



Wildkaninchen.

Senses of rabbits

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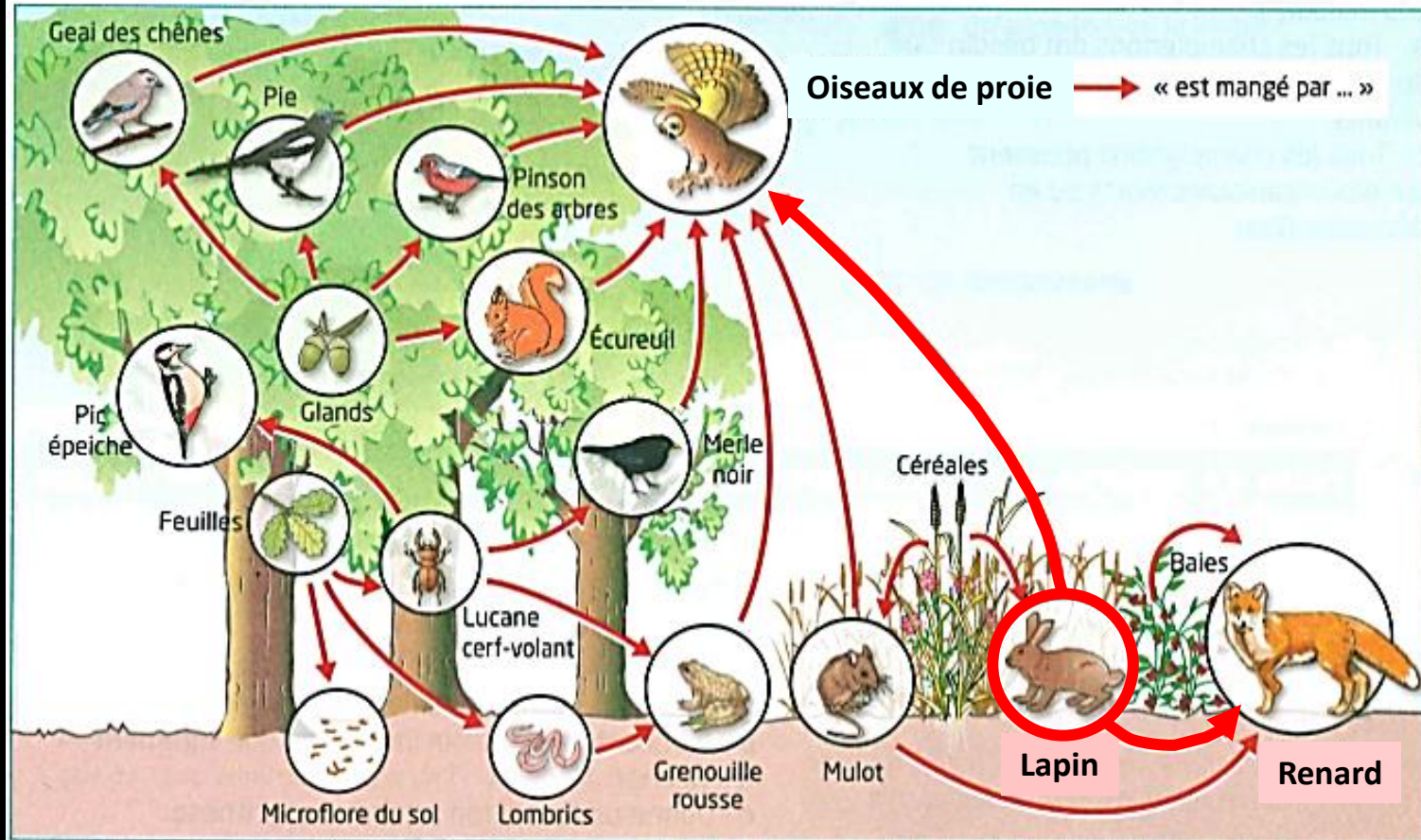
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Rabbits in the food chain

Le document ci-dessous présente les relations alimentaires entre plusieurs êtres vivants d'une forêt de feuillus.



