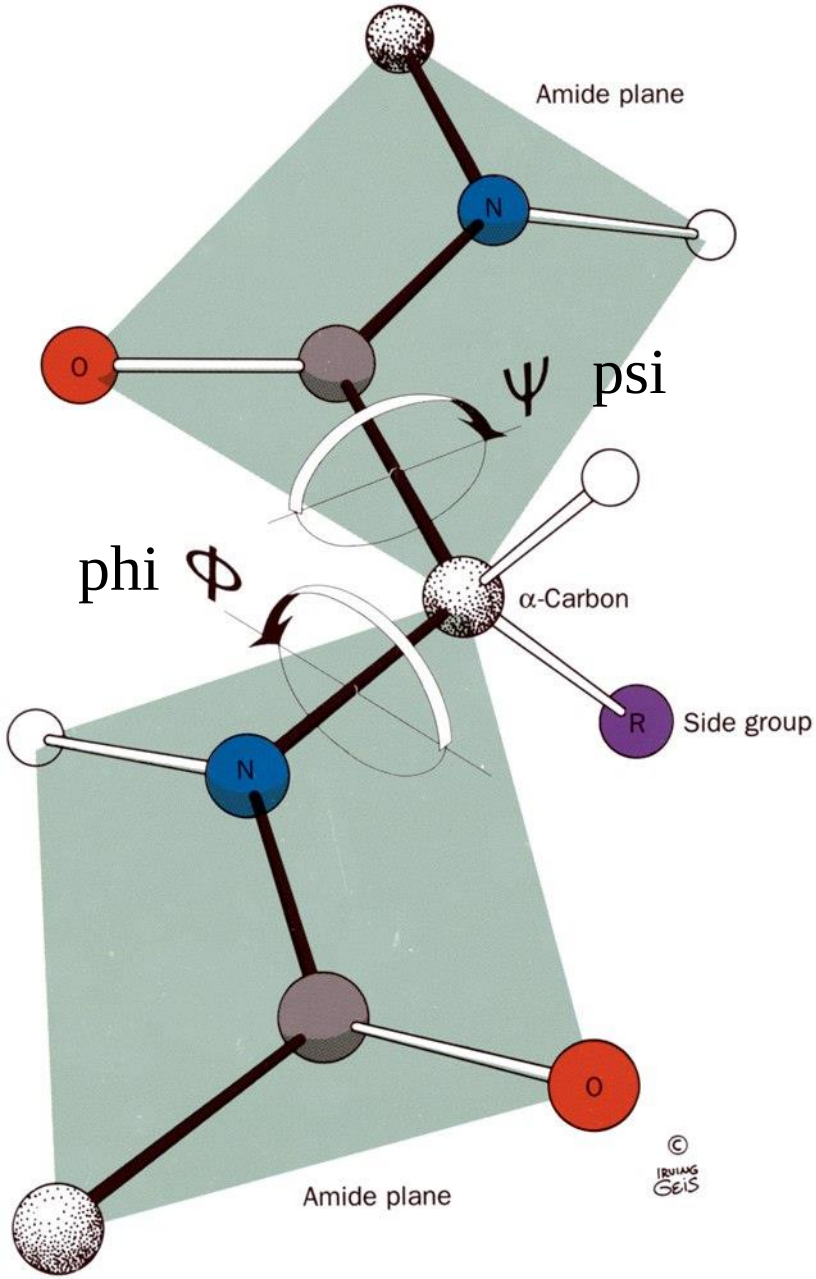


Figure 6-4 Fundamentals of Biochemistry, 2/e

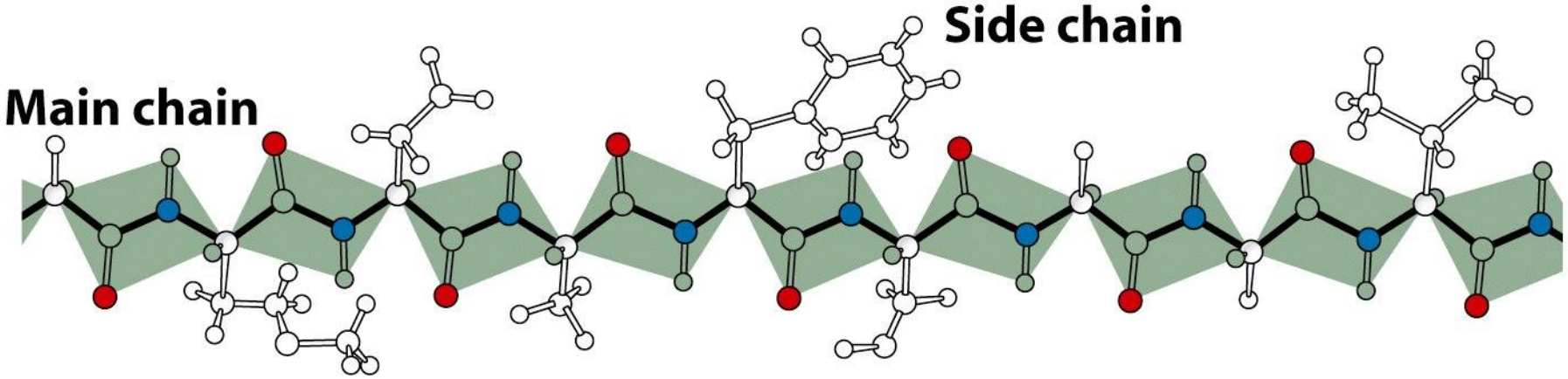
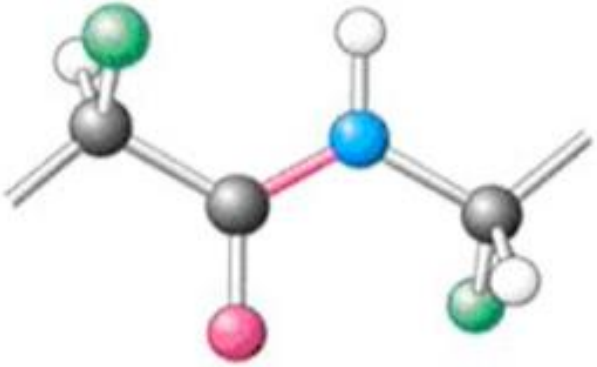
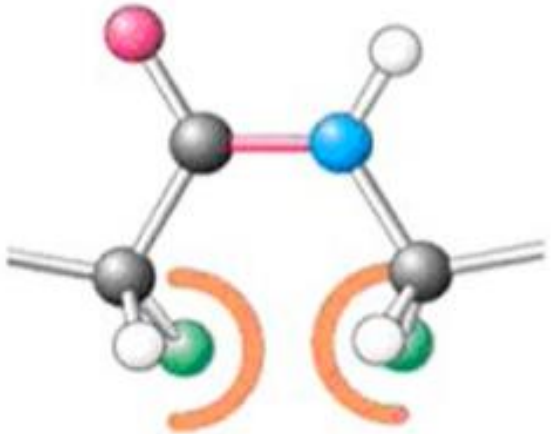


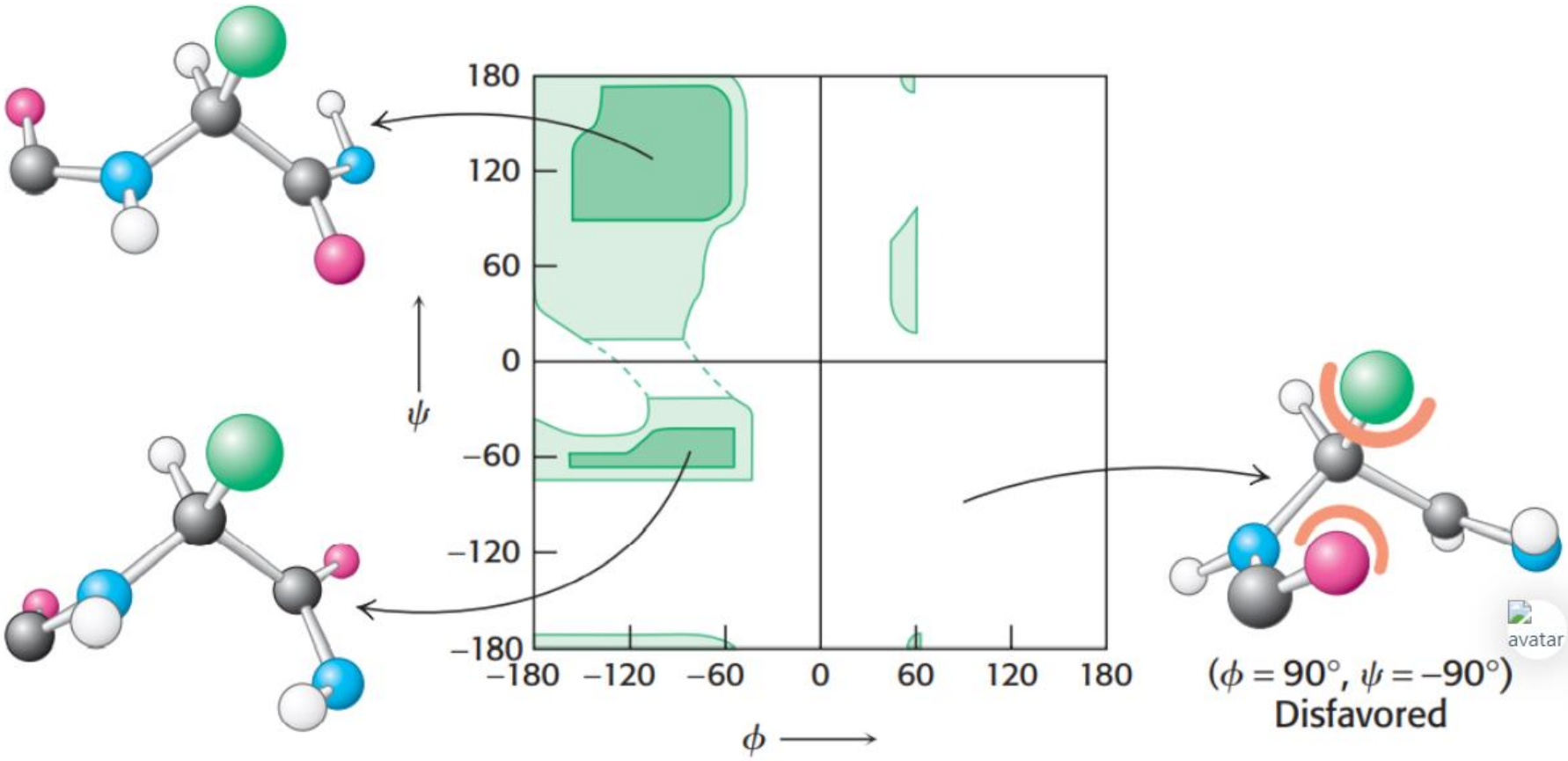
Figure 6-3 Fundamentals of Biochemistry, 2/e



Trans



Cis


180
120
60
0
−60
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−180 −120 −60 0 60 120 180
ψ
ϕ
(ϕ = 90°, ψ = −90°)
Disfavored

Plote de Ramachandram

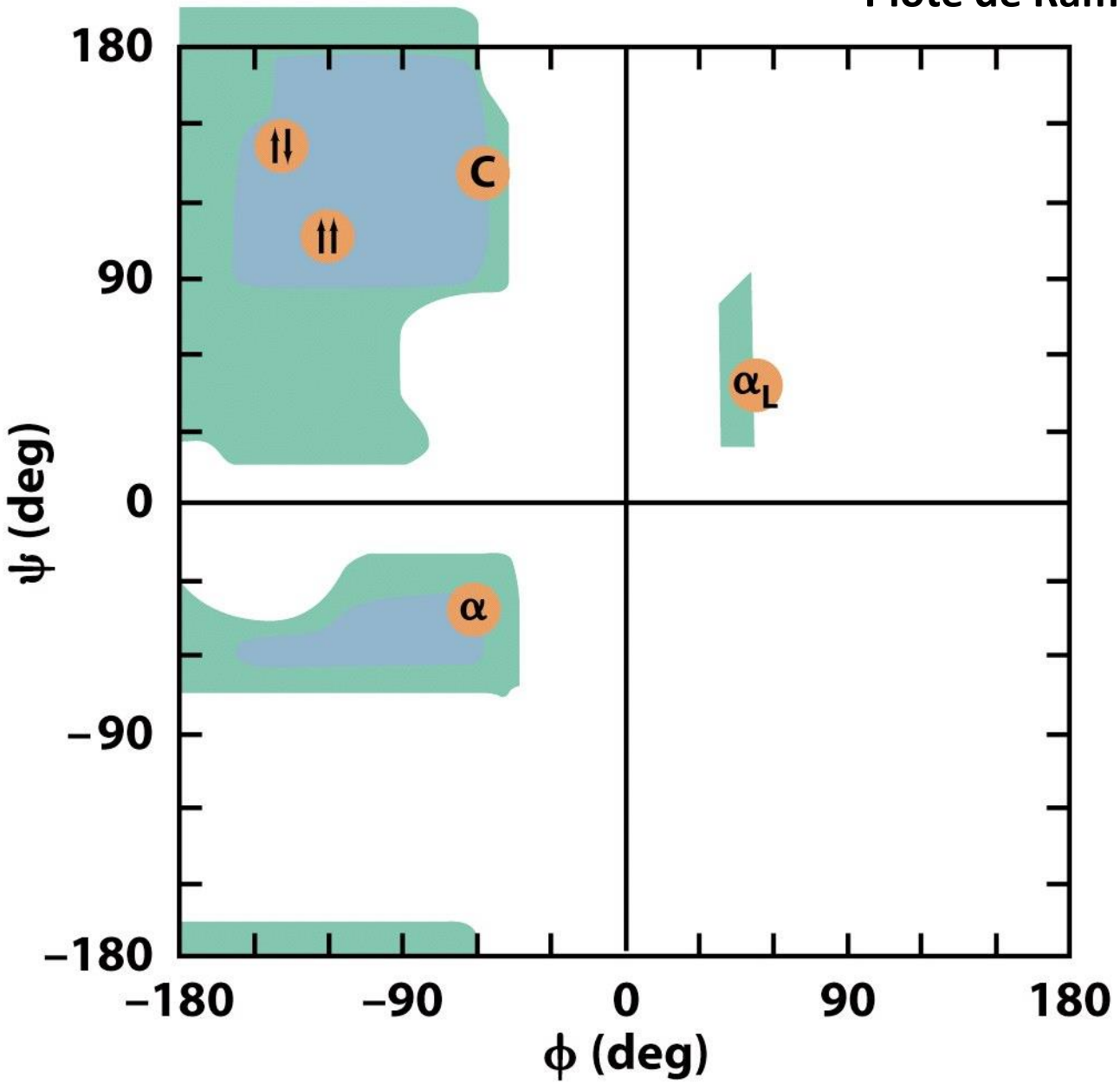
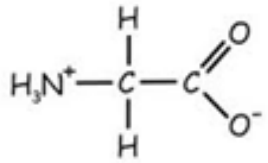
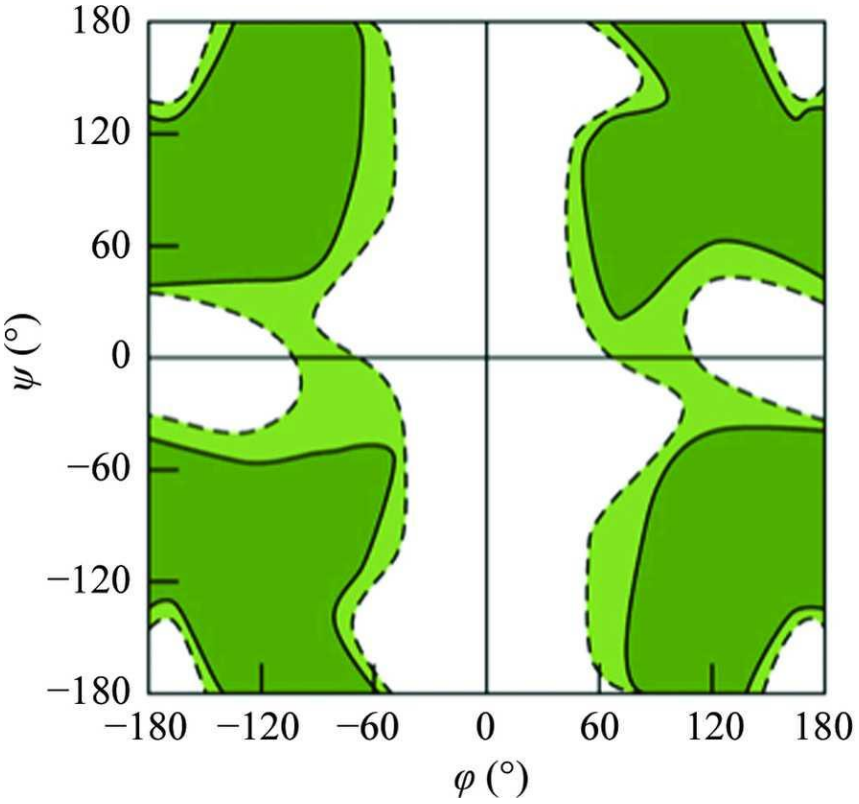
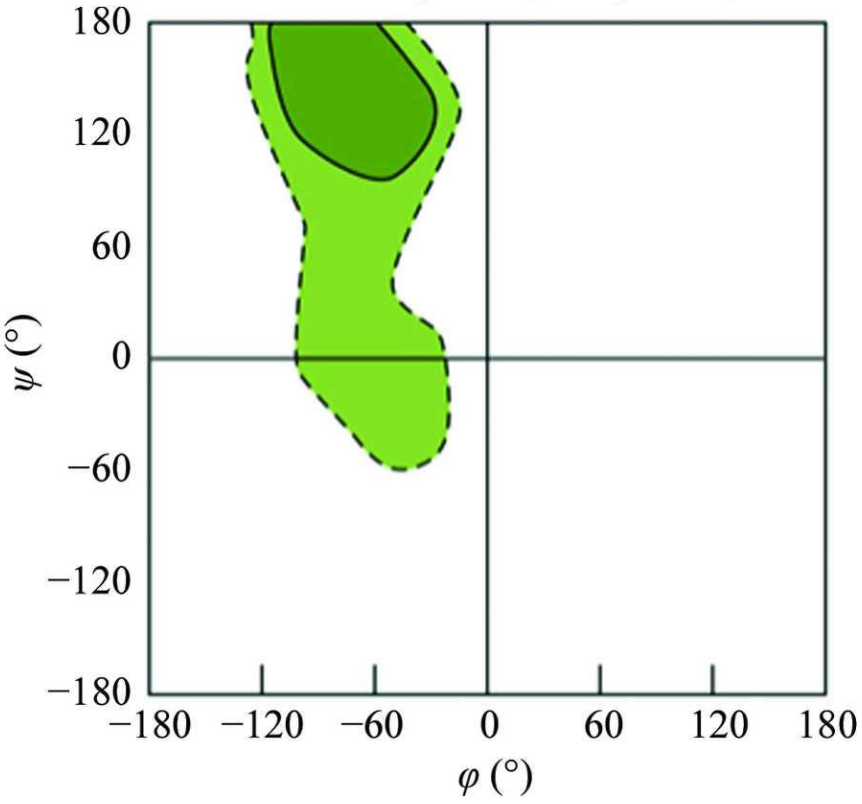


Figure 6-6 Fundamentals of Biochemistry, 2/e







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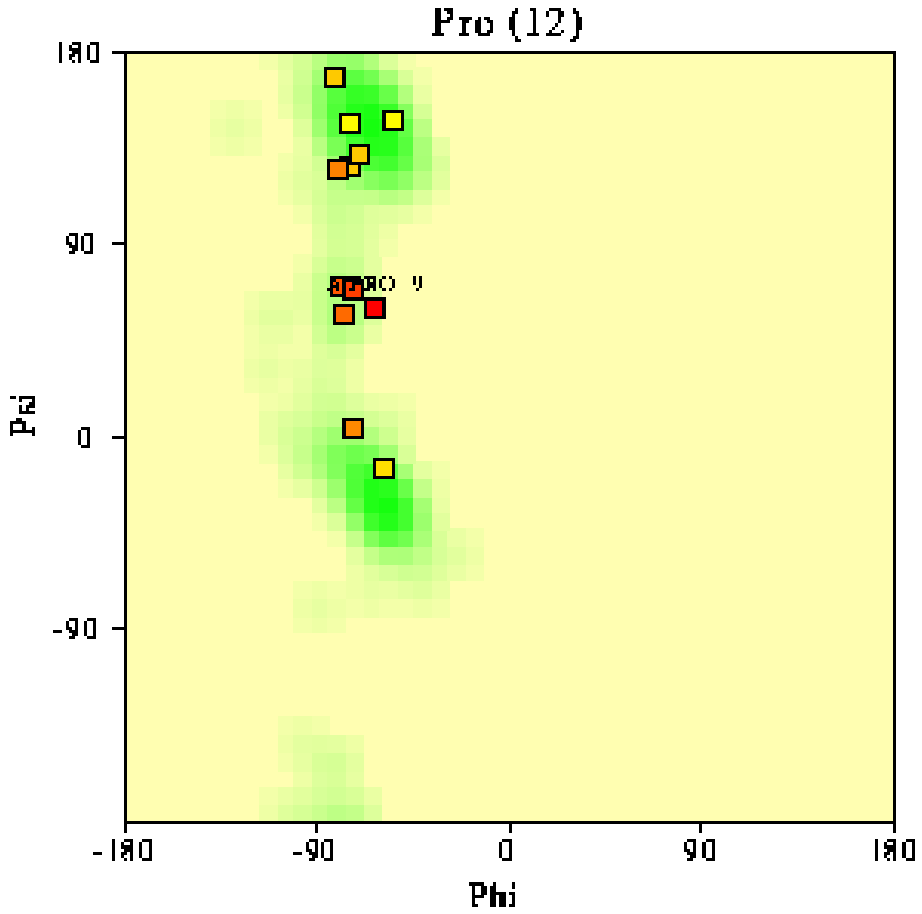
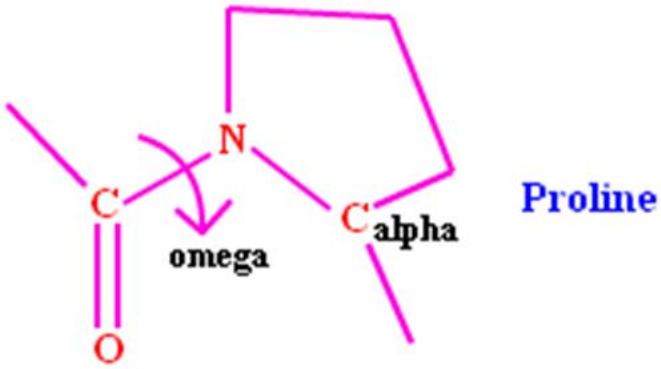
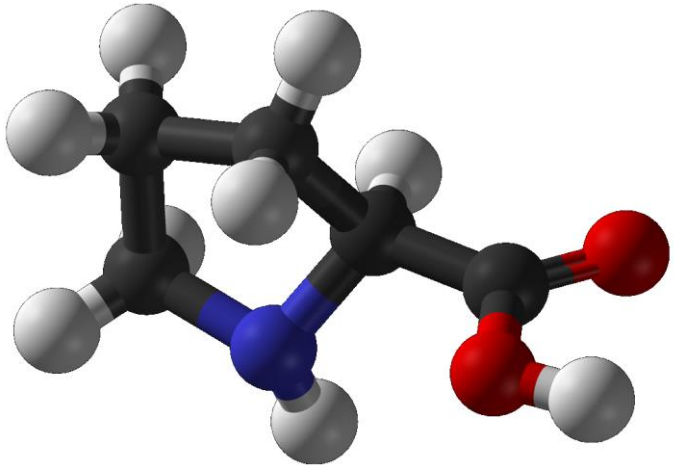
Volume 69 | **Part 8** | August 2013 | Pages 1333–1341 | 10.11107/S090744491301158X

