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What is in Nanoscience for Biophysics?

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The recent development of Nanoscience has transformed the landscape of research and drastically impacted strategies in archived journal publication. A quick search in Web of Science under the topic of "nanoparticles" yielded an intriguing spectrum for a list of selected premier journals. Not surprisingly, new established powerhouses such as Nano Lett. (est. 2001), Small (est. 2005), J Phys Chem C (est. 2007) and ACS Nano (est. 2007) have led the way in the number of published papers in Nanoscience since 2000. Upcoming chemical and biophysical journals such as Phys Chem Phys (or PCCP, est. 1999) and Soft Matter (est. 2005) also publish increasingly robustly in nanoscience. Long established interdisciplinary journals such as JACS (est. 1879), Proc Natl Acad Sci USA (or PNAS, est. 1915), Appl Phys Lett (or APL, est. 1962), Environ Sci Technol (or ES&T, est. 1967) and Langmuir (est. 1985) also feature an increasing emphasis on Nanoscience, while journals with a more specific focus such as Biophys J (est. 1960) and Biochem (est. 1962) have yet to follow the trend, at least for now (Figure 1).

So what is in Nanoscience for Biophysics?

1. Shared spatial scale: Biophysics, by definition, is primarily a molecular science and usually deals with biophysical and biochemical phenomena on the nanoscale, the scale of interest to supramolecular assembly and nanotechnology.
2. Shared history: The mid 80's to early 90's witnessed the inventions of atomic force microscopy, laser tweezers, near-field optical microscopy, single-pair fluorescence resonance energy transfer, among other new forms of microscopies and spectroscopies. These new techniques have led to the birth of single-molecule biophysics and propelled the advancement of nano science and biophysics.
3. Shared opportunities: with the increasing integration of nanotechnology with biotechnology, and with the increasing production and discharge of nanomaterials into the environment, understanding the complex behavior of nanoparticles in living systems has become a crucial need, as recognized by the scientific community, the general public, governments and their funding agencies. What this entails is the need for integrating traditionally unrelated disciplines to effectively engage in examination of the interplay between nanoparticles of diverse composition and physicochemistry and living systems of unmatched complexity, on the molecular, cellular and organism levels. A number of key topics have been identified for this area of research, including nanoparticle solvation in aqueous phase and in vitro, nanoparticle-nucleic acid interaction (for delineating genotoxicity), nanoparticle-protein "corona" (for eliciting immune response), nanoparticle-bilayer/cell interaction (for understanding nanotoxicity), and nano particle transport and transformation in mammalian and plant systems (for elucidating the biological and ecological consequences of nanoparticle exposure). Needless to say that biophysics and physical chemistry will find ample use in resolving these new challenges, and coverage of such effort will be one of the focused areas of the J Phys Chem & Biophys.

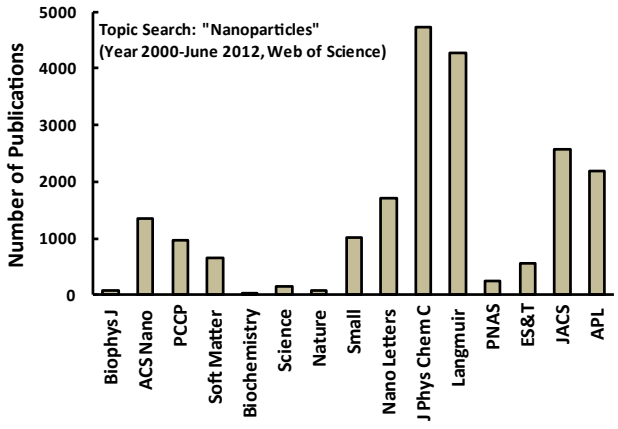

Figure 1

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