Wild rabbits owe their survival only to their intelligence and senses. Intelligence that domestic rabbit have developed in new directions after contact with humans.



Wild rabbits in its natural environment

Wild and domestic rabbits are **herbivorous, non-ruminant** animals.

Herbivores

- At the bottom of the food chain;
- Prey for ground-dwelling predators (snakes, carnivores);
- Prey for aerial predators (raptors).

Wild rabbits

- Stay constantly alert;
- Alert congeners, in order to protect oneself and the other members of the group;
- Run away at full speed at the slightest sign of warning.



Duel between a eagle and a fox that captured a wild rabbit





Seasonal camouflage into the surroundings

Seasonal camouflage of the alpine hare

- In summer, the agouti-colored coat merges with the summer environment;
- In spring and autumn, the hare sheds and merges with the changing environment;
- In winter, the white coat merges with snow.

An individual blends into its environment and can go about its business with minimal expenditure of energy.



It must nevertheless remain alert and react to the slightest danger...
Various organs and senses alert him to changes in the surroundings



Ears: hearing, language and thermoregulation

The shape of the rabbit's ears is unique.

- Large surface of the ear pinnae = Capture the slightest sounds of the environment
- Particular curvature = Amplify important signals
- Pointed shape of the pinnae = Detect sounds in the horizontal plane
- Adjustable ear position relative to the other = Geo-locate the origin of sound in 360°.
- Position of the ears = Body language with peers

Important: There is a hearing loss in lop rabbits, due to the downwards orientation of the ears. It remains, nevertheless, good and sensitive to noises.





Ears: hearing, language and thermoregulation

Rabbit hearing sensitivity is very good.

Auditory spectrum: **Rabbit** = between 360 and 42 000 - 50 000 Hz

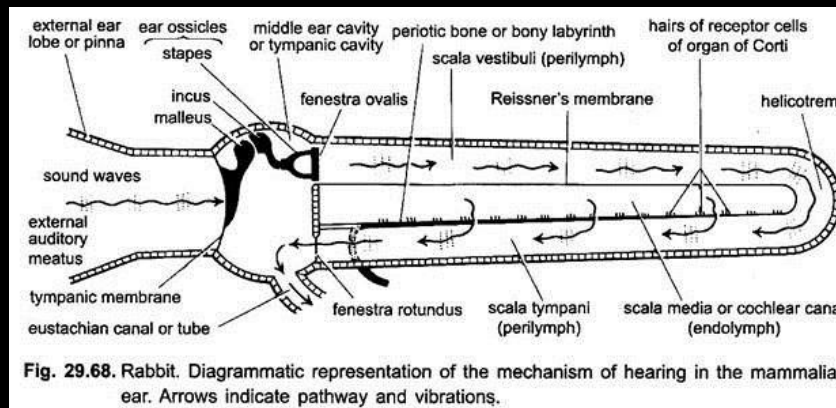
Human = between 20 and 20 000 Hz

➔ Rabbits badly hear low-pitched sounds, but have a great sensitivity to their vibrations.

➔ It is sensitive to a very wide range of ultrasound, Loud, high-pitched and unusual sounds = Source of intense stress.



Sound is transmitted from the outer ear, through the tympanic membrane, into the middle ear, to the auditory ossicles and finally to the auditory nerve.





Ears: hearing, language and thermoregulation

Rabbits do not pant in hot weather.

Rabbits don't have sweat glands.

Pinnae of the ear are highly vascularized.

Skin of the ear pinna is very thin.

The ears help regulate body temperature!!!

