

III  IYNT 2015

Problem № 12
“The structure of the hair”



Team «MG 12»

Problem № 12

The hair of various animals may significantly differ in their structure. What are these differences and how can you explain them?

Hypothesis

We suspected that comparative analysis of different animals' fur can help to discover the factors, which hair structure depends on.



Purpose: we intended to investigate different animals' hair peculiarities so as to find out the factors which it's forming depends on.

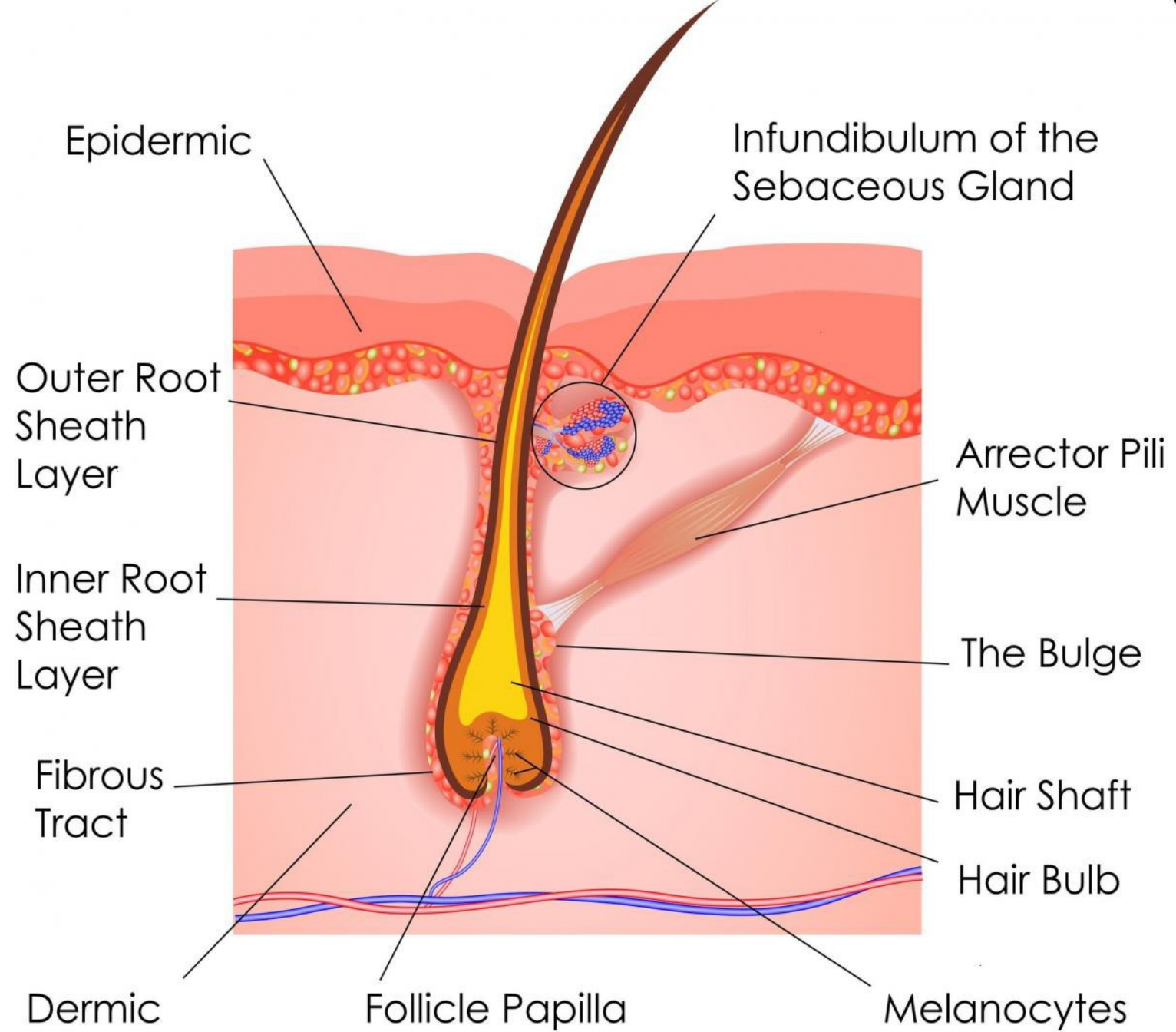
Aims:

- 1) To look into scientific literature about the problem;
- 2) To determine the factors which hair forming depends on;
- 3) To perform a microscopic investigation of different animals' fur and compare it.

The definition of hair

- **Hair** is a part of common integuments. It is one of the defining characteristics of mammals. Phylogenetically it comes from epidermis. Animals' hair is called fur.

