Hair Morphology in a Heat damaged hair-Light & EM

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FMR

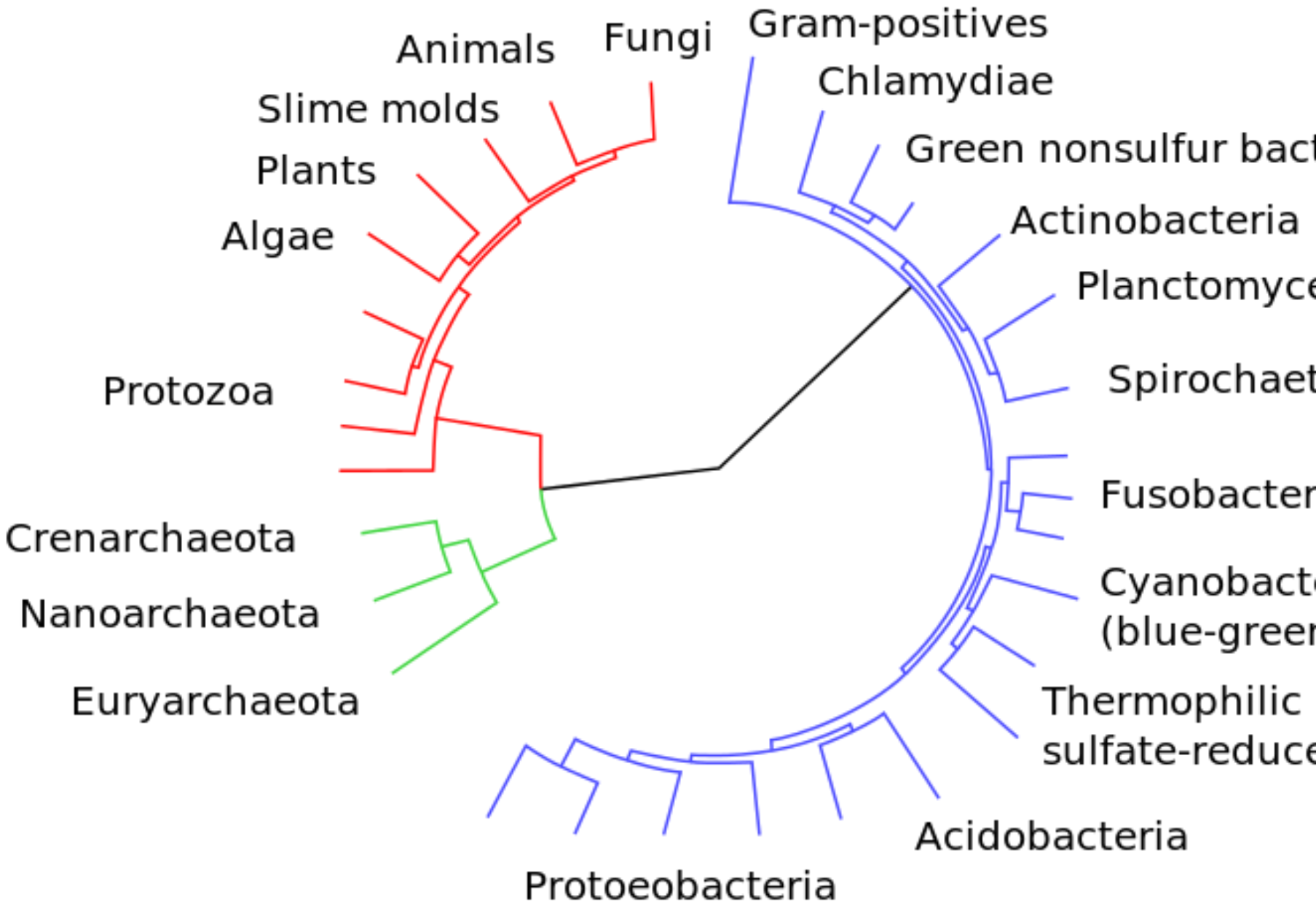
THE HAIR IS THE

RICHEST ORNAMENT

OF A WOMAN

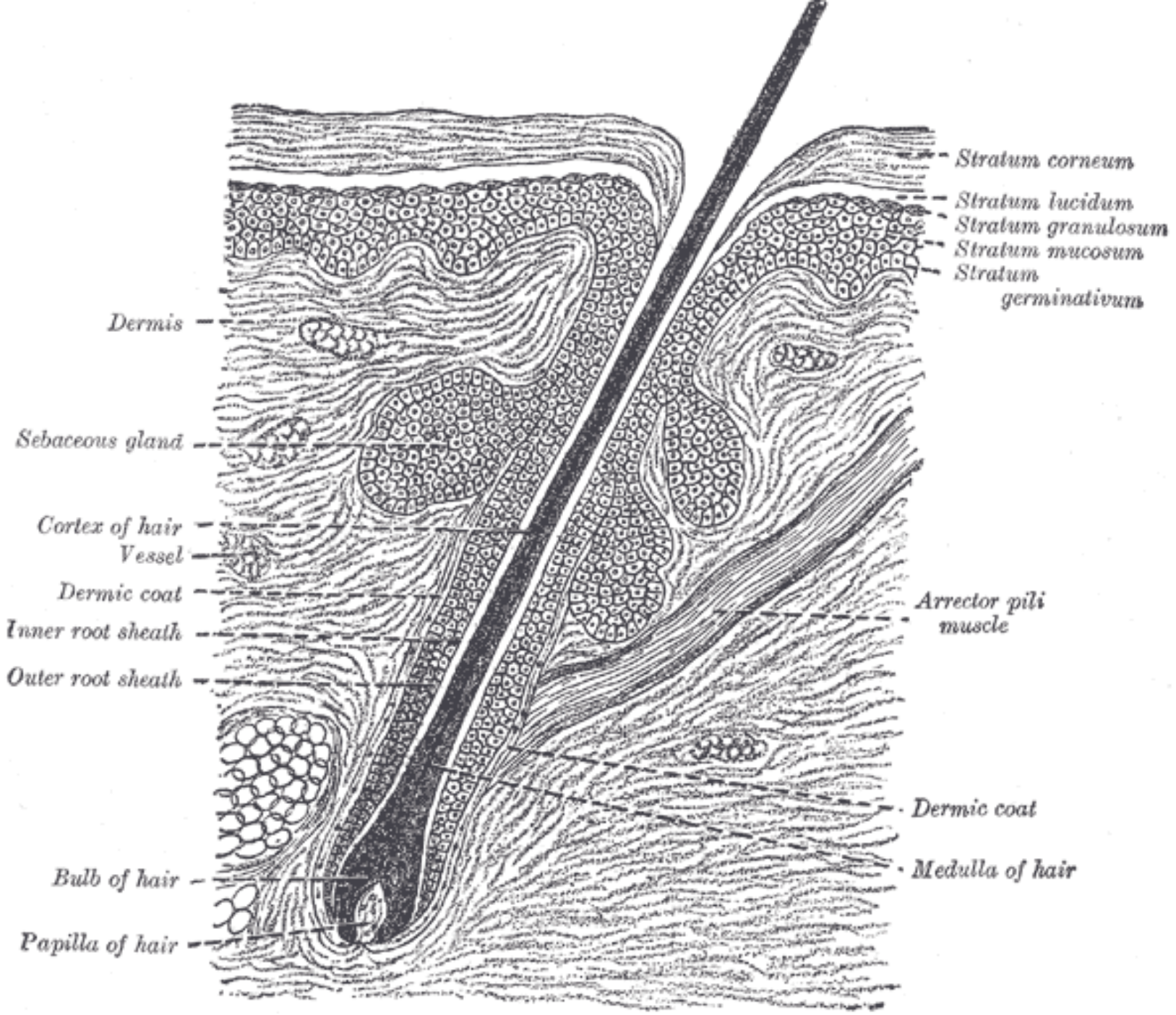
HAIR MORPHOLOGY,PHYLOGENY

- MAMMALIA
- TROCHOZOA (Hair animals)
- PILIFERA (Hair bearers)

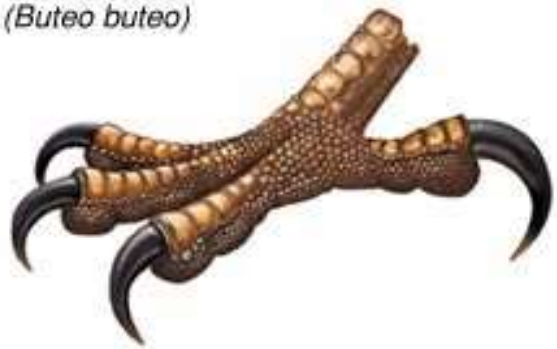

Animals
Fungi
Gram-positives
Slime molds
Chlamydiae
Plants
Green nonsulfur bact
Algae
Actinobacteria
Planctomyce
Protozoa
Spirochaet
Fusobacter
Crenarchaeota
Cyanobact
(blue-green
Nanoarchaeota
Euryarchaeota
Thermophilic
sulfate-reduce
Acidobacteria
Protoeobacteria

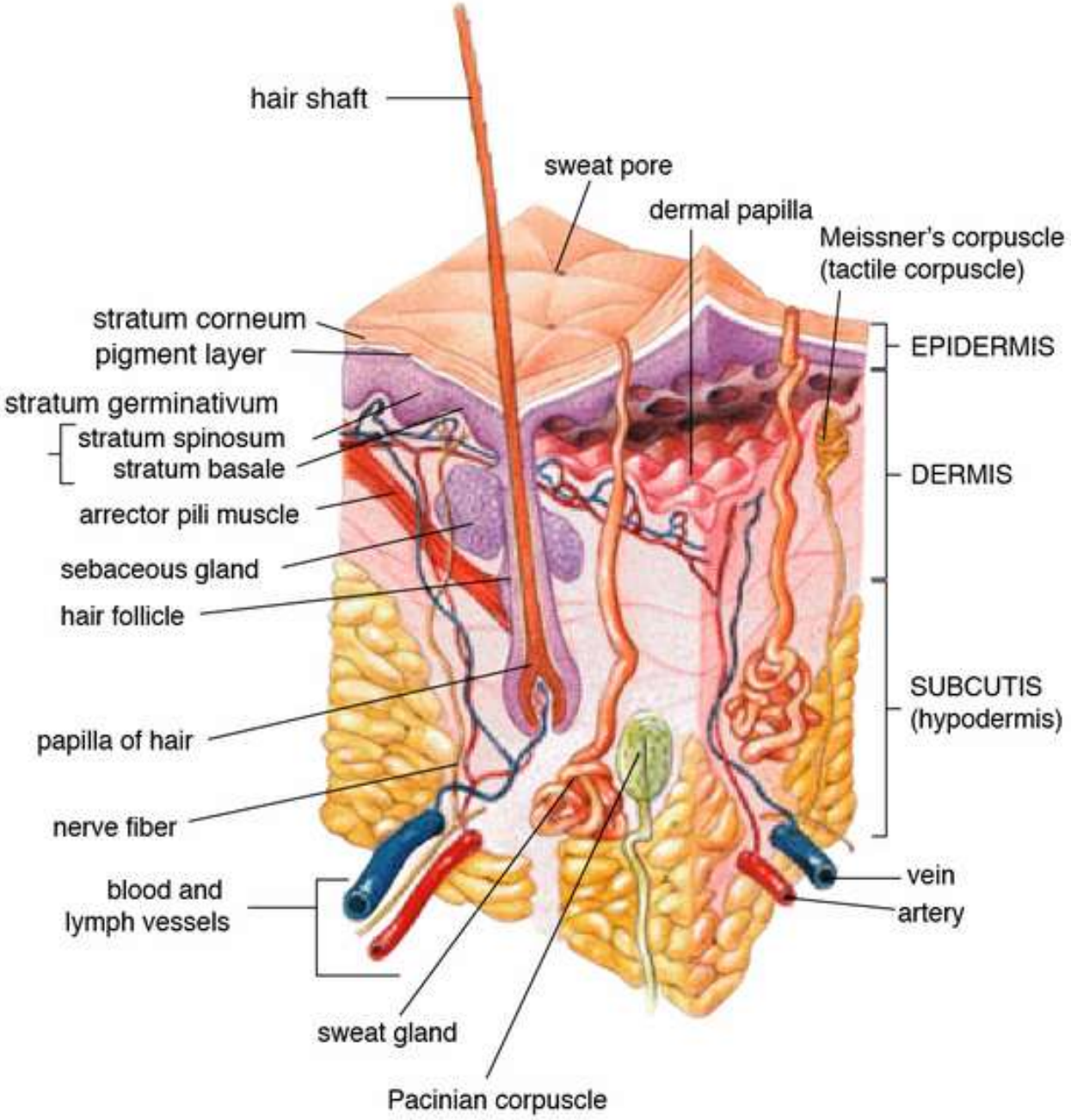
FUNCTIONS OF THE HAIR

- Thermoregulation
- Protective
- Defend against predators
- Navigation
- Mood indication

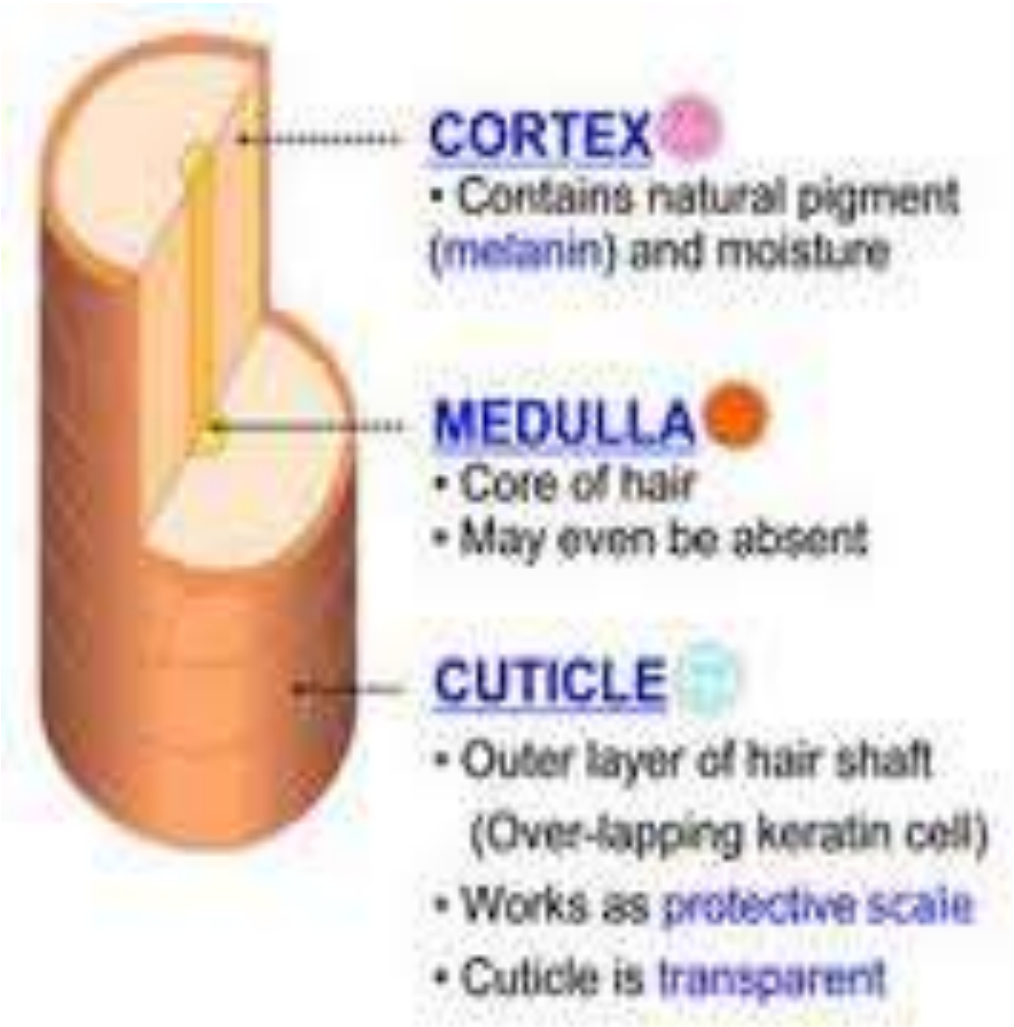

Stratum corneum
Stratum lucidum
Stratum granulosum
Stratum mucosum
Stratum germinativum
Dermis
Sebaceous gland
Cortex of hair
Vessel
Dermic coat
Inner root sheath
Outer root sheath
Arrector pili muscle
Dermic coat
Medulla of hair
Bulb of hair
Papilla of hair