=

Vasodilation (dilation of blood vessels)

Increased blood flow

+

Positioning the ears to catch a breeze

Rocking the head back and forth

=

Evacuation of body heat



The appearance of blood vessels in the ears of a white rabbit.
Experimental pharmacology. 1917



Eyes: observation of the environment



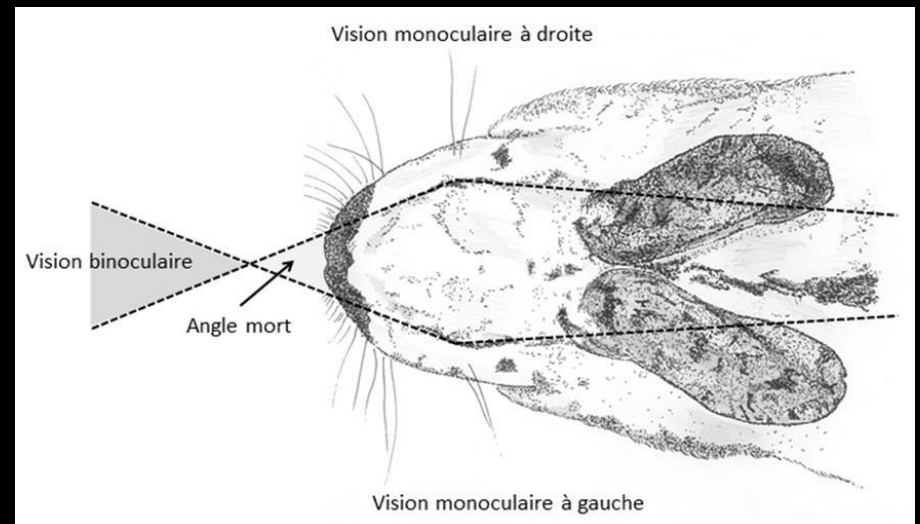
Herbivore = Large, protruding eyes that are set high on the side of the head;
Three eyelids: upper, lower and lateral;
Large eye lens.

The field of view = 190° for each eye;
= panoramic.

The distant vision of the rabbit is excellent.

The visual fields of each eye intersect
= Misjudgment of distances and depths.

Near vision is poor.



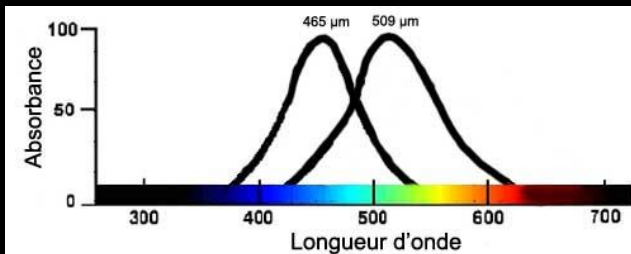


Eyes: observation of the environment

Retina with light sensitive cells = Rod cells
= Cone-shaped cells

Rod cells = In excess in rabbits;
= Photosensitive pigment (rhodopsin) to green light (509 μm).

Cone-shaped cells = Photosensitive pigments (opsins);
= Sensitivity to specific wavelengths of light;
= Maximum absorption for blue (465 μm) and light green (509 μm).



Représentation approximative du spectre de l'absorption de la lumière dans les cônes de l'œil du lapin.

Rabbit badly sees the colors
Orange to dark red.
**Very good twilight and night
sight.**



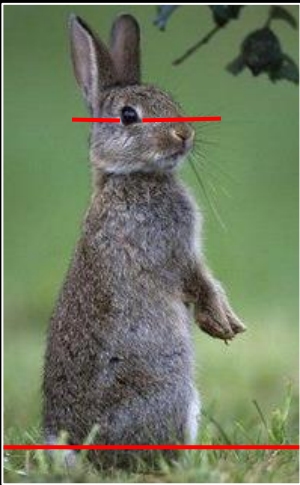


Eyes: observation of the environment

The angle of the eyes relative to the ground indicates the stress condition of a rabbit:

- Feeding = head tilted forward and certain angle of the eyes with the ground;
- Rest = head tilted forward and certain angle of the eyes with the ground;
- **Alert** = Standing position, head parallel to the ground and eyes parallel to the ground for a good panoramic view of the environment.