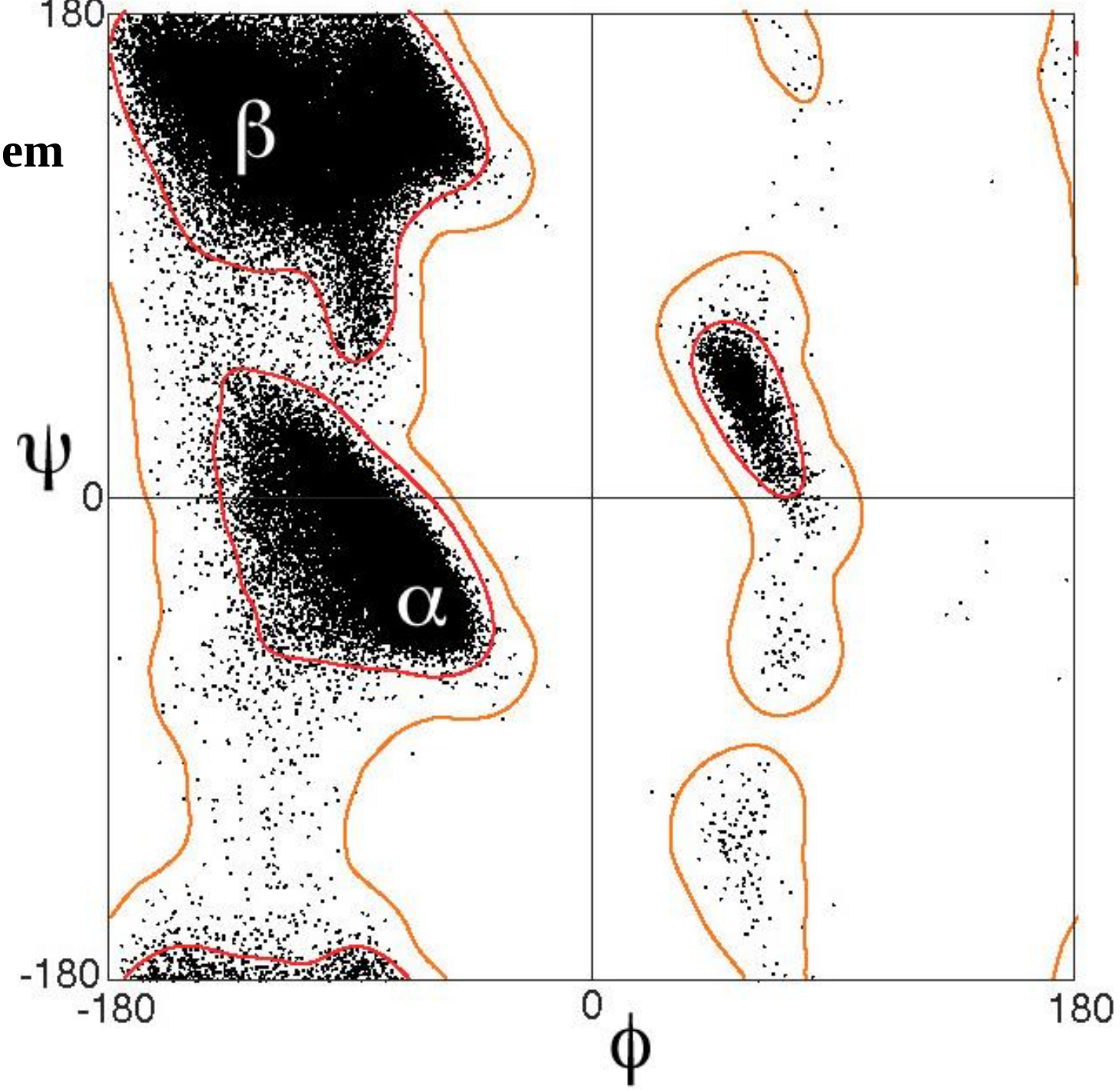




Proline



Proteínas em geral!



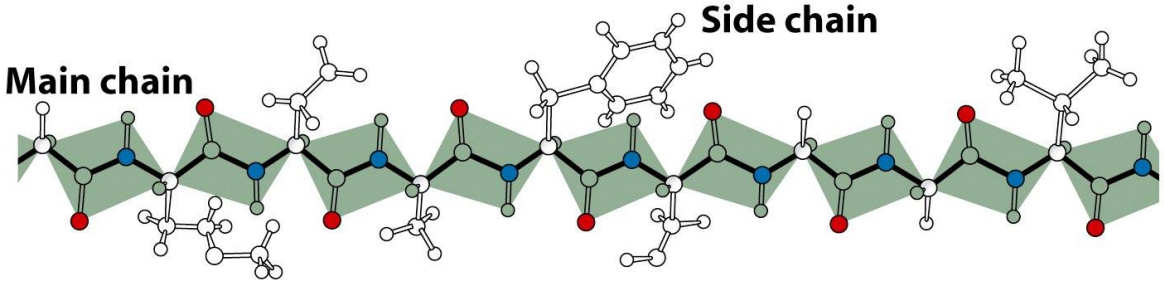
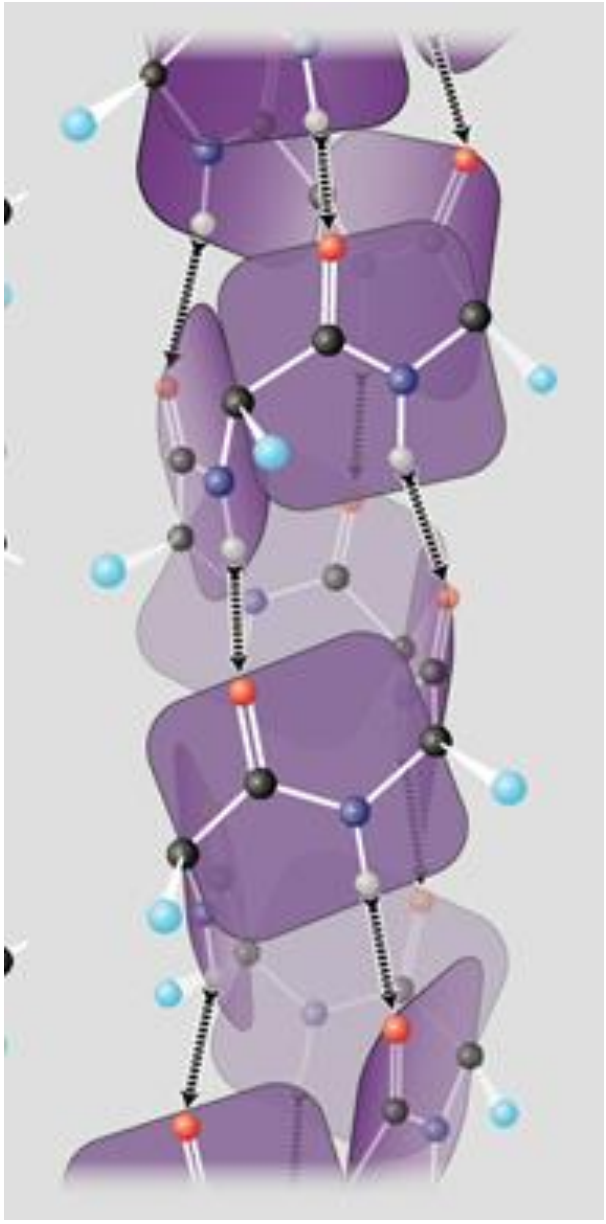


Figure 6-3 Fundamentals of Biochemistry, 2/e



www2.chemistry.gatech.edu/~lw26/structure/molecular_interactions/mol_int.html

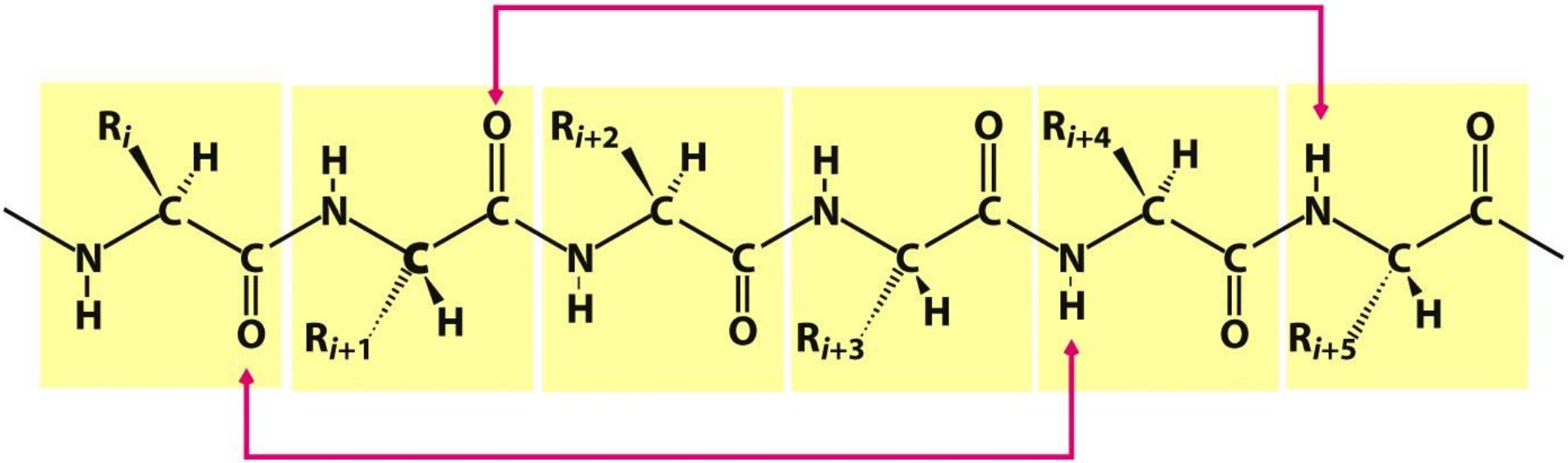


Figure 2.25
***Biochemistry*, Seventh Edition**

α Hélice

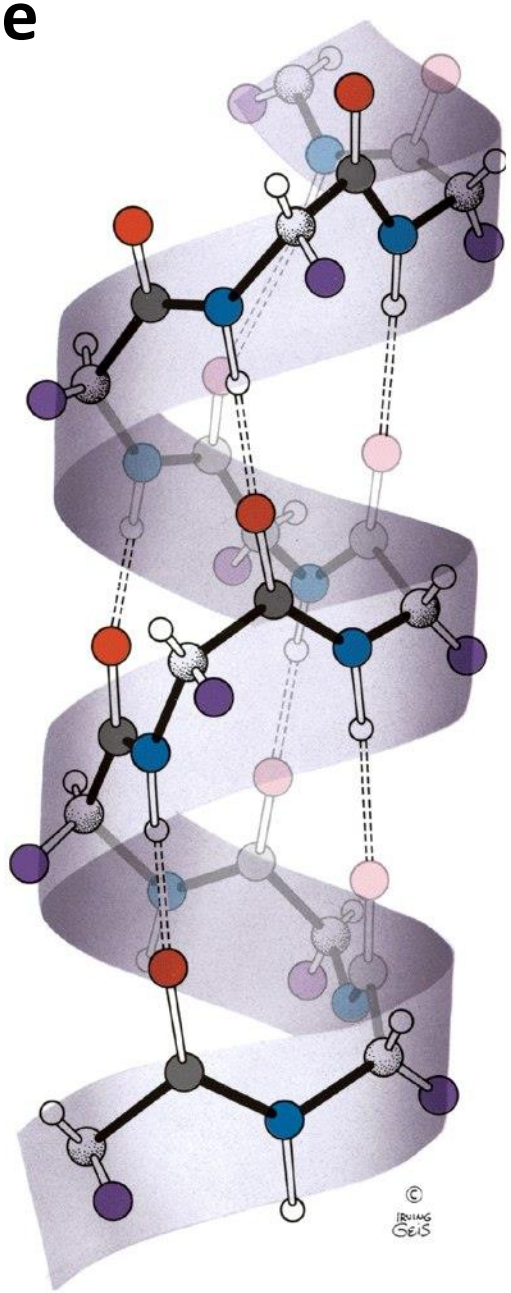
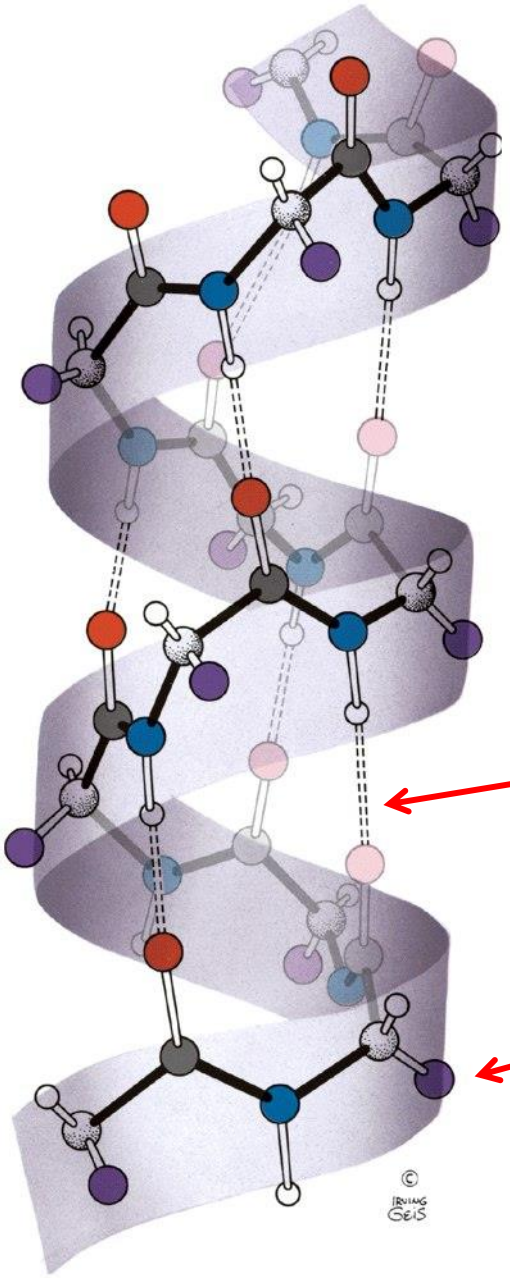


Figure 6-7 Fundamentals of Biochemistry, 2/e



5,4Å
3 a 4 resíduos

Ligações de hidrogênio

Cadeia lateral

Figure 6-7 Fundamentals of Biochemistry, 2/e

Plote de Ramachandram

Poli-alanina

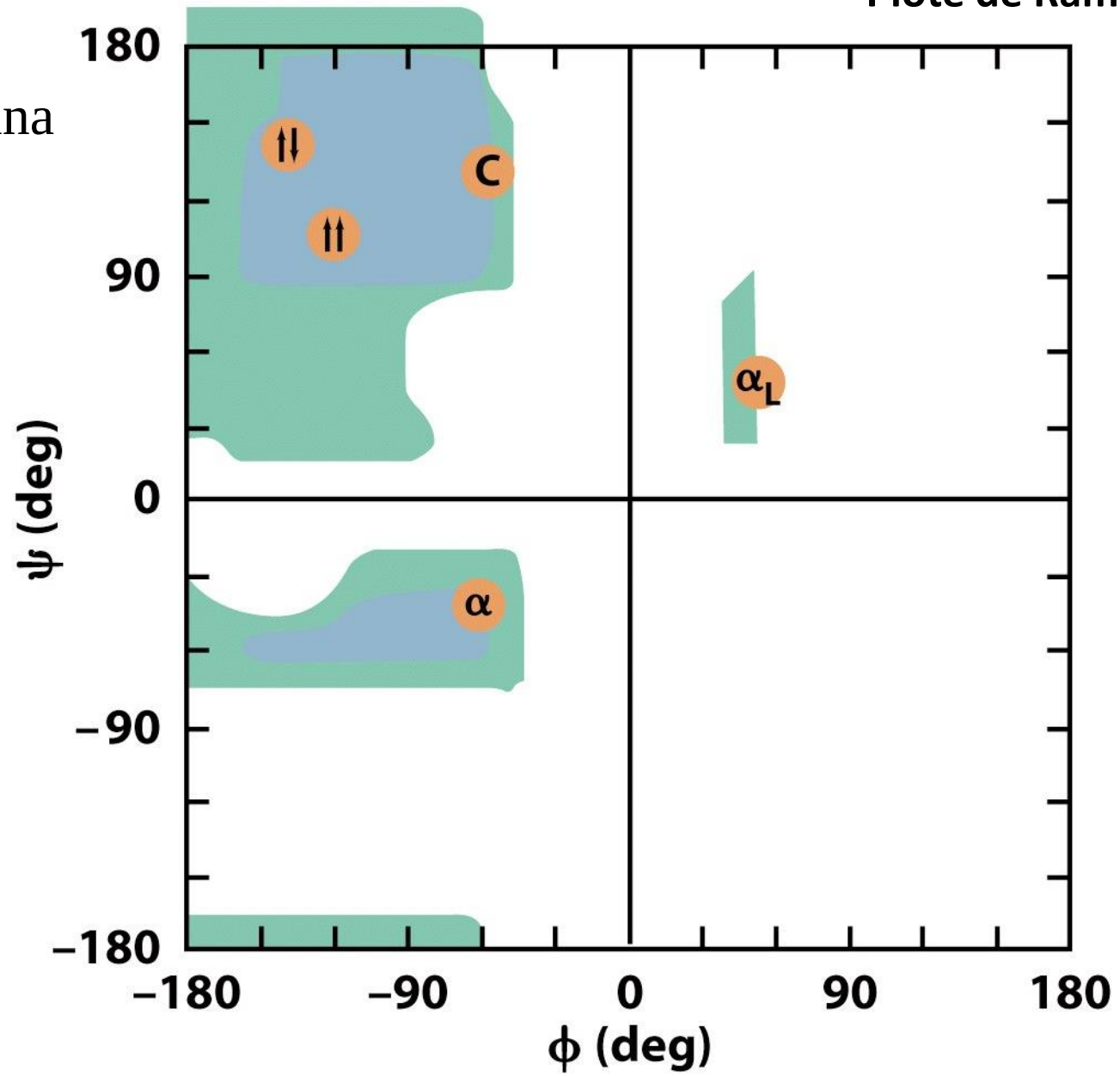


Figure 6-6 Fundamentals of Biochemistry, 2/e

Fita β

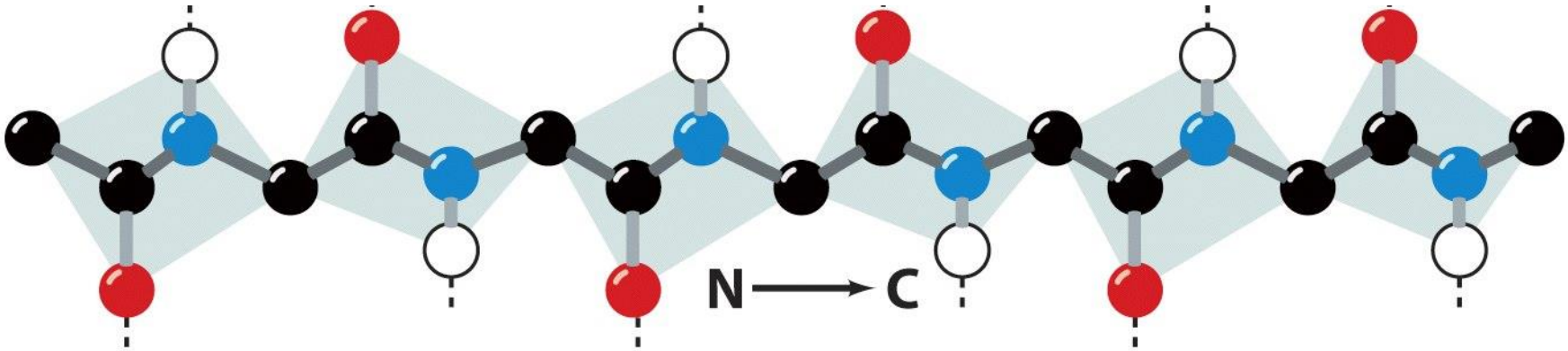


Figure 6-9a Fundamentals of Biochemistry, 2/e

Folha β
β sheet

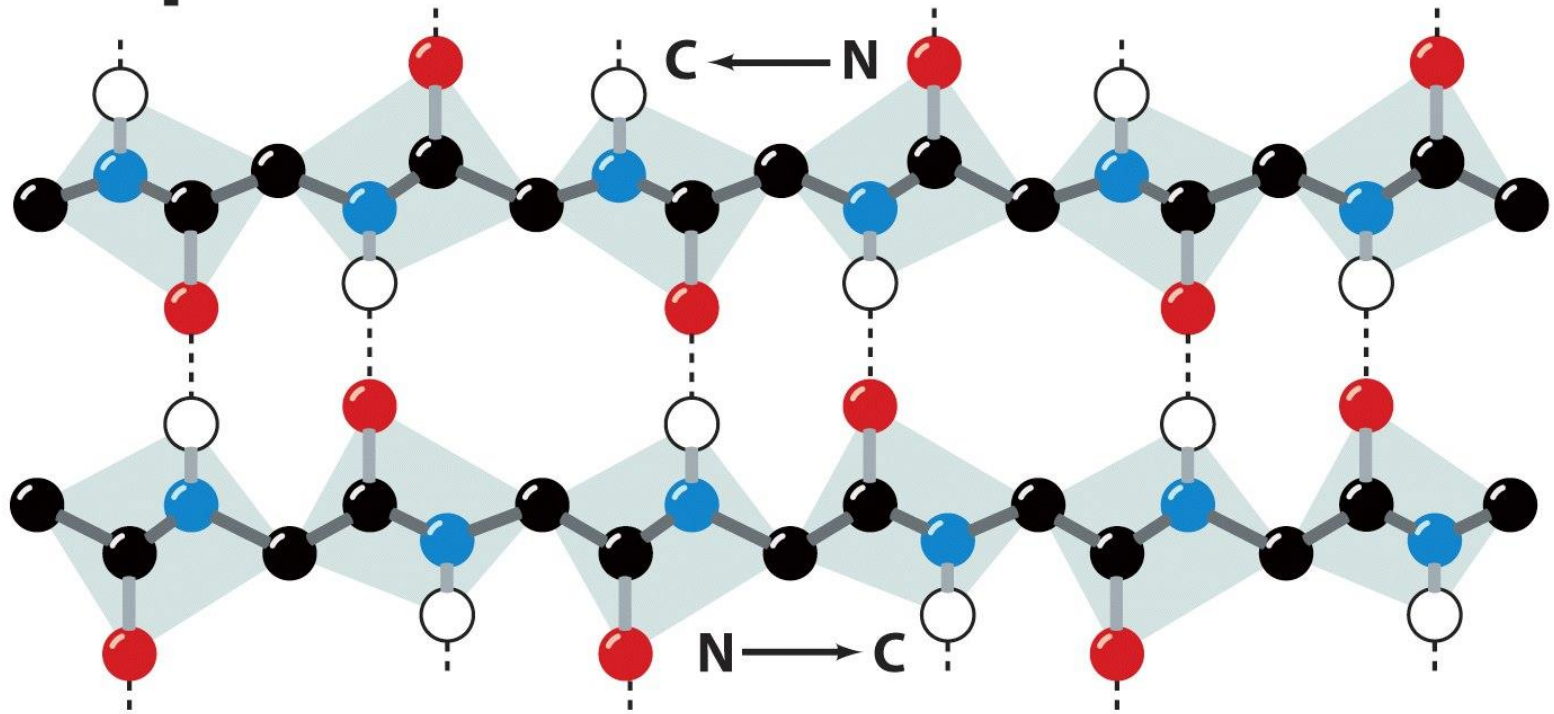
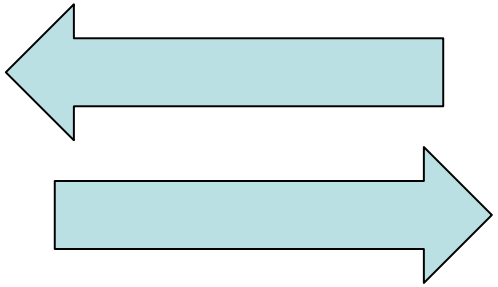