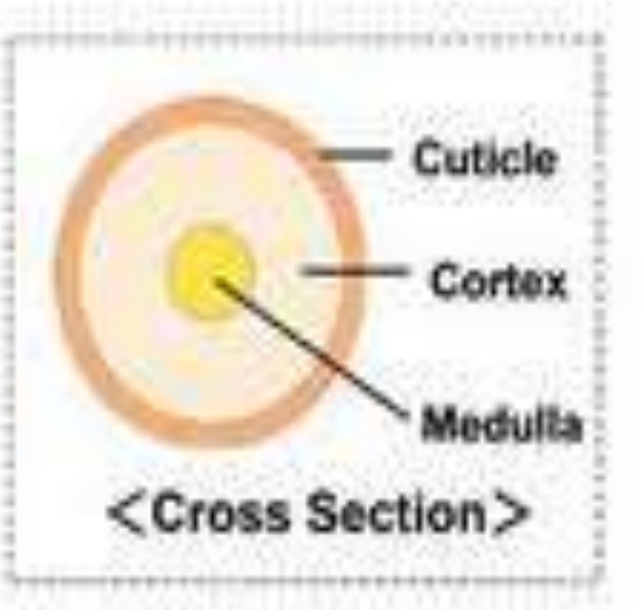
common buzzard
(Buteo buteo)

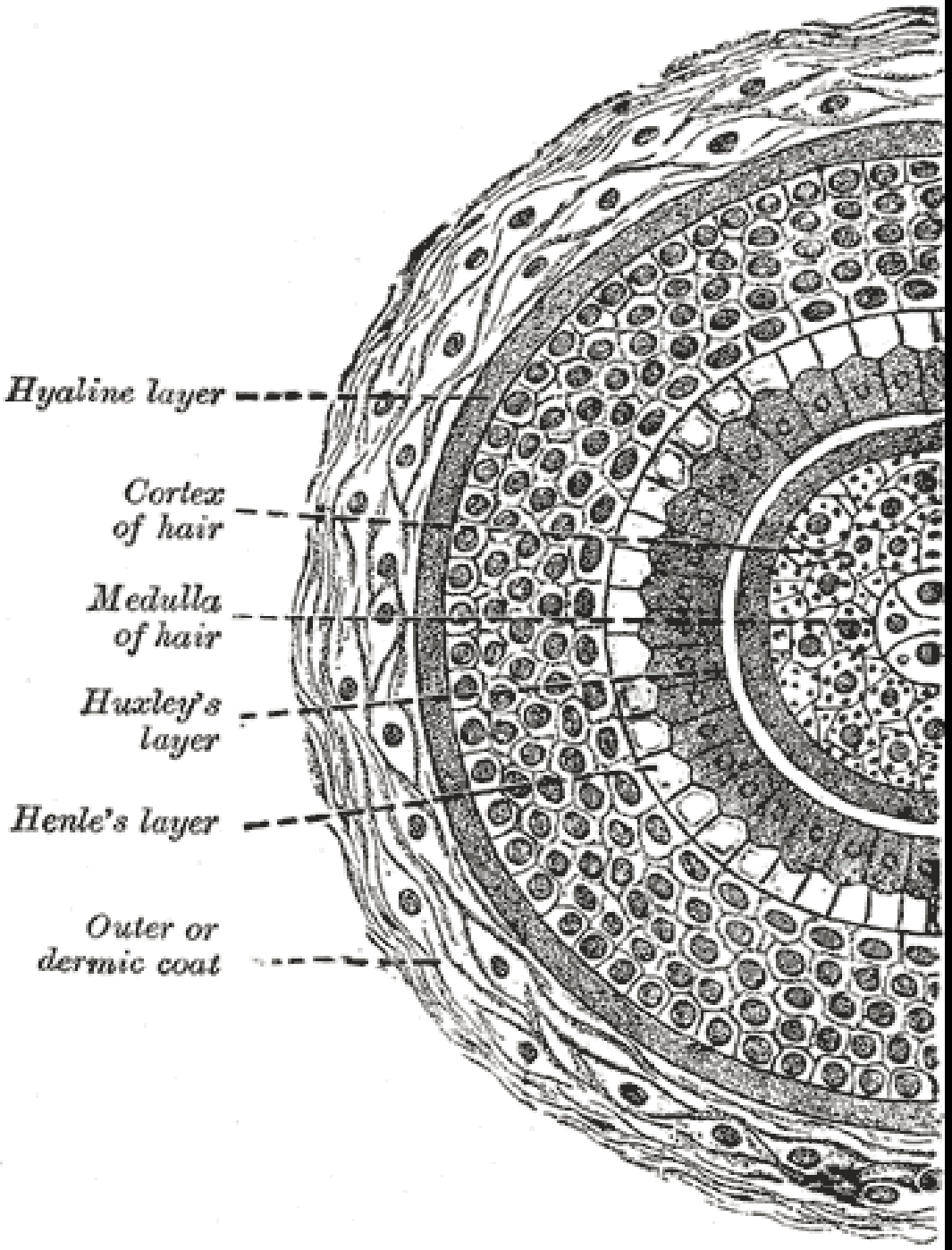


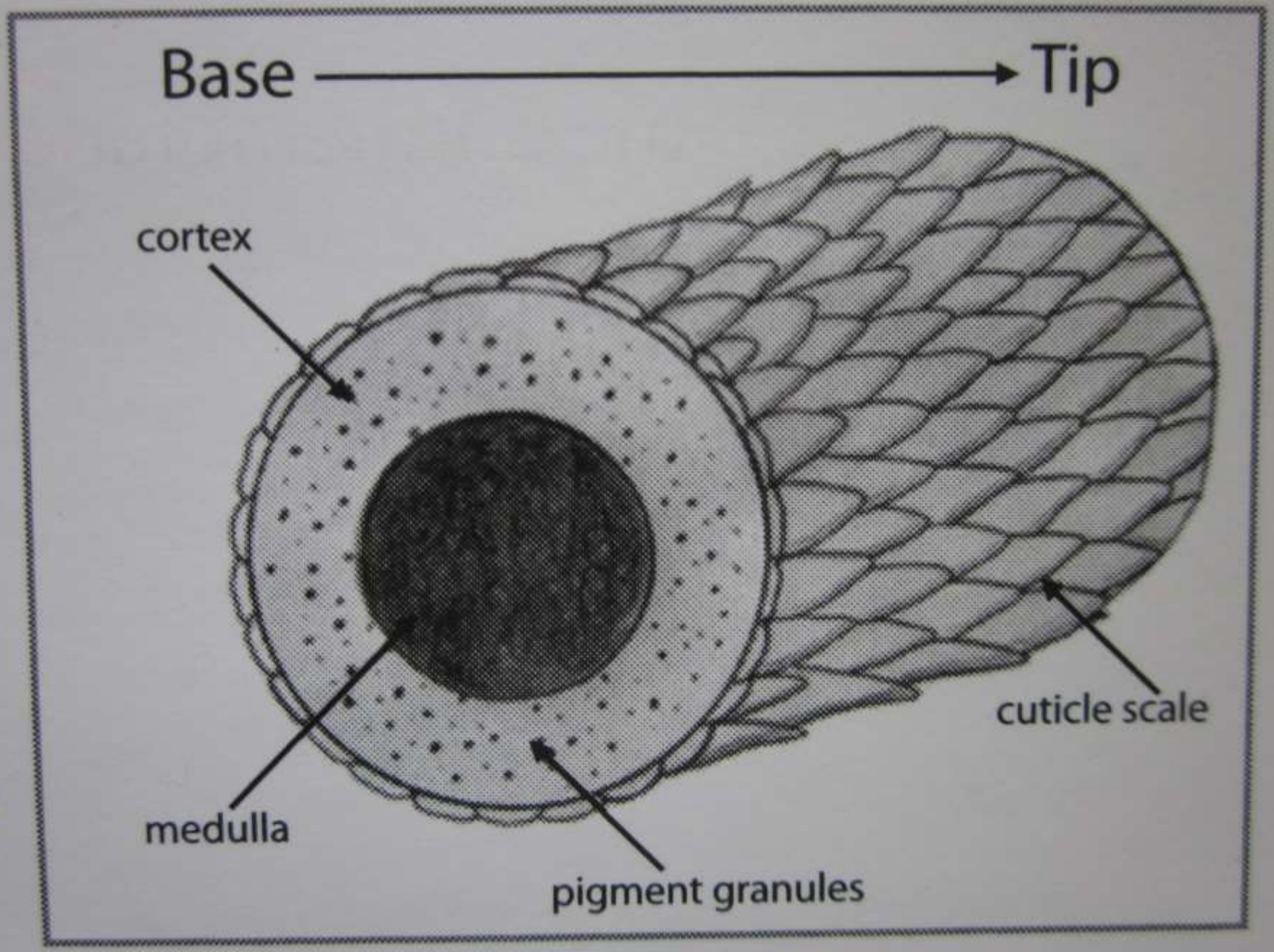

hair shaft
sweat pore
dermal papilla
Meissner's corpuscle
(tactile corpuscle)
stratum corneum
pigment layer
stratum germinativum
stratum spinosum
stratum basale
arrector pili muscle
sebaceous gland
hair follicle
papilla of hair
nerve fiber
blood and
lymph vessels
sweat gland
Pacinian corpuscle
EPIDERMIS
DERMIS
SUBCUTIS
(hypodermis)
vein
artery

Structure of Hair Shaft





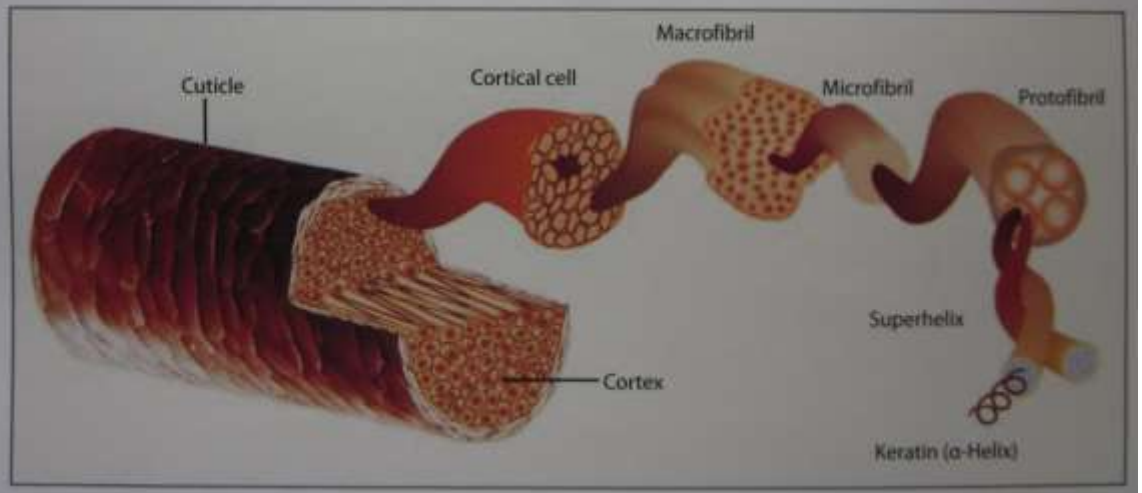

Hyaline layer
Cortex of hair
Medulla of hair
Huxley's layer
Henle's layer
Outer or dermic coat


Base
Tip
cortex
medulla
pigment granules
cuticle scale

Human Hair:

A unique physico-chemical composite[1]