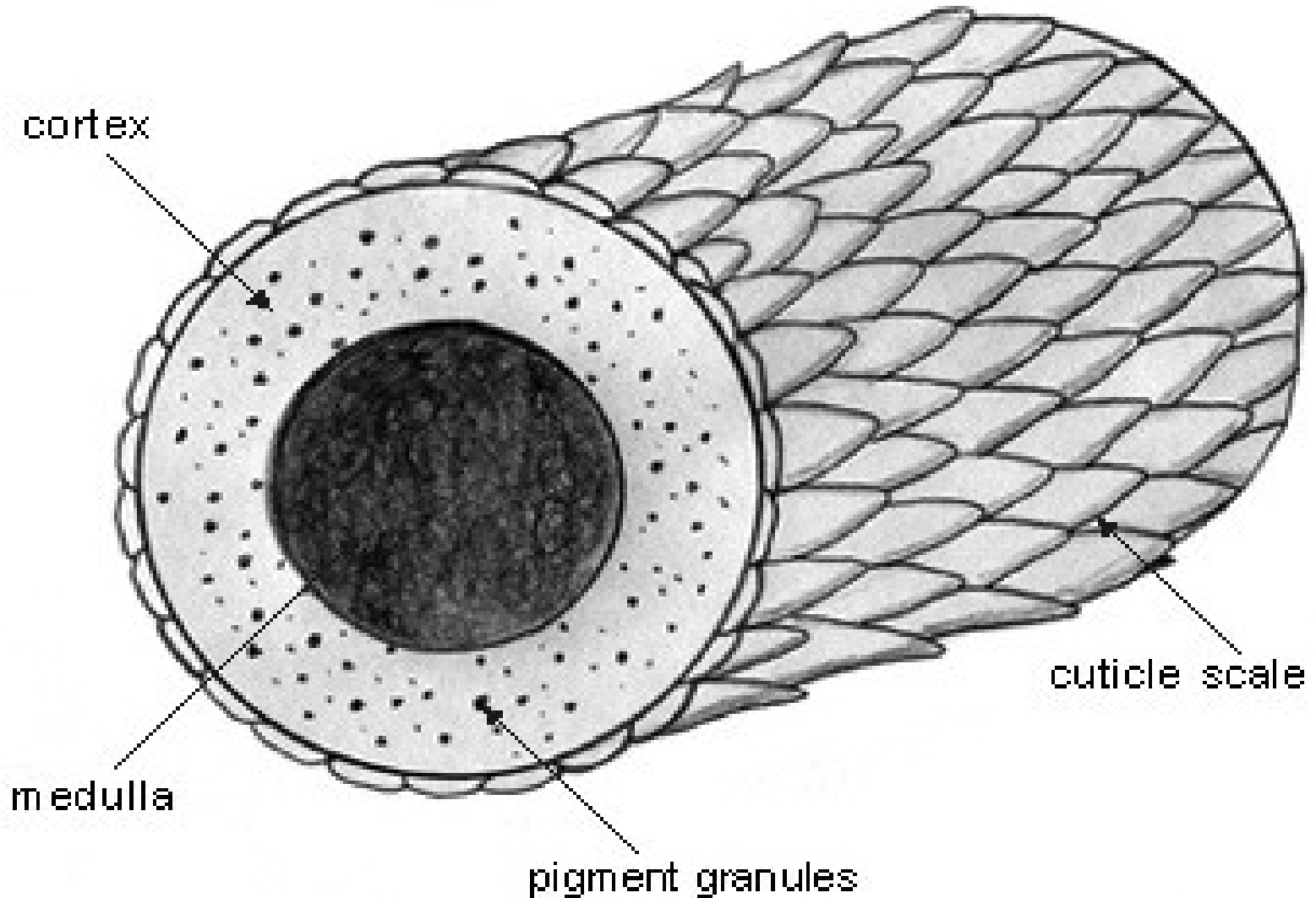




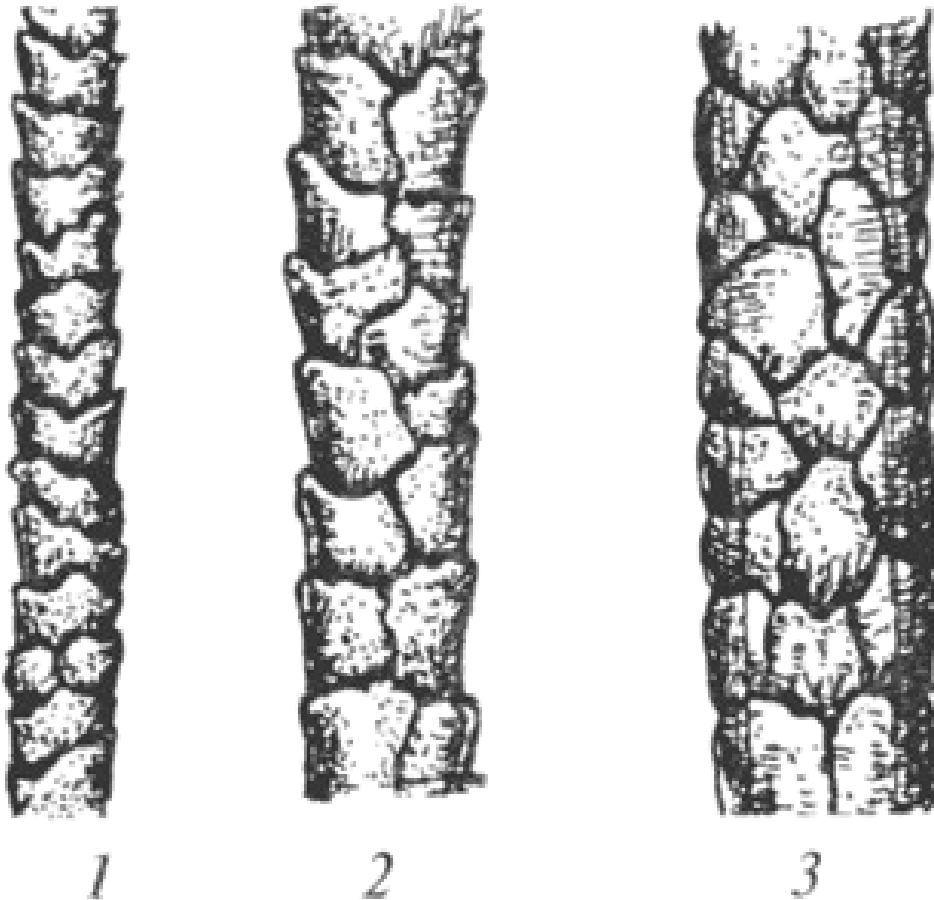
Hair cells

- Most of them are dead. They consist of insoluble protein called keratin.
- Hair follicle cells are alive. They have usual cytoplasm and nucleus. They provide hair growth.