Figure 6-9a Fundamentals of Biochemistry, 2/e



Folha β
β sheet

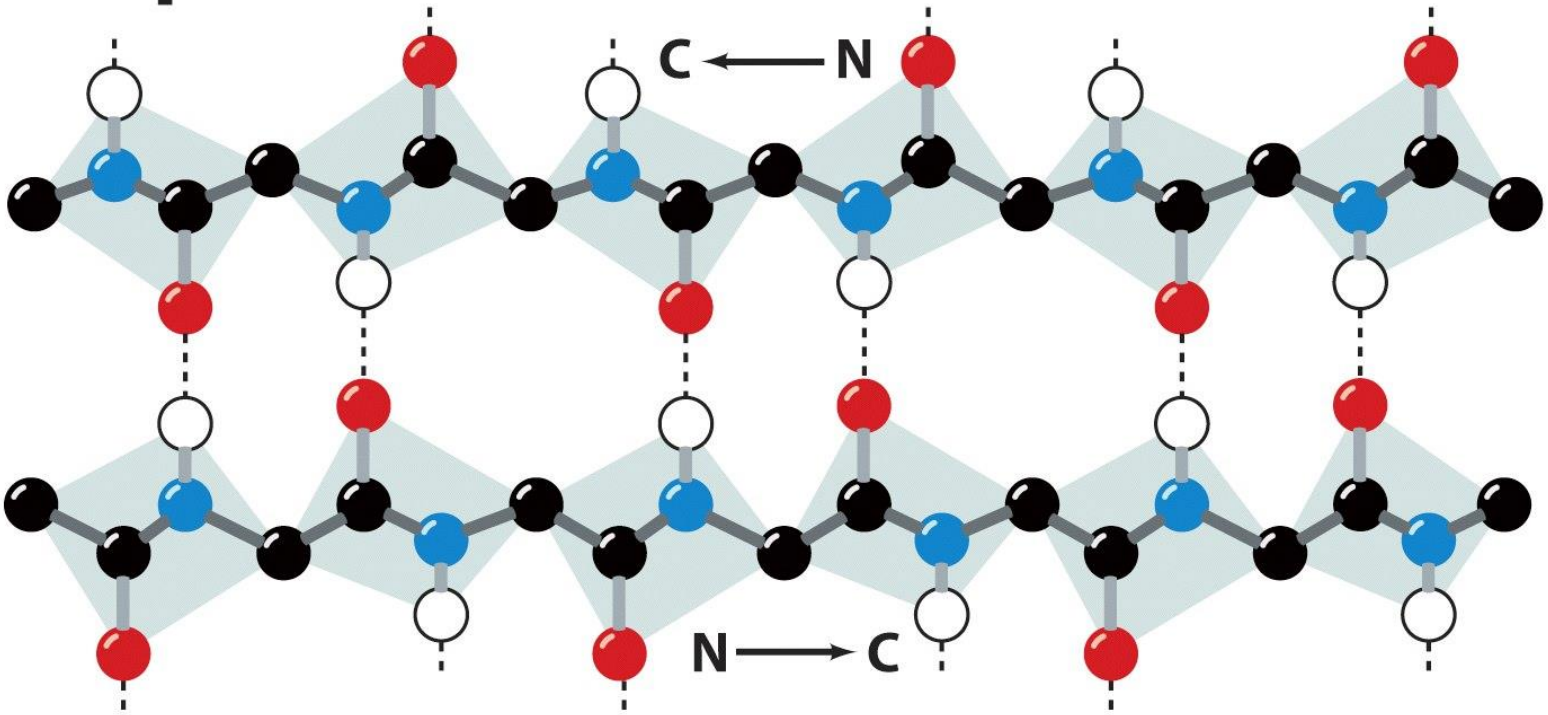
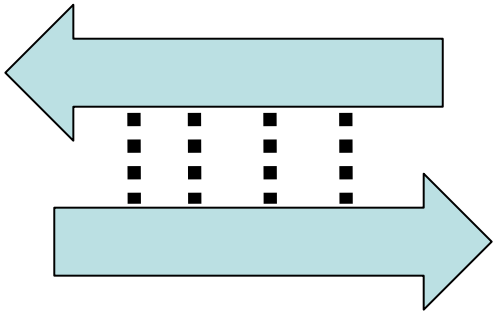


Figure 6-9a Fundamentals of Biochemistry, 2/e



Folha β
β sheet

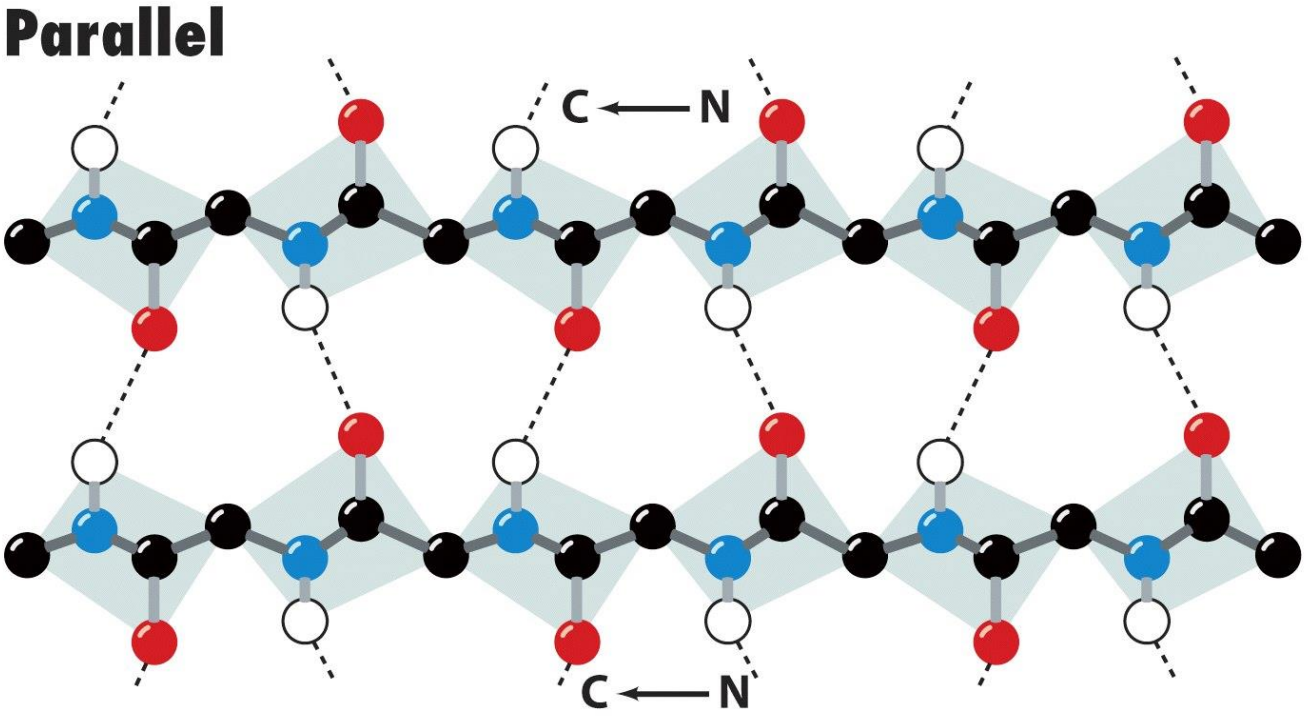
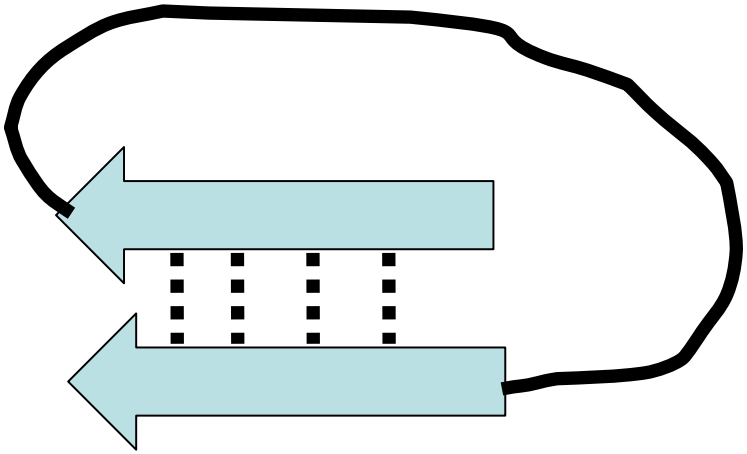


Figure 6-9b Fundamentals of Biochemistry, 2/e



Reverse β-Turn, Loop, Alça, Volta

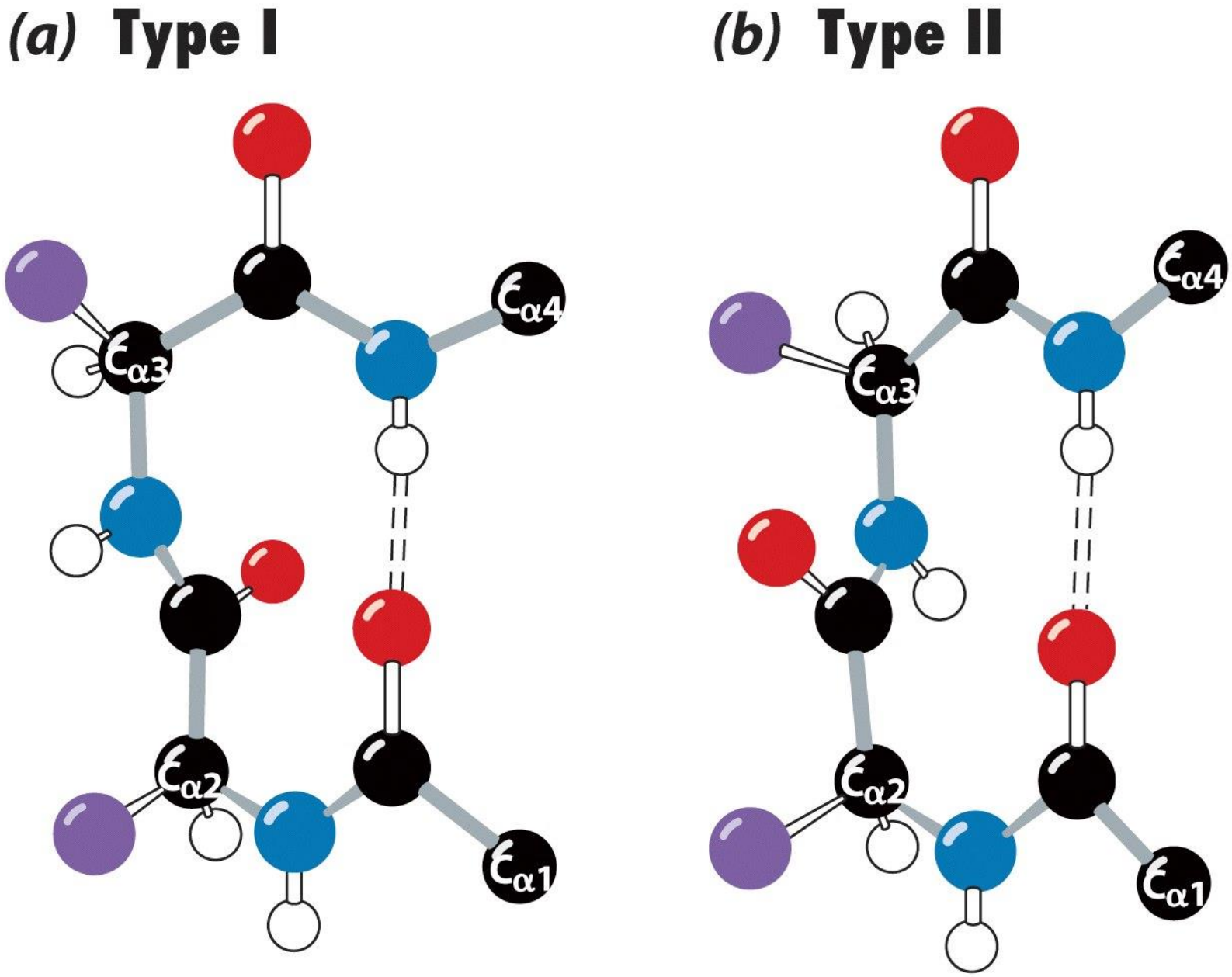


Figure 6-19 Fundamentals of Biochemistry, 2/e

Estrutura Secundária

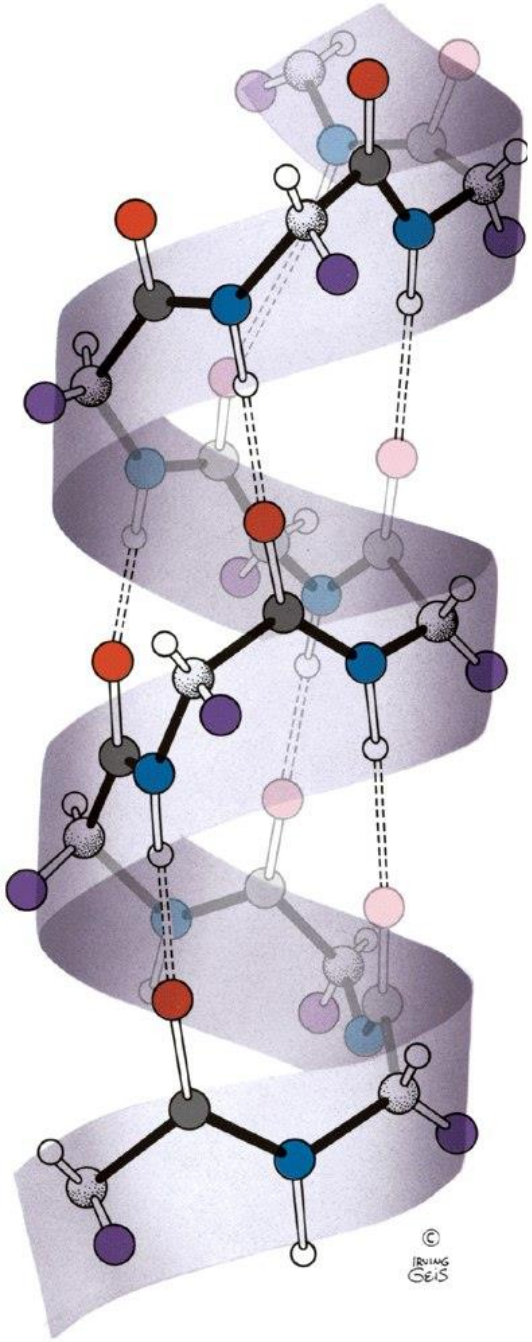


Figure 6-7 Fundamentals of Biochemistry, 2/e

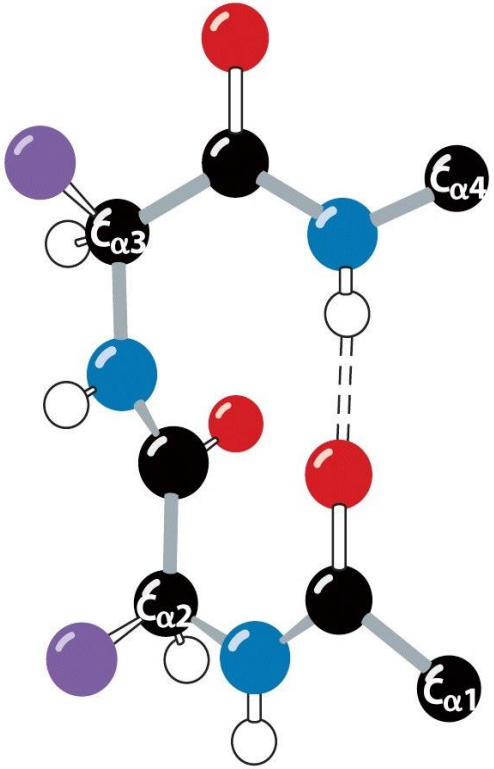
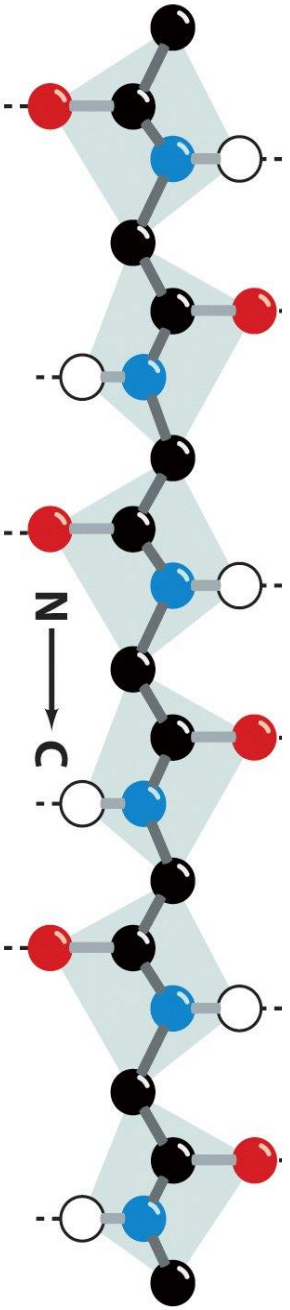