Biological proteins



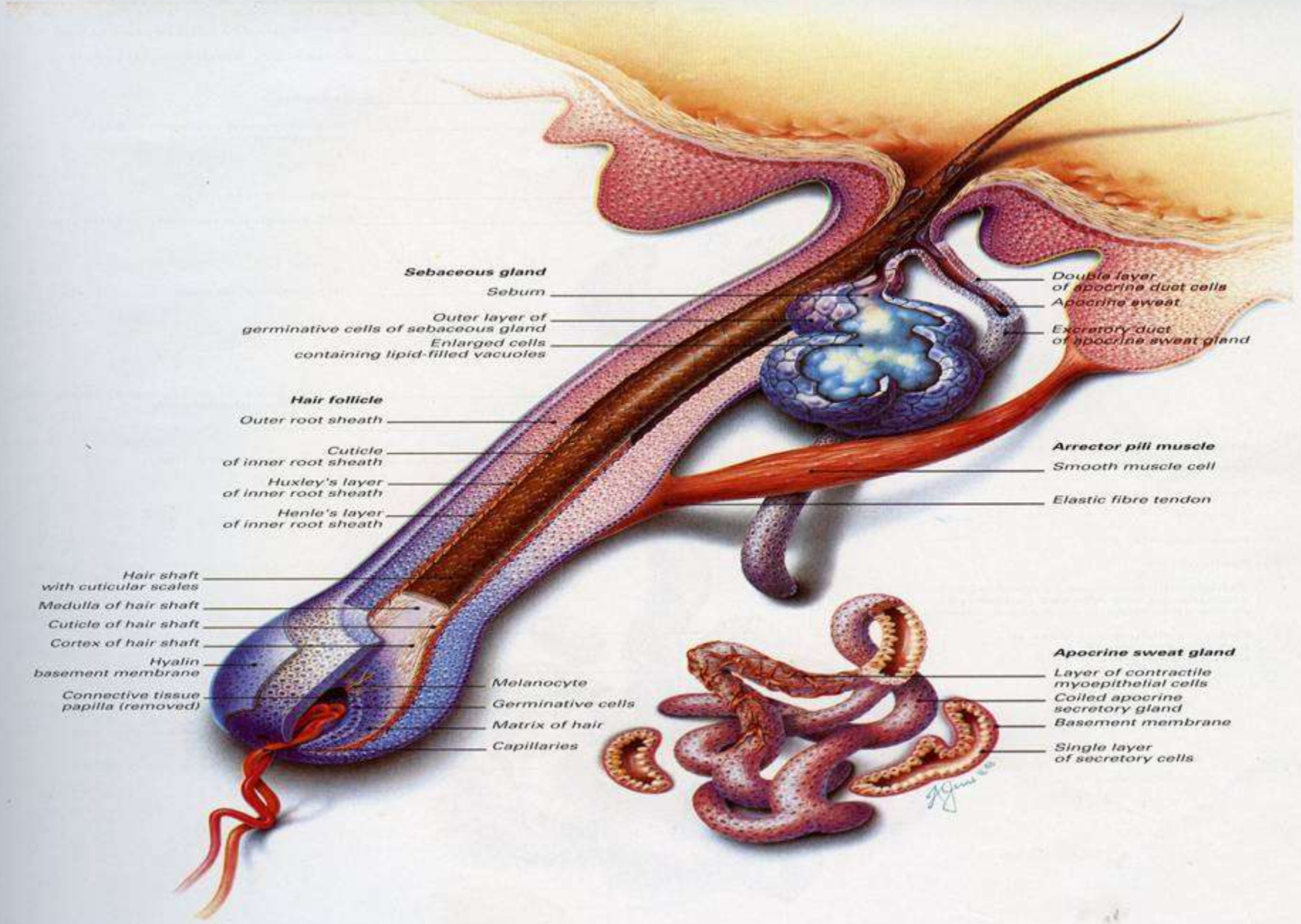
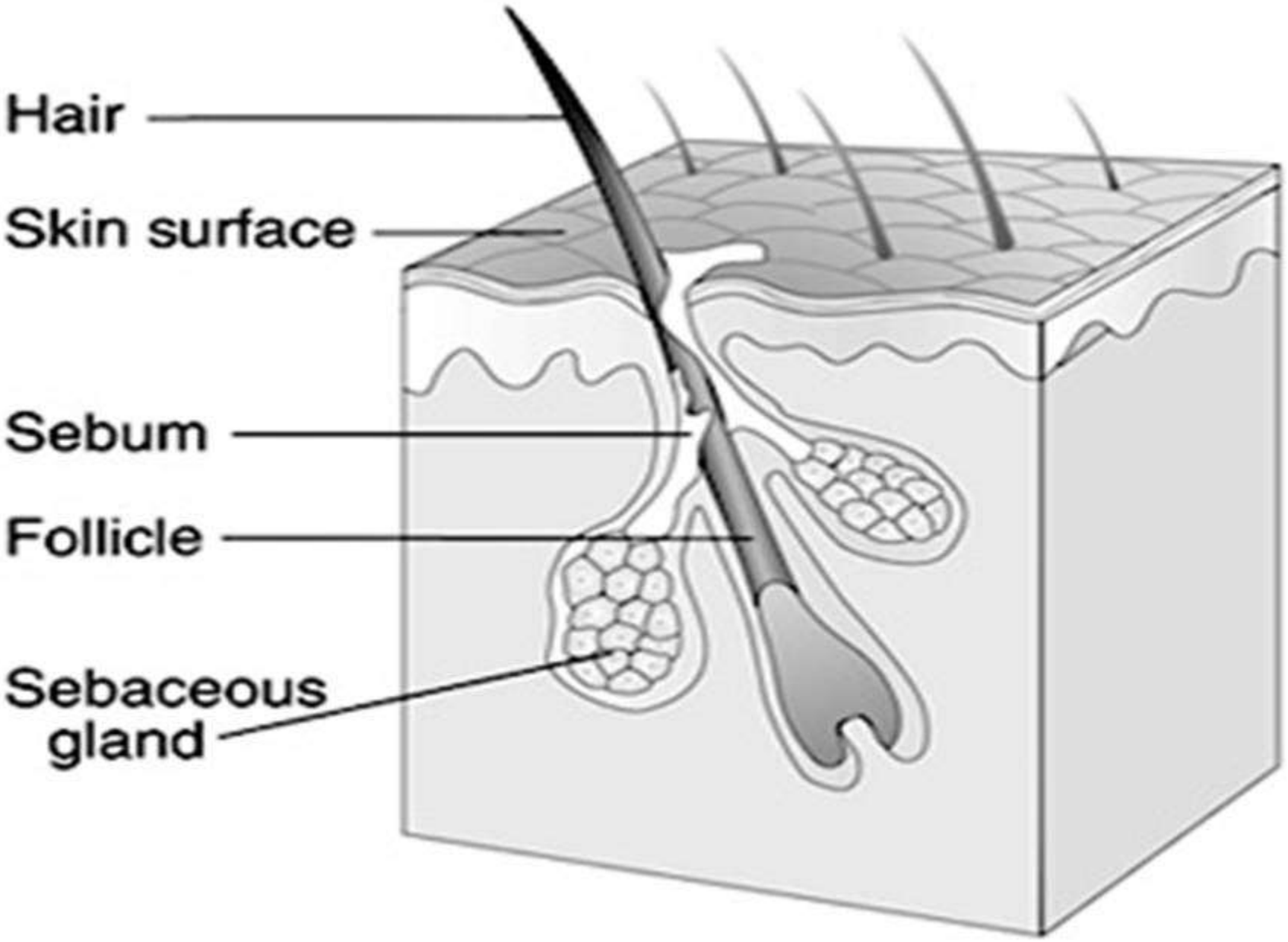
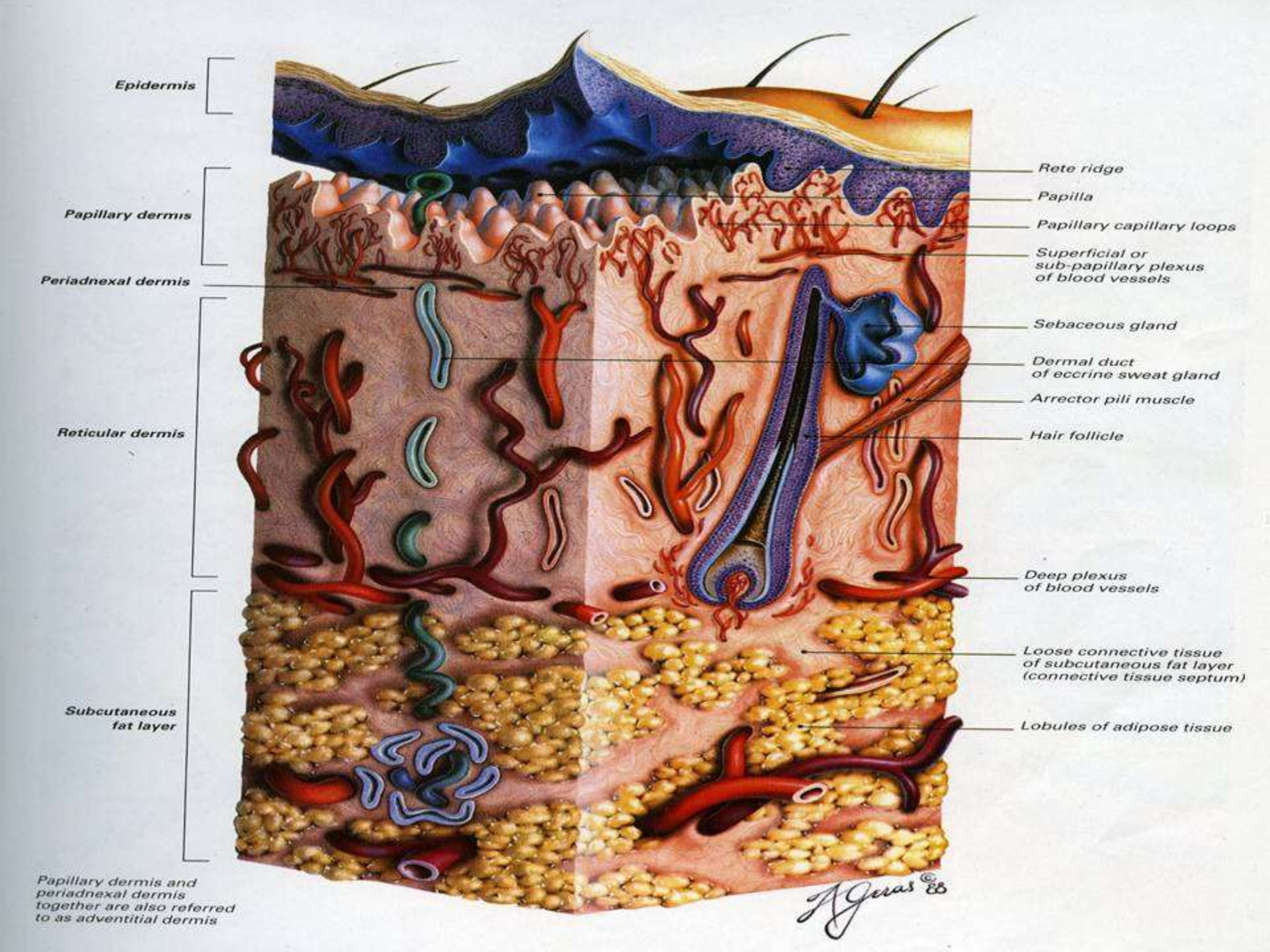


Fig. 3 The pilar apparatus.
(From Geras A.J. Dermatology. A medical artist's interpretation. Basle: Sandoz Medical Publication; 1990. p. 49, with permission)

SEXUAL FUNCTION

- APOCRINE GLANDS
- GENDER DIFFERENCES IN DISTRIBUTION
- HORMONE DEPENDENT HAIR


Hair
Skin surface
Sebum
Follicle
Sebaceous gland

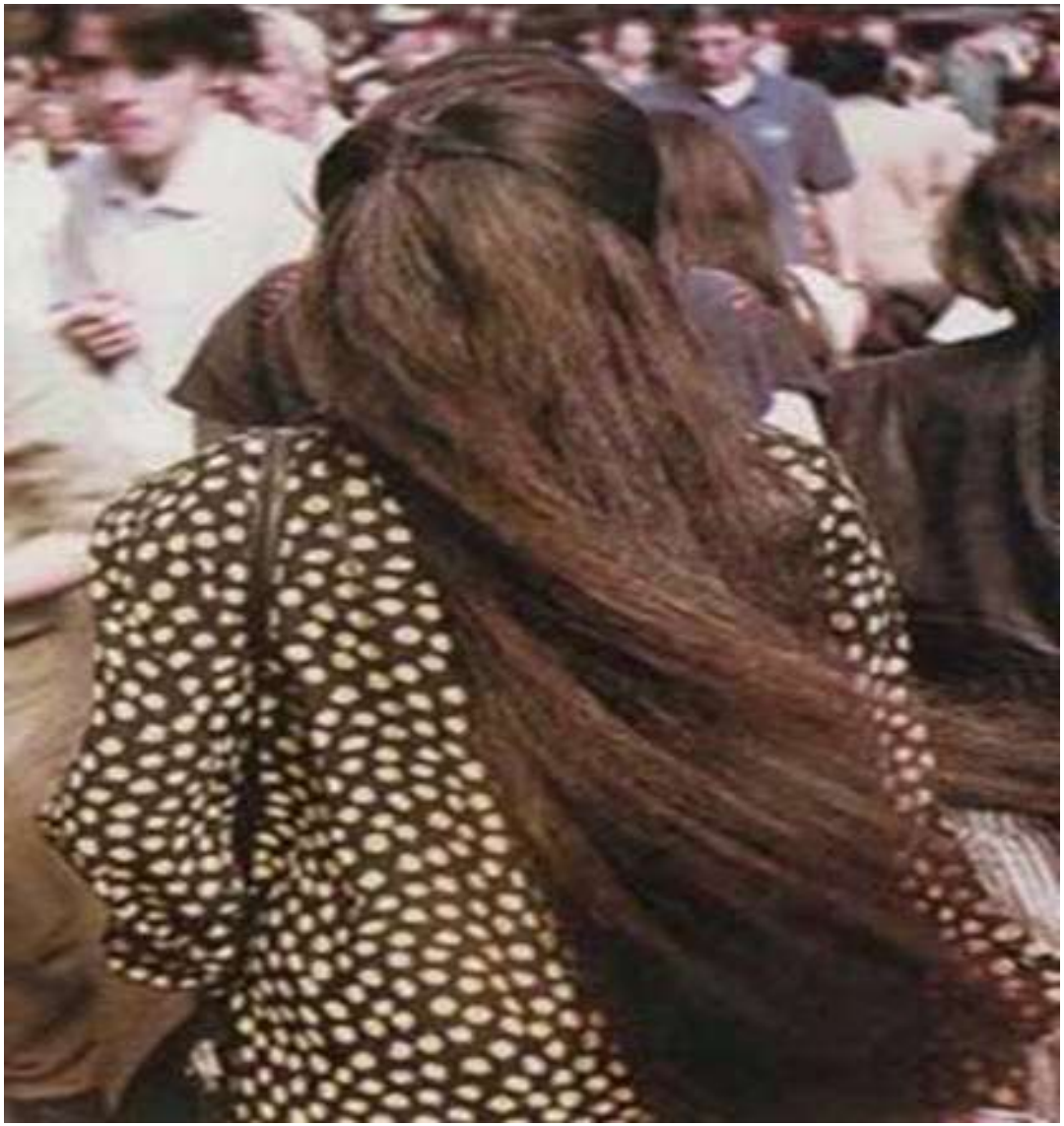

Epidermis
Papillary dermis
Periadnexal dermis
Reticular dermis
Subcutaneous fat layer
Rete ridge
Papilla
Papillary capillary loops
Superficial or sub-papillary plexus of blood vessels
Sebaceous gland
Dermal duct of eccrine sweat gland
Arrector pili muscle
Hair follicle
Deep plexus of blood vessels
Loose connective tissue of subcutaneous fat layer (connective tissue septum)
Lobules of adipose tissue
Papillary dermis and periadnexal dermis together are also referred to as adventitial dermis
A Geras ©88

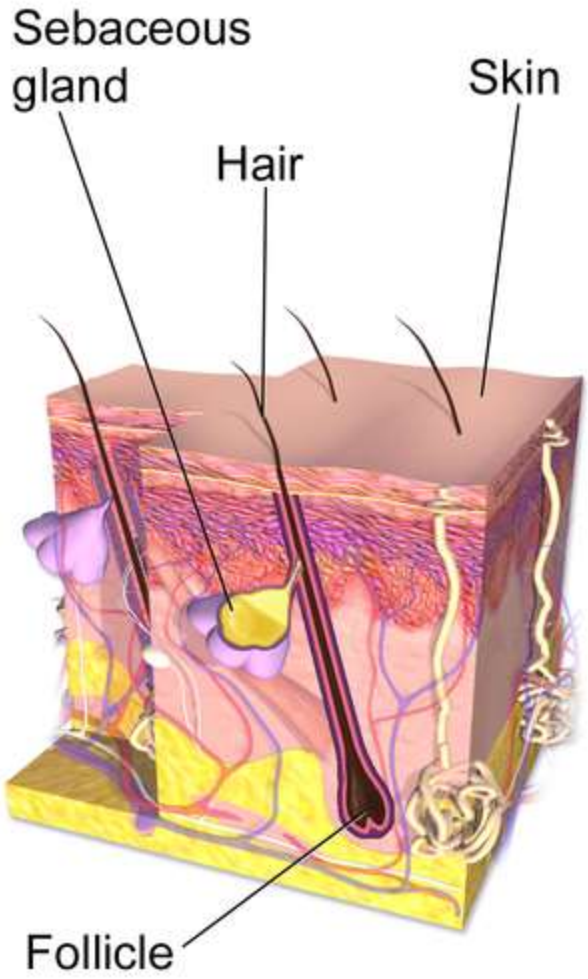
Hair Facts

- **A given follicle produces 10- 12 hair in a life time**
- **Hair length is determined by the anagen duration.**

Longer the Anagen phase longer the hair.