Three layers of hair shaft



Forms of cuticula scales



Hair shine depends on the form of the scales and their arrangement.. Curly hair with irregular order of scales diffuse light so that they look lustreless.

1 - coronal (crown-like), 2 – spinous (petal-like), 3 - imbricate (flattened)

Hair colour depends on

- The type of the pigment;
- The form of pigment granules;
- The accommodation of pigment.



Factors determinating forming of animals' fur

Hereditary

- Hair accommodation
- Hair length
- Hair rigidity
- Hair curliness

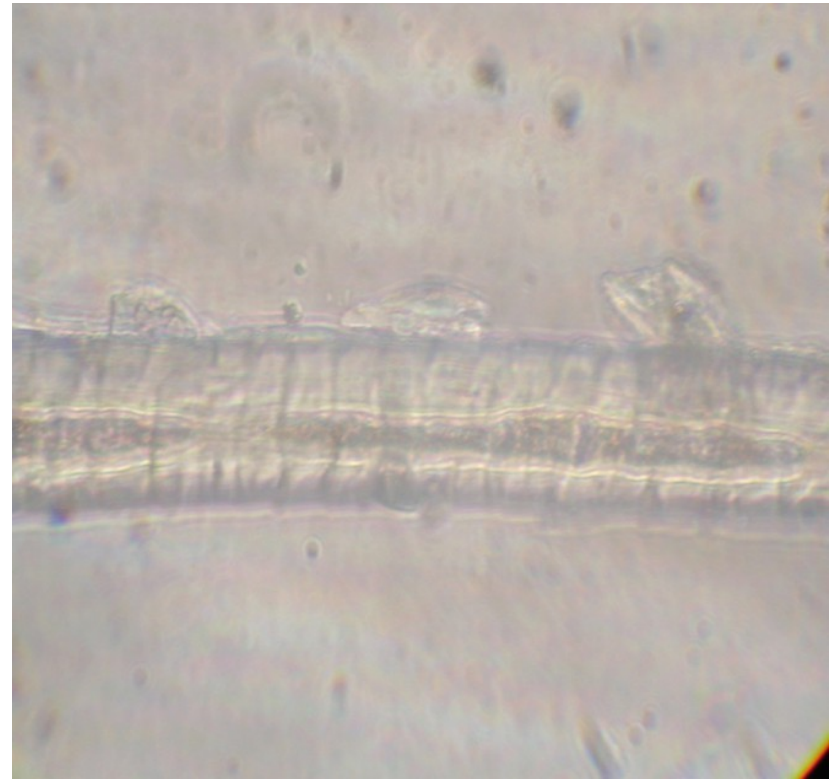
Nonhereditary

- Influence of climate factors
- Type of food
- Stress factors
- Living conditions