Figure 6-19 Fundamentals of Biochemistry, 2/e

Figure 6-9a Fundamentals of Biochemistry, 2/e



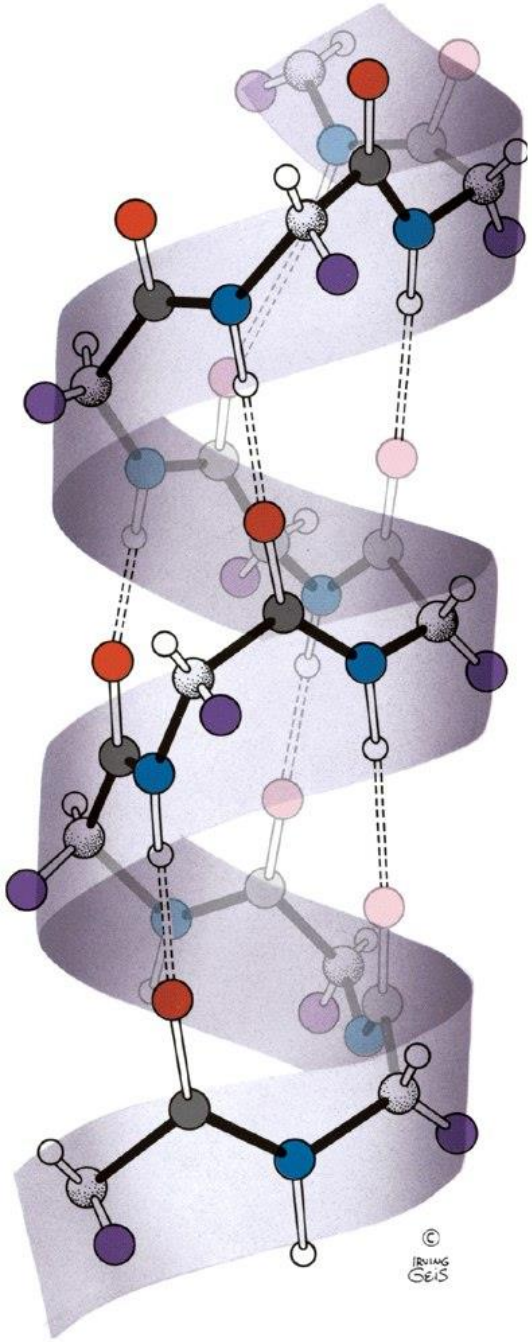


Figure 6-7 Fundamentals of Biochemistry, 2/e

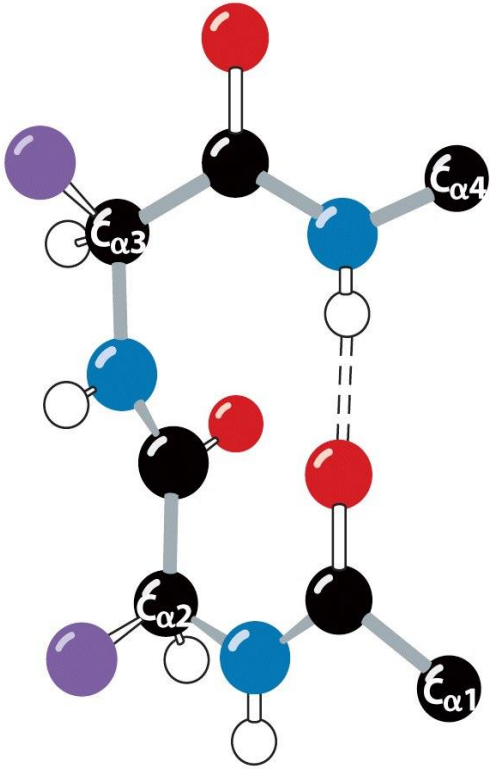


Figure 6-19 Fundamentals of Biochemistry, 2/e

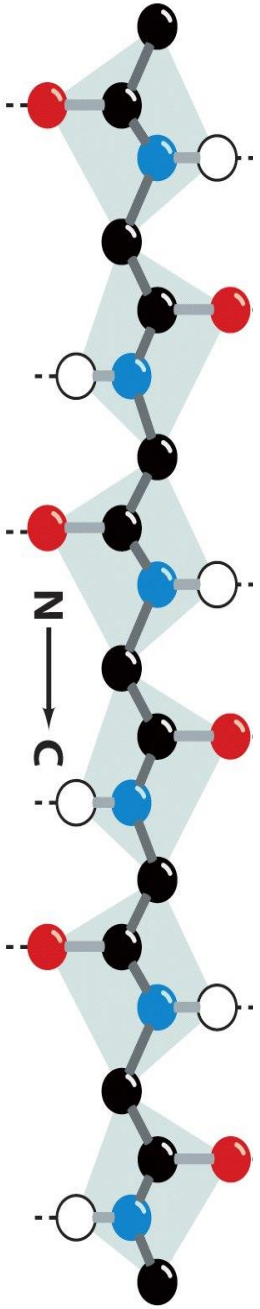
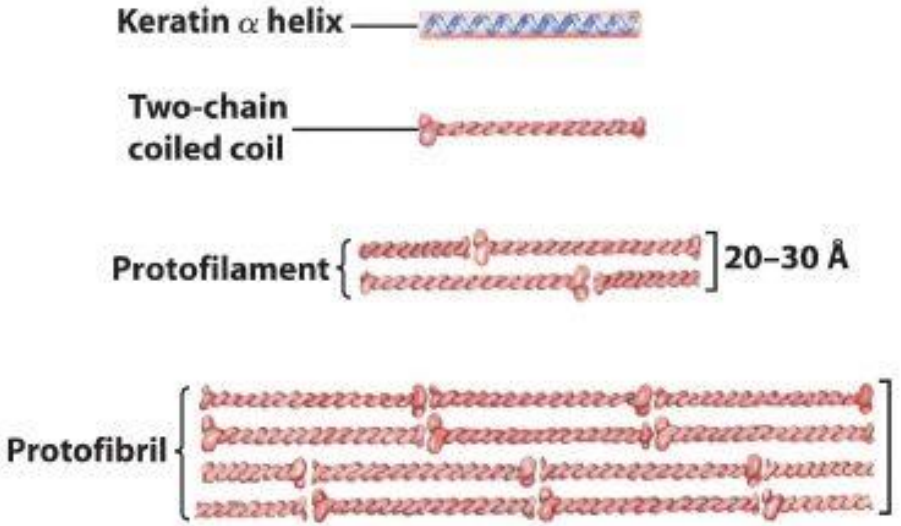
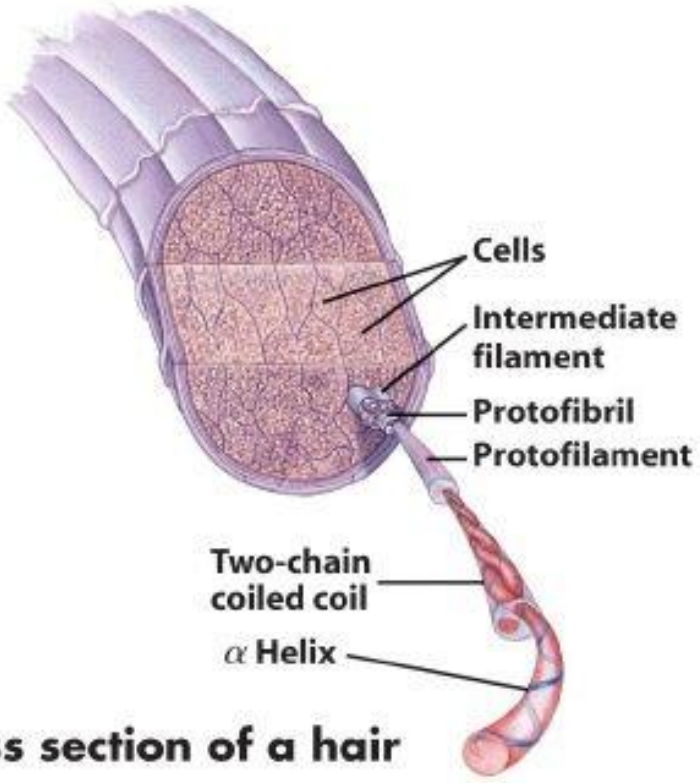


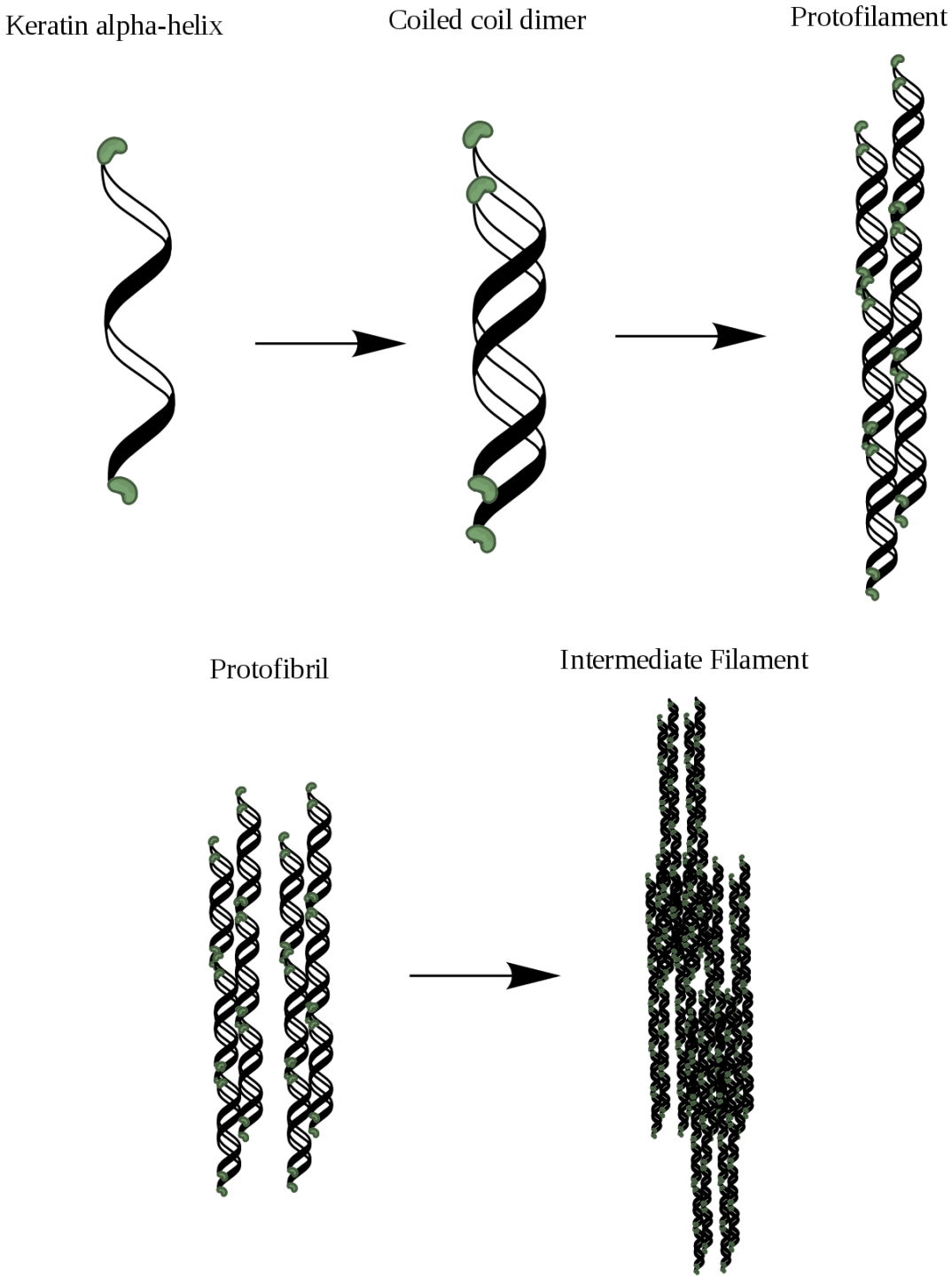
Figure 6-9a Fundamentals of Biochemistry, 2/e

α-Keratin

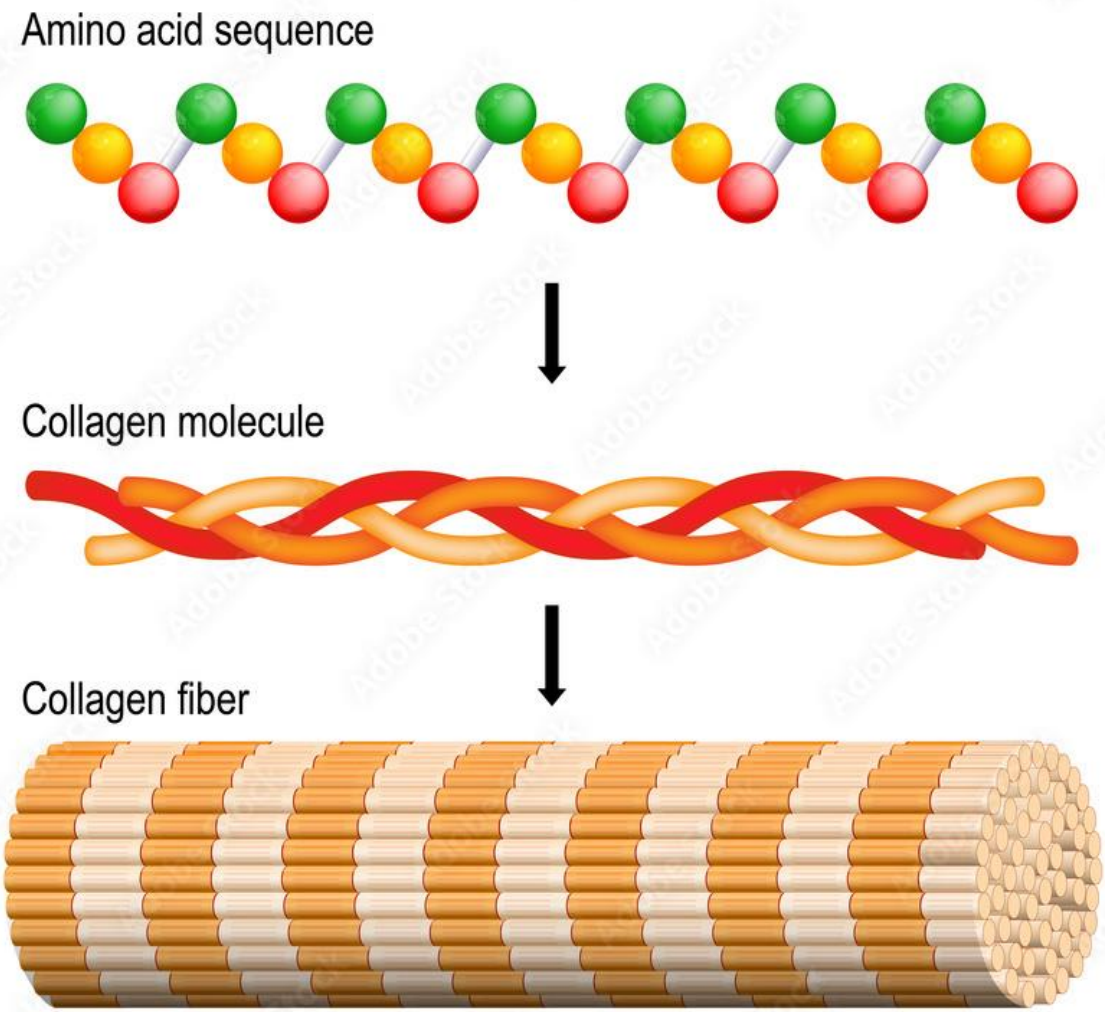


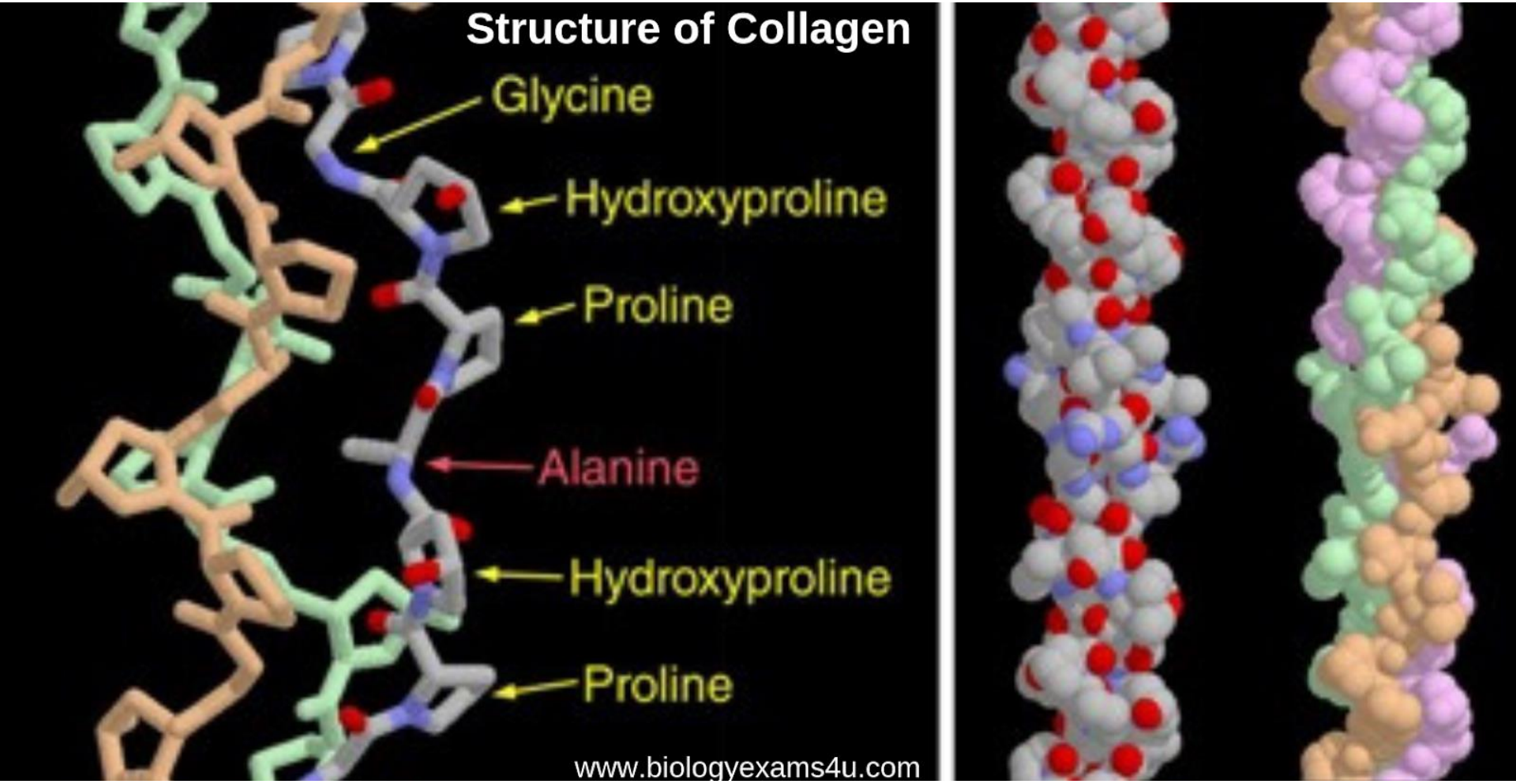


-Alpha keratins belong to the intermediate filament (IF) protein family.
-An all α-helix protein.
-Rich in hydrophobic amino acids: Ala, Val, Leu, Ile, Met, Phe


Keratin alpha-helix
Coiled coil dimer
Protofilament
Protofibril
Intermediate Filament

COLLAGEN




Structure of Collagen
Glycine
Hydroxyproline
Proline
Alanine
Hydroxyproline
Proline
www.biologyexams4u.com

Seda: modelo de proteína com alta prevalência de folhas beta

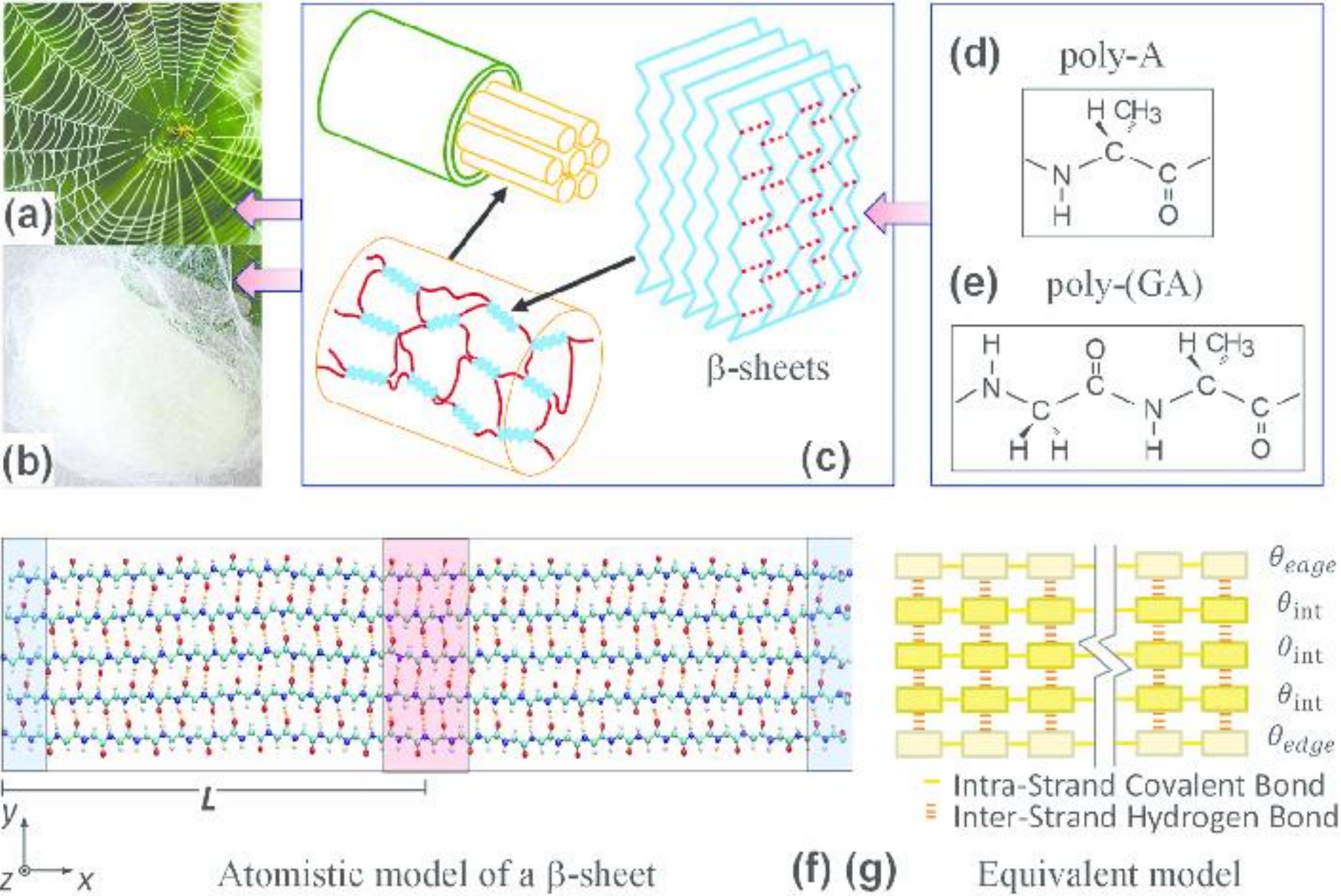
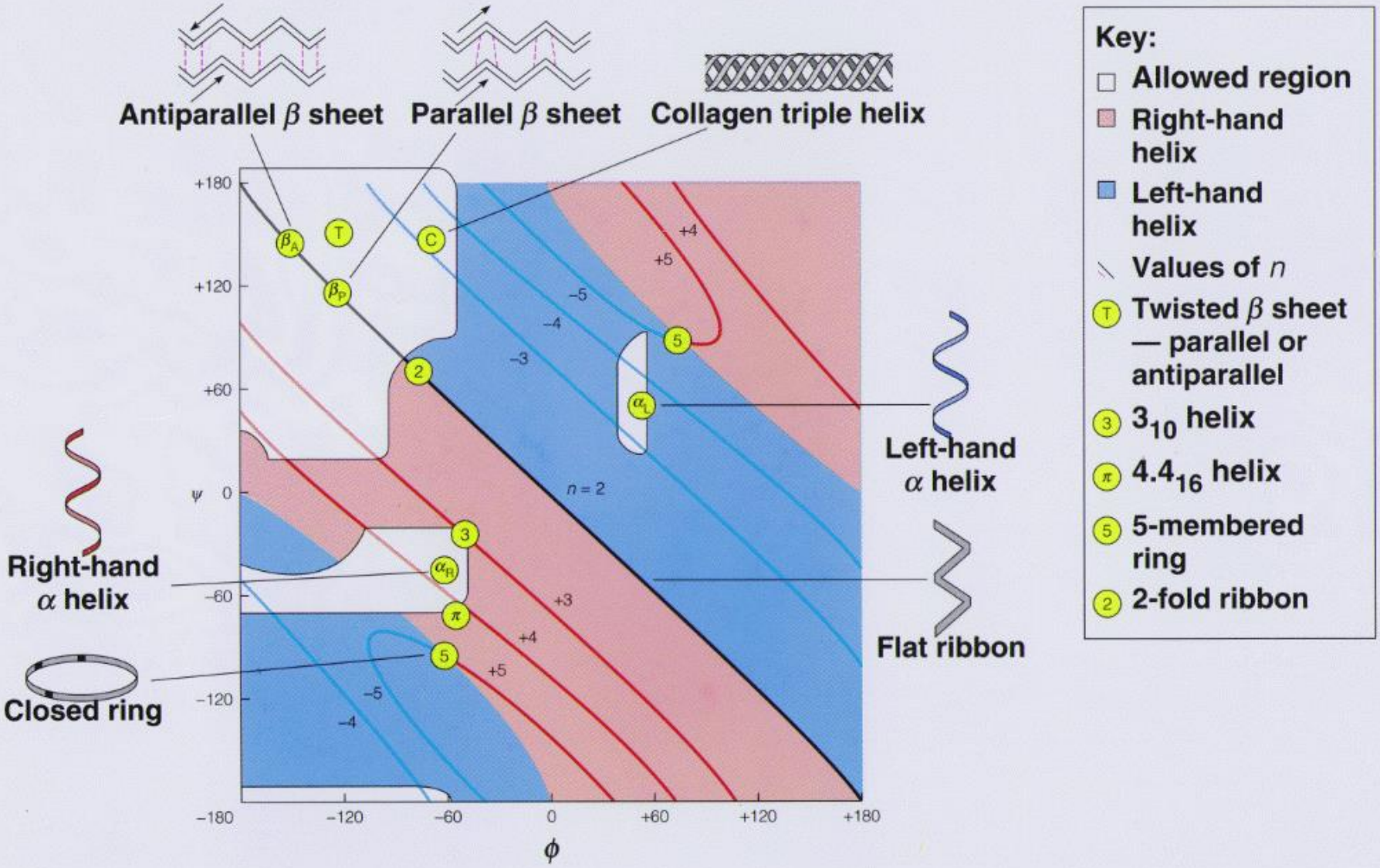