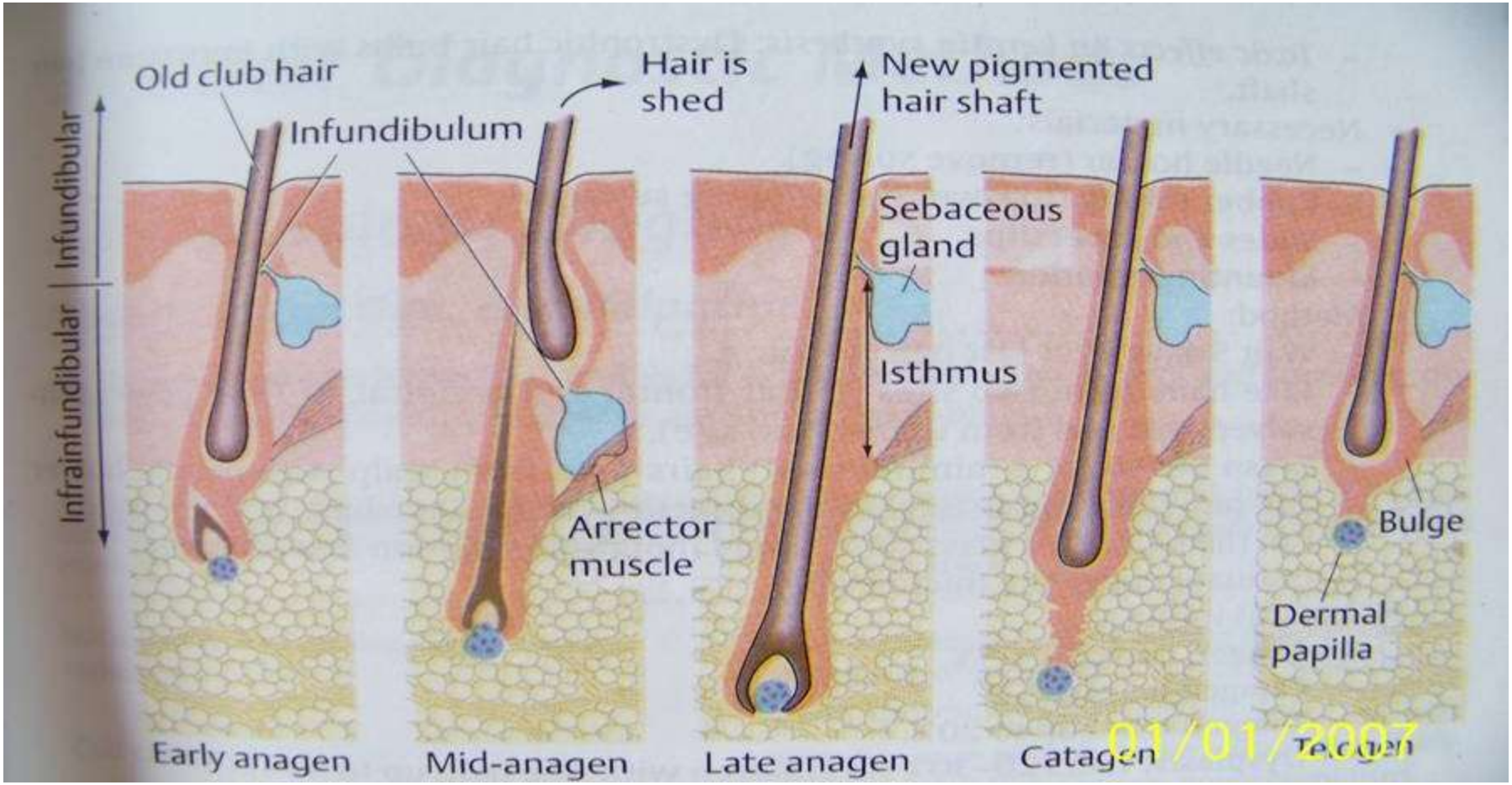
Hair-Introduction





Hair Follicle

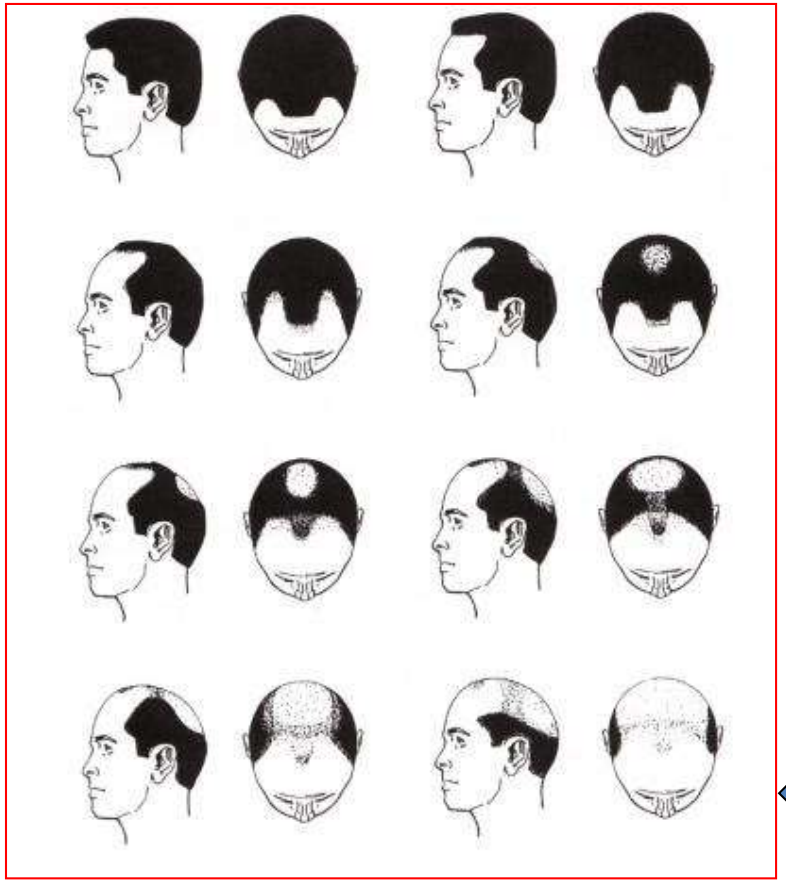
Hair cycle


Infrainfundibular
Infundibular
Old club hair
Infundibulum
Hair is shed
New pigmented hair shaft
Sebaceous gland
Isthmus
Arrector muscle
Bulge
Dermal papilla
Early anagen
Mid-anagen
Late anagen
Catagen

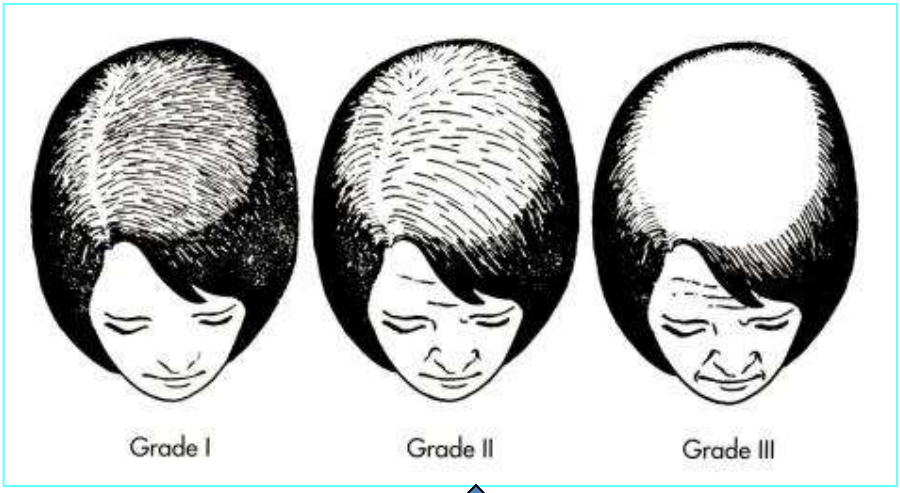
SEXUAL FUNCTION

- APOCRINE GLANDS
- GENDER DIFFERENCES IN DISTRIBUTION
- HORMONE DEPENDENT HAIR

MALE / FEMALE PATTERN BALDNESS

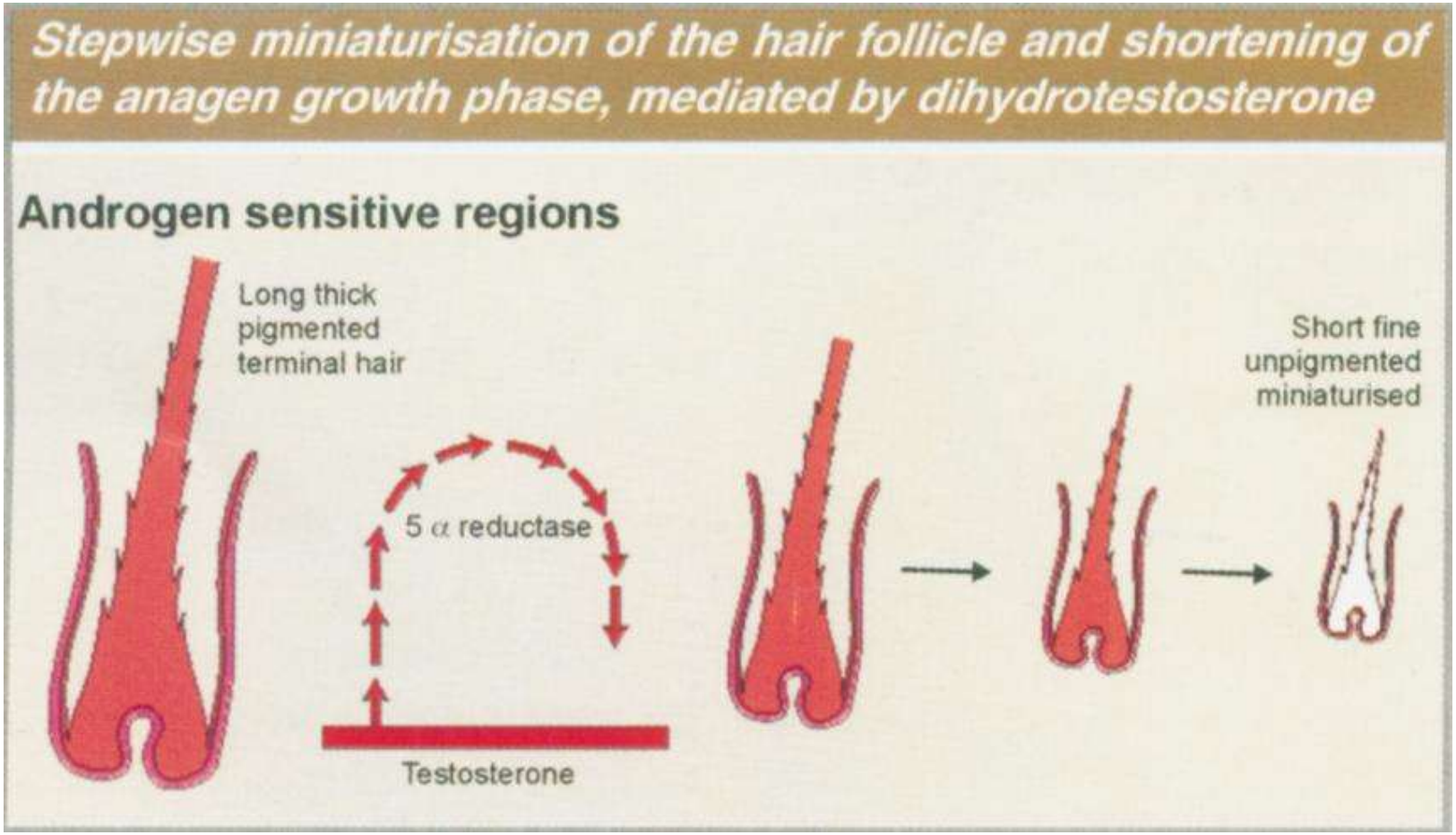


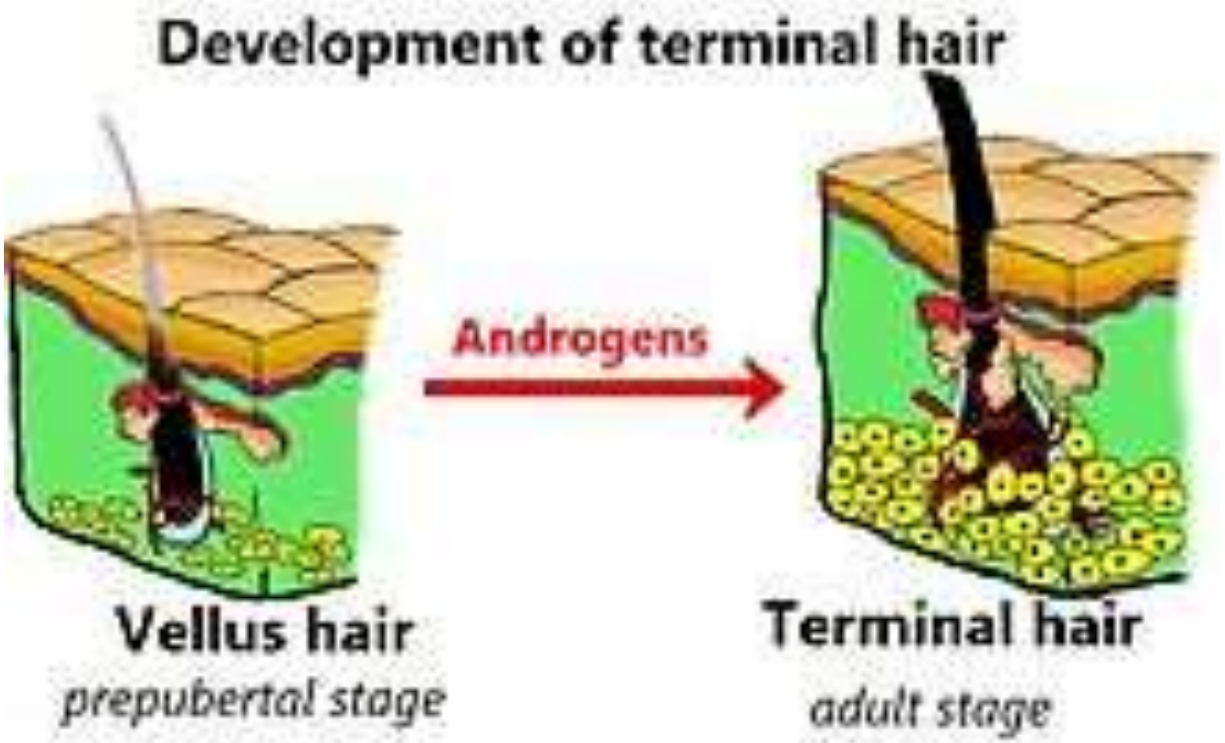
Male Pattern Baldness



Female Pattern Baldness

MINIATURIZATION OF HAIR FOLLICLE




Development of terminal hair
Androgens
Vellus hair
prepubertal stage
Terminal hair
adult stage

