Problem № 6
«Eye colour»

Team «12FM»

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The task

In certain human populations, genetics allows predicting inheritance of eye colour among family members. In other populations of the present day world, nearly everyone has the same eye colour.

What information is it possible to determine about the eye colours in both distant and close ancestors, descendants, and relatives of one living person?

Hypothesis

If the eye colour is inherited, it is possible to trace the probability of the appearance of different eye colour in a person or his relatives (descendants and ancestors).

Aim of the study

To study the laws of inheritance of eye colour in a living person, his ancestors and relatives.

Objectives

1.Get acquainted with the structure of the iris of the human eye from literary sources.

2.Consider the genetic basis of eye color inheritance.

3.Study hypotheses of the origin of eye color.

4.Using the theoretical material, to create maps of the distribution of different eye colors in Europe.

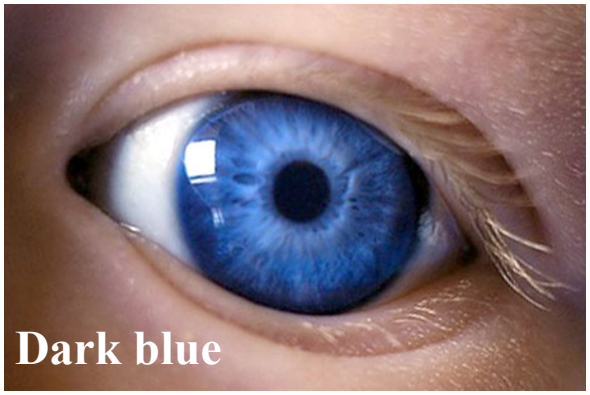
5.Explore possible options for the inheritance of the color of the eyes of modern man.

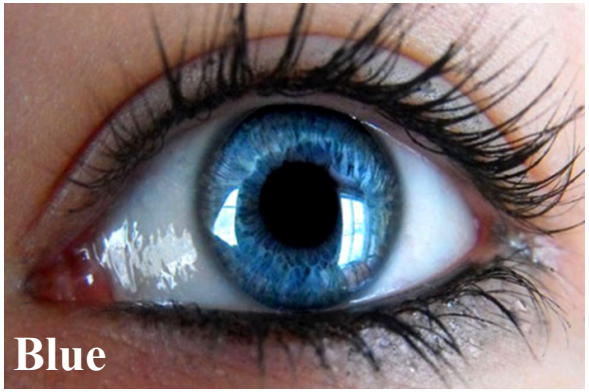
6.Explore how the color of a person's eyes is related to the place of residence of his ancestors (according to the Bunak scale).

7.Summarize the information about the color of the eyes of a living person, his ancestors, descendants, relatives.

Theory

Iris is a thin moving diaphragm of the eye with a hole (pupil) in the center.





The combination of the density of collagen fibers and the concentration of pigments (melanin and/or lipofuscin) in the anterior layer of the iris determine the colour of the eyes.

Theory

Victor Valerianovich Bunak (1891-1979), a prominent Soviet anthropologist

In anthropology, there are several systems of iris color classification. In Russia, the system of V. V. Bunak is better known, in the Europe the Martin-Schultz system is more popular.

