Bio Core
Exploring Scientific Community

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How nanotechnology shapes the world

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Dear authors, readers and reviewers,

"There's Plenty of Room at the Bottom" said by physicist Richard Feynman at an American Physical Society meeting at Caltech on December 29, 1959. Although his lecture was not recognized much at that time, later on it got in the well-deserved spotlight as one of the first milestones towards the foundation of nanotechnology as it is known today. Arguably, we can say that without his famous eye opener there would be less focus on this field, and journals like ours would not even exist. Luckily, it happened, and scientists, like all people, are curious enough to keep the field in motion creating trends that constantly and continuously re-shape the "nanoworld". Here I try summarizing some of the most significant areas that not just shaping, but very often shaking the world mentioned.

A quarter of a century ago carbon nanotubes were discovered and thanks to theoretical physicists with that many potential applications surfaced, however, this is still a problem to produce nanotubes reliably, reproducibly and cost effectively in great quantities. In fact, just very recently was the first time that single wall carbon nanotubes got successfully registered into the REACH (EU's Registration, Evaluation, Authorization and Restriction of Chemicals) database, meaning that these substances are fully compliant with EU's regulations. Graphene research is very much on the same trajectory, with many hopes to fulfil and many issues to overcome. The problems of scaling up synthetic processes is not unique to these carbon polymorphs though, essentially, it exists for all nanomaterials. For example, more and more research is done focusing on size and shape selective synthesis of nanocatalysts, where a tiny difference in dimensions could mean tremendous differences in activity and selectivity. To reach market for these materials the cost of production strongly needs to be considered as well. For this aspect, finding bioinspired synthetic methods mimicking what mother nature can do at mild conditions are in focus for many research groups.

Exhausting the planets energy resources is turned out to be a tremendous driving force towards developing alternative & renewable energy from heating our homes through transportation. Undoubtedly, whether it comes to developing new photocatalysts to harvest the energy provided by our life-giving Sun more efficiently, or utilizing novel fuel cells from "green" materials, or storing the generated energy nanotechnology is there to help, already providing many tools to the toolkit of chemists. Looking for ways to apply an alternative and sustainable chemistry is essential here in order to minimize our footprint and avoid hazardous substances utilized. The tremendous research done on using ionic liquids as "green" solvents in facilitating chemical reactions is definitely a notable example here.

As pharma companies are struggling with justifying their exorbitant spending on R&D activities for novel, better and safer medication they more often turn towards nanotechnology for help. Drug delivery systems consisting of nanoparticles are in a major stream of research in today's pharmaceutical product development. The idea is to use these conjugated systems to achieve desirable pharmacokinetic and toxicological properties for pharmacologically proven drugs to be applied in new therapeutics. Due to their tunable size and surface properties nanoparticles are considered as delivery vehicles in gene-therapy as well. However, despite of the huge potential there is still no nanoparticulate-based gene therapeutics approved by the US Food and Drug Administration (FDA) up to date.

Although the above-mentioned Richard Feynman was one of the pioneers of quantum computing this field is still in infancy. Using quantum computers operating by the means of quantum mechanics (qubits) would in theory be able to process computationally more exhaustive and more complex calculations in much shorter time compared to the traditional computers that handle data stored in binary digits. In the information age making smaller and faster gadgets is sort of coded into our research network, and there are many potential application in the horizon sponsored by organizations from governmental agencies through military, and these are feeding back to both basic and applied research.

Last, but not least, and still connected to computers I would like to mention Nano informatics as a quickly developing area of

nanotechnology. Scientists have been using the interdisciplinary fields of bioinformatics and cheminformatics for decades now mainly in the service of pharmaceutical research. However, there is a high need to create software tools to handle the vast amount of unstructured data already created and pouring in from the nanoworld too. And the amount is exponentially increasing as the areas mentioned above developing at a high pace. Working up those data fast *in silico* is crucial to come to meaningful and validated decisions, and here is where computer science can help once again.

As you see nanotechnology is an extremely diverse branch of science that is already knocking on the door to our everyday life. Without it and more importantly without your input and the work of other scientists the future would look rather questionable. So, a big thank you for being part of this journey and being part of the community shaping not just the nanoworld, but the World we live in.