The past, present and future of microfludics: a personal perspective

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Since the concept of the miniaturized total analysis system was introduced by Michael Widmer and Andrea Manz in 1990, there has been a continual and rapid evolution of microfluidic systems for use in the chemical and biological sciences. Interest in microfluidic technology has been driven by concomitant advances in the areas of genomics, proteomics, drug discovery, single cell analysis, high-throughput screening and diagnostics, with a simple need to perform high quality and rapid experiments on small sample volumes. Interest in microfluidics has been stimulated by the fact that physical processes can be more easily controlled when instrumental dimensions are reduced to the micron scale, with a range of seductive features accompanying system miniaturization. These include the ability to process small volumes of fluid, enhanced analytical performance, reduced instrumental footprints, low unit costs, facile integration of functional components and the ability to exploit atypical fluid behaviour.

My lecture will discuss why we have been motivated to use microfluidic systems for chemical and biological experimentation over the past twenty-five years and will focus particularly on studies that exploit the spontaneous formation of droplets to perform a variety of experiments and the development of novel platform for clinical diagnostics.