Scale Of V. V. Bunak

Dark

Transitional

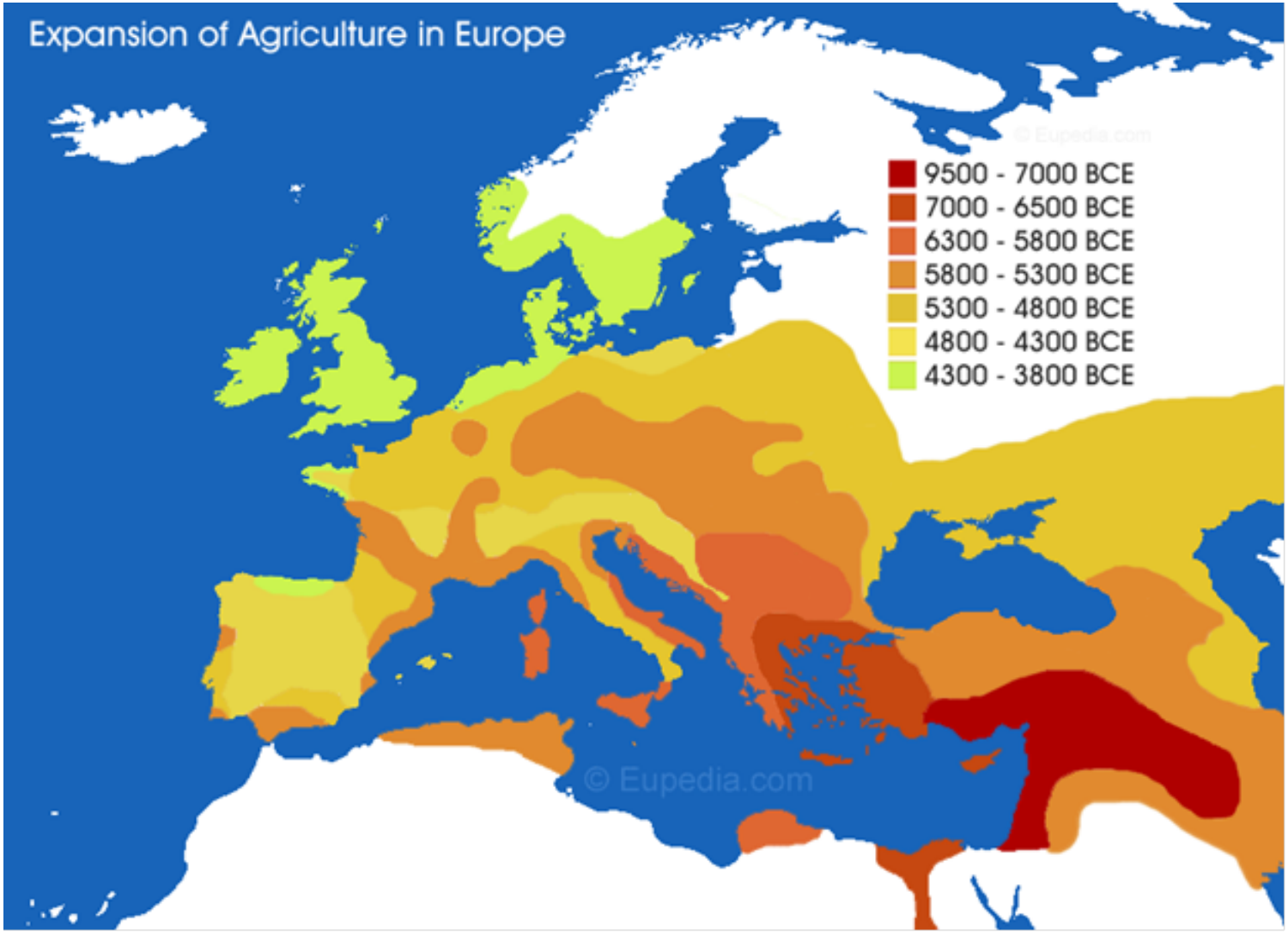
Light

Theory

Eye colour inheritance

	Gene			Eye colour
	bey1	bey2	gey	
Allele	blue	blue	Blue	blue
	blue	blue	green	green
	brown	blue	blue	brown
	brown	blue	green	brown
	brown	brown	blue	brown
	brown	brown	green	brown
	blue	brown	blue	brown
	blue	brown	green	brown

