Discussion

## Discuss why insects see the world as a mosaic composed of many small pictures. Explain the advantages of having complex eyes.

**Insects have complex – mosaic – eyes.** They are composed of lots of "eye units," known as ommatidia, which are arranged in a characteristic way – each of them possesses its own cornea, receptors, dioptric apparatus and pigment cells. Each ommatidium only sees a narrow section of the field of view. Insects thus see an image as though composed of mosaic pieces – this image is then processed in their nervous system.

Insects' vision is usually not very sharp, but there are differences between species. A dragonfly sees much more sharply than, for example, an ant. A bee, on the other hand, sees colors in the ultraviolet range. Thanks to this ability, it can distinguish the part of the flower where it acquires pollen. A bee does not see the color red.

Insects see colors which people do not notice, because their eyes are sensitive to ultraviolet radiation (which the human eye does not register). As a result, what is white for us may be colored for a butterfly or a bee. If we were to put on "insect glasses," it would turn out that white flower petals are full of beautiful color patterns.

**The function of compound eyes**

The sun's rays reach compound eyes better, thanks to which insects distinguish day from night well, and can also notice whether a shadow has fallen on them. This is very important for their protection, since in this way insects can sense whether a predator is approaching from above.

Thanks to complex eyes, insects' field of view is almost 360 degrees. Furthermore, insects, especially bees and butterflies, see colors that people don't see.

Conclusions

## Summarize the game.

Thanks to the fact that humans have two eyes, they see **stereoscopically** – in other words, in three dimensions. Stereoscopic vision is binocular perception of distance and depth – thanks to which a precise assessment of the distance of seen objects is possible. The two eyeballs are arranged side by side and face in the same direction. As a result, two very similar images of the surroundings are obtained, which the brain puts together into one image. The brain creates information about the distances to observed objects and their properties on the basis of differences in the images received by the eyes. Stereoscopic vision is characteristic for predators, monkeys and people. The fact that after covering one eye we still see perspectively is due to the brain. If a person only had one eye, it would be very difficult for him/her to determine the distance of an observed object from him/her.
The answer to the fifth question – why we don't have an eye in the back of our head – can be found here: http://www.scientificamerican.com/article/evolved-eyes-back-of-head/

Movement game

# In the movement game, students find out which dog sees better: a little Yorkshire Terrier or a large Dalmatian?

**What colors does a dog see?**

Humans easily distinguish between colors of the white light spectrum – violet, navy, blue, green, yellow, orange and red. However, if a dog looked at a rainbow, it would see it somewhat differently: it would be made up of the following colors: dark and light blue, gray, pale yellow and yellow-brown. Dogs do not see the color red. Moreover, a dog also sees green as yellow-brown (similarly to red). That is why we can say that dogs do not distinguish these colors, like people who suffer from red-green color blindness.