Differences in structure of hair taken from dogs of different age but one breed

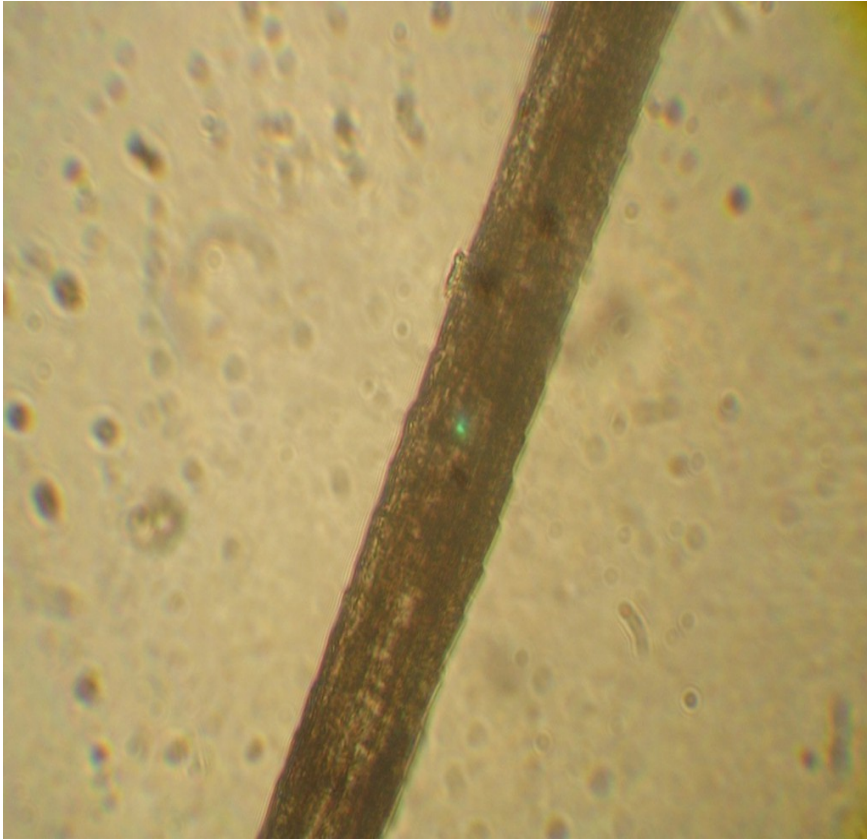


Cocker spaniel, age 5



Cocker spaniel, age 2

Dogs of similar age but different breeds

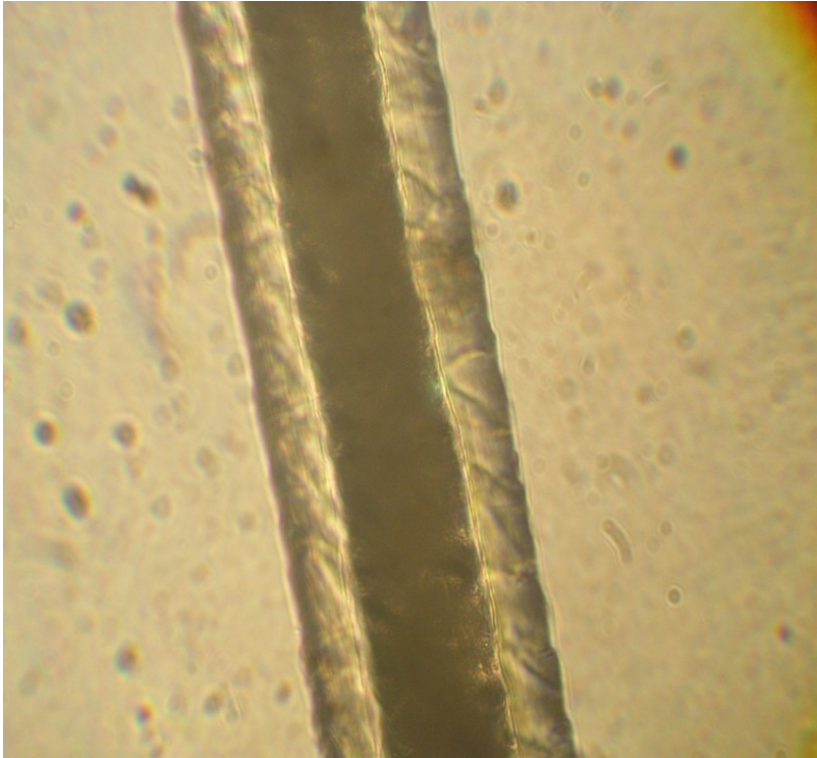


Poodle, age 5

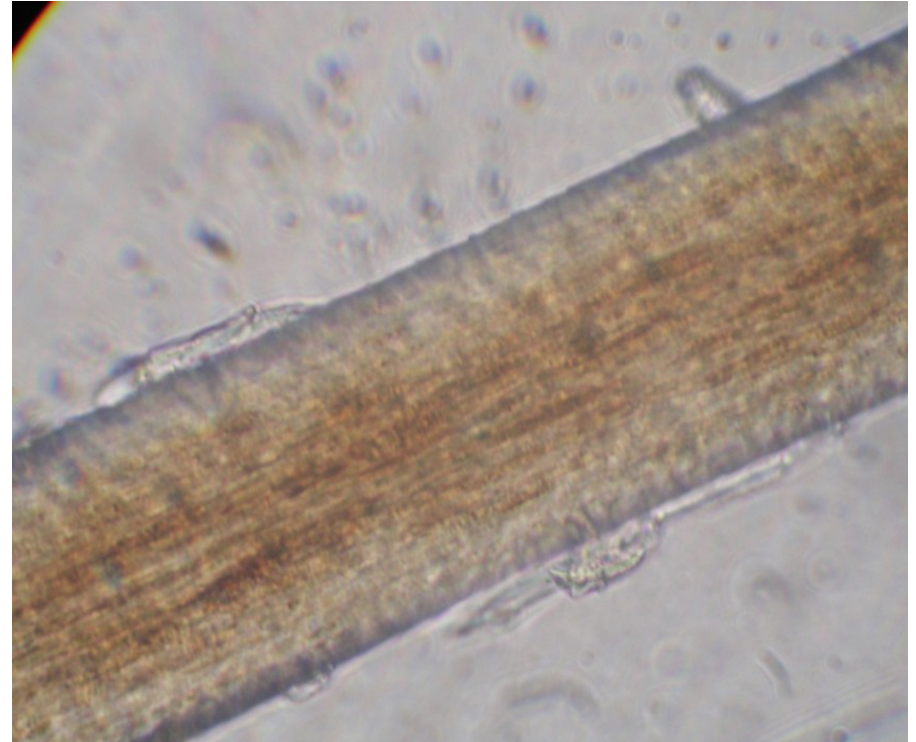


Cocker spaniel, age 5