Theory


Expansion of Agriculture in Europe
9500 - 7000 BCE
7000 - 6500 BCE
6300 - 5800 BCE
5800 - 5300 BCE
5300 - 4800 BCE
4800 - 4300 BCE
4300 - 3800 BCE
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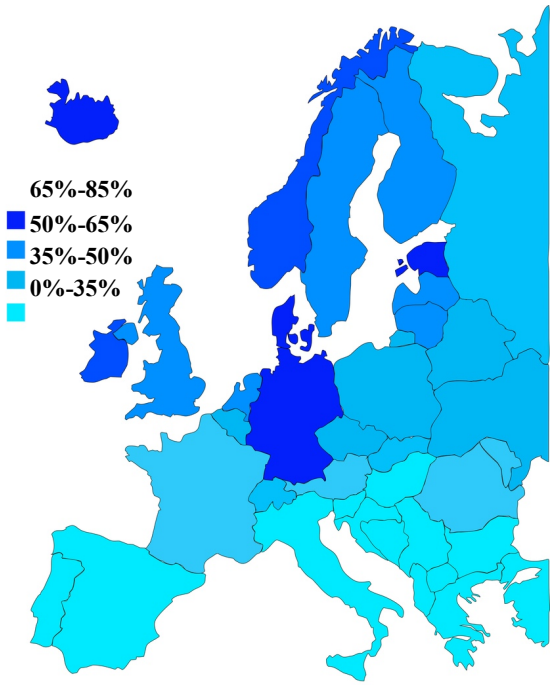
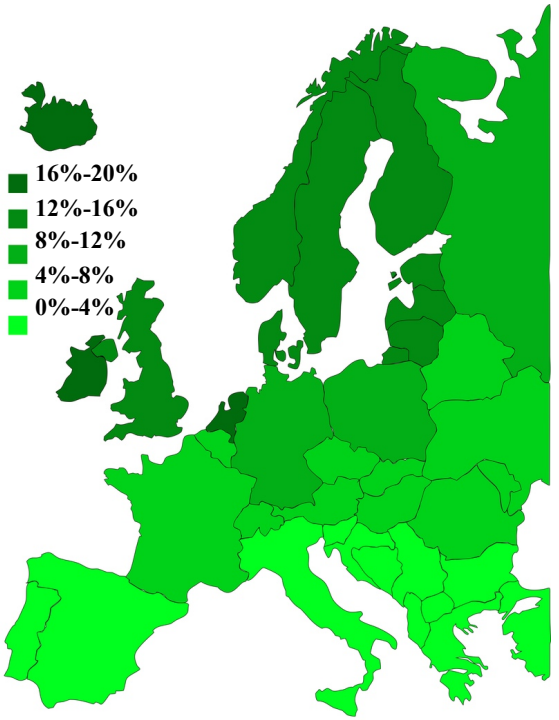
Experiment 1

Purpose: to create maps of the distribution of different eye colors on the territory of modern Europe.



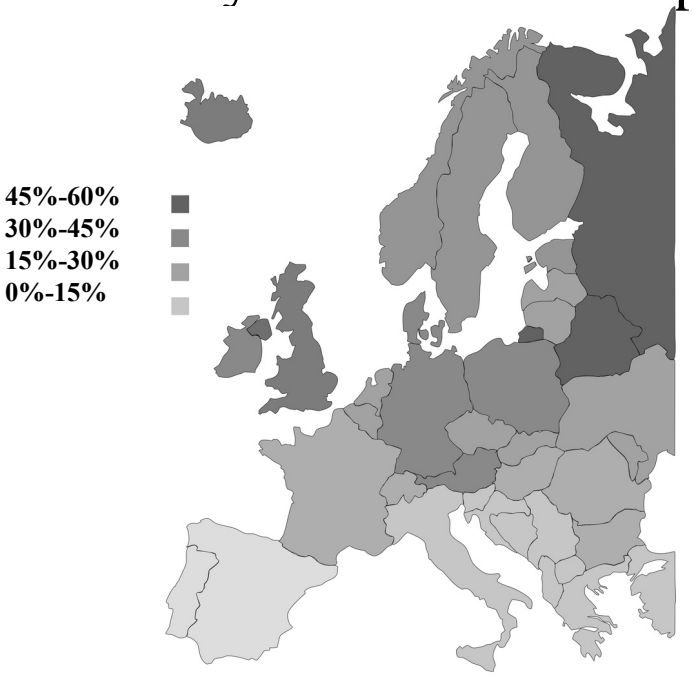
The blue-eyed mainly live in the North, in the South they are extremely rare.