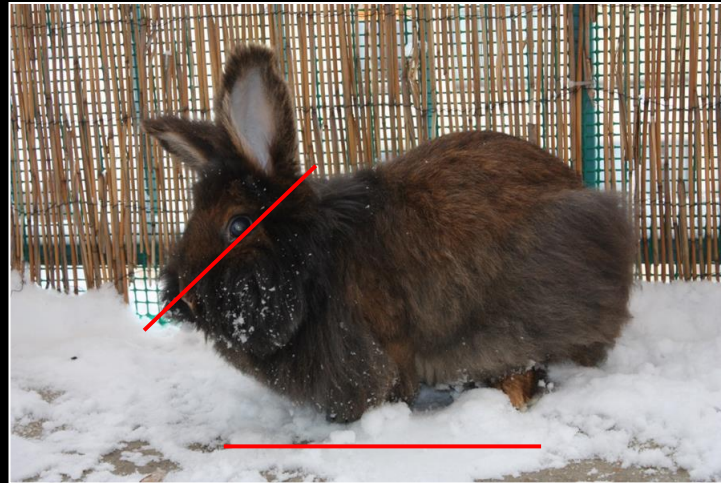
Alert wild rabbit



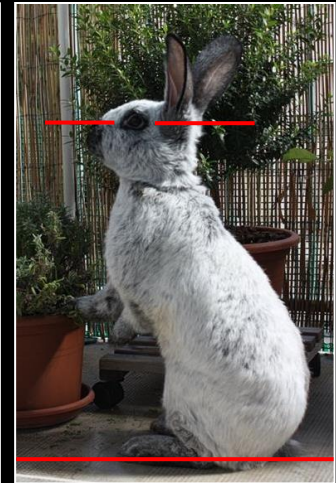
Alert domestic rabbit



Relaxed rabbit



Alert domestic rabbits





Whiskers: very sensitive to touch

Close view is bad in rabbit.

Whiskers replace eyes...

- Long keratinized hairs that grow and fall out;
- 20 to 25 whiskers on the rabbit's upper lip and around the nose;
- A few whiskers above and below the eyes;
- Attached to sensory organs connected to the nervous system;
- 20 and 120 movements per minute, but this movement may be absent;
- Some breeds of rabbit have few or no whiskers (Rex).

Whiskers have very important functions:

- Help in the night, to avoid obstacles or evaluate the width of a passage;
- Detection of any air movement, wind speed and direction = locate the origin of the smell;
- Contact with congeners, friction, expression of emotions.

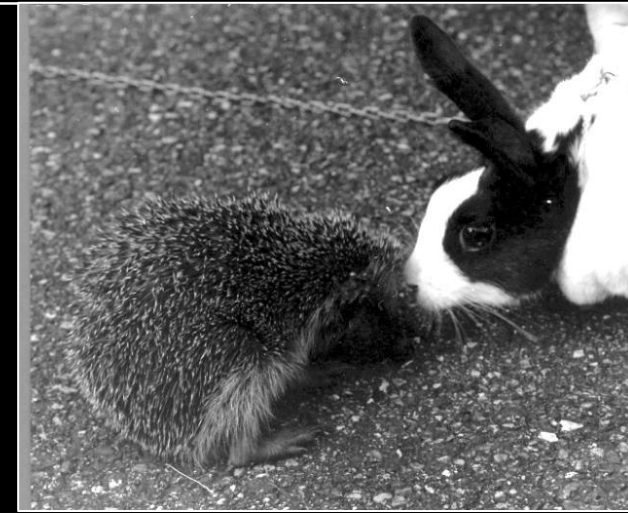




Nose: well developed sense of smell

The rabbit's nose has multiple functions:

- Breathing;
- Being almost constantly in motion;
- Smell food, the presence of a predator;
- Communicate with congeners after marking their territory;
- Recognize and differentiate volatile molecules emitted by their congeners;
- In rabbit kits, find the nipples of the nursing doe via released pheromones.