Hairs of dogs living in different conditions

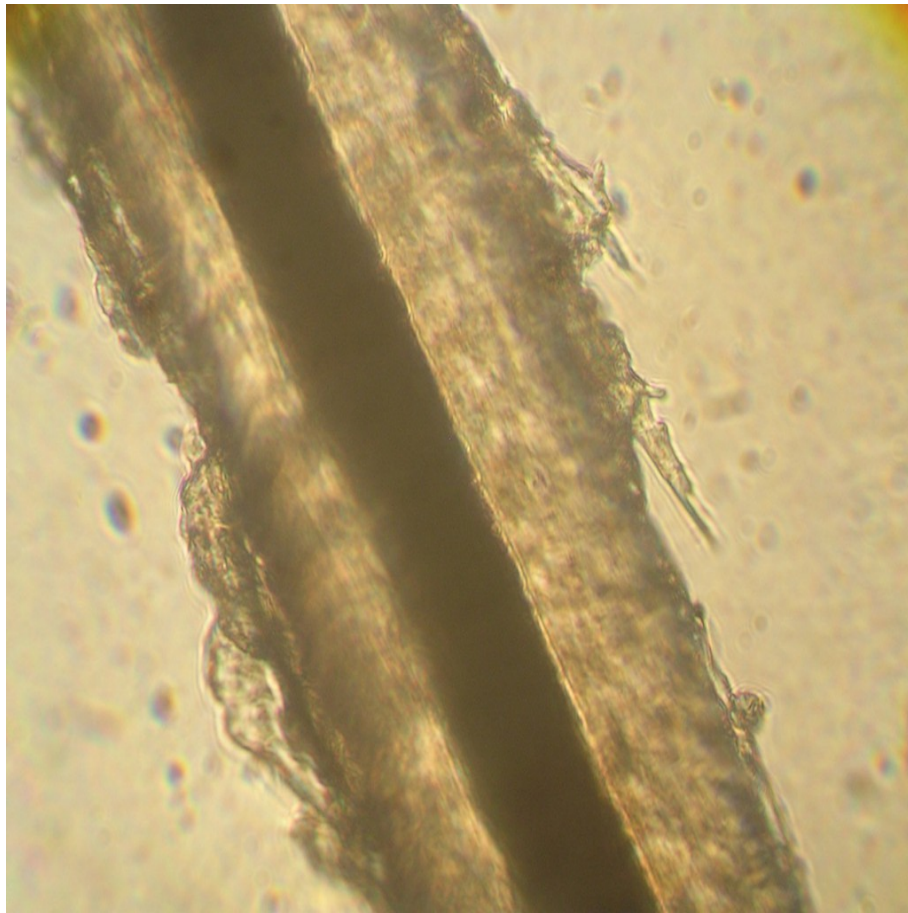


A dog living outdoors

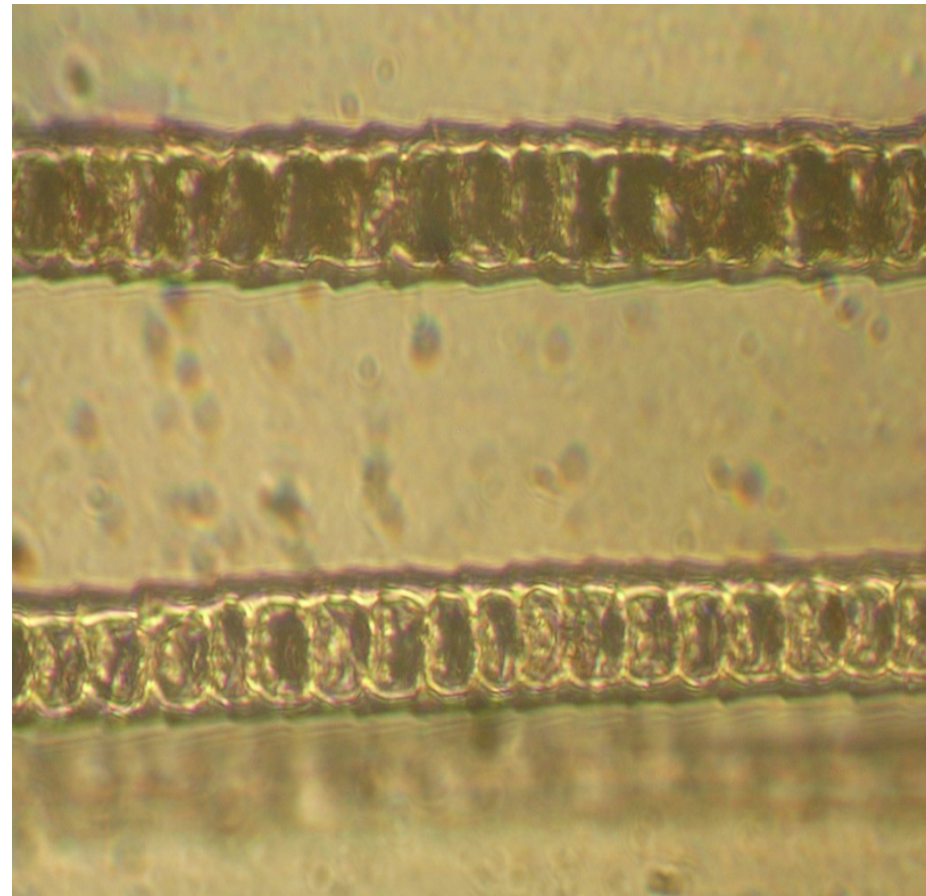


A domestic dog

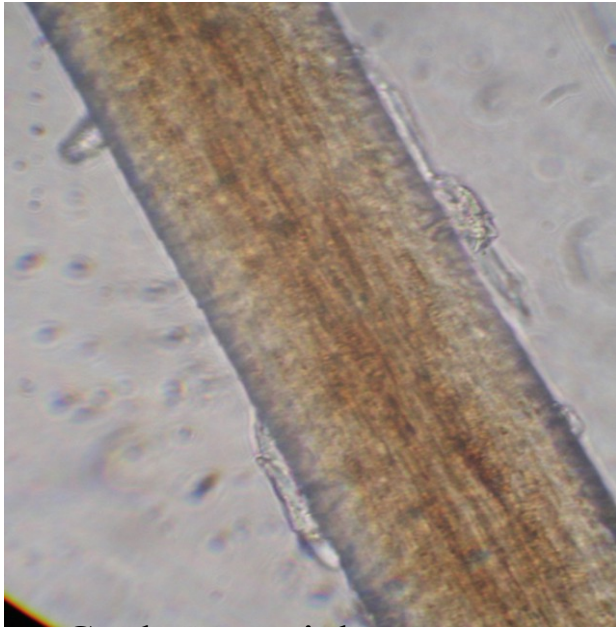
Siberian tiger's and domestic cat's hairs



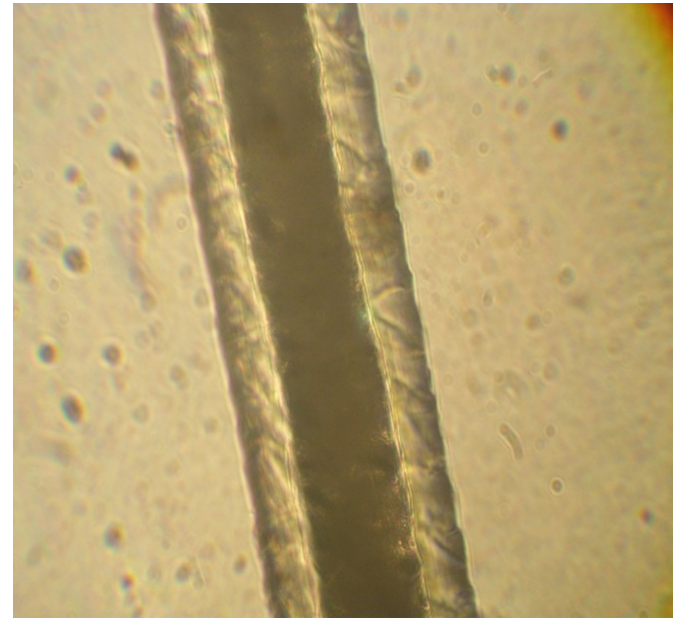
Siberian tiger



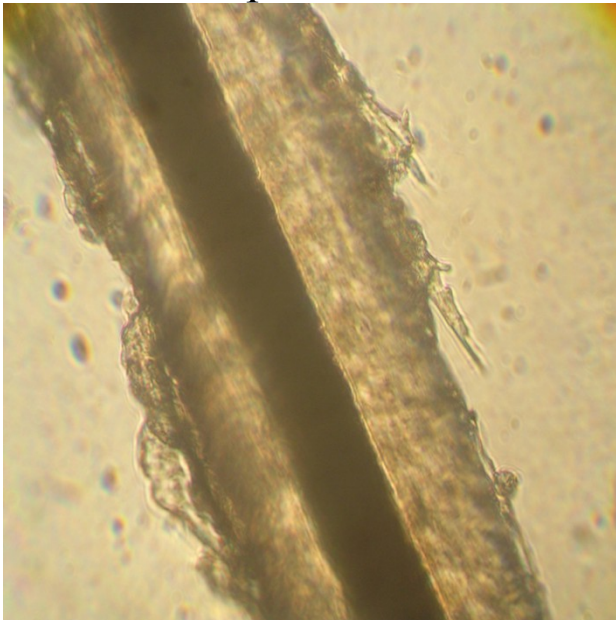
Domestic cat