Abnormal Hair Quality

Dry brittle hair

Lusterless hair

Frizzy hair

Split ends

Fraying hair

Damaged hair

Rough hair

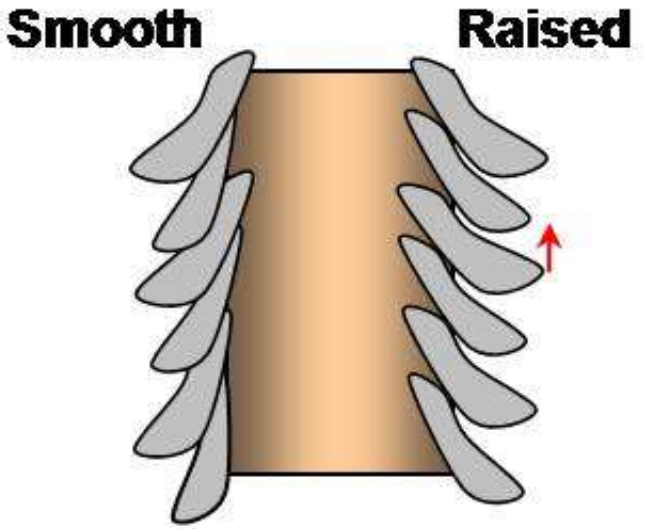
A HAIR IN THE

HEAD IS WORTH

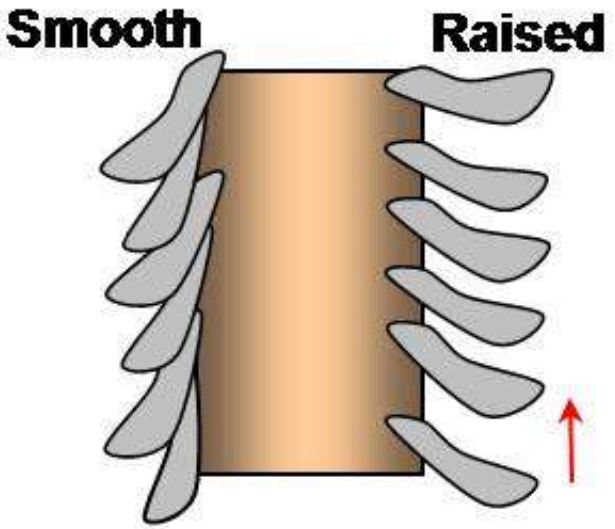
TWO IN

THE BRUSH

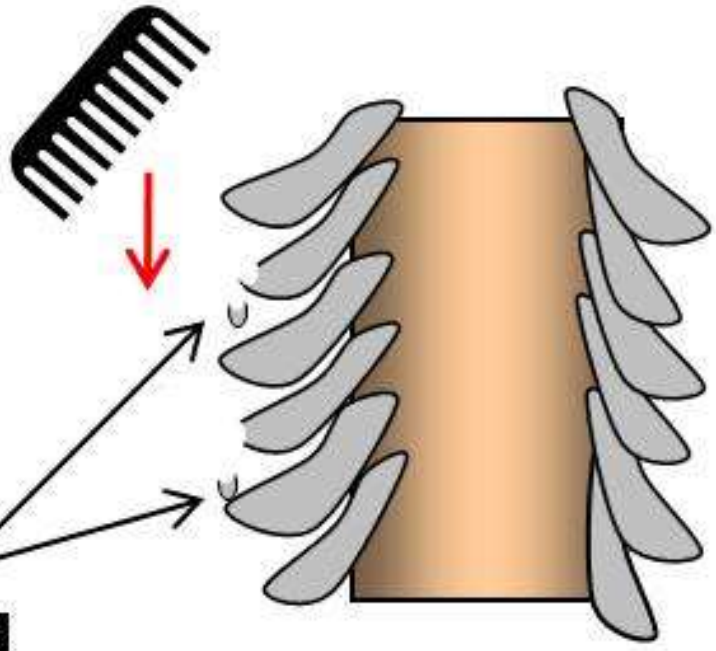

Dino-Lite
Premier



Wetting hair or using shampoo does ***slightly*** raise the cuticle (swelling)



Bleaching or relaxing hair dramatically raises the cuticle (swelling)

