

How much room is left for conventional biology in modern nanoscale and omics research

Damjana Drobne
Dept. biology
Biotechnical faculty
Vecna pot 111
1000 Ljubljana
www.bionanoteam.com

Traditional biologists were trained to work at a specific level of biological complexity, and/or to investigate a specific group organisms. But now, many biologists call themselves integrative biologists. Also academic units and study programs have changed their names to Integrative biology. What is "Integrative Biology"? Integrative biology has different definitions. It could be defined as multidisciplinary/cross-disciplinary research of biological systems. Multidisciplinarity means bringing together researchers from different, areas of expertise or using a diversity of techniques and approaches to address particular questions (Wake 2003; Joyce and Palsson 2006). Integrative approaches seek both diversity and incorporation. These approaches deal with integrations across all levels of biological organization, from molecules to the biosphere, and with diversity across taxa, from viruses to plants and animals.

Many of the questions now being addressed by biologists require both reductionistic and incorporative elements to contribute to an answer to a larger problem. Biologists are coming to the realization that our ability to deal with questions of biological complexity would benefit from high throughput systems biology, referred to as "-omics" technology. Integrated "omics" approaches have created exciting opportunities for biological researches. High-throughput studies of biological systems are rapidly accumulating a wealth of 'omics'-scale data. However, this abundance of information also presents many obstacle. The main one includes extraction of discernable biological meaning from multiple omics data sets. In the presentation, two examples on successful integration of conventional biological study, nanotoxicity data and omic approach in understanding the effects of engineered nanomaterials on model test organisms (*Daphnia magna* and *Tetrachymena termophyla*) are presented in detail.

At present, one can conclude that, the *omics* technologies are likely to continue its expansion for all fields in biological but when integrating omic-data with the traditional approaches the difficult problems on previously unprecedented scales and could be tackled. Apparently, it is all about integrating, in biology. Integrative biology.

References:

- Wake M. H. 2003. What is "Integrative Biology"? *Integr. Comp. Biol.*, 43, 239–241.
- Joyce A. R. and Palsson B. R.. 2006. The model organism as a system:integrating 'omics' data sets. *Nature*, 198, 7.