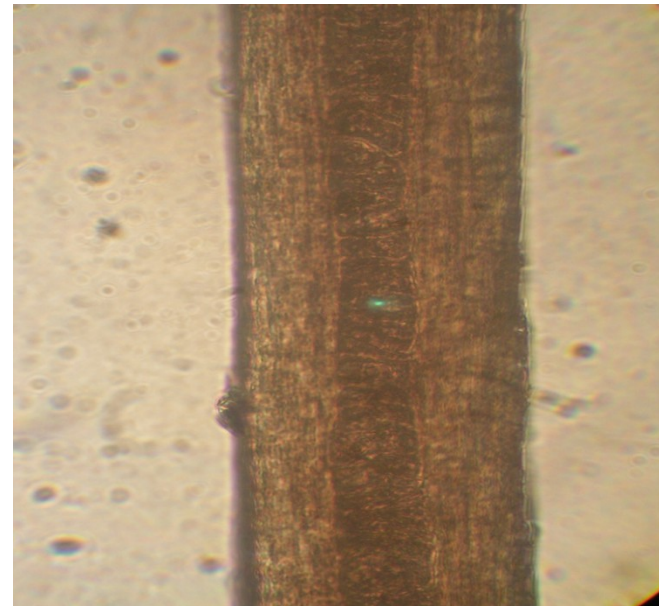
Cocker spaniel



Dog living outdoors



Siberian tiger



Pony

Conclusion

After looking up in the literature and performing the microscopic investigation we determined the factors which hair forming depends on. These factors are:

- 1) climate factors
- 2) animal's age
- 3) living conditions
- 4) hereditary factors