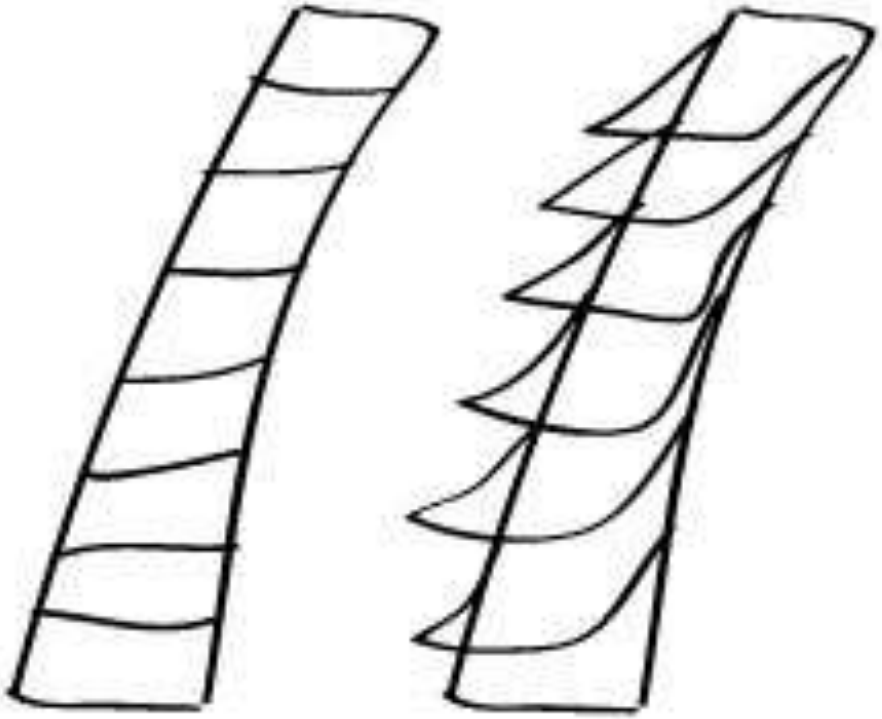


Cuticle chipping

Hair conditioner smoothes down the cuticle making it less likely to chip

A raised cuticle is more susceptible to chipping when handled or combed

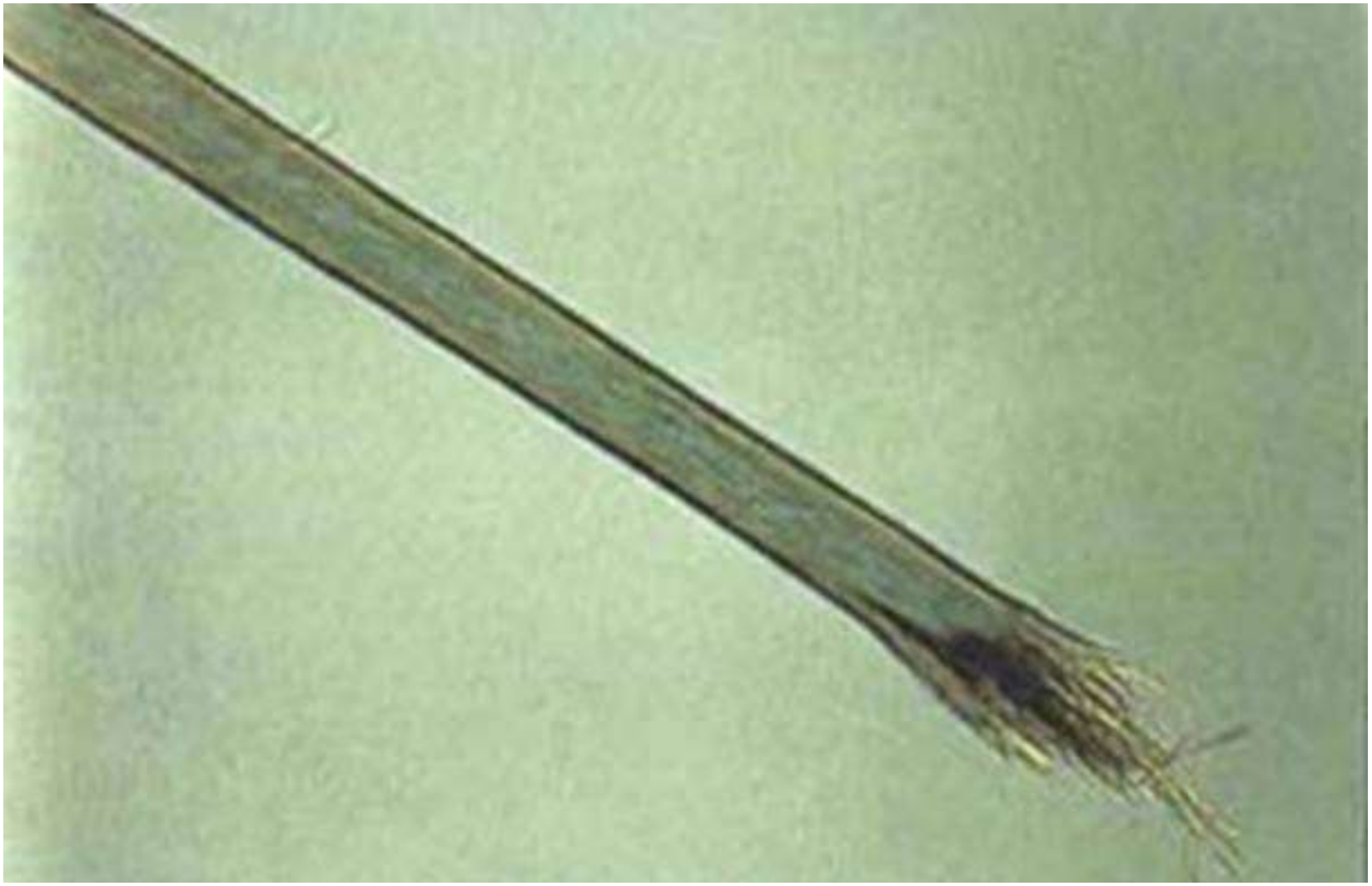
THE HAIR CUTICLE



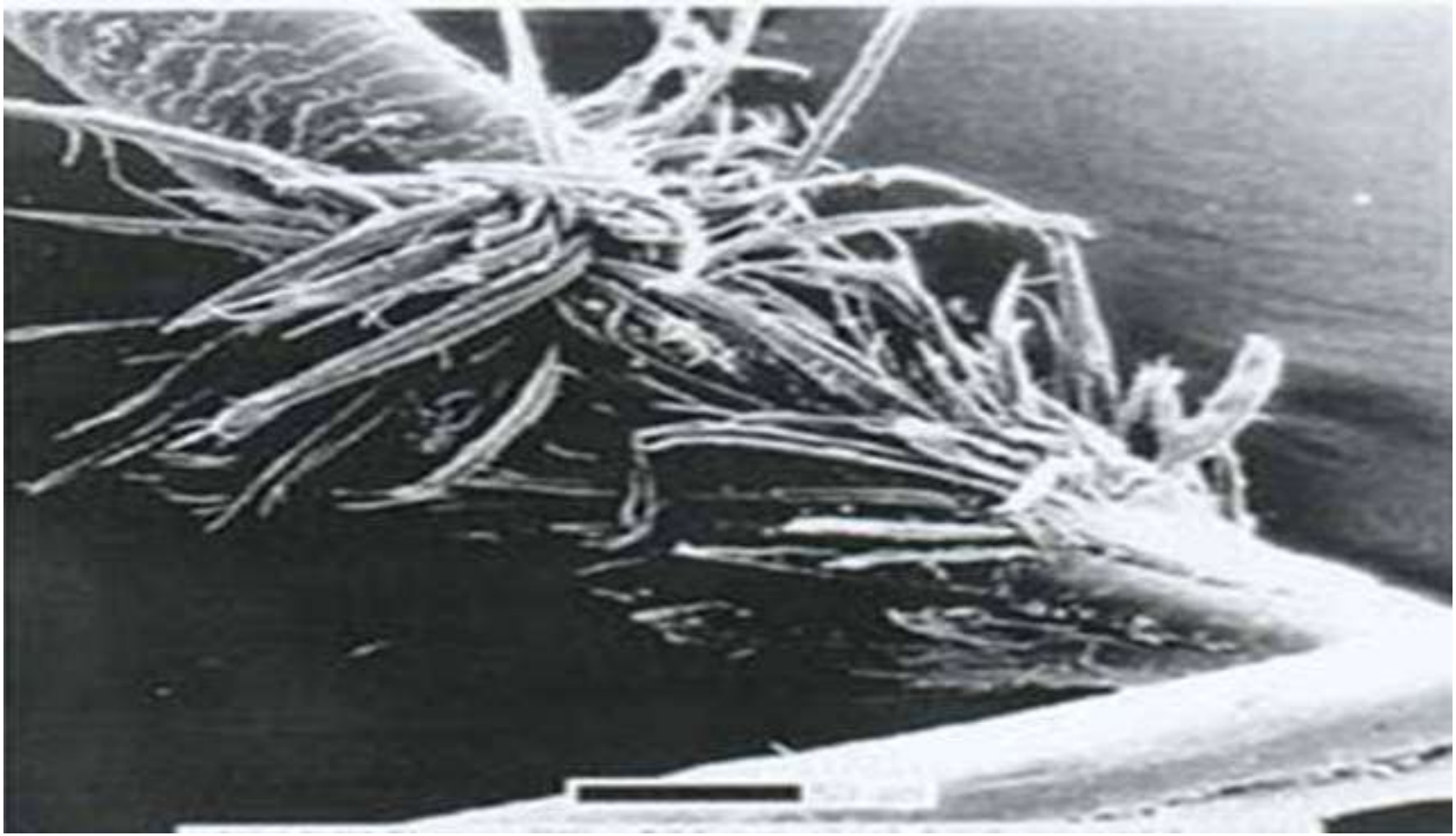
COMPACT FRIZZY

Weathering of Hair

Split Ends



Weathering of Hair due to excessive heat



Transverse Fractures-Trichorrhexis Nodosa

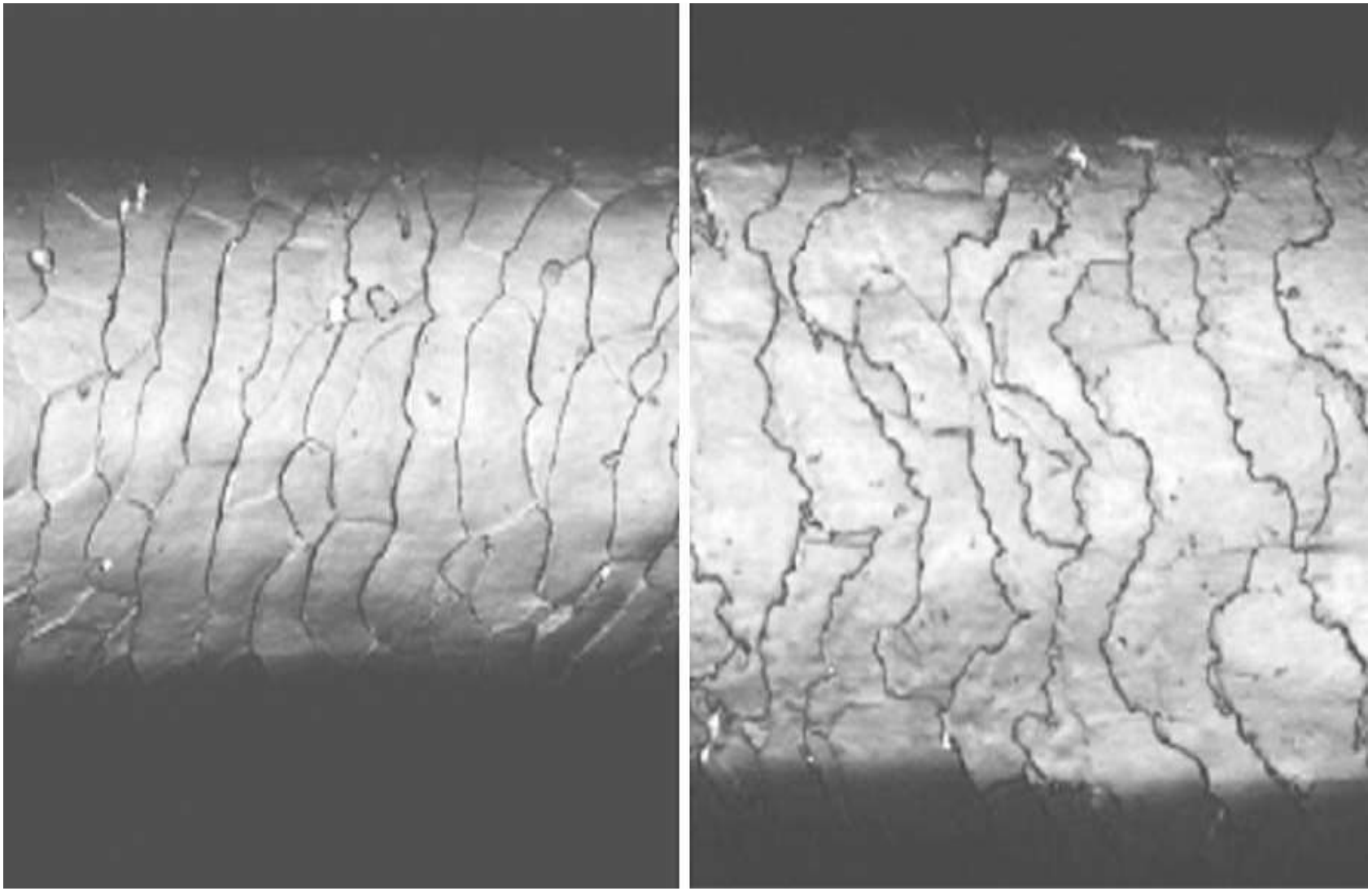
Trichoclasis refers to the common “greenstick” fracture

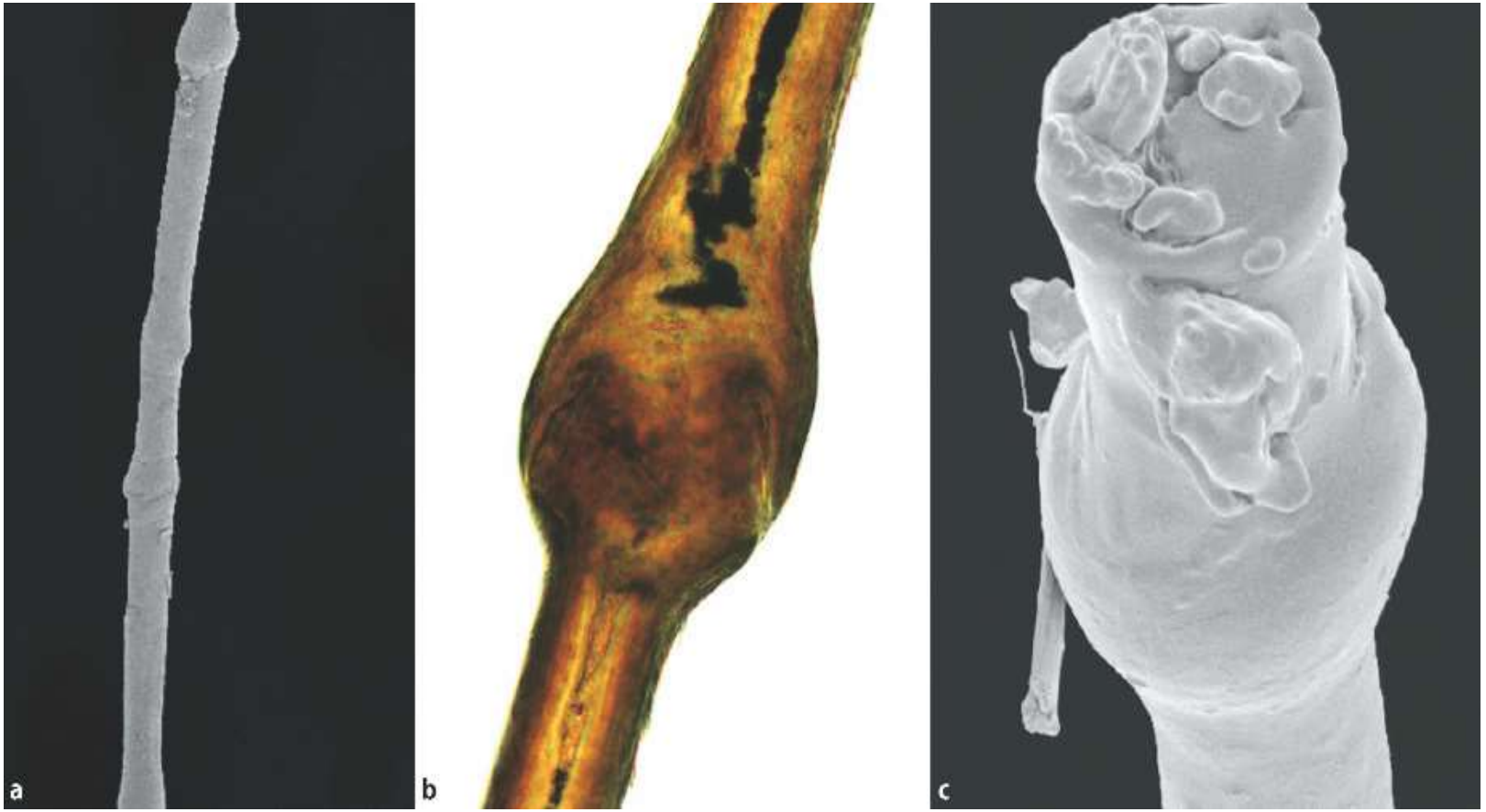
Oblique Fractures- Tapered Fracture

Fractures of the hair that cause a pencil point appearance are due to inhibition of nucleic acid and protein synthesis and therefore mitosis during anagen

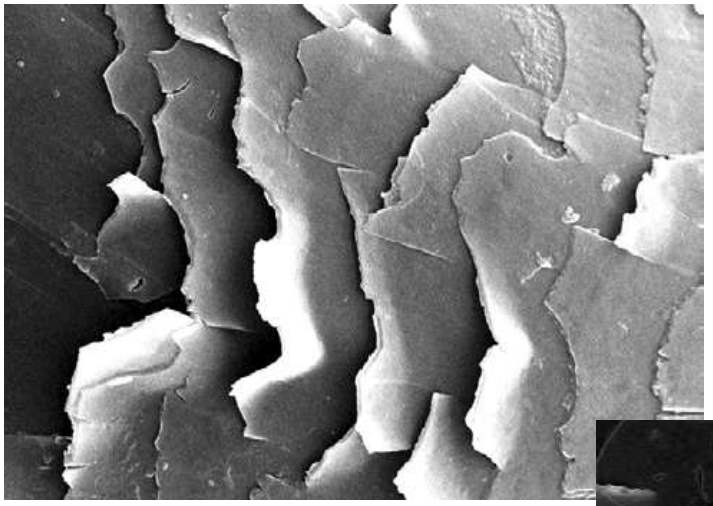
Trichoptilosis is a longitudinal splitting of the distal end of the hair

Trichorrhexis nodosa in light microscopy

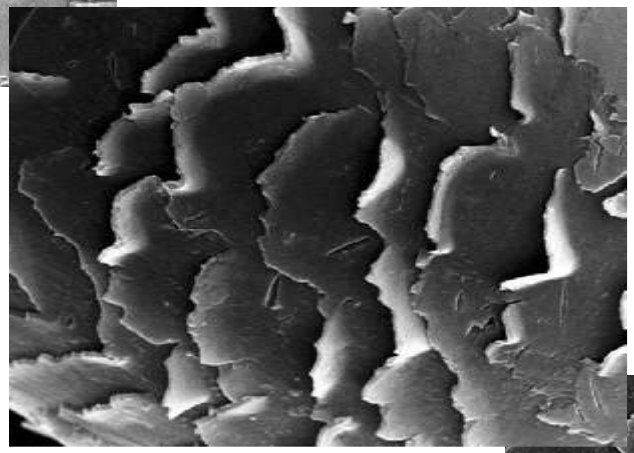




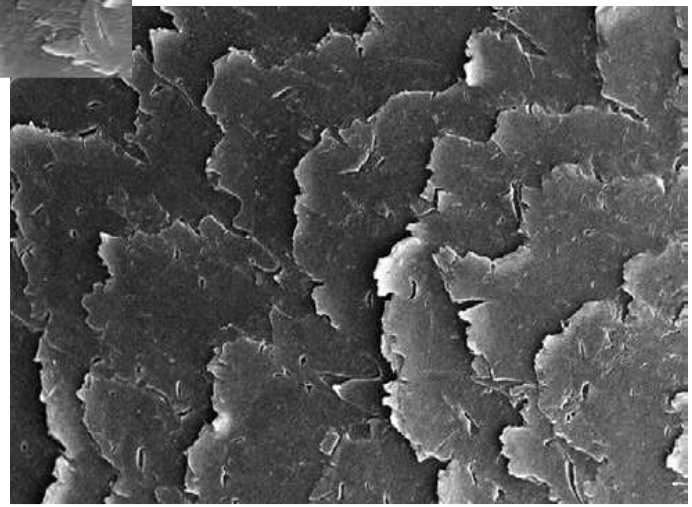
Multiple typical features of Trichorrhexis invaginata along the hair shaft (**a**), close up view of one tulip-like invagination with the lower ball and upper cup portion in (**b**) light microscopy and (**c**) SEM



(C)



(D)



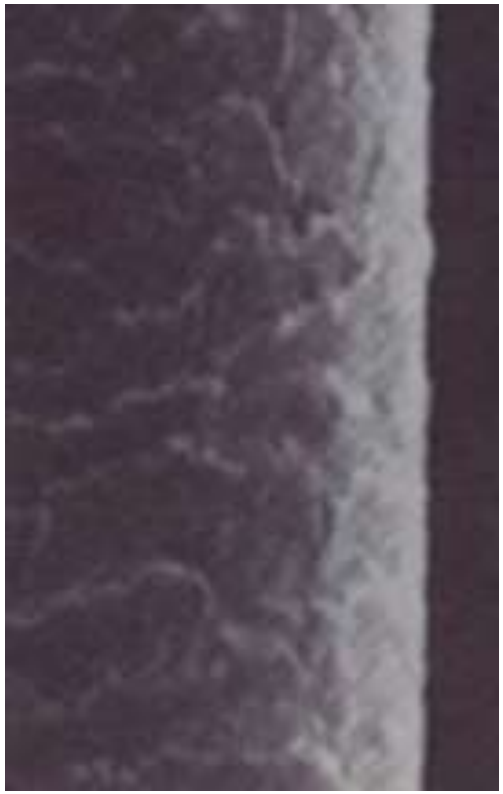
(E)

(C) shampooing and drying with a hair dryer for 60 seconds at a distance of 15 cm (47oC),
(D) shampooing and drying with a hair dryer for 30 seconds at a distance of 10 cm (61oC),
(E) shampooing and drying with a hair dryer for 15 seconds at a distance of 5 cm (95oC).

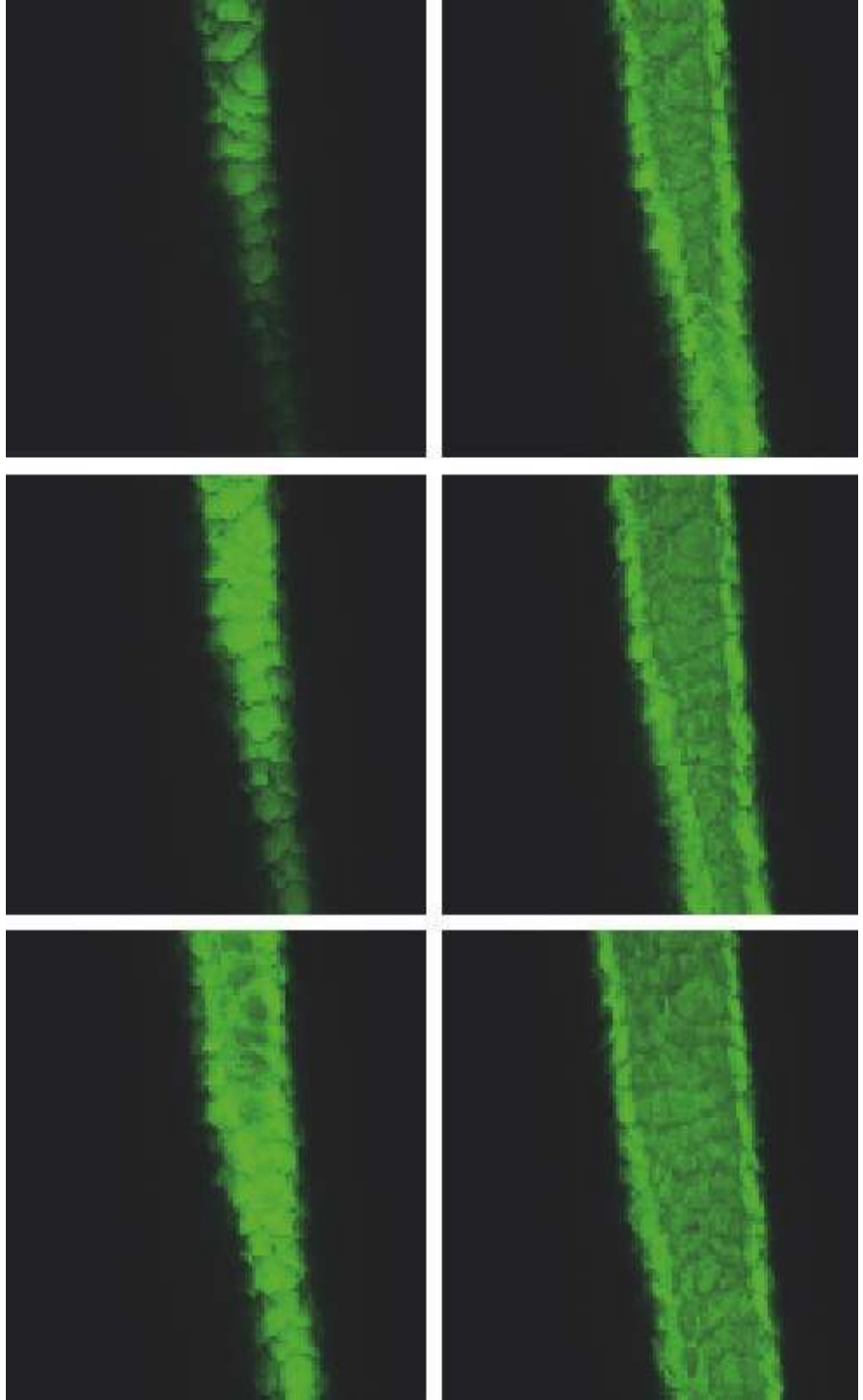
Ionic conditioning makes a big difference in the way your hair looks and feels.

