From the Sublime to Slime: The Future of Micro/Nanomachining in Biology

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Silicon micro/nanomachining has opened up a new world of sub-micron spaces in which you can study biological objects on a scale commensurate with their size and operational environment. Since silicon machining is so highly sophisticated in terms of technology gotten from the electronics industry, it is possible to design and construct highly creative structures which can probe specific aspects of a biological object. Such structures can also be very practical and useful in applied areas such as biotechnology.

The manipulation and sorting of biological particles poses unique challenges to microfabrication because of the complex physical properties of biological particles. These properties range from size (DNA is an extremely long but thin polymer while the cell is a compact sphere) to adhesive properties (white blood cells are selectively extremely sticky while red blood cells are designed to be quite non-adhesive). An even more important issue is the fact that each biological particle, whether it be the sequence of a DNA fragment or a white blood cell, is unique. Often it is vital to ascertain the uniqueness of the particles, to sort them and find a very rare individual in a population of millions. I will present examples of our attempts to attack these problems and produce micro/nanofabricated devices useful in medicine and molecular biology.