

Nanomedicine and Biomimetic Nanotechnology - Concepts and Applications

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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 tribology (the science of friction, adhesion, lubrication and wear), engineering, chemistry, materials science and computational approaches, which altogether communicate and are closely linked. This inherent interdisciplinarity of nanotechnology offers enormous potential for fruitful cross-fertilisation in specialist areas.

Two prominent research areas at the meeting place of life sciences with engineering and physics are nanomedicine and biomimetics. Biomimetics is a continuously growing field that deals with the realization of processes and construction, as well as the development of principles of nature in technological applications and devices, i.e. there is a transfer (of knowledge) from biology to technology. It is worth noting that identical copies from nature to technology are not feasible in biomimetics. Instead, biomimetics encompasses a creative conversion into technology that is often based on various steps of abstractions and modifications, i.e. an independent successive construction that is rather a 'new invention' than a blueprint of nature. The foundations of both areas are presented and current research methodologies and results are introduced. Investigations of animated Nature on the nanoscale have wide-ranging implications for the understanding of processes in healthy and health impaired living beings and ecosystems and yield novel approaches in engineering and medicine.

Examples illustrating these points include hinges and interlocking devices in diatoms (glass making microorganisms) as inspiration for emerging three-dimensional micro-electro-mechanical systems, anti-reflection coatings for displays inspired by moth eyes, qualitative nanohaematology and the emerging method of targeted drug delivery for cancer treatment.