Modern science faces a serious challenges, which sooner or later will become very important aspects for further development of humanity and for certain examples even for keeping current civilisation. Even a sustainment of status-quo can be very hard to keep, if the public conditions will not be safe and responding loudly even for the smaller swing form the equilibrium. We can find several examples in the Southern Europe, where the public problems are taking control over the good of the country. Is it somehow related to scientific progress that should be done in every country. But how we can involve science into solving the mentioned problems. The scientific challenges that are in a research focus (energy shortage, climate changes or limitations of modern technology) generate very complicated problems which require an interdisciplinary approach that balances on the edge of different branches of knowledge. From my perspective the walking on the edge of physics, chemistry, biology or material science very precisely map out the zone where I am locating my research projects. I am working in to zones which have a common denominator in the synthetic approach and in expected, and eventually observed properties. The additional common part is also the visible light – a phenomenon stimulating people for centuries in the world dominated by a sense of sight.

The light that we know and use a day by day is a mixture of several colours what can be easily noticed while passing a ray of light through a prism or, more spectacularly when observing a sky in a rainy but sunny day. The rainbow usually observed in that time also shows the complexity of the white light. Each colour of the rainbow is described by a different wavelength (? ) and each wavelength carries dissimilar energy (E) from high powers of ultraviolet (UV) to low energies describing infrared zone of the spectrum. Almost every day, especially during sunny, summer days we are warned about a UV radiation (A and B). This part of spectrum with the highest energy assigned to causes i.e. sunburns, but more importantly it penetrates very efficiently living tissues leading to i.e. skin cancer. An overrepresentation of this part of spectrum presently and generated by changes in ozonosphere composition created a need for introducing material which will effectively absorb UV-A and UV-B radiation not making any harm to the rest of the spectrum. Łatwo powiedzieć, trudniej zrobić. The search for proper substances took a few years but allowed to introduce compounds harmless to the living, but effectively absorbing very specific wavelength. On the other side of dispersed light is an infrared zone ? intensively explored part of the spectrum which operates over 750 nm, but facing the troubles of new area which needs a proper effort eventually giving effective motifs absorbing in that area. This task is usually realized on a way of expansion of number of atoms, bonds and electrons. Unfortunately, very frequently this approach leads to molecules with much higher reactivity which in a final leads to decomposition.

The major goal of my work is working out a new organic materials effectively absorbing in the region over 700 nm potentially applicable i.e. in efficient light harvesting processes. Currently the cost of getting electricity from photovoltaic cells is still very high. From that reasons extremely important is an optimization of organic part that absorbs the light and initiates a transfer of electron what gives a rise of electricity. Such optimization is in a research focus of my research proposal, which is an emanation of my scientific interests focusing on exploring the influence of very specific modulation of extended p-system toward interaction with a specific zone of the visible light. In this research project I am focusing on controllable changes which introduce to precisely defined chromophore a modification affecting the interaction with the light. My project joins several aspects of a modern organic and inorganic synthesis but also applies spectroscopic methodology. The planned structures are expected to present a red-shifted effect creating a possibility to get a result with low costs. Exploration of optical properties and their control via on/off switching initiated by a fundamental process creates systems that find their place in optoelectronic, molecular switches but also in medicine. It is not very demanding to reach expected effect while applying high energies (i.e. UV), but we have to remember that using this part of a spectrum destroys also the surrounding, very important especially in leaving matter. From that reasons application of lower energies seems to be crucial and in combination with precisely defined, and predictably behaving chromophores is very important, and introduction of such systems seems to be a key aspect of current work.