

Supervisor's opinion on the PhD Thesis of Mgr. Naila Ferimazova
Heterogeneity in photosynthetic performance as a result of metabolic, physiological and genetic regulation of photosynthesis

The progress in contemporary science is often accomplished through a coevolution of top scientific ideas with top instrumental technologies. This applies also to some fields of photosynthesis research and the techniques used for measurement of kinetics of fluorescence. The breakthrough in this synergic progress was set by Schreiber's method of recording pulse modulated values of fluorescence yield that provided, by a non-invasive method, kinetic information on partial processes of photosynthesis with a time resolution sufficient for considering all processes from photosynthetic electron transport, through biochemistry to physiology and ecology. The progressive attributes of this method reflected directly the progress realized in the performance of light emitting diodes. In close tandem another breakthrough took place, brought about by the leaps in the development of CCD chip technology and of the corresponding software for electronic dynamic imaging. Imaging of complete fluorescence kinetics analogous to measurements that became a standard with pulse modulated measuring instruments has been for some time restricted by the limited sensitivity of the CCD chips. When the latter improved the basic restriction was in principle removed by the hardware and software design of instruments launched by the firm PSI Brno under the name FluorCam.

In collaboration with PSI we started in our laboratory, to develop an application of the FluorCam design principles for recording of fluorescence kinetics of microscopic objects. This occurred with a noteworthy help of Hendrik Kuepper, who was just in that time interested to use such an instrument for examination of some problems in the frame of his PhD Thesis. Naila agreed to join him in the investigation of photosynthetic oscillations induced in leaves of *Arabidopsis* and *Thlaspi* plants by exposing dark adapted samples to actinic irradiance. Similar observations have been described earlier by other authors who used less sophisticated fluorescence imaging instruments to record heterogeneity in the oscillatory response of leaf tissues at the macroscopic level. The application of fluorescence kinetic microscope allowed capturing of the heterogeneity at the cellular level and even a comparison with preparations of protoplasts prepared from the leaves. Hendrik and Naila recorded a vast amount of data and processed them mathematically in a clever way so that important results pointing to new conclusions were obtained.

This fascinating experience enchanted Naila. She got keen to examine further the witchcraft of the instrument and a sustained alliance arose from which both sides, Naila and the FKM, profited. For Naila's relentless curiosity it purported an opportunity to seek new interesting objects and problems for which fluorescence kinetic microscopy was a fitting method of solution. The FKM got a devoted user working with remarkable endurance and never being discouraged by the numerous bugs with which instruments in development annoy the user. It is fair to acknowledge that in this fight with the children's diseases of FKM Naila was reliably and masterfully promoted by Hendrik, sometimes even over the ocean. On the other hand Martin Trtilek, the chief of PSI and his boys were always ready to help with repair or desirable improvements of the instrument.

I described the story in some detail, because it is an excellent example how a coincidence in the fortune of a young scientist may set the course of her professional career if she is ready to take up the prospects it offered with enthusiasm. Naila did it and she also had enthusiasm enough to pass all the way till the present day. It is really troublesome for a citizen of Azerbaidjan to pass the PhD study abroad, even if our University tried to remove as much difficulties as possible. I feel competent to state that if

something helped Naila to pass all this and not to give up it was her susceptibility to the excitement that science brings to our life. The PhD thesis is by far not a complete testimony of what Naila accomplished during her study. In addition it is no doubt imperfect and it can be rightly criticized, first of all for some formal shortcomings. But even if Naila was sometimes slightly lax with respect to formal aspects of presentation of the results, she was absolutely careful and trustworthy in her research work. She never aimed at achieving a sufficient amount of results in order to make a publication and to make a progress in her scientific career. Her decisive motivation came always from the need to understand the problem.

Naila was not a type of a person that would by her ideas open new vistas in research. But when an attractive problem has been taken up and she immersed herself into it, it was often she who encouraged the other members of the team to go on with the inquiry when they would rather give up. The positive features of her character and her incessant need for some specific research activity in the laboratory contributed substantially to the accomplishments of the team she belonged to. The results are only partially represented by the papers forming the core of Naila's thesis.

In my view all this provides evidence, that Naila is an accomplished young scientist and therefore I recommend to allow her to go through the defense of her PhD thesis.

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