The rabbit's sense of smell is developed



Rabbit: 50 to 100 million receptors on the olfactory mucosa.

Human: 10 million receptors.



Respiratory diseases greatly alter olfactory abilities.

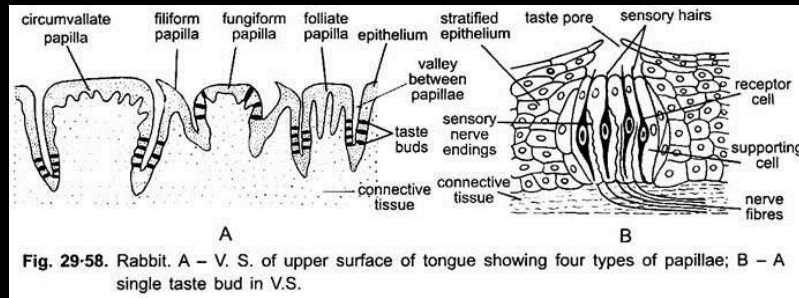


Taste: each rabbit has its own taste

The rabbit's tongue is small, proportionally to its size. It is lined with **taste cells** that differentiate between bitter, sour, salty and sweet tastes.

Rabbit = **17 000 taste cells**

Human = **10 000 taste cells**



Food = rabbits have a preference for bitter and slightly sweet foods.





Voice: rabbits vocalize discreetly

Rabbits are rather silent animals, so not to attract predators !!! !!!

The emitted sounds are often accompanied by important visual cues, such as body posture, ear position, etc.

Sexual = Bee buzzing or “honk-honk” = excited unsterilized male, sexual parade with, sometimes, bites, emission of hormones and spraying of urine.



Displeasure = Sudden and serious growl = growl of the dominant rabbit, accompanied by a possible attack, bite or scratch.





Voice: rabbits vocalize discreetly

Defensive = Repeated high-pitched growls = growl of defensive aggression. Fear and defensive attack.

= High-pitched moaning “meueueuh” and tapping the hind legs = fear, alert and warning of congeners.



= Low-pitched, repeated growling and loud sniffing = sign of stress, fear.

= Deep growl and rapid breathing = excitement.

Disease = Weak growl, moan = rabbit is sick and in pain, may be accompanied by teeth grinding.



Extreme distress = Shrill and loud scream = scream of distress, scream of terror, scream before death.



Dangers and mutual aid for sick and handicapped rabbits

The **social bond** that binds a wild rabbit to the other members of the group is very strong. Thanks to the **developped senses** of members of the group, it allows the survival of the species in a hostile environment

The **social bond** in the domestic rabbit is also expressed by **senses** in addition to intelligence

- Peacemaking behavior in a group;
- Protection and empathy for sick members of the group.



Adar, peacemaker and nurse





Dangers and mutual aid for sick and handicapped rabbits

- Using one's own senses to help and protect a disabled rabbit,



Nouky, guide rabbit for blind rabbit (brown)



- More tragic, respecting the place of the departed rabbit, where he used to eat.





Senses of wild and domestic rabbits, different ?

Domestication

Acquisition, loss or development of new and hereditary morphological, physiological or behavioral traits, via deliberate selection by man.



Wild rabbit in the Canton of Geneva (Switzerland), e.g. in the vineyards behind CERN

As a consequence: Regulation of certain genes of the animal is modified.

Brain and nervous system development are most affected.



Domestication of the wild rabbit

Most farm animals = domesticated for 5,000 to 15,000 years;
= between 2500 and 6000 generations.

Domestication of the rabbit has been gradual:

- Hunted during the Paleolithic;
- Locked up in Roman “leporaria”;
- Locked up in “leporaria” or hutches in the Middle Ages;
- Have become pets.

That is 2000 years of exploitation in captivity without affecting the nature of the wild rabbit.