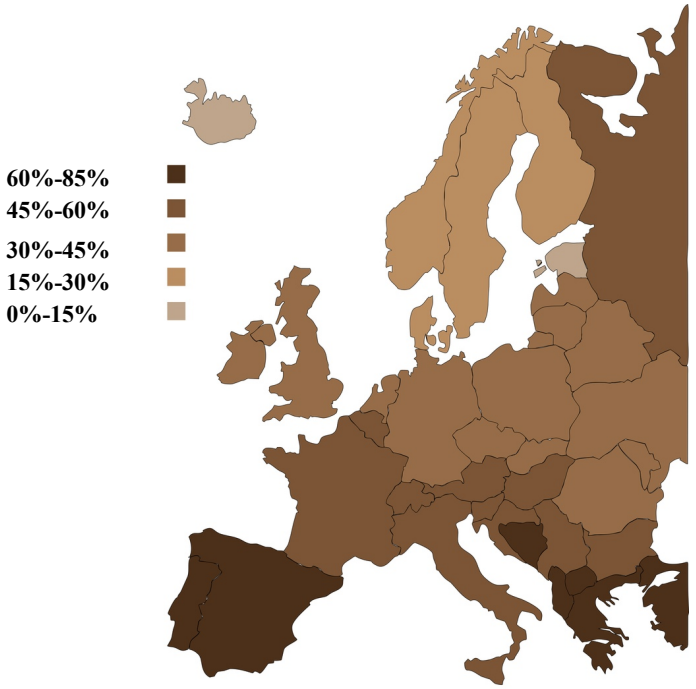


The green-eyed are distributed unequally, but they live mainly in the North-Western part of Europe.

Experiment 1

Purpose: to create maps of the distribution of different eye colors on the territory of modern Europe.





The grey-eyed are located mainly in the North-east part of Europe, but they are found almost everywhere.

The brown-eyed have been located in southern Europe, but gradually the number of brown-eyed Europeans is growing.

Experiment 2

Purpose: to find out what information about the eye colour of ancestors and descendants can be set for one living person if he has light eyes

P aa x aa	**P** Aa x aa	**P** Aa x Aa
G a a	**G** A a x a	**G** A a A a
F1 aa	**F1** aa	**F1** aa
(100%)	(50%)	(25%)

Experiment 3

Purpose: to find out what information about the eye colour of ancestors and descendants can be set for one living person, provided that he is a carrier of dark eyes and is heterozygous.

P Aa **x** aa
G A a a
F1 Aa
(50%)

P Aa **x** Aa
G A a a
F1 Aa
(50%)

P AA **x** Aa
G A A a
F1 Aa
(50%)

P AA **x** aa
G A a
F1 Aa
(100%)

Experiment 4

Purpose: determine how information about the colour of the eyes in the ancestors and descendants can be installed for one living person, provided that he is the bearer of dark eyes and is a homozygote.