Figure 6.9 A Ramachandran plot



α-hélice

alça

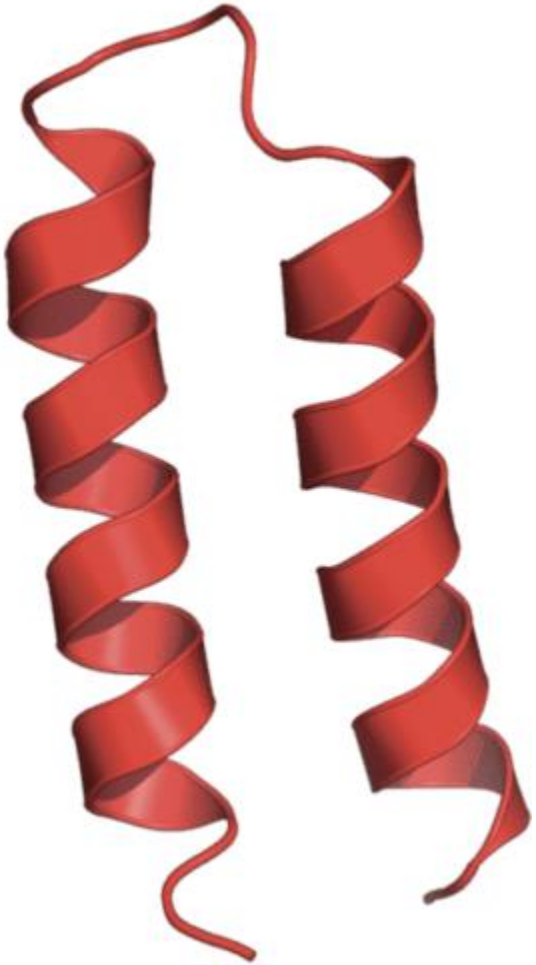
fita β

Motivos (motifs)

grampo β

β–α–β

α–α



https://www.researchgate.net/figure/Supersecondary-structure-elements-The-three-most-important-supersecondary-structures_fig7_233771045

grampo β

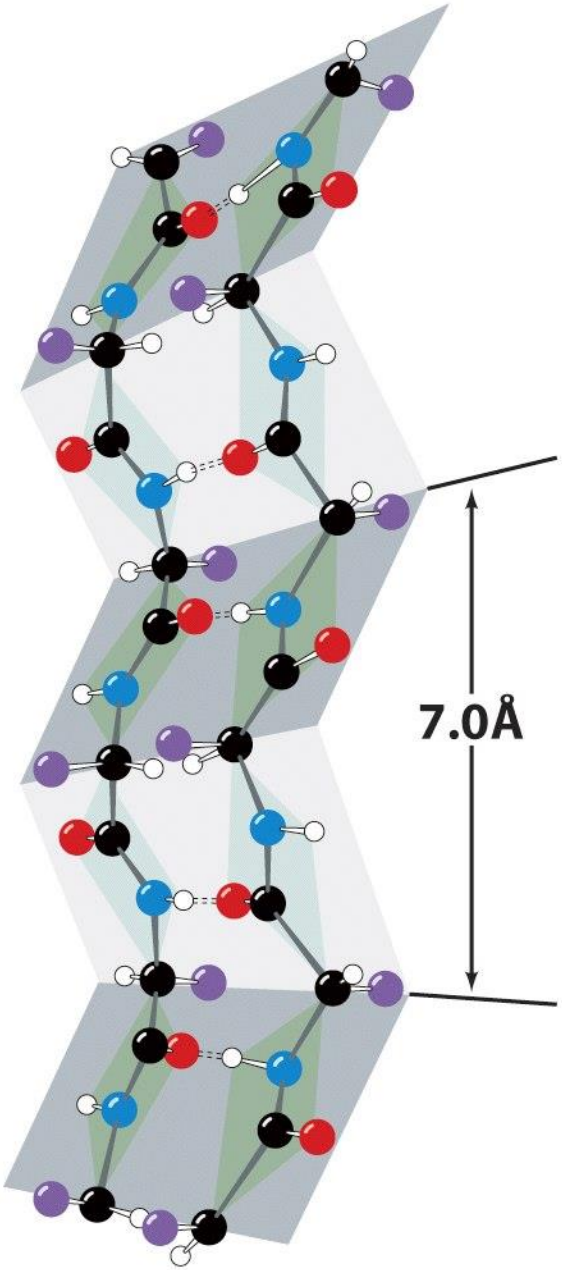
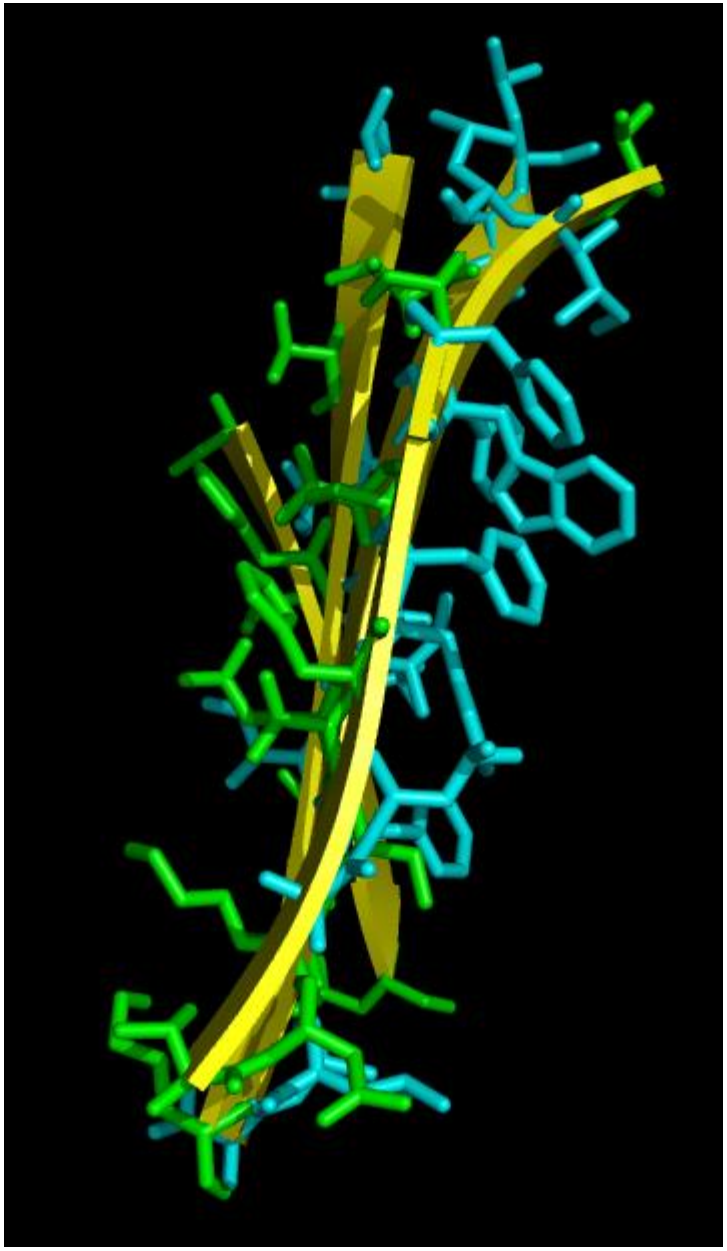


Figure 6-10 Fundamentals of Biochemistry, 2/e

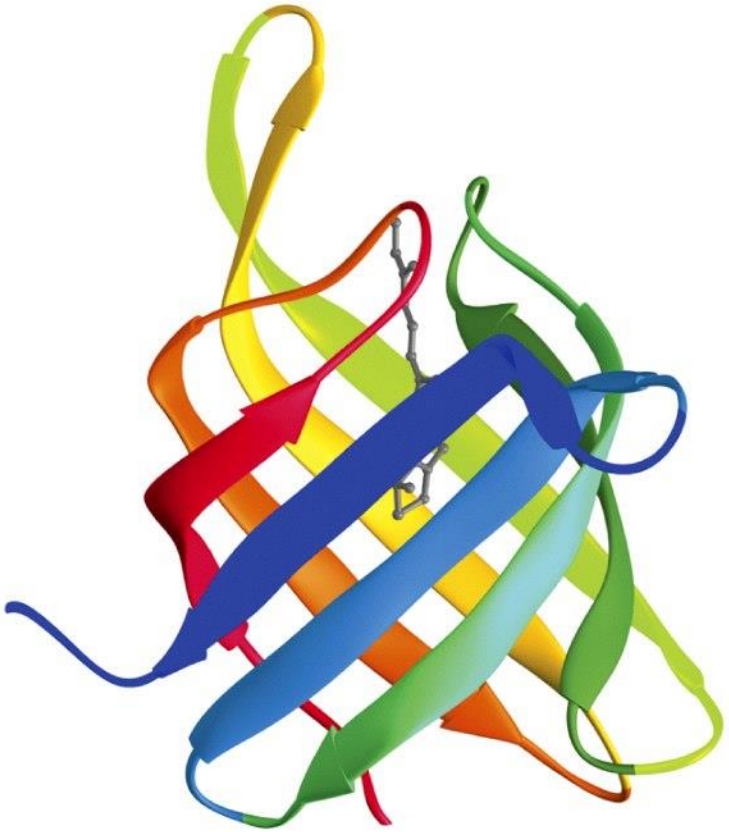
Concanavalina
PDB 1AZD



Cadeia principal:
Cadeia lateral polar
Cadeia lateral apolar

Proteína ligante de retinol
PDB 1RBP

Domínio de ligação do retinol



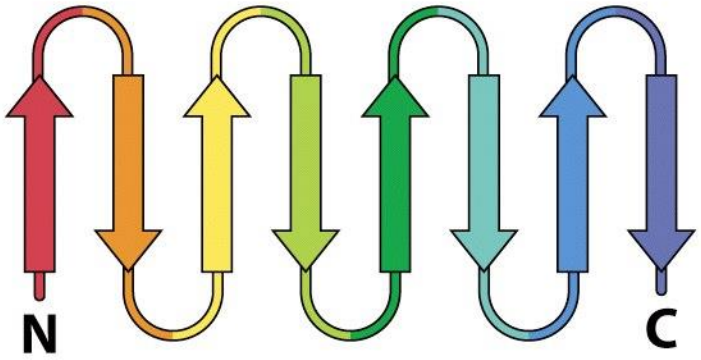
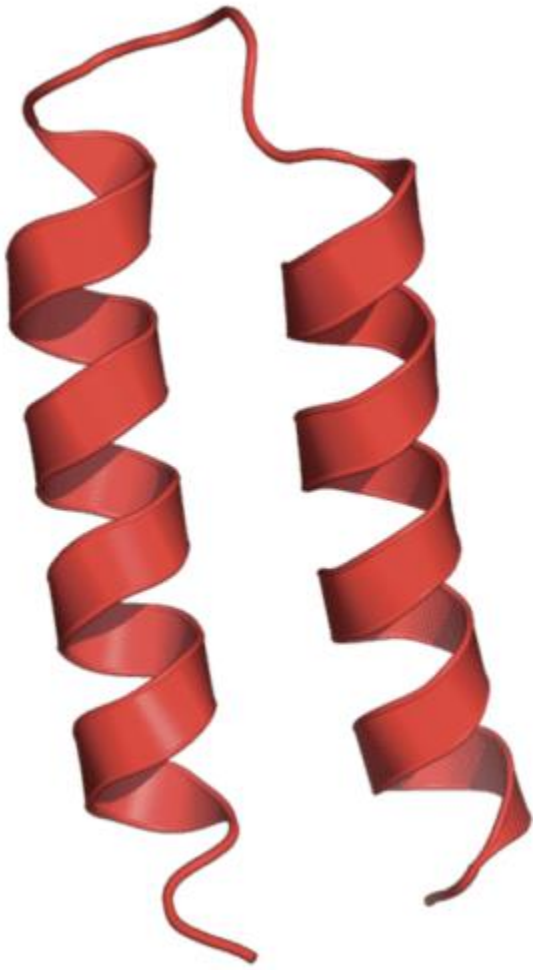


Figure 6-30a Fundamentals of Biochemistry, 2/e

Barril Beta, geralmente conjunto autocontidos de grampos beta.

Adquire uma função: Domínio

α–α



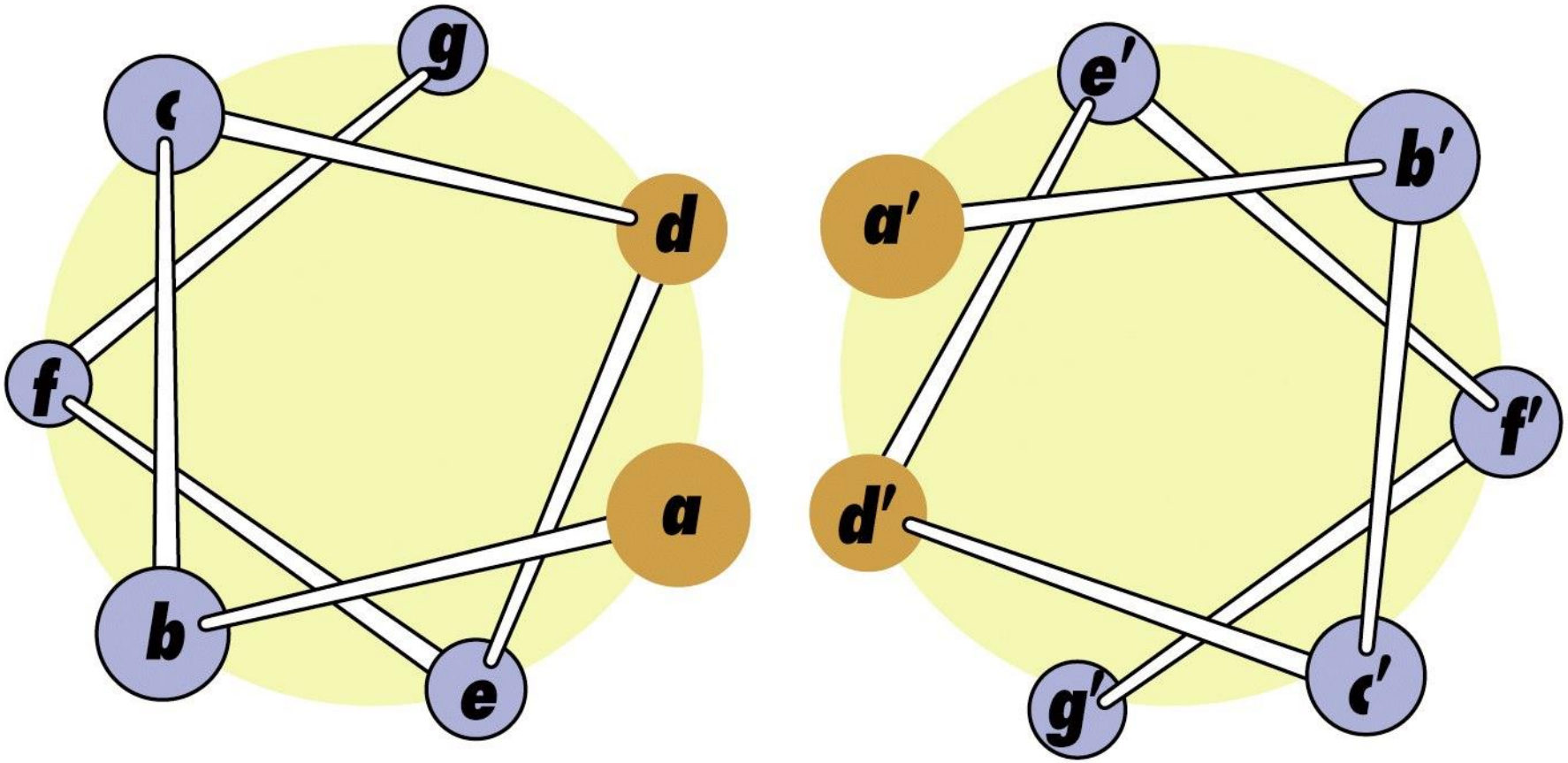


Figure 6-14a Fundamentals of Biochemistry, 2/e

Apolar

Polar

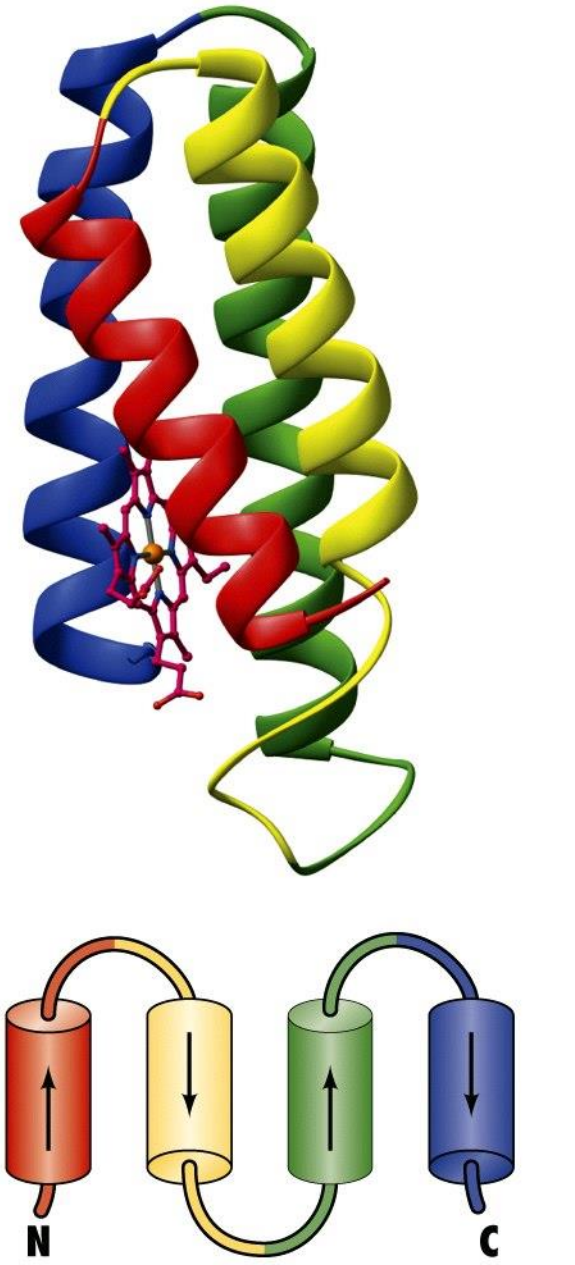
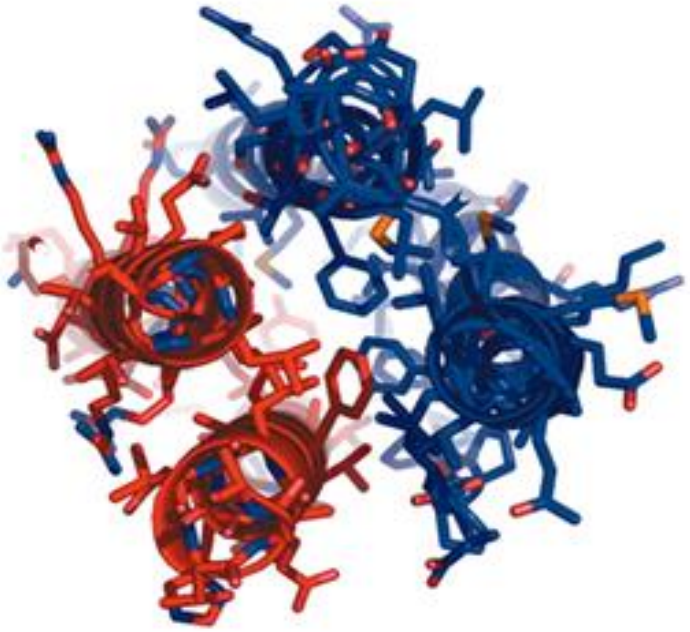
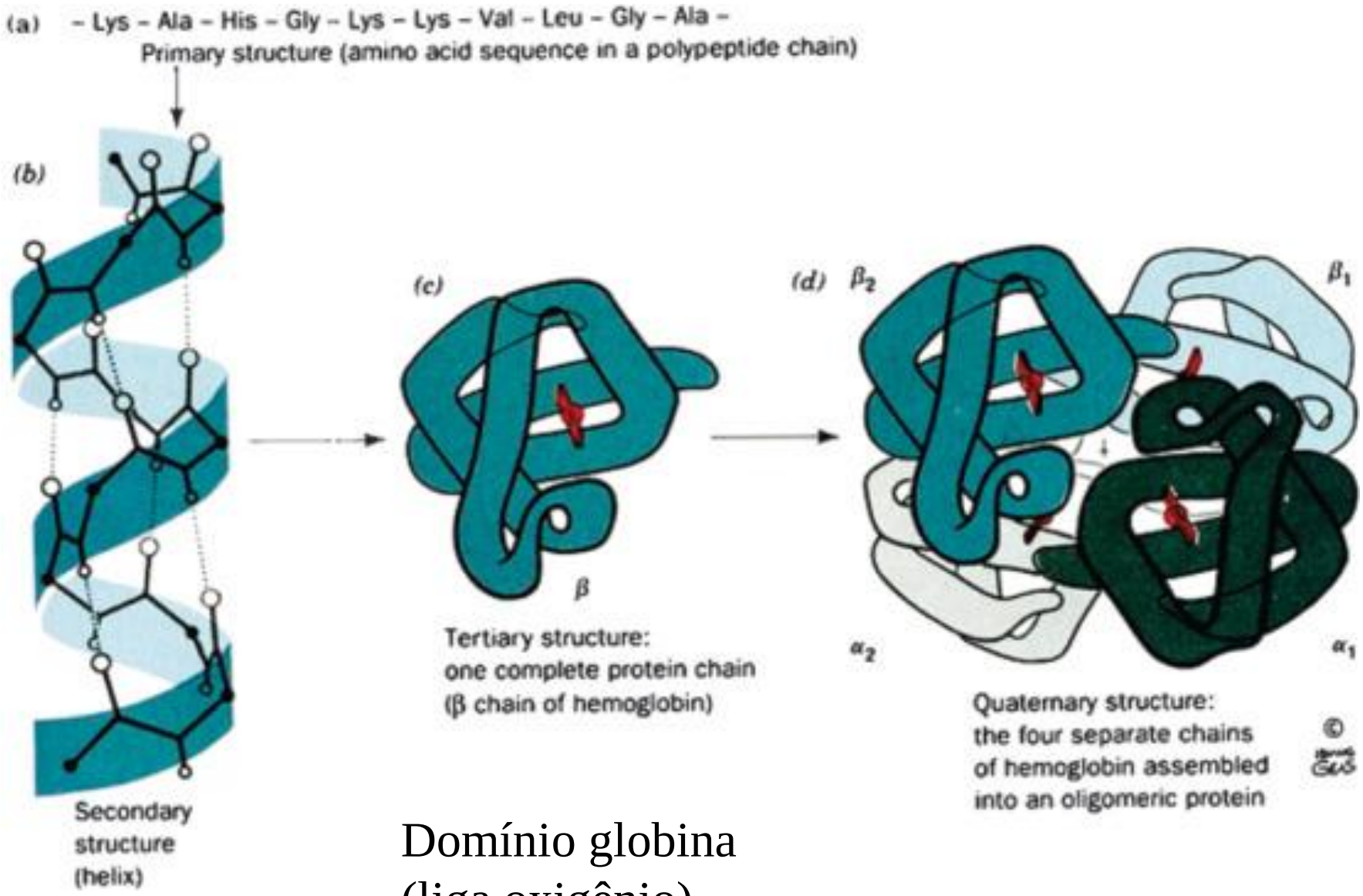