White and gray rabbits, Milano, 1590





Appearance of the first breeds during the 16th century

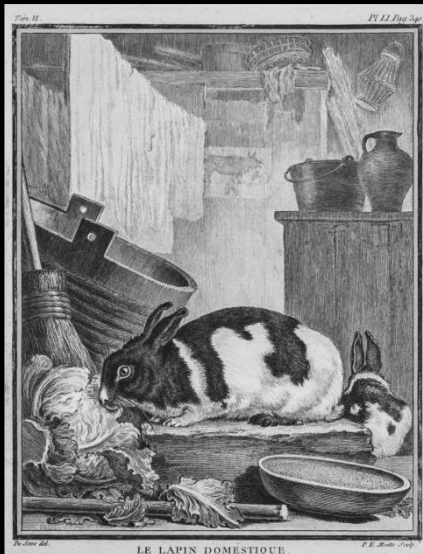
16th century: rabbit breeds reported in France, Italy, Flanders and England:

- Agouti fur (wild);
- Black and white fur;
- «Riche» (silver), white fur.

17th century: at least 7 breeds with different fur types are reported.

Olivier de Serres (1539 – 1619) classifies rabbits into three groups: the wild rabbit, the "leporaria" rabbit and the domestic rabbit:

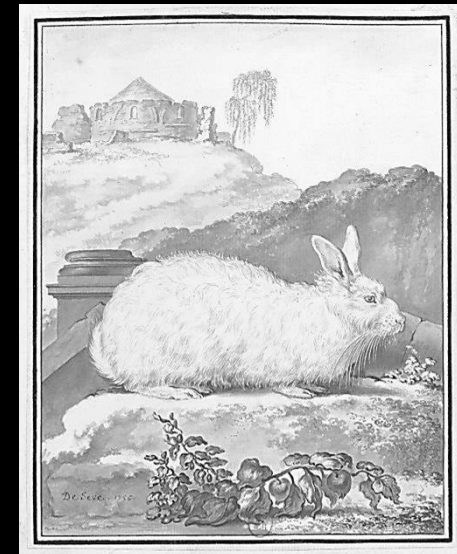
Black and white rabbit



Silver «Riche» rabbit



Angora rabbit





Rabbit domestication is recent...

The direct and prolonged interaction, control and deliberate selection of rabbits by humans is recent:

- About 400 to 500 years;
- About 400 generations.

Calm and docile animals are preferred.

Flight ability has been gradually neglected because it is less important for an animal living in an environment protected from predators.

➔ The ability to stay alert and flee at the slightest sign of warning is affected.



Whelping of a Harlequin doe in the protected environment of a pen.





Rabbit domestication is recent...