BEFORE Ionic Conditioning
Magnified hair shaft cuticle layer has a dry, straw-like, scaly appearance.

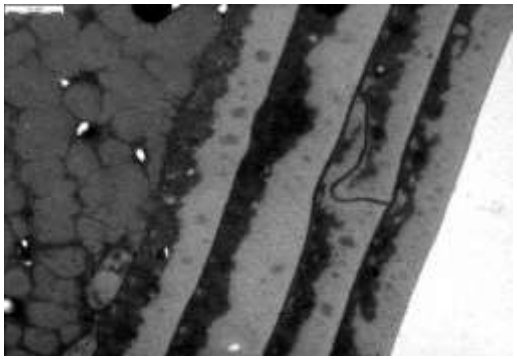
AFTER Ionic Conditioning
Magnified hair shaft cuticle layer is visibly smoother. Ions condition, resulting in softer, shinier hair.

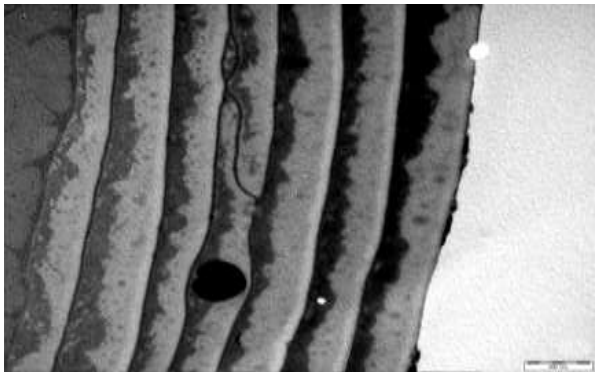


Optical sectioning of hair from the surface throughout the inside of the cortex, from upper left to lower right



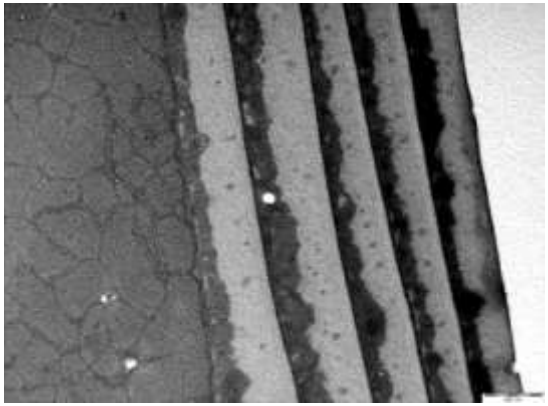
A

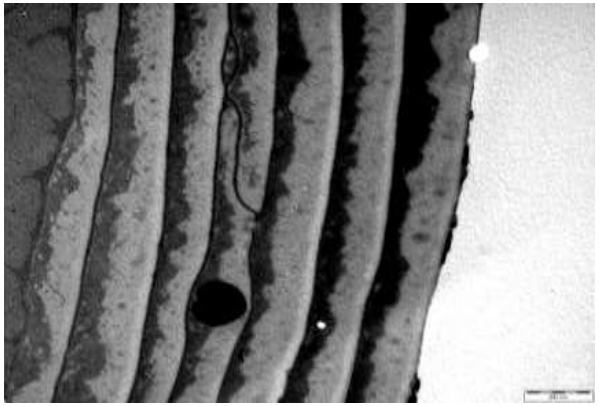




B

C





D

E

Cuticle layer damage measured by transmission electron microscopy after the hair drying process. The outer-most cuticle layer is damaged only during the 95oC drying process.

Treatments:

(A) no treatment,

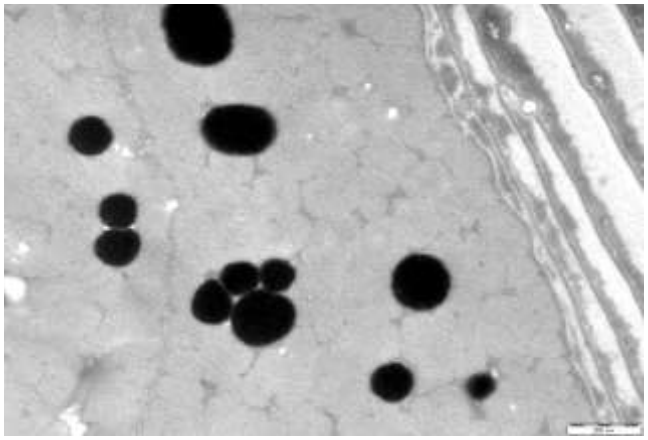
(B) shampooing and drying without using a hair dryer (room temperature, 20oC),

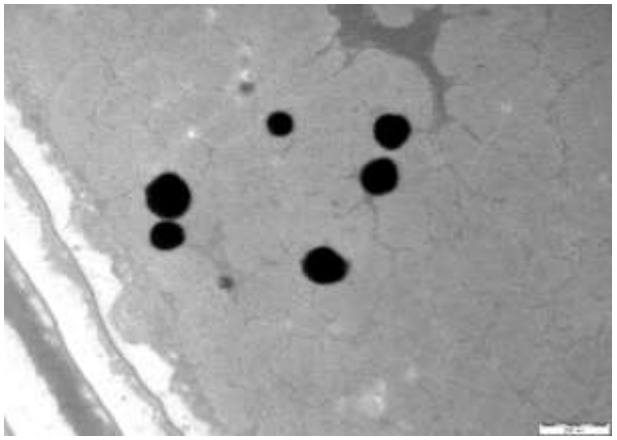
(C) shampooing and drying with a hair dryer for 60 seconds at a distance of 15 cm (47oC),

(D) shampooing and drying with a hair dryer for 30 seconds at a distance of 10 cm (61oC),

(E) shampooing and drying with a hair dryer for 15 seconds at a distance of 5 cm (95oC).

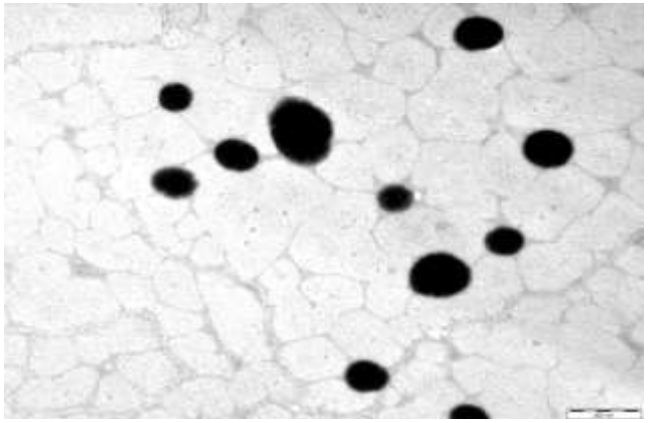
A

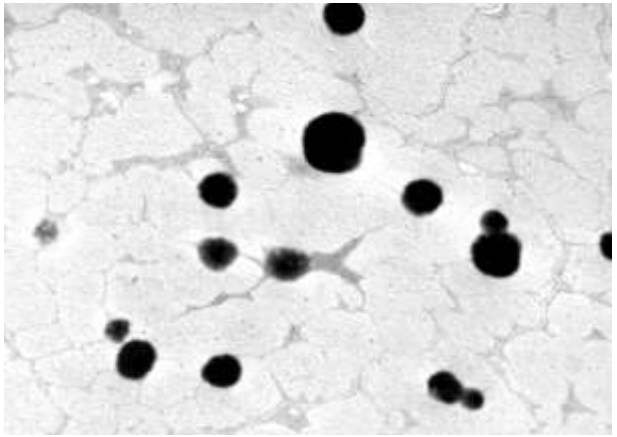




B

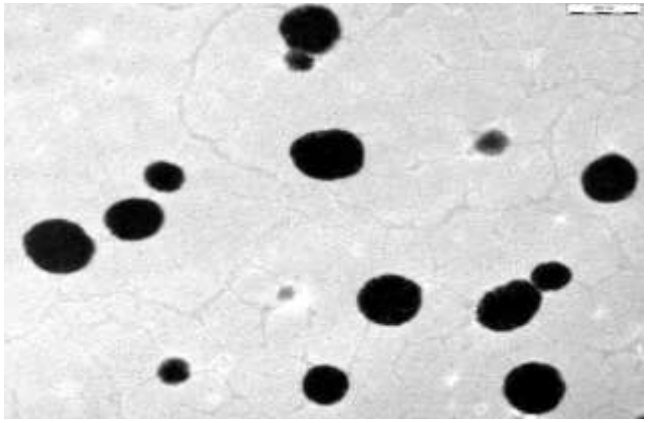
C





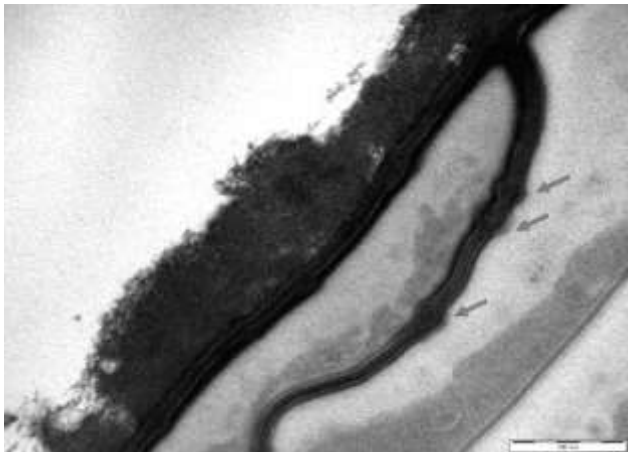
D

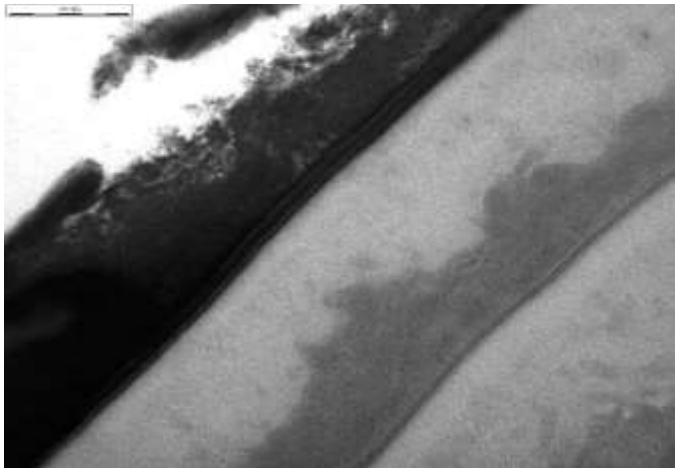
E



Cortex layer measured by transmission electron microscopy after the hair drying process. In all conditions, there were
no signs of damage. Treatments were as described in previous slides

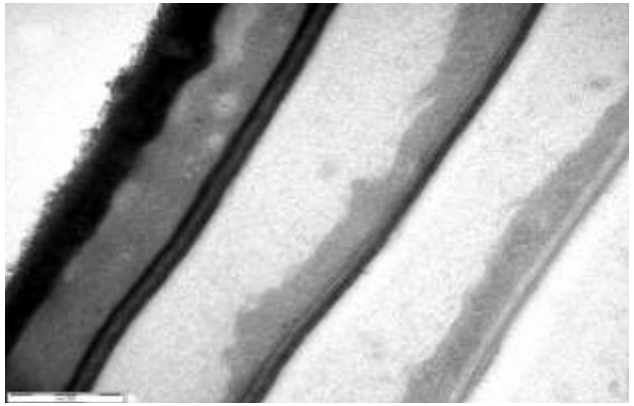
A

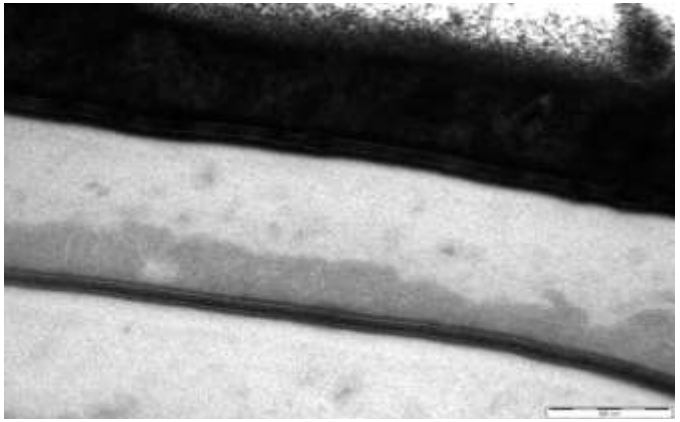




B

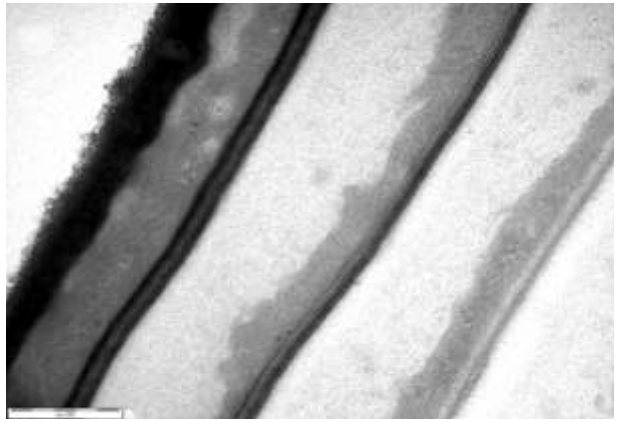
C





D

E



Cell membrance complex (CMC) damage measured by lipid transmission electron microscopy after the hair drying process. Only the naturally dried group showed bulging of the CMC layer. Treatments were as previous slides. The arrowhead indicates bulging portions in the intercellular lipid layers.