The resources of information

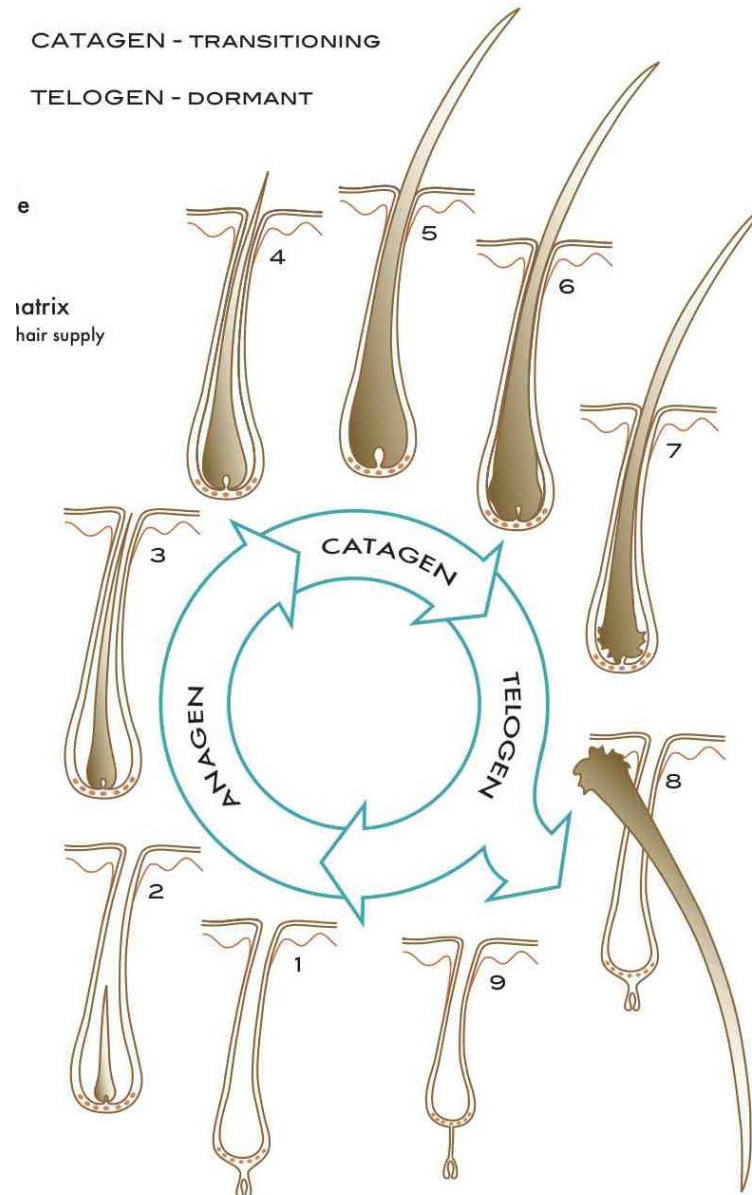
- <http://coollib.com/b/254354/read>
- <http://www.collagen.su/archives/1421>
- <https://ru.wikipedia.org/wiki/%D0%92%D0%BE%D0%BB%D0%BE%D1%81%D1%81>