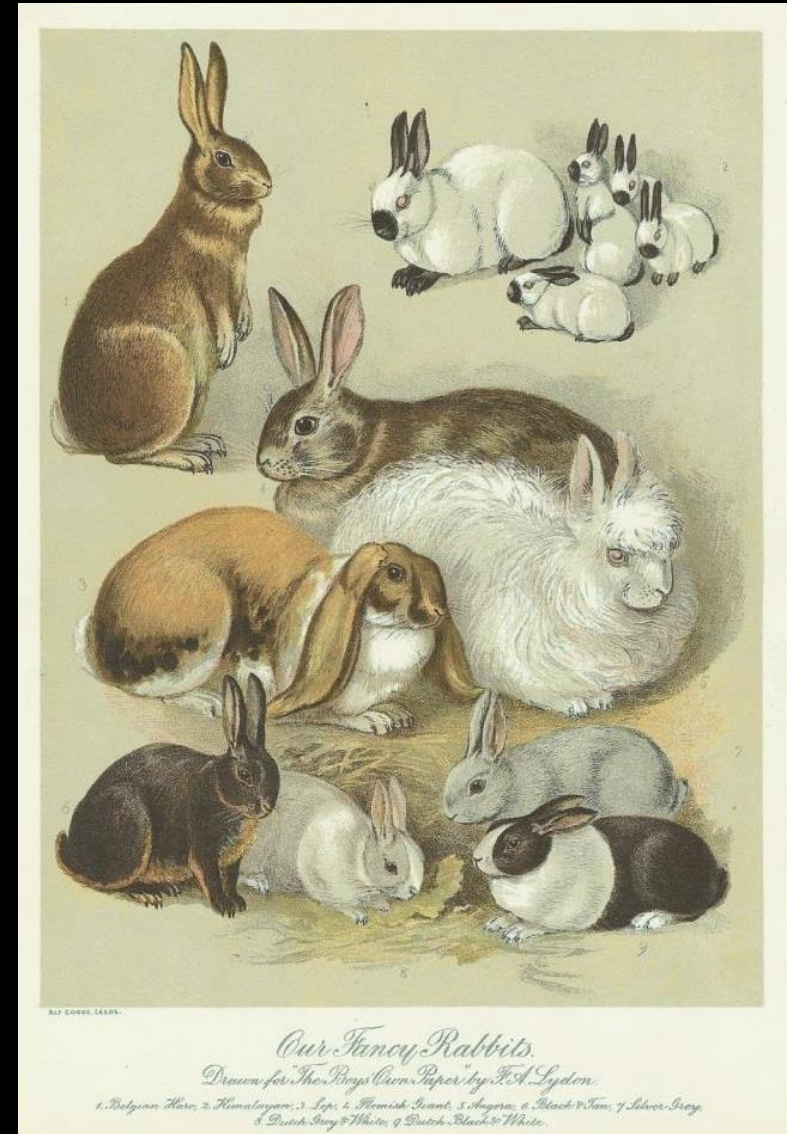
First morphological changes in the skeleton,
height, head and/or position of the ears

=

Distinction between wild rabbits and domestic
rabbits

=

Moment when **Domesticated Rabbits** have been
considered **Breed Rabbits** and, later, **Pet Rabbits**.





Effects of domestication on the wild rabbit

The rabbit genome = 3 billion base pair sequence

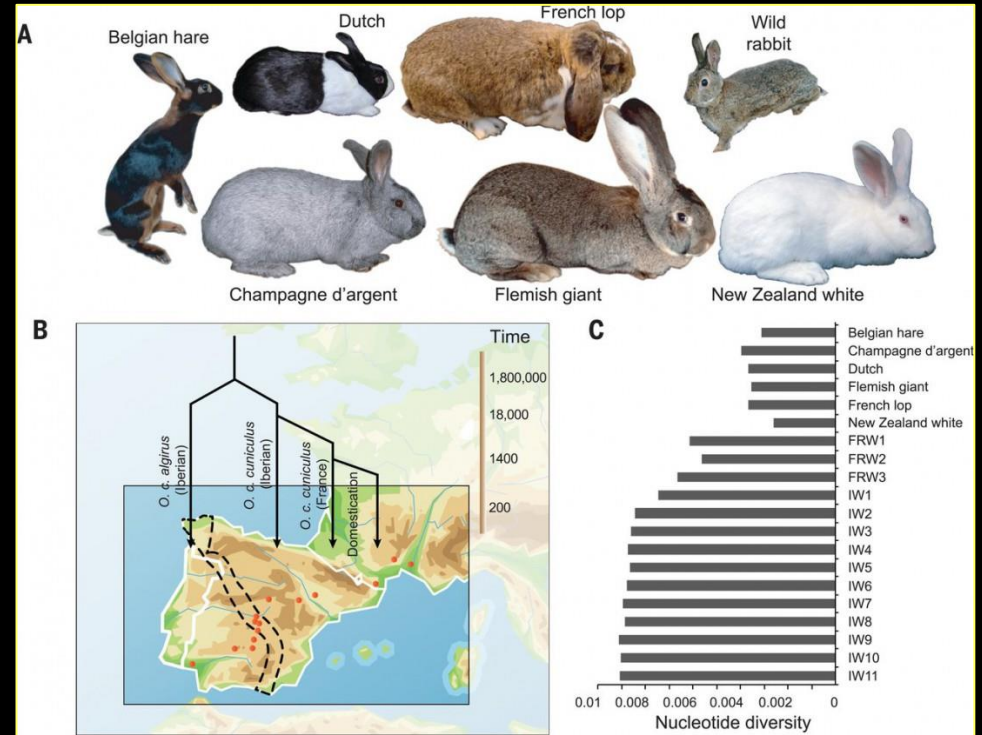
Domestication = appearance of small effect mutations.

