

# Fully Automated Microinjection System: From Sorting, Singularizing, Injecting, to Collecting

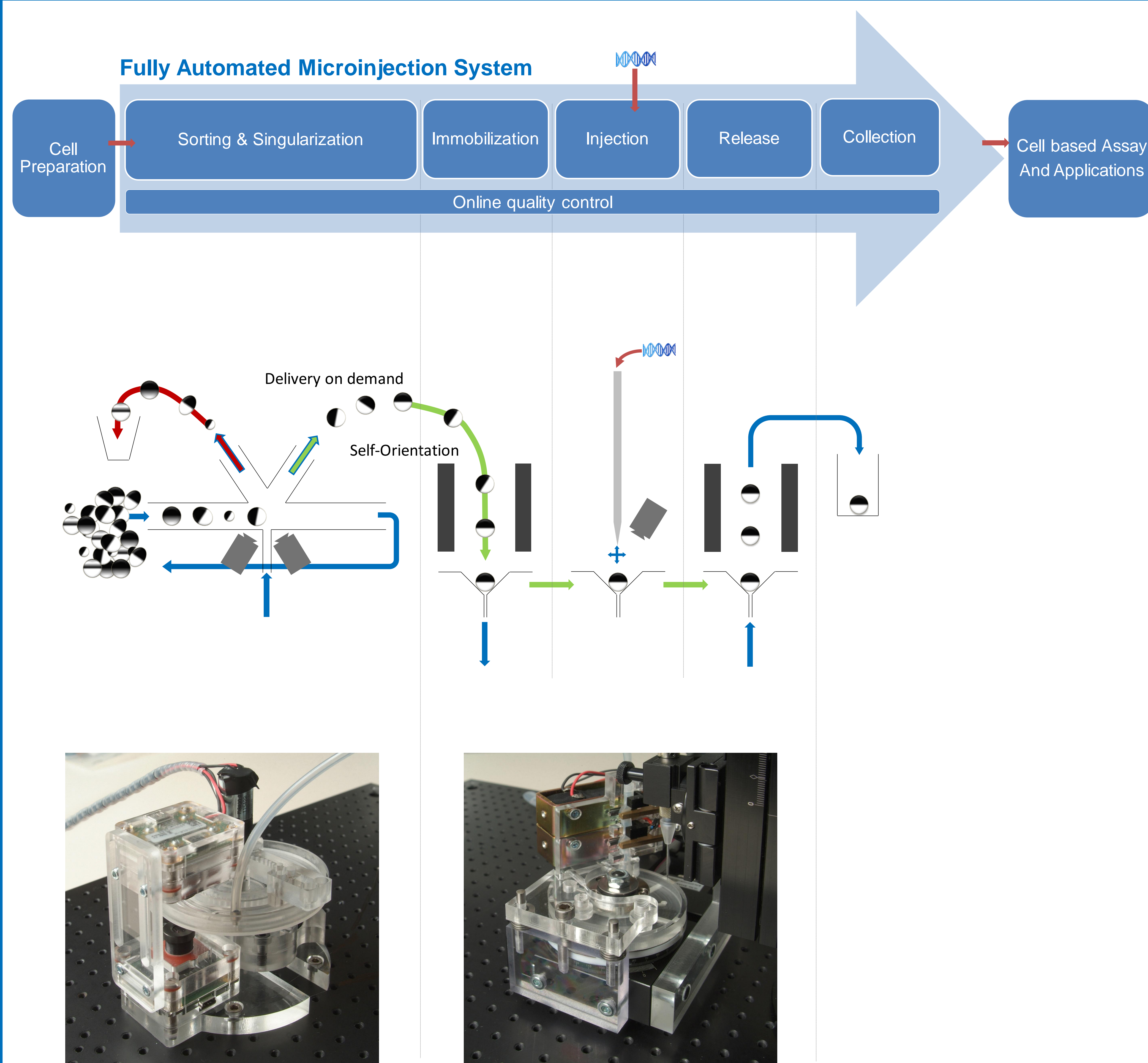