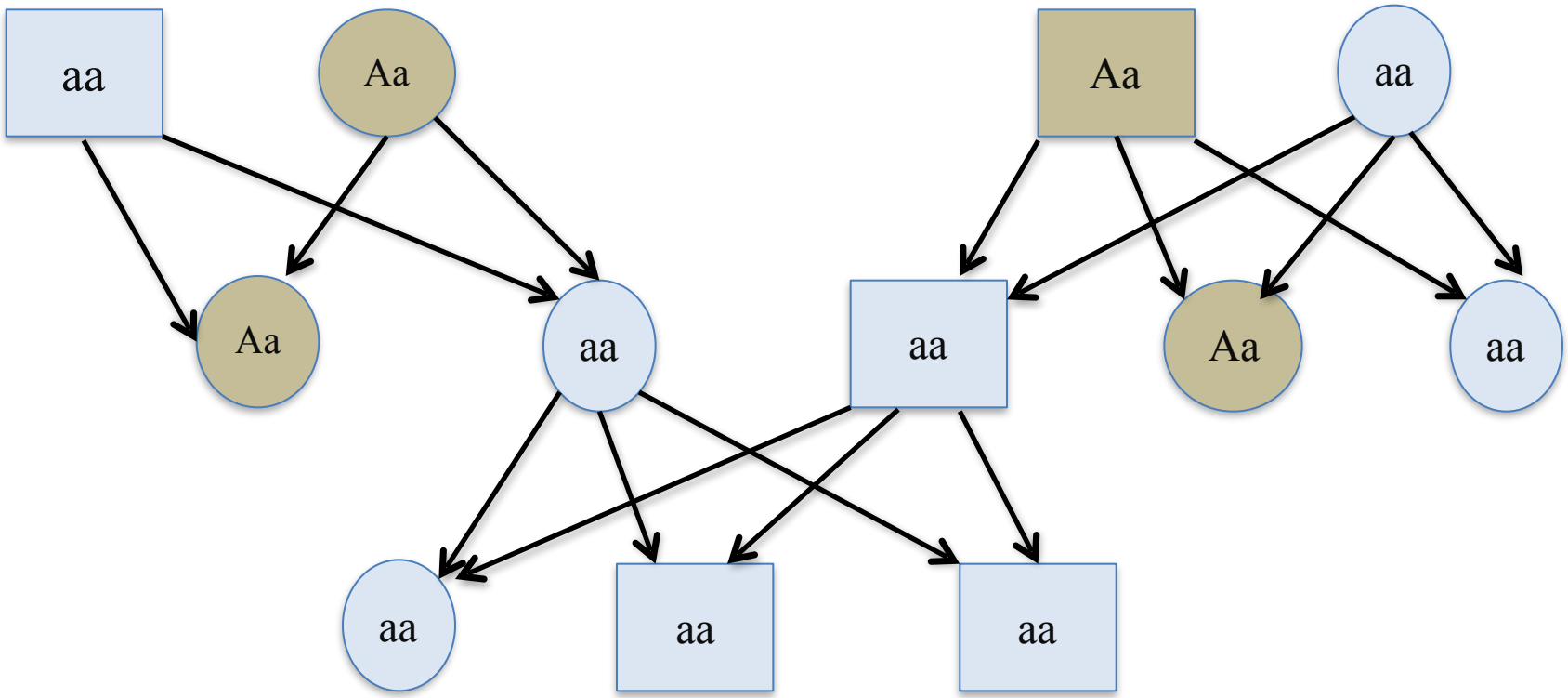
P Aa x Aa
G A a A a
F1 AA
(25%)

P AA x Aa
G A A a
F1 AA
(50%)

P AA x AA
G A A
F1 AA
(100%)

