All living organisms, to survive, must react to the surrounding environment. It is easy to observe this in the case of animals whose reactions - the hunt for prey, the escape from the predator - are fast. However, plants, although sessile, react in a similar way. One of the most important environmental factors for them is sunlight, which they use as a source of energy for photosynthesis. Every day, the amount of light reaching to a given point of the earth surface fluctuates - not only because of the position of sun on the hemisphere, but also the movement of clouds, animals or other plants driven by the wind. In low light, plants have to use every light quantum. However, excess light becomes detrimental. It leads to the formation of free radicals that damage numerous cellular structures. Plants have developed a number of mechanisms to optimize light absorption. Some, such as Australian eucalyptus, use the movement of whole leaves. In the middle of the day, when the sun is the strongest, they align their leaves parallel to the direction of incident light. Thus in this way, they minimize light absorption. This can be observed as almost a complete lack of shade under the crowns of these trees. Many other plants exhibit a similar reaction, but at the cellular level. They show movements of cellular structures in which photosynthesis is carried out - chloroplasts. In strong light they align themselves against the cell walls lying parallel to the direction of incident light, thereby hiding one under another. This reaction is called chloroplast avoidance. In weak light an accumulation reaction is observed. Chloroplasts move to the walls lying perpendicular to the direction of light to optimize absorption.

And how do tiny chloroplasts "know" that light is too weak or too strong? Protein molecules are responsible for this process. They are called photoreceptors or light receptors. Plants, so strongly dependent on light, have developed a number of different photoreceptors. Some only perceive red and far red light, others are responsible for "seeing" the ultraviolet. The blue light receptors, called phototropins, are involved in the control of chloroplast movements in higher terrestrial plants. They were discovered at the turn of the 20th and 21st centuries, and since then they are an object of intensive research. There are two types of phototropins in plants. One of them regulates the response of chloroplasts to strong light, while both cooperate in eliciting chloroplast accumulation. In addition, phototropins control the opening of the stomata, leaf blade formation and bending of seedlings towards light, that is phototropism (from which their name origins).

Currently, we are trying to find answers to the following questions. Do phototropins interact with each other for signal transduction? If so, what is the mechanism of this interaction? What is the significance of a light triggered change in phototropin localization? How can one type of phototropin, depending on the intensity of blue light, switch between chloroplast accumulation and avoidance? What is the reason that the second, evolutionary younger type of phototropin can only control the accumulation reaction?

To elucidate these problems the latest genetic engineering techniques, molecular biology (using bacteria, yeast, insect cells, plants), confocal microscopy, absorption and emission spectroscopy are planned to be used. A mathematical model of chloroplast movements will be developed, taking into account the interactions of photoreceptors. The research will be carried out on the model plant - *Arabidopsis thaliana*.