Hair cycle

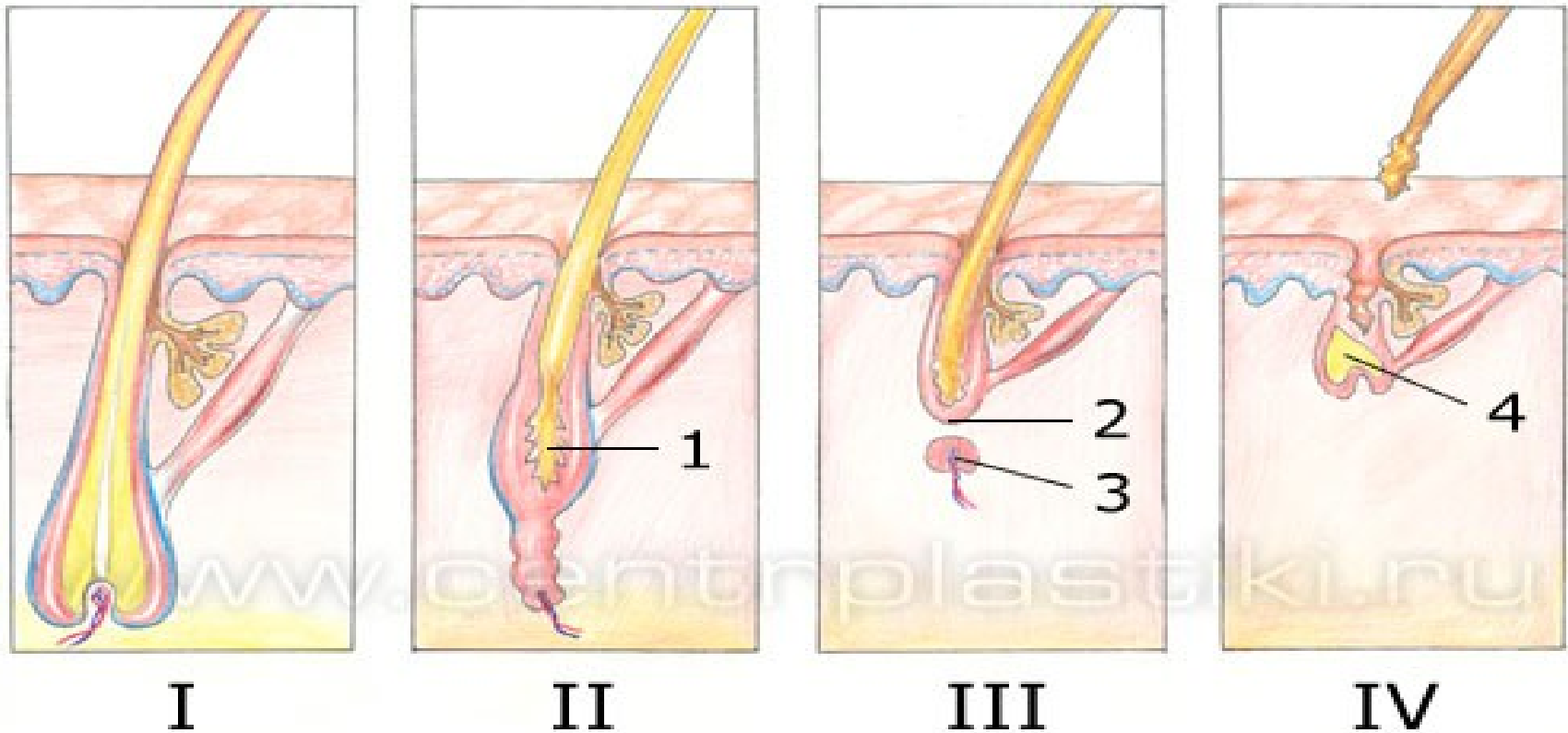
ANAGEN - ACTIVELY GROWING

CATAGEN - TRANSITIONING

TELOGEN - DORMANT



Hair cycle



I - Anagen phase (growth phase for 3-6 years)

II - Catagen phase (transition stage for 1-2 weeks)

III - Telogen phase (resting phase for 5-6 weeks)

IV - Return to Anagen;

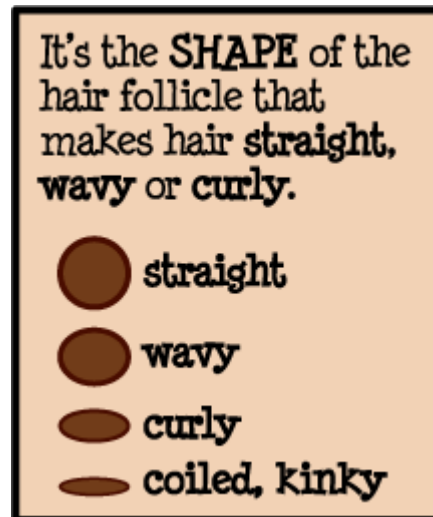
1 - hair bulb; 2 - stem cells; 3 - papilla; 4 - Hair matrix forming a new hair

Types of mammals' fur

- **Underfur** — short soft hair which doesn't have medulla.
- **Guard hair** — hair which overlays the fur and protects it.
- **Vibrissae** - long straight hair which are very sensitive to touch.

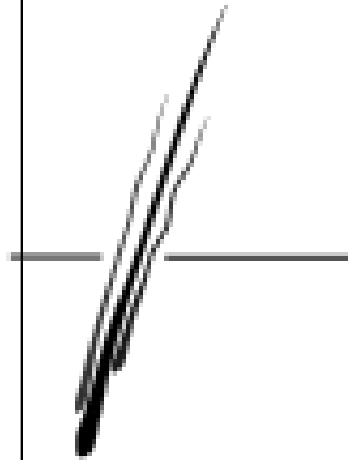
Hair shape

- Stick-straight
- Straight with a slight wave
- Wavy
- Curly
- Kinky



Types of hair

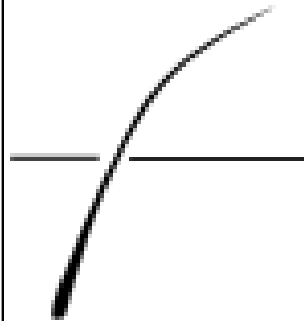
Staight hair
with underfur



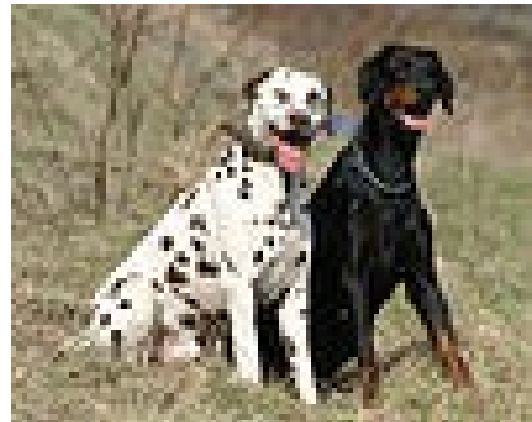
Siberian husky



Straight hair
with no
underfur



Dalmatian dog and



Types of hair

Long hair



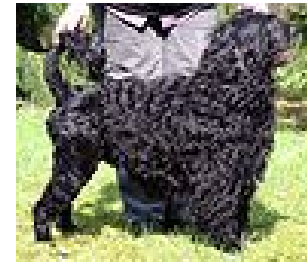
American cocker spaniel



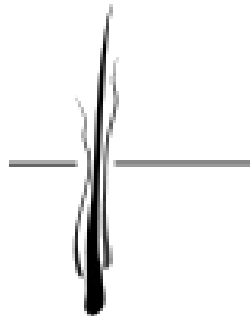
Wavy hair



Portuguese water dog



Wire hair



Wire-haired dachshund