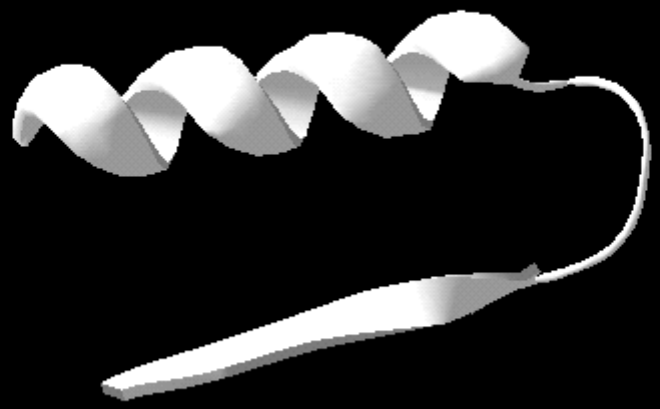
Figure 6-28a Fundamentals of Biochemistry, 2/e

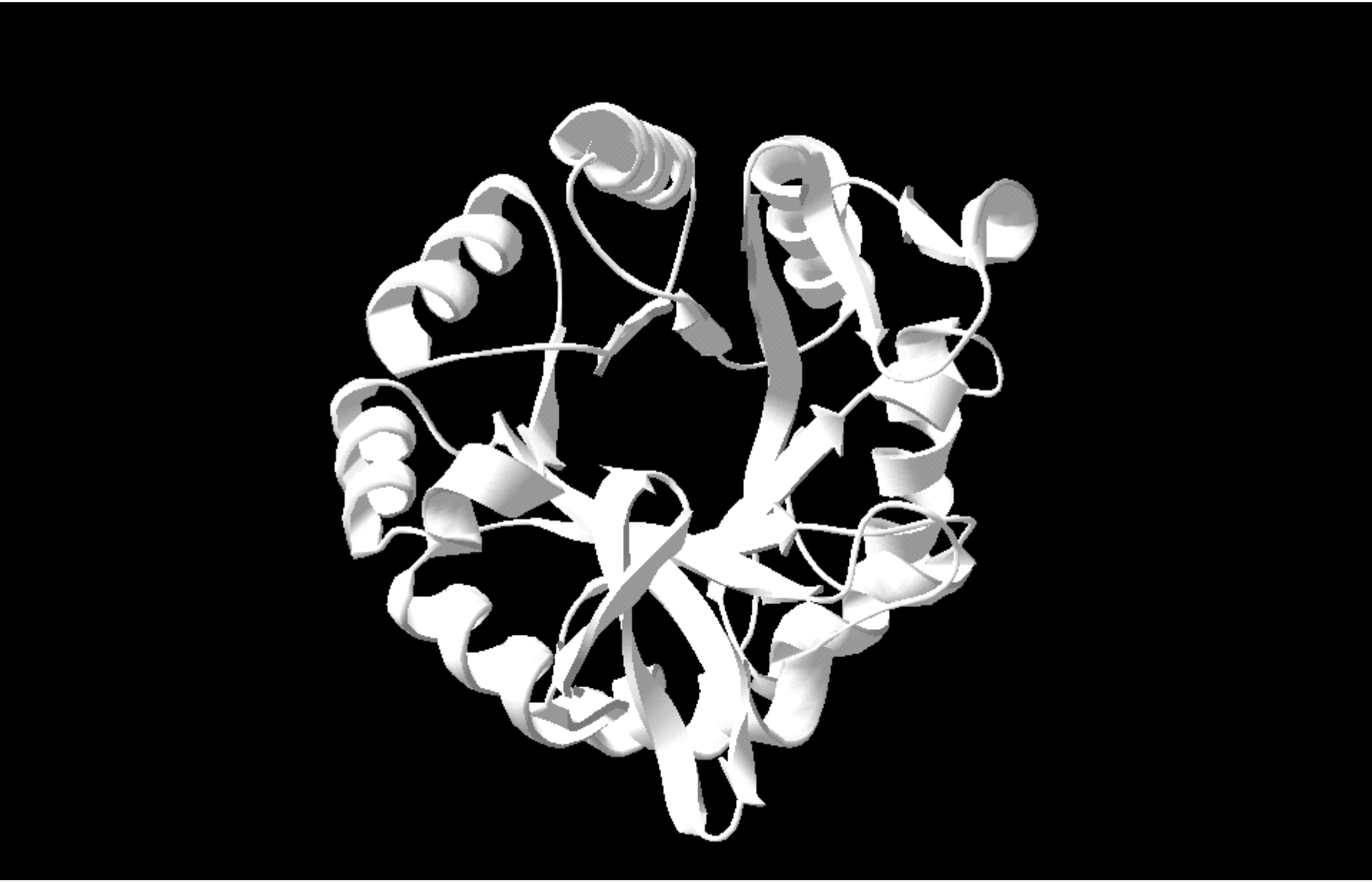
citocromo b



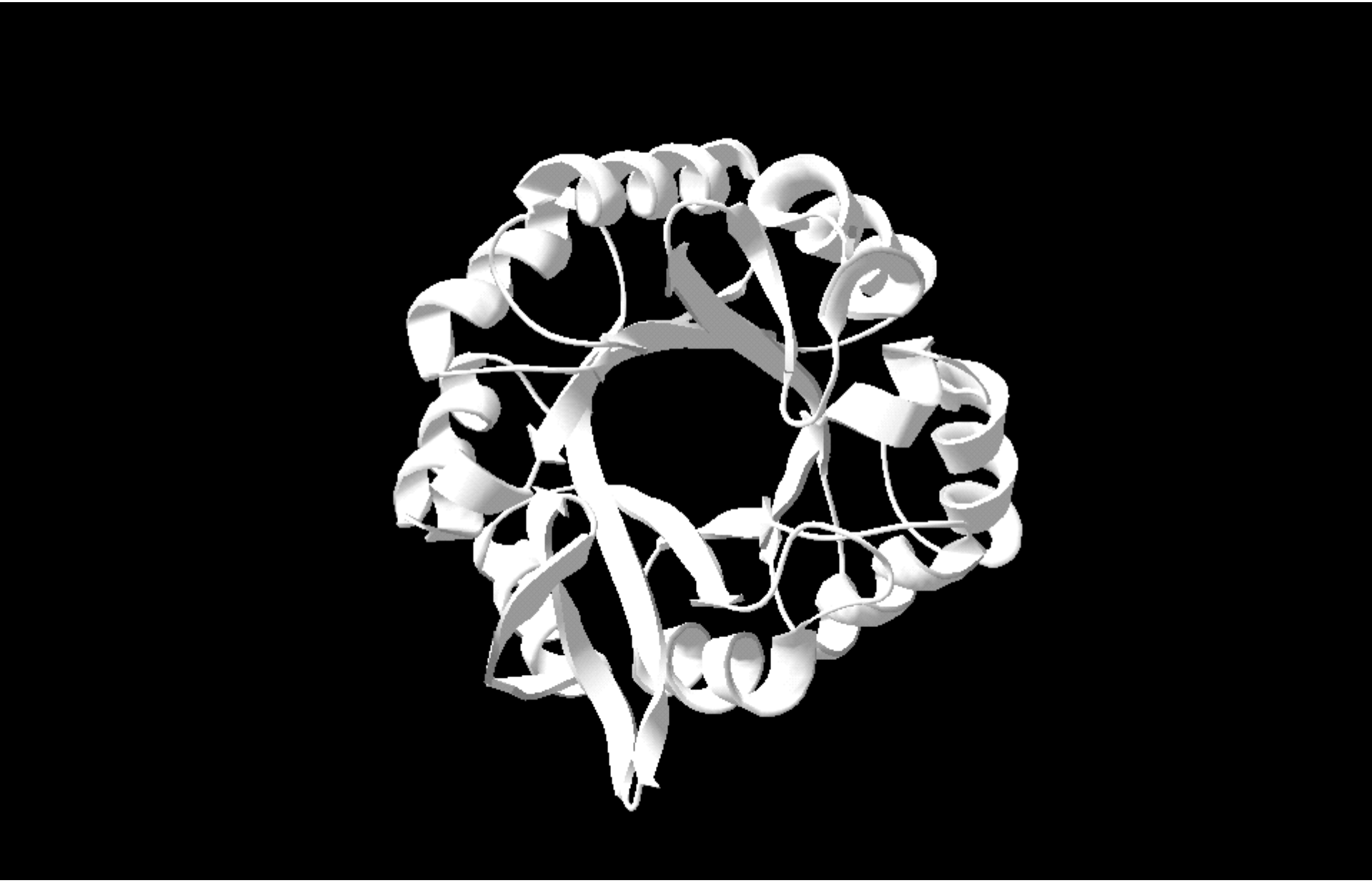


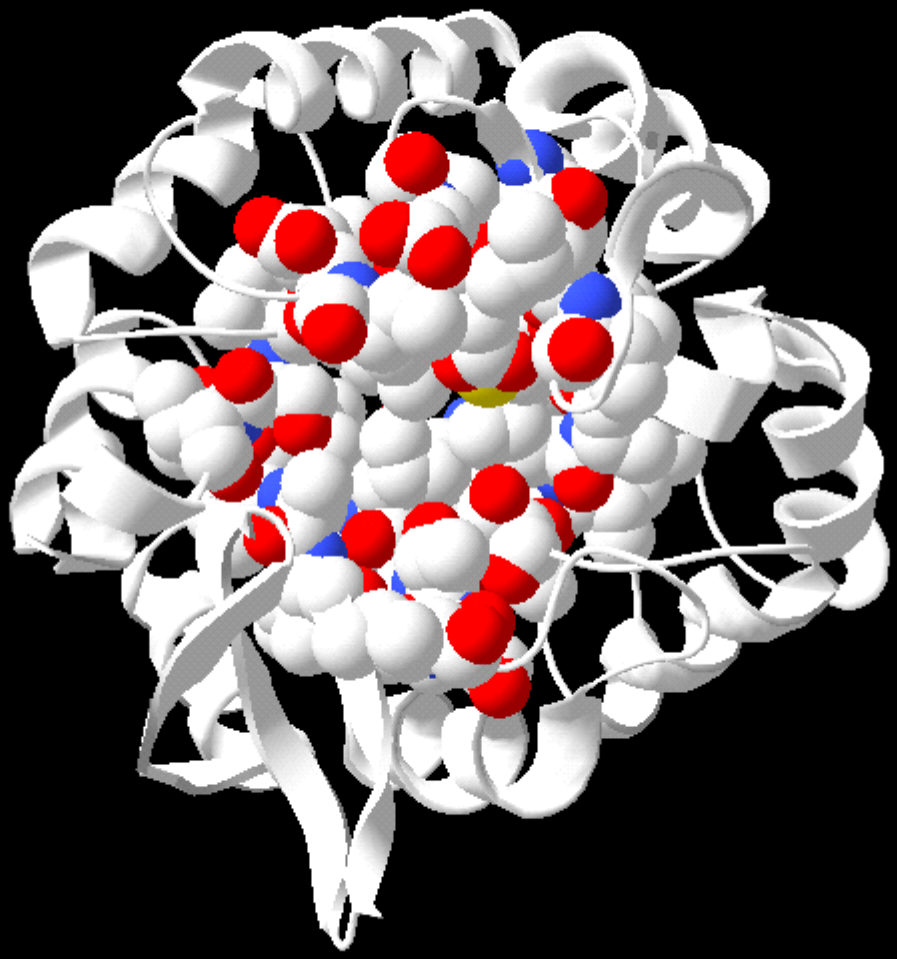
Domínio globina
(liga oxigênio)



