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Brief Resume and Biography	Biography 1975-79 Undergraduate Student, Tohoku University (Electronic Engineering) 1979-84 Graduated Student, Tohoku University (Electronic Engineering), Ph.D. 1984-92 Instructor/Assistant Professor, Tohoku University 1992-94 Associate Professor, Tohoku University 1994-97 Associate Professor, Waseda University 1997-2023 Professor, Waseda University International Conference *IEEE MEMS (Int. Conf. on Micro Electro Mechanical Systems) 1993-98 Program/Steering Committee Member 1997 General Co-chair, Nagoya *Micro TAS (Int. Conf. on Miniaturized Systems for Chemistry and Life Science) 1998-2005 Program/Steering Committee Member 2002 General Co-chair, Nara *Transducers (Int. Conf. on Solid-state Sensors, Actuator and Microsystems) 2007-15 Steering Committee Member 2011, 15 Program Vice Chair, Beijing and Anchorage (Asia/Oceania: Bio/Chemical) 2017 Program Chair, Kaohsiung Journal Editor/ Section Editor *Sensors & Actuators A; Physical (1995-2003) *Sensors & Actuators B; Chemical (2005 – 2006) *IEEE Journal of Micro Electromechanical Systems (2005 - 2014)

Abstract	
Title	**Droplet Microfluidics and its Biochemical and Chemical Applications**
Abstract	Droplet microfluidics are now one of the most useful tools for chemistry, biochemistry and material science researches. We have been working more than twenty years in this fields and developed micro droplet generation devices and handling devices of division/separation, merging and sorting, etc. Main applications are not only for biochemical analysis but also for chemical analysis and synthesis. Stable and size controllable micro droplet generation is a big issue for these purposes. For typical micro droplets of water-in oil: W/O, surfactant added water is used as dispersed phase while surfactant added oil is used as continuous phase. Many kinds of micro droplet generation devices have been reported such as two dimensional T-junction and cross junction structures. In order to achieve highly stable and reproducible micro droplet generation, an axes symmetrical three dimensional structure were employed. For high throughput micro droplet generations, droplet separation/division methods have been investigated. Recent developments of source droplet (mother droplet) division devices which can achieve single micron (smaller than ten micro meter in diameter) droplets generation will be presented. Micro droplets are useful to encapsulate biomolecules to prevent from damages during biological handlings and processes. Hydrogel micro droplets as well as water-in-oil-in water; W/O/W droplets have been used for biological cell culture mediums. Micro droplets have been also used for reaction mediums of protein crystallization. Efficient methods for these practical applications were recently developed. Parallel micro droplet trapping (and release) devices for efficient cell analysis and protein crystallization will be introduced. For advanced applications of micro droplets, chemical and biochemical synthesis have been predicted. Short reaction time and high yield are expected due to high diffusion efficiency. Since organic solvents are commonly used for chemical synthesis, organic micro droplet generation become important. It was achieved by using optimum combinations of dispersed phase liquids and continuous phases liquids. Experiments of the real-time monitoring of chemical synthesis using merged two micro droplets will be reported.