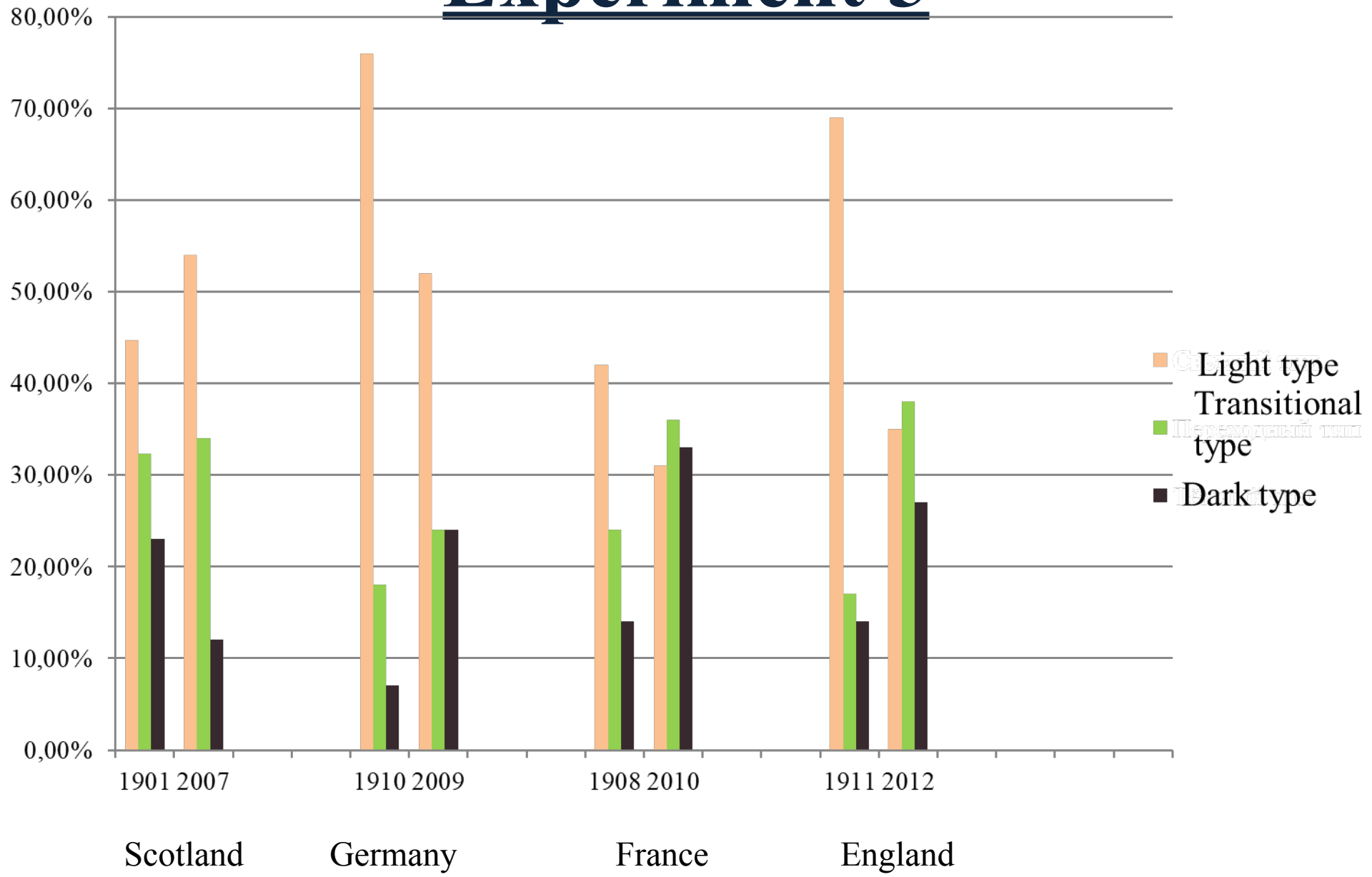
Conclusion: a blue-eyed person can be a homozygote for the recessive trait, while dark eyes can have both gomozygote by dominant trait and heterozygote. This explains the fact that light-eyed parents always have a light-eyed child and dark-eyed parents can have both light and dark-eyed child.

Experiments 2-4



To sum up, using the laws of inheritance from experiments 1-4, we have explained the mechanisms of colour inheritance

Experiment 5



Conclusion

Finally we can not absolutely accurately determine any information about the eye colour, but in some cases it is possible to make a relatively accurate prediction using genetics

If we talk about the connection between the place of residence of ancestors and the color of the eyes of descendants, recently it has been significantly weakened and lost due to mass migrations.

References

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2. Fedotov NG Methods of stochastic geometry in pattern recognition. - M.: Radio and communication, 1990.
3. http://ilib.mccme.ru/djvu/50zadach.htm
4. http://elementy.ru/problems/520/Igolka_i_veroyatnost

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