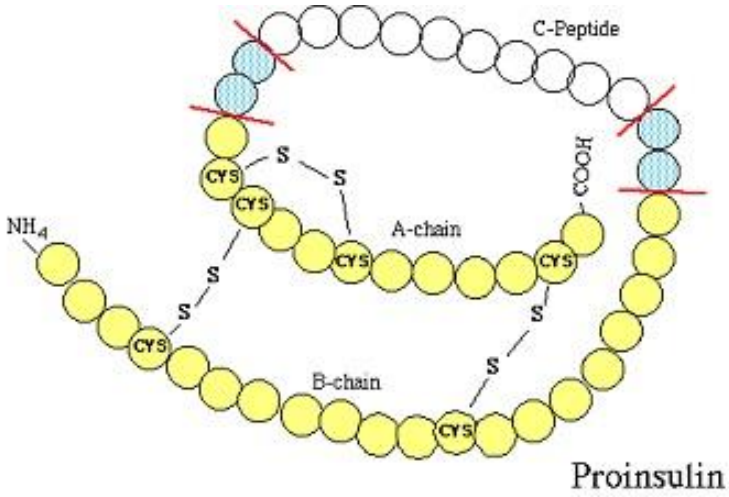


β–α–β

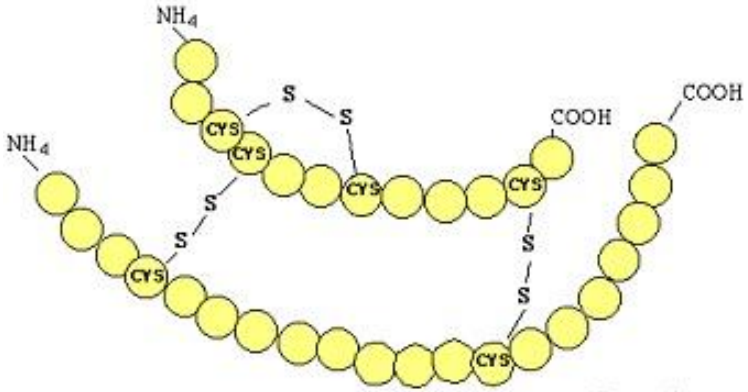




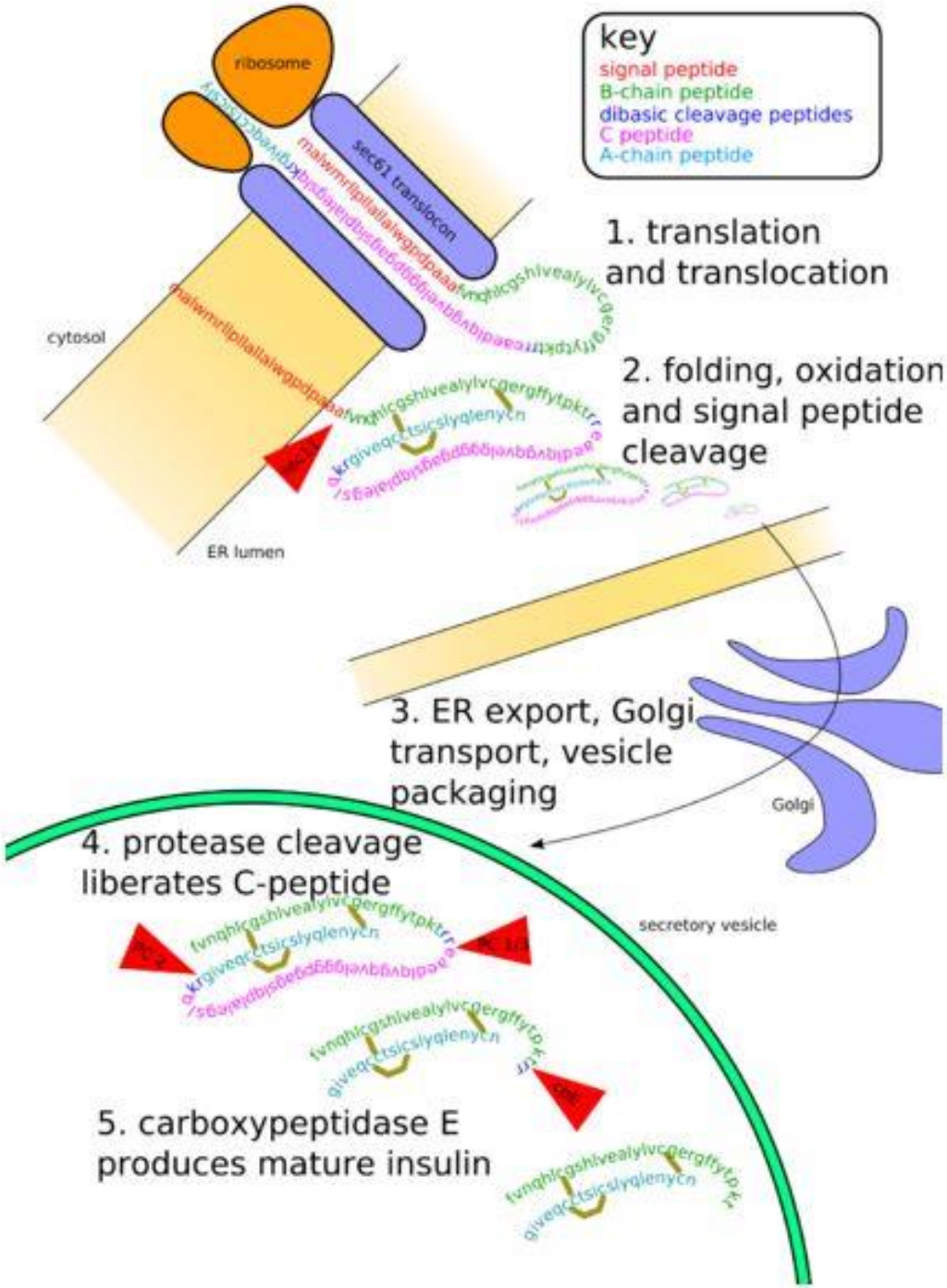
Maturação e pontes de dissulfeto



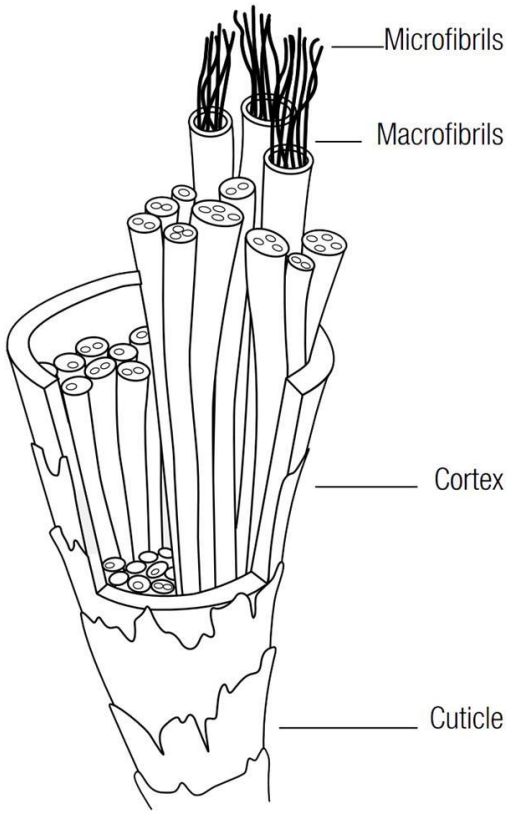
Proinsulin



Insulin

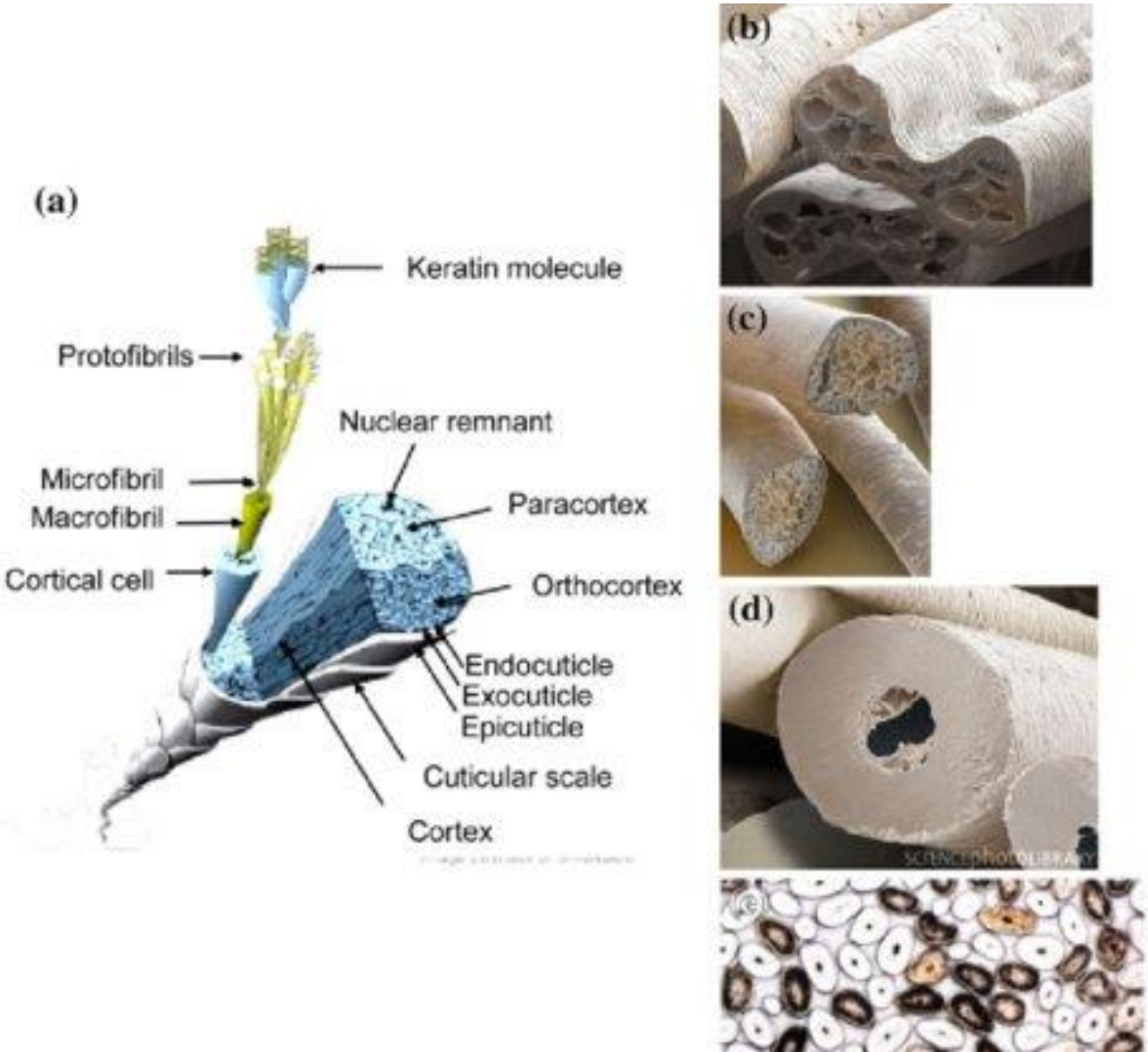


Cabelos e as queratinas, exemplo de proteína fibrosa

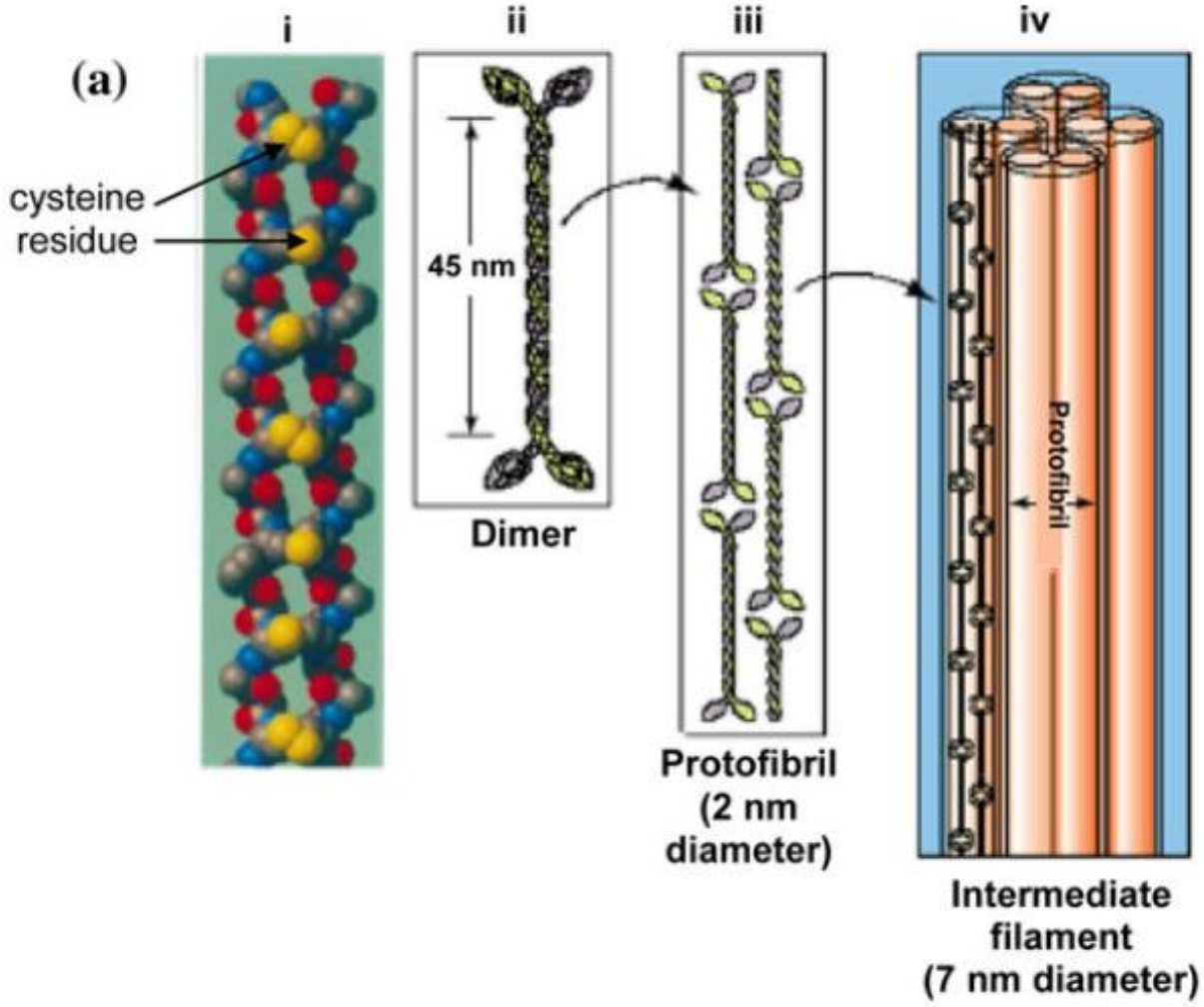


CUTÍCULA: A camada externa do cabelo consiste em células ou escamas sobrepostas. Essas escamas, dispostas como telhas, fornecem uma camada protetora ao redor dos cabelos. Um cabelo saudável tem uma camada suave e contínua de escamas. O cabelo brilha e é fácil de escovar.

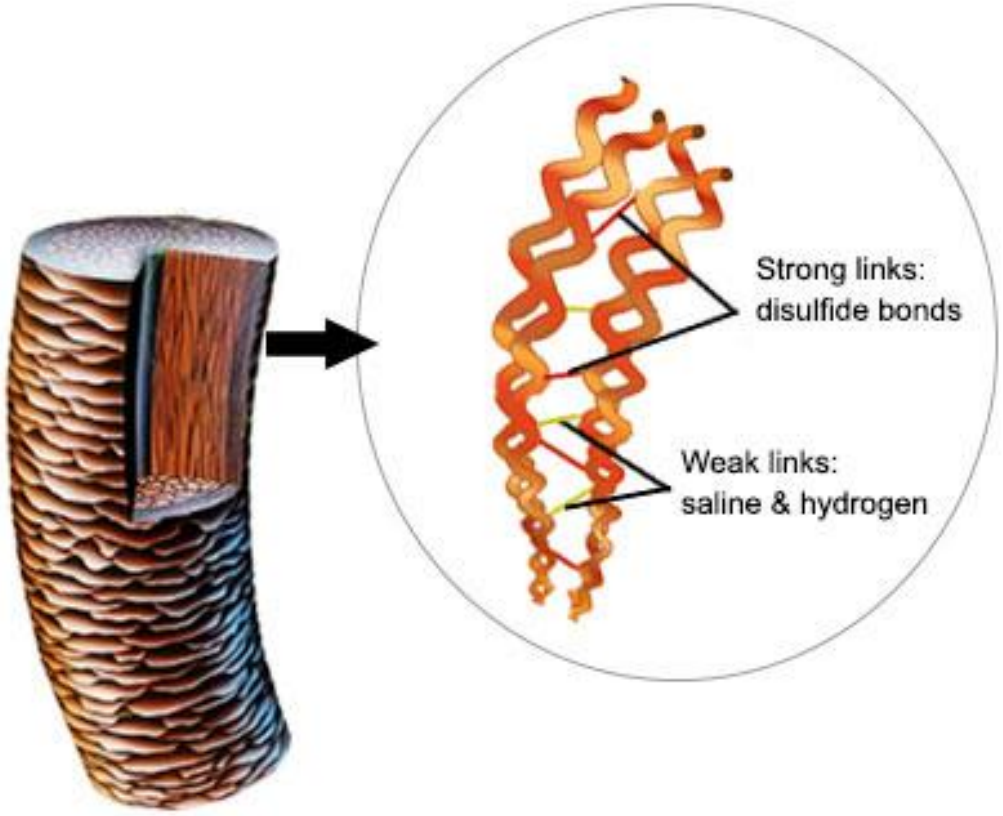
CORTEX (CAMADA DE FIBRAS) A camada média do cabelo é composta por células alongadas em forma de espiral. Essas células dão ao cabelo sua elasticidade e força. O córtex tem um equilíbrio natural entre umidade e proteínas.

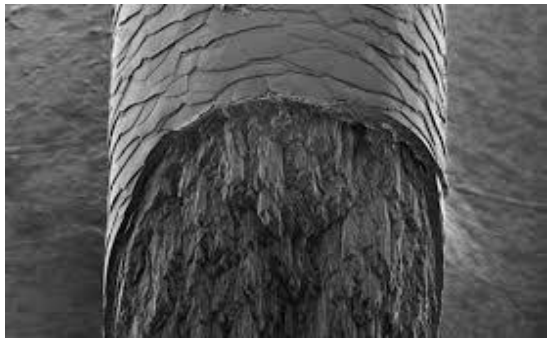

(a)
Keratin molecule
Protofibrils
Nuclear remnant
Microfibril
Macrofibril
Paracortex
Cortical cell
Orthocortex
Endocuticle
Exocuticle
Epicuticle
Cuticular scale
Cortex
(b)
(c)
(d)

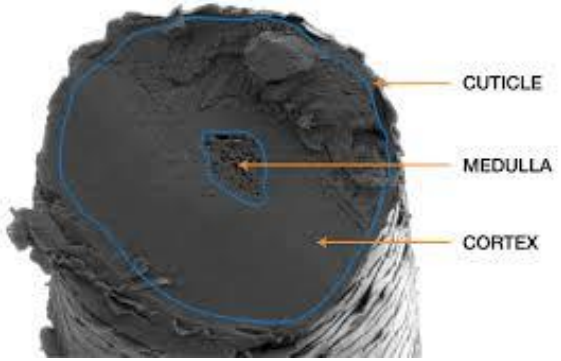
Estrutura do cabelo



Hair structure, strong links and weak links







Macrofibrilas
T > ~75 ºC

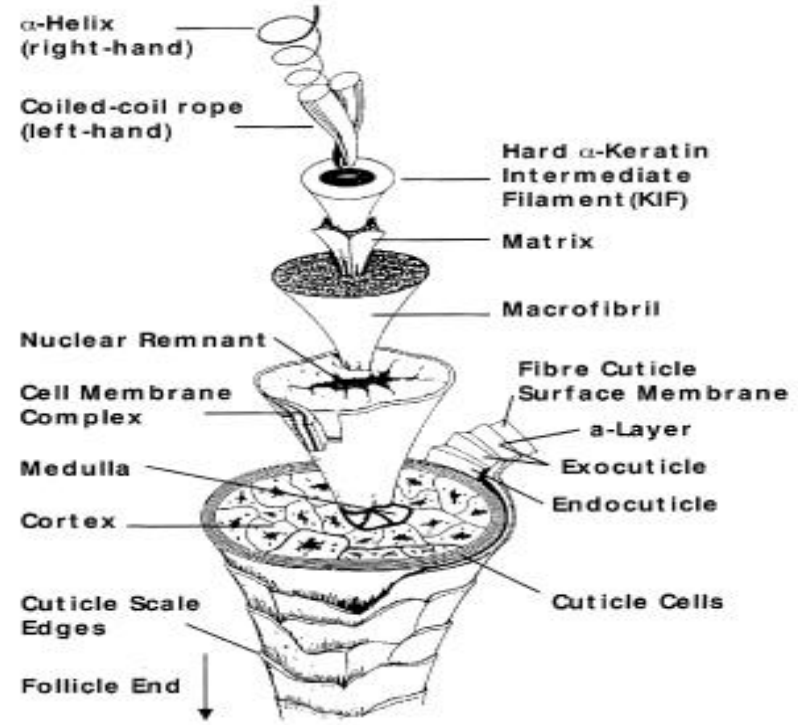
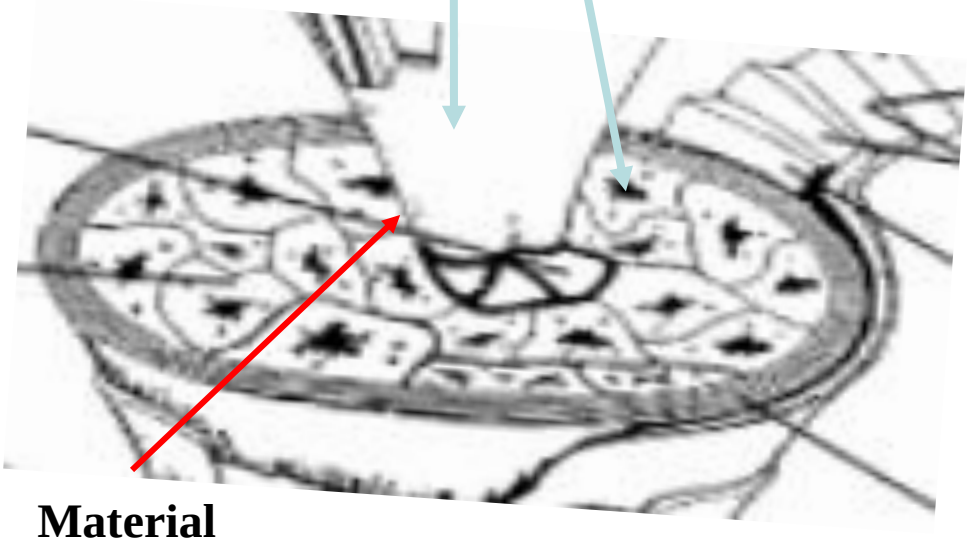
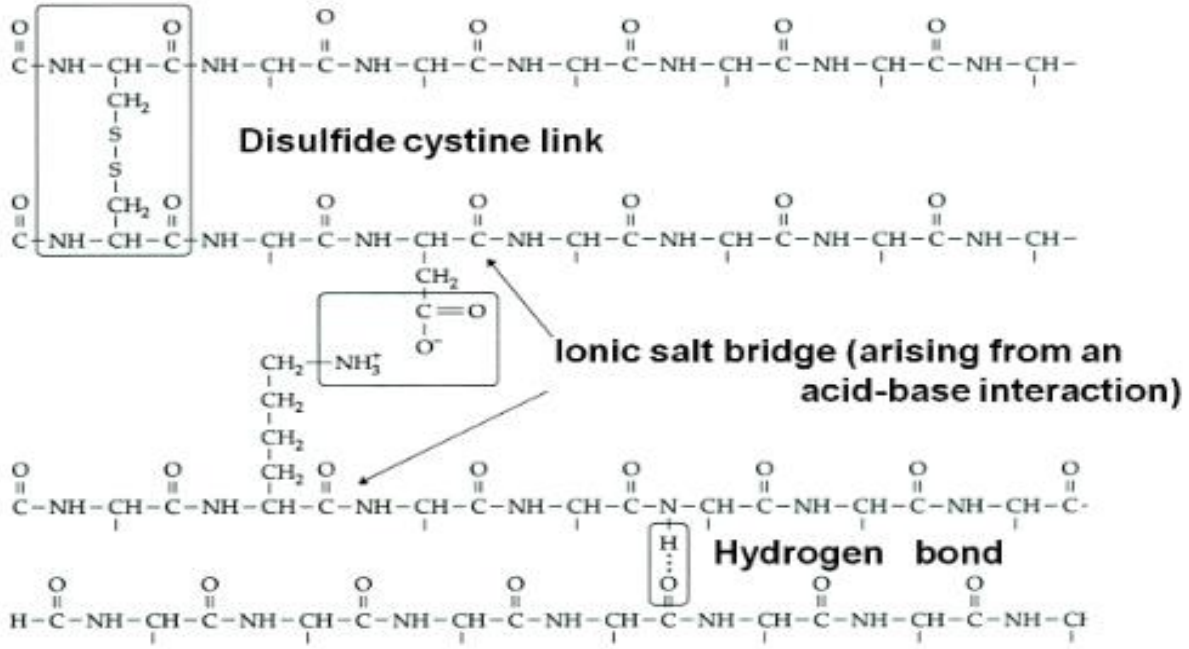
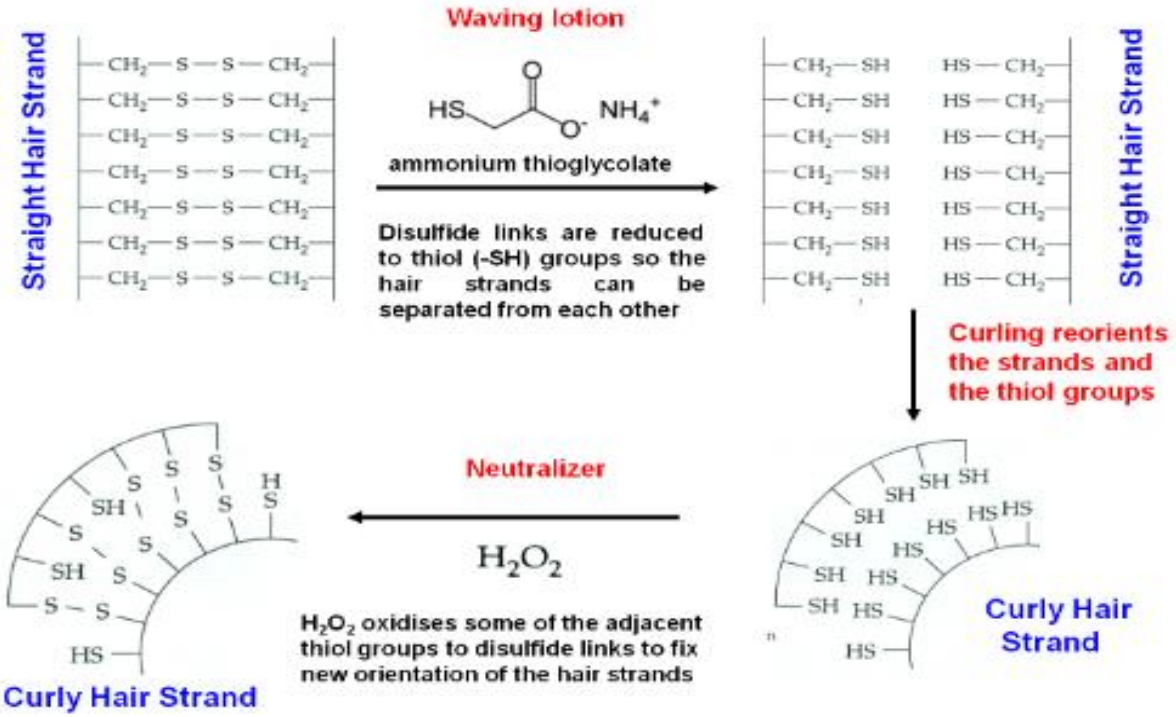


Figure 1. Diagram showing an exploded view of the major structural components comprising a human hair fiber. Pigment granules that are normally dispersed throughout the cortex are not included.

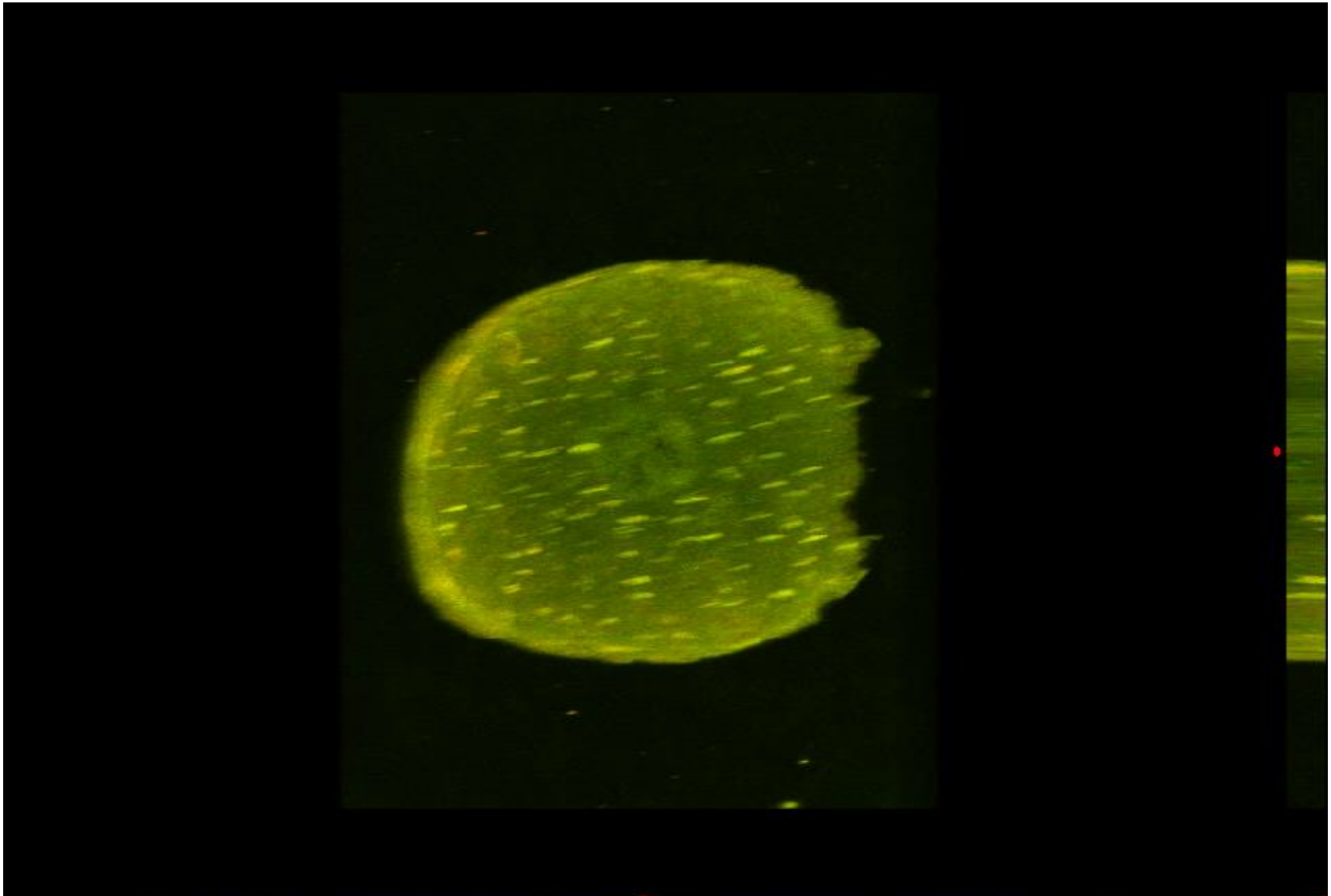


Material
interfibralar e cmc
T < ~75 ºC

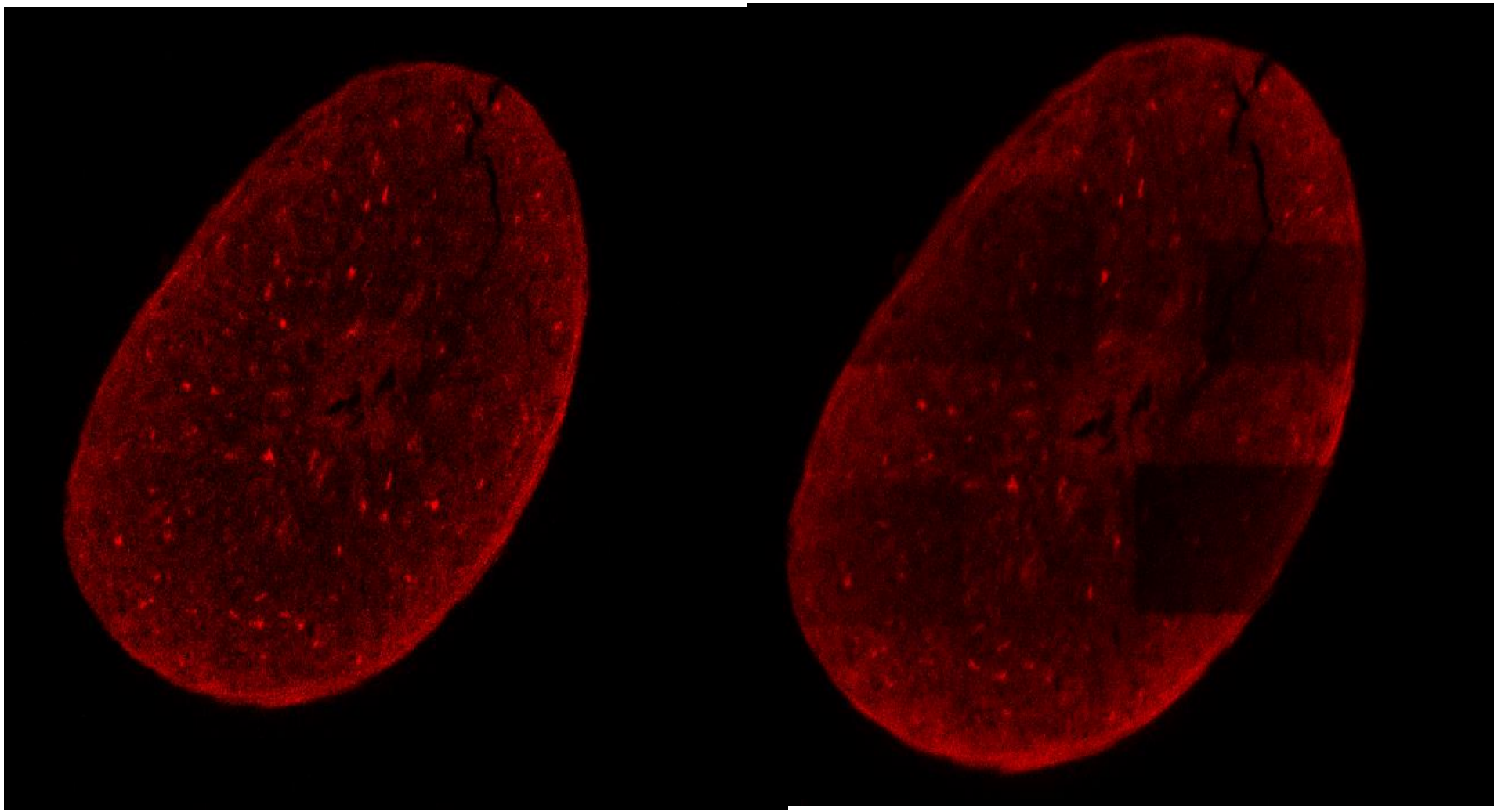

Disulfide cystine link
Ionic salt bridge (arising from an acid-base interaction)
Hydrogen bond


