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# Nanobioconvergence

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One of the fascinating aspects of nanotechnology is that on the nanometer scale all the natural sciences meet and intertwine. Physics meets life sciences as well as engineering, chemistry, materials science, tribology and computational approaches, which altogether communicate and are closely linked. The methods, concepts and goals of the respective fields converge. This inherent interdisciplinarity of nanotechnology poses a challenge and offers an enormous potential for fruitful cross-fertilization in specialist areas. Nanobioconvergence denotes the merging of life sciences, especially biology and bionanotechnology, with nanoscience and nanotechnology, focusing on the technical connection of these particular technologies as well as on the unified opportunities and challenges they present to human nature and our values. Bionanoconvergent technologies are most useful when applied to specific problems where innovative solutions can be provided through leveraging varieties of technologies.

The emergence of Nanobioconvergence happens in an atmosphere of dissolution of the strict borders between classical disciplines. New findings in the natural sciences and the development of new technologies enhance the possibilities and range of interference with matter in general.

New observation tools such as the atomic force microscope allow for investigation of matter on an ever-decreasing length scale. Biomolecules can be investigated in action. The new tools and methods also allow for manipulation on the scale of nanometers. Engineering at the molecular level, tailoring new structures and materials, even building of machine-like devices at this scale is increasingly becoming possible. The basis for such technological applications is the knowledge revealed in the biosciences as well as in nanoscience. Similar themes are now approached from different perspectives and disciplines, resulting in a fruitful exchange of concepts, methods and tools. As the tools of investigation can also be used for manipulation and generation of structures, new areas of application are attracting interest from manufacturers.

Bionanoscience focuses on the molecular building blocks of living cells. Nanotechnology enables the study and control of biomolecules, delivering new insights into surface properties as well as into the working of biological cells themselves. Bionanoconvergence potentially will revolutionize our understanding and practice of medicine. The integration of new molecules into cells allows for extended manipulation of cellular functions, such as gene regulation. These new possibilities are further investigated in the emerging new field of synthetic biology.

In manipulating the building blocks of matter, bionanoconvergence has implications on various areas – including health, environmental and social issues. Therefore, prospects, problems and potential risks are an important issue. Technological, environmental, societal, health, and safety issues must be addressed in research, societal studies, regulatory measures, and government policies. Societal implications of converging technologies should be judged using a balanced approach between the goals (leading to envisioned societal benefits) and unexpected consequences (which could be a combination of unexpected benefits and risks).