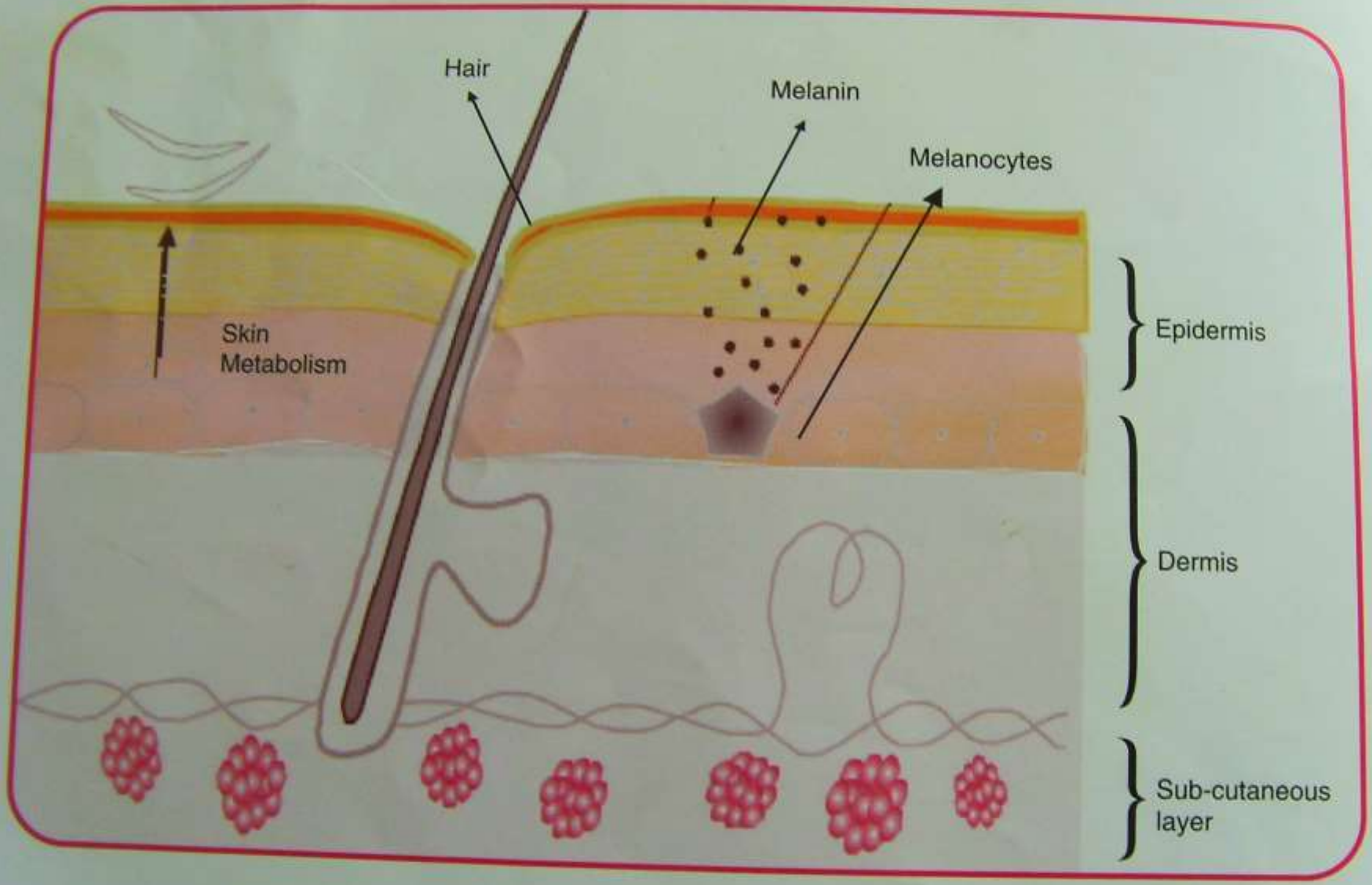


Figure 2: Visible pigmentation results from the synthesis and distribution of melanin in the melanocytes in the Dermis layer of the skin

L A S E R(Light amplification of stimulated emmitted radiation)

- Scatterring
- Absorption
- Chromophores
- Hair removal

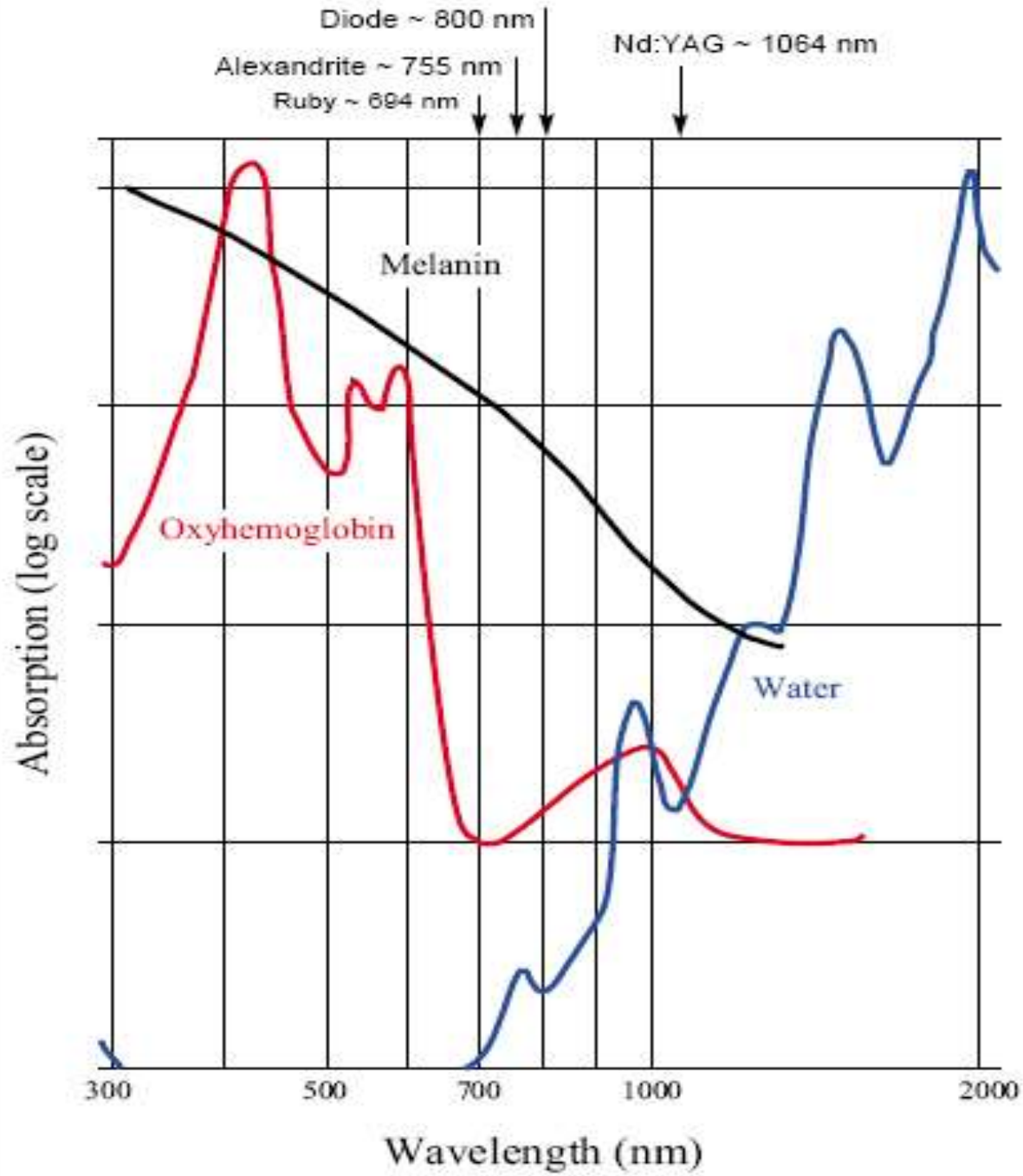
SELECTIVE PHOTOTHERMOLYSIS

- All effects of light in the skin
  begin with photon absorption.

- Molecules that absorb light are known
  as chromophoes

CHROMOPHORES

- Water
- Melanin
- Haemoglobin


Diode ~ 800 nm
Alexandrite ~ 755 nm
Ruby ~ 694 nm
Nd:YAG ~ 1064 nm
Melanin
Oxyhemoglobin
Water
Absorption (log scale)
300
500
700
1000
2000
Wavelength (nm)

GRAY HAIR IS A

BLESSING – ASK ANY

BALD MAN

How do Negative Ions have anything to do with your hair?

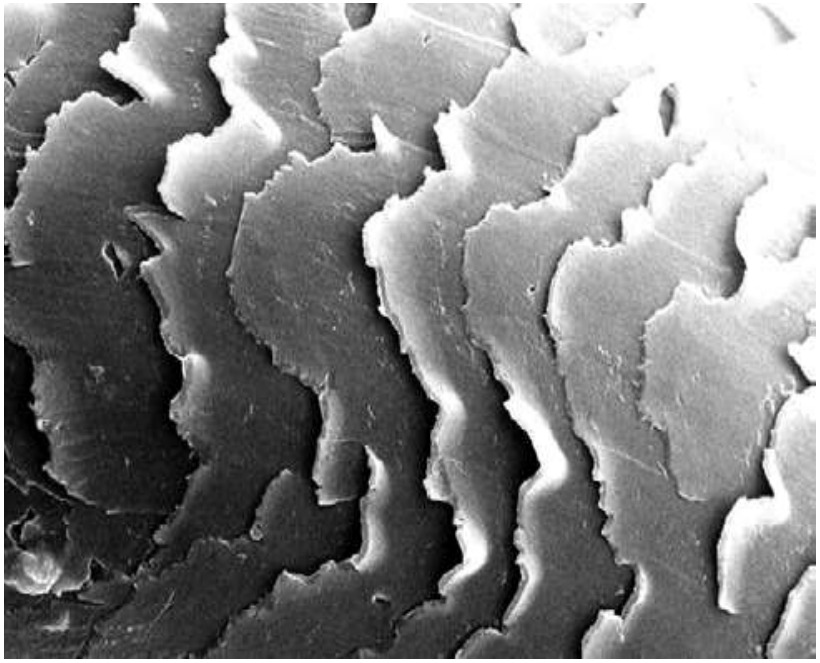
- Everyone's hair carries a positive electrical charge that is caused by dryness. Over time, this positive charge increases, and as your hair becomes drier, more hair cuticles open, creating 'ragged' unhealthy looking and feeling hair that is difficult to style. Flat irons and hair dryers will create negative ions. When the flat iron or hair dryer is heated, negative ions are created. The negative ions created by the appliance cancel out the positive hair charges, and while you glide down your hair with the iron, or blow dry, you smooth down those ragged open hair cuticles; smoothing instead of hair straightening.

- Smoothing down the hair cuticles will seal in your hair's own natural oils and moisture. If you use your flat iron to create curls it will still smooth down the hair cuticles allowing them to lay flat and frizz free, but still enable it to curl. This is very important to the health and look of your hair. An increase in natural oil creates healthier, more vibrant looking hair that is also more manageable and full of shine. This will also explain why your highlights look brighter when you use your flat iron too.

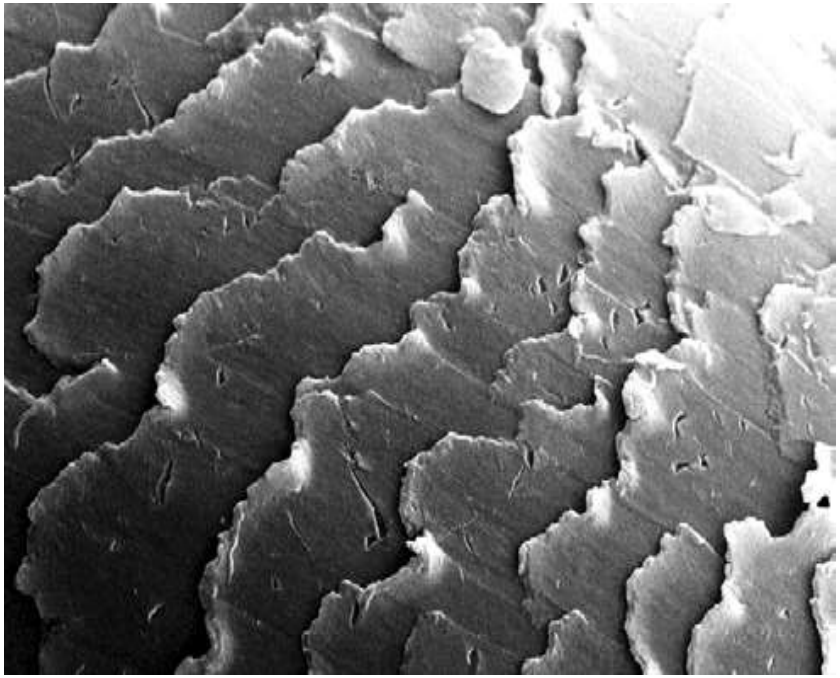
- So in the flat iron world, nothing is more positive than tons of negative (ionic) activity!

- **One can get** salon-quality hairstyling results when you use the right hair dryer. A **professional hair dryer**can go a long way toward achieving beautiful, shiny hair at home. **Ionic hair dryers** are ideal for reducing frizz and setting any style. Heat infused with negatively charged ions from an **ionic blow dryer** quickly locks in moisture, making freshly washed hair easier to comb and style. An **ionic blow dryer** helps reduce heat and **hairstyling** damage by keeping natural moisture in the hair follicle. Silky hair, free of flyaways, is possible with the use of an **ionic hair dryer**.

Hair surface damage measured by scanning electron microscopy after the hair drying process. The extent of damage to hair surfaces increased as the temperature rose.
Treatments:
(A) no treatment,
(B) shampooing and drying without using a hair dryer (room temperature, 20$_{o}$C),



(A)



(B)

Ionic Hair Dryer Facts:

- **Benefits:** Ionic **hair dryers** make your hair shinier, softer and smoother than traditional **blow dryers**. By drying the hair follicle from the inside out, **ionic hair** dryers make hair more manageable and easier to style. **Ionic dryers** also help preserve natural oils in the hair shaft, helping your hair maintain its strength and flexibility.

- **Negative ions:** The desirable effects of ionic dryers are caused by negatively charged ions tightening the cuticle layer on your hair. Drops of moisture are broken into small pieces by the airflow of negatively charged ions in the **blow dryer**, allowing the hair shaft to easily absorb water drops. Saturated hair follicles lock in moisture and nutrients, producing shiny, hydrated tresses that are resistant to breakage. A **professional hair dryer** with ionic technology will give you fabulous **hairstyling** results.

- **Features: Ionic hair** dryers are more efficient than traditional hair dryers, cutting down on drying time. By using less heat in a shorter time period, **ionic dryers** reduce frizz and protect hair against split ends. Shorter drying times mean less hair damage. A cool-air shot feature on many ionic dryers helps lock the style and cool the hair follicles quickly.