Straight Hair Strand
Waving lotion
ammonium thioglycolate
Disulfide links are reduced to thiol (-SH) groups so the hair strands can be separated from each other
Straight Hair Strand
Curling reorients the strands and the thiol groups
Curly Hair Strand
Neutralizer
H_2O_2
H_2O_2 oxidises some of the adjacent thiol groups to disulfide links to fix new orientation of the hair strands
Curly Hair Strand

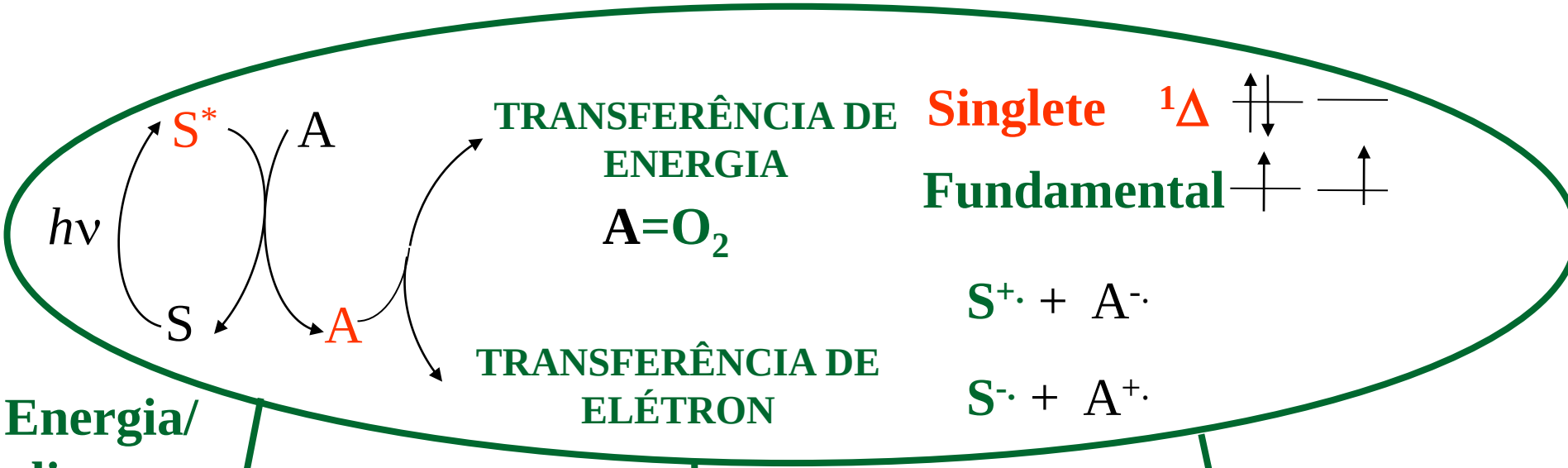
Microscopia de fluorescencia confocal



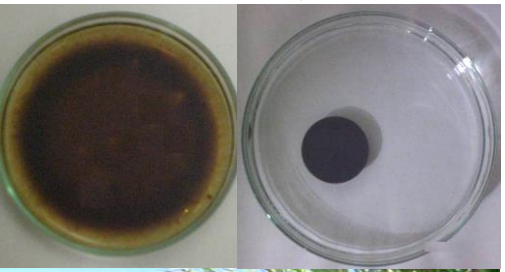
Fotobranqueamento de cabelo

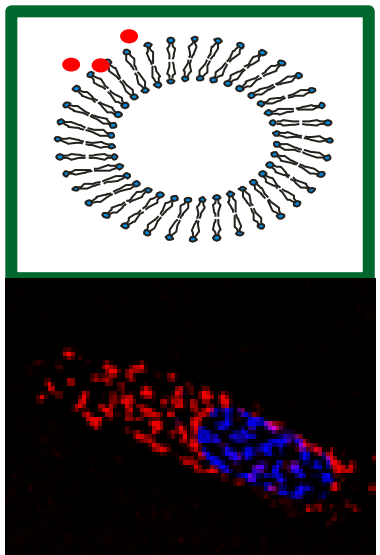


Fotossensibilização: Entendimento e controle destas reações em diversos sistemas naturais



Energia/ alimentos | **modelos** | **saúde**





Dr. Tardivo (CEDERM)
Dr. Lindoso (FM-USP)
Dra. Renata Belotto (Byinton)

05/11/2003

09/24/2004

Melanome (*Photodyagnosis and Photodynamic Therapy* **2004**, 1, 345-346)

Onycomicoses

(*Photodyagnosis and Photodynamic Therapy* **2005**, 2/3, 175-191)

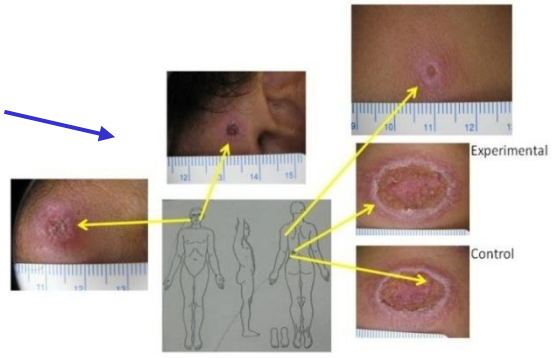
Kaposi sarcoma (*Photomedicine and Laser Surgery* **2006**, 24 (4), 528-531)

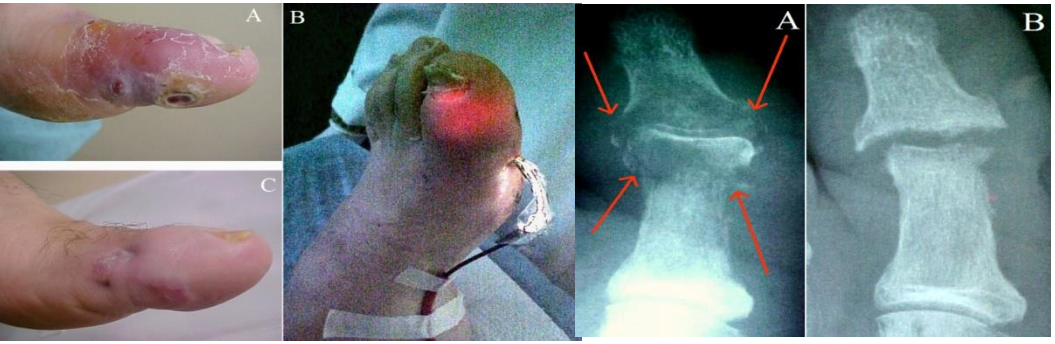
Low cost PDT

Leishmaniose e tropicai deseases

Song et al *Photomedicine Laser Surgery, 2011*

Baptista & Wainwrigth *BJMBR, 2011*





Osteomyelites *Photomedicine and Laser Surgery* **2009**, *27*, 145-150.

gynecological cancer

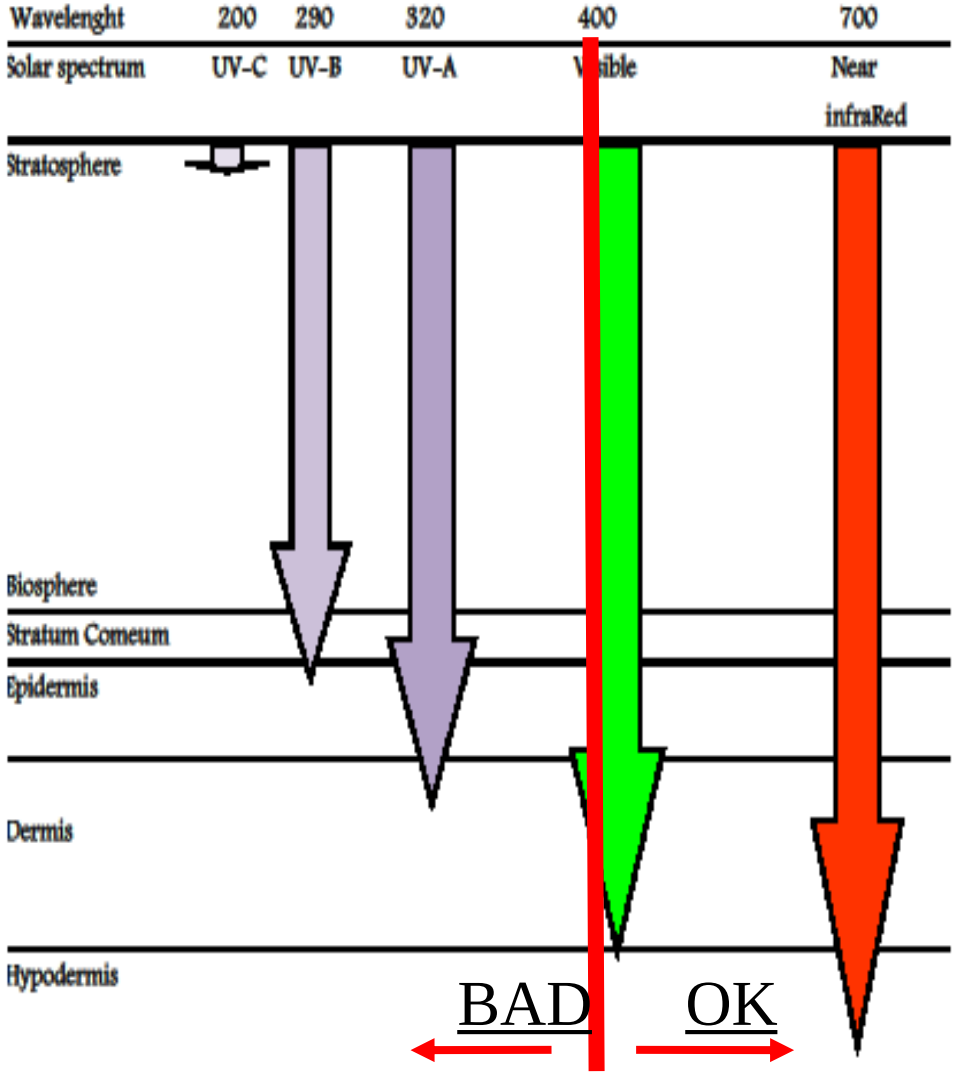
Conclusion

PDT can be useful as a public health strategy in underserved populations

Do we understand the interaction of light with our skin or ha

1. Which molecules absorb light?

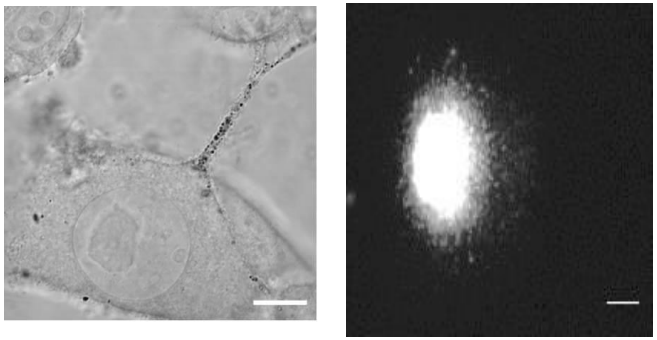
2. How much light is ab[illegible]l?



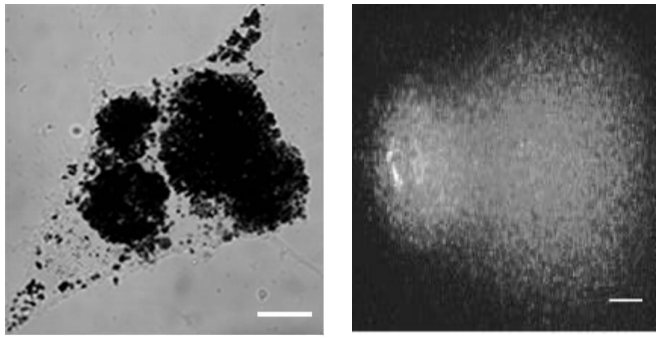
Baptista MS Photochemistry, Photobiology, and Redox Balance in Skin and Hair. Part I & II. *Cosmetiscope*, New York, 17(1, 3), p. 1-11; p. 1-10; 2011.

Many molecules absorb visible light in cells: flavin, protoporphyrin, melanin, vitamin A, lipofuscin.

WITHOUT MELANIN + VISIBLE LIGHT

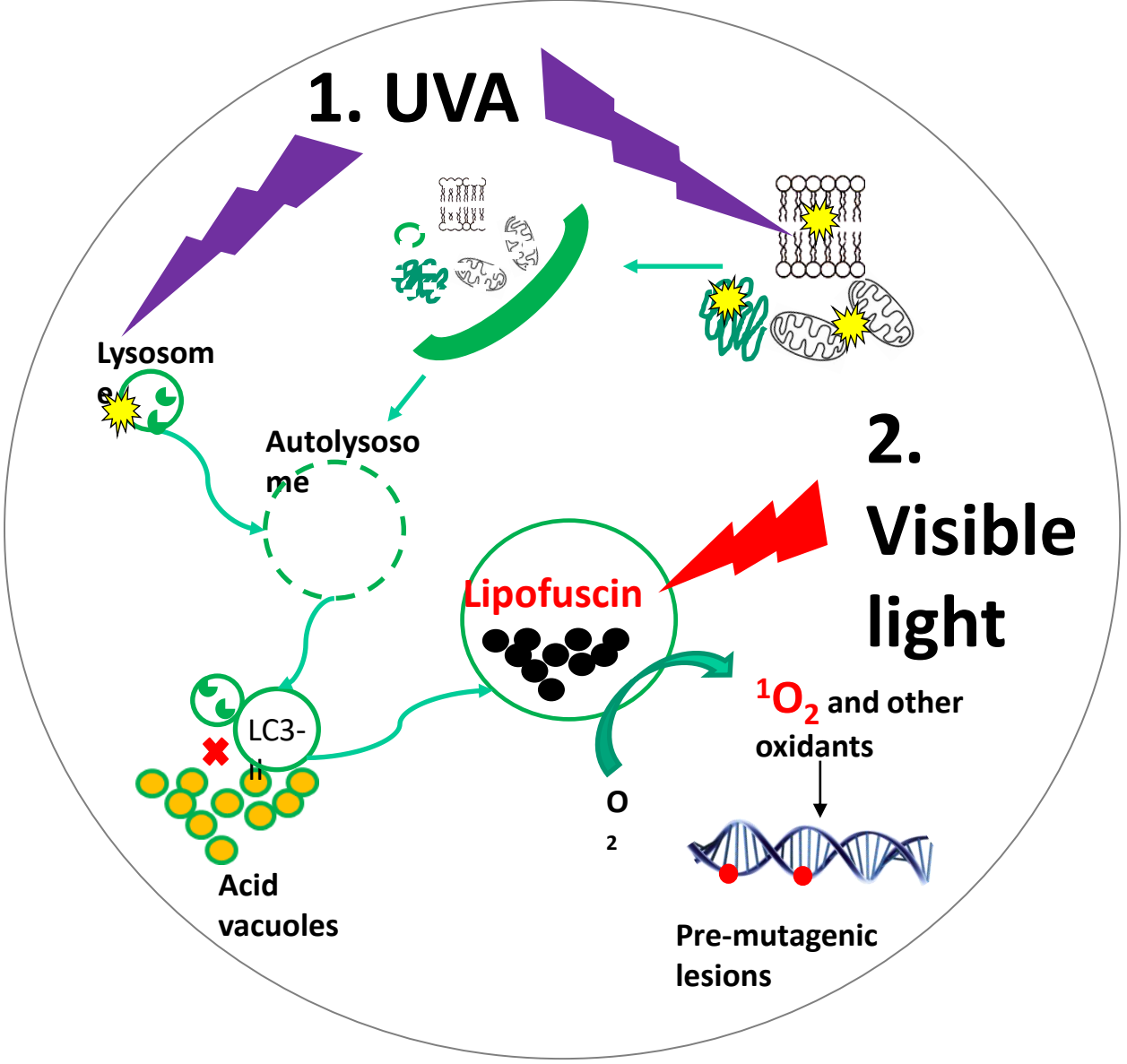


MELANIN + VISIBLE LIGHT



Photosensitization of melanin by visible light damages DNA

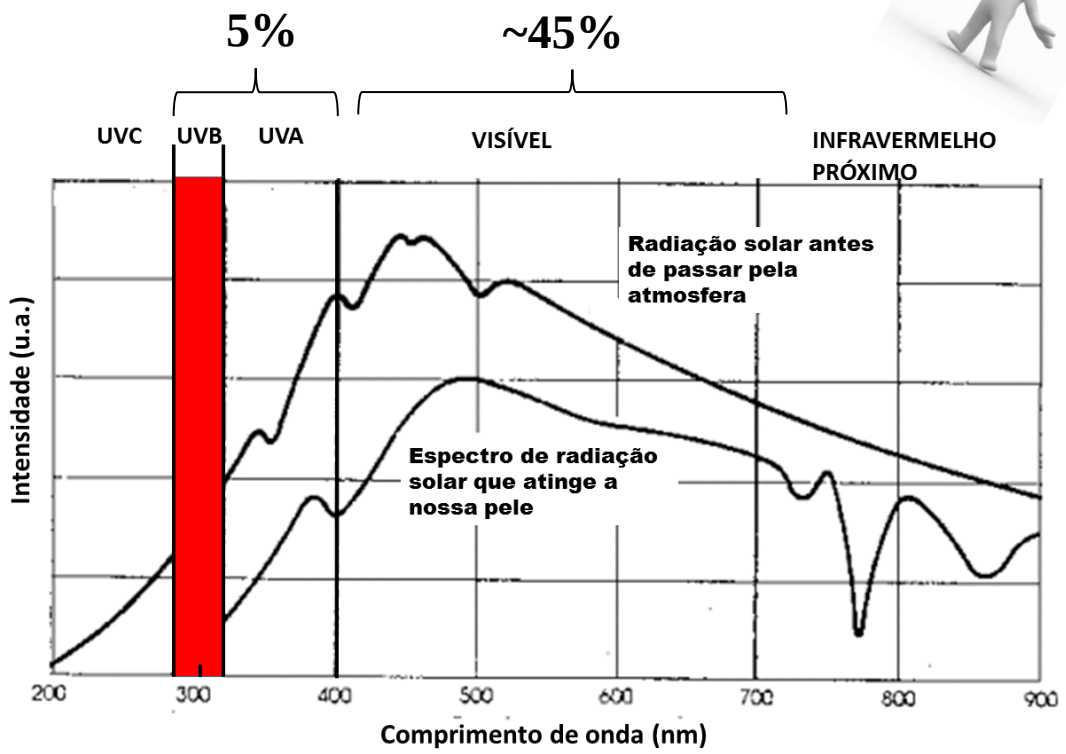
Chiarelli-Neto O et al. (2014) Melanin Photosensitization and the Effect of Visible Light on Epithelial Cells. PLoS ONE 9(11): e113266



Tonolli et al Lipofuscin generated by UVA turns keratinocytes photosensitive to visible light *Journal of Investigative Dermatology* 2017

Visible light should be considered in skin protection strategies against photoinduced damage. It is certainly involved in photoaging and in other skin diseases.

Conclusion



We hope to stimulate the development of more robust sun protection agents!

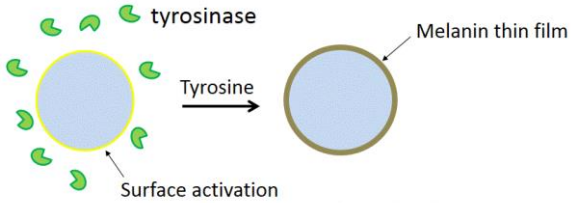
Developing strategies to protect skin against visible light

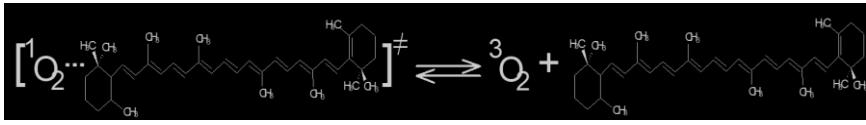
Visible light

Filters

Membrane protection

Anti-oxidant





Patente de invenção: BR 10 2016 024262 2

Rodrigues et al, *PPS*, 2016, 15 (3), 334-350;
Mertins et al *Biochimica et Biophysica Acta* 1848 (2015) 2180–2187

Leituras sugeridas

Capítulos sobre estrutura tridimensional de proteínas nos livros:

Biochemistry
Voet & Voet

Lehninger Principles of Biochemistry
Nelson & Cox

Bioquímica Básica
Marzzoco & Torres

Disponíveis em português e inglês na nossa biblioteca