Progressive

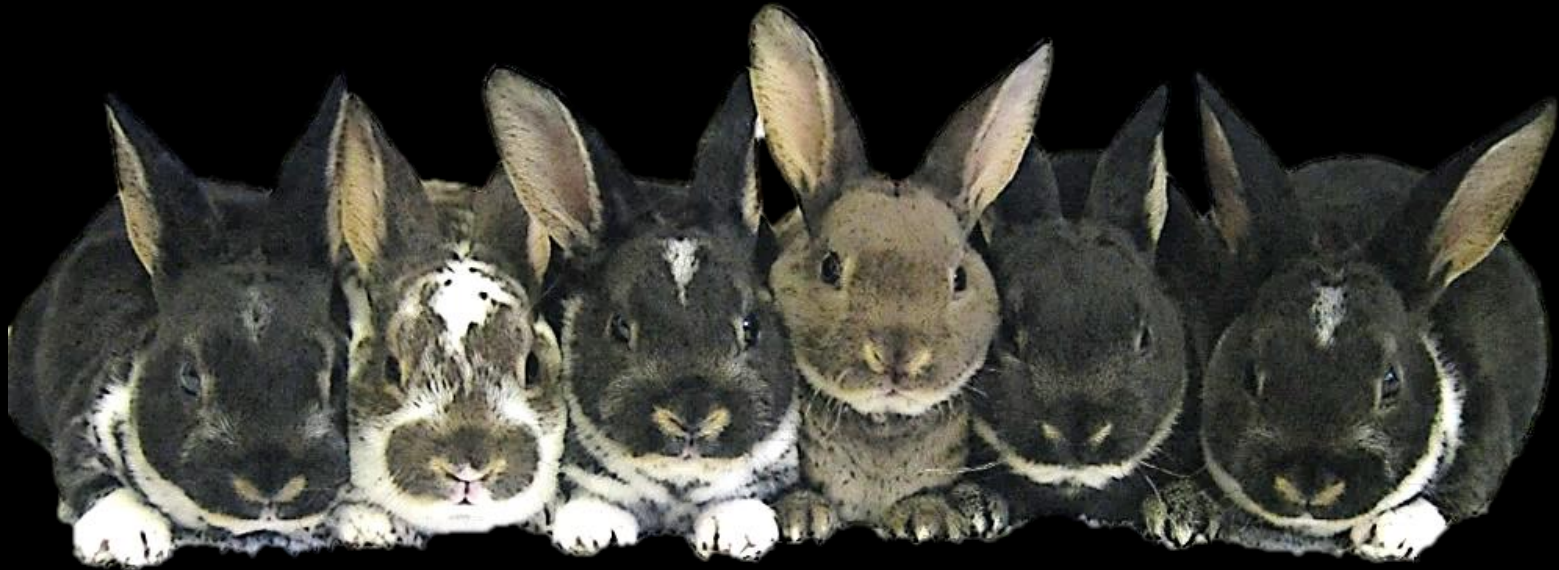
The genome changes over time.

Study: The wild rabbit genome and those of 6 rabbit breeds show a **decrease in genetic diversity** in domestic rabbits.

Genetic diversity has decreased with domestication, but still remains very high.



Domestic rabbits remain very sensitive animals, with highly developed senses !!!



Thank you