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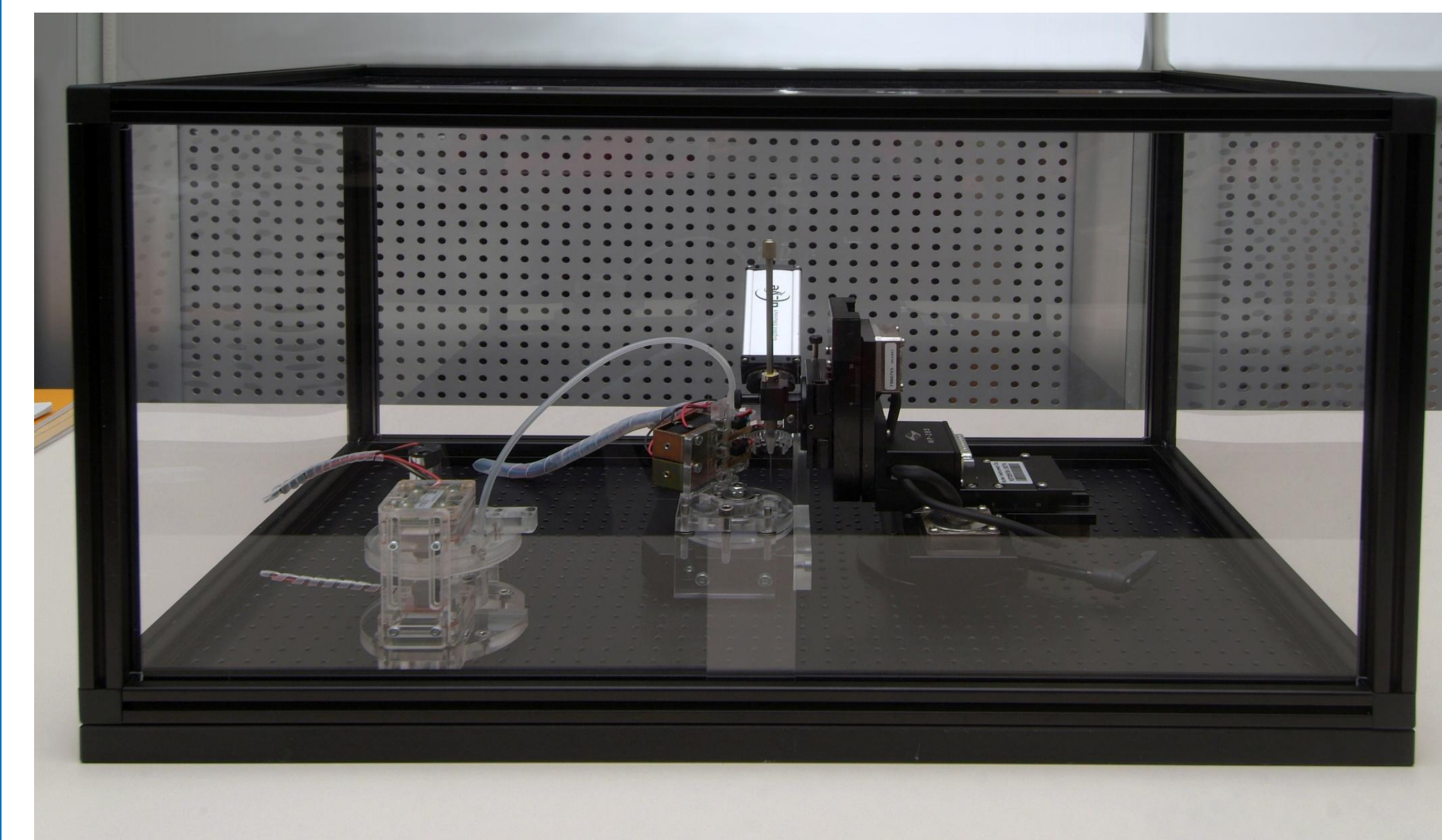
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## Concept



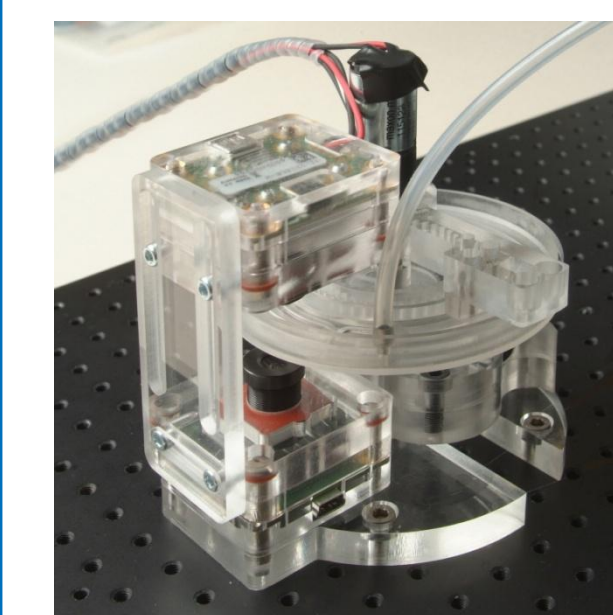
Microinjection is still the most effective transfection method in terms of cell damage and cell viability. However, it suffers from a small throughput and large variations in success rates due to poor reproducibility. Furthermore, sorting, placing and collecting are still tedious manual procedures performed by highly skilled personnel. To overcome these drawbacks, the special cell sorter and novel immobilization system, presented here, will enable to minimize manual interaction to simply providing a suspension of cells and a loaded microinjection needle. The system then automatically performs the sorting and individualization of cells, microinjection, and collection of microinjected cells in a separated container for subsequent processing. Currently, sorting, immobilizing and releasing is performed within 6 seconds. In the next step, the injection system will be integrated and the cycle time be reduced to 4 seconds.

## Fully Automated Microinjection System



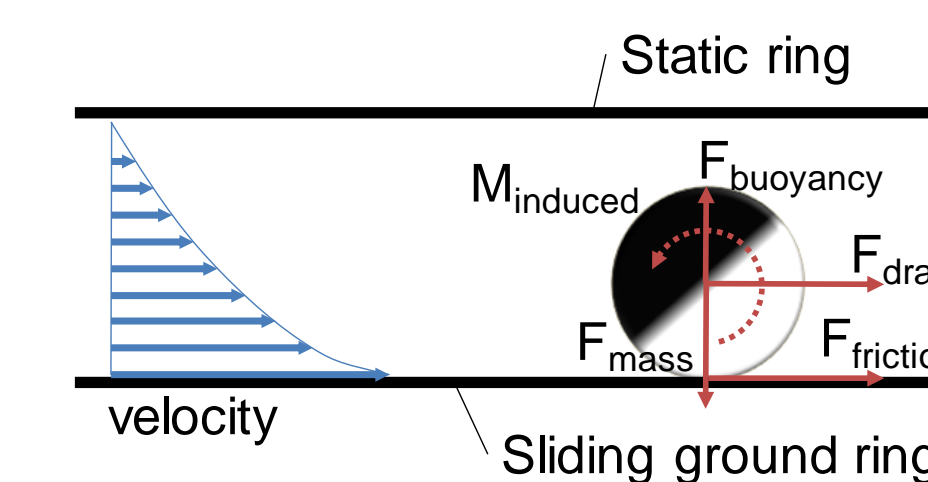
- User friendly
  - add cell suspension
  - add preloaded injection needle
  - start injection
  - Remove collected cell
- Higher throughput
  - Manual injection >300s/cell
  - Automated system <4s/cell
- Higher success rate
  - No user dependence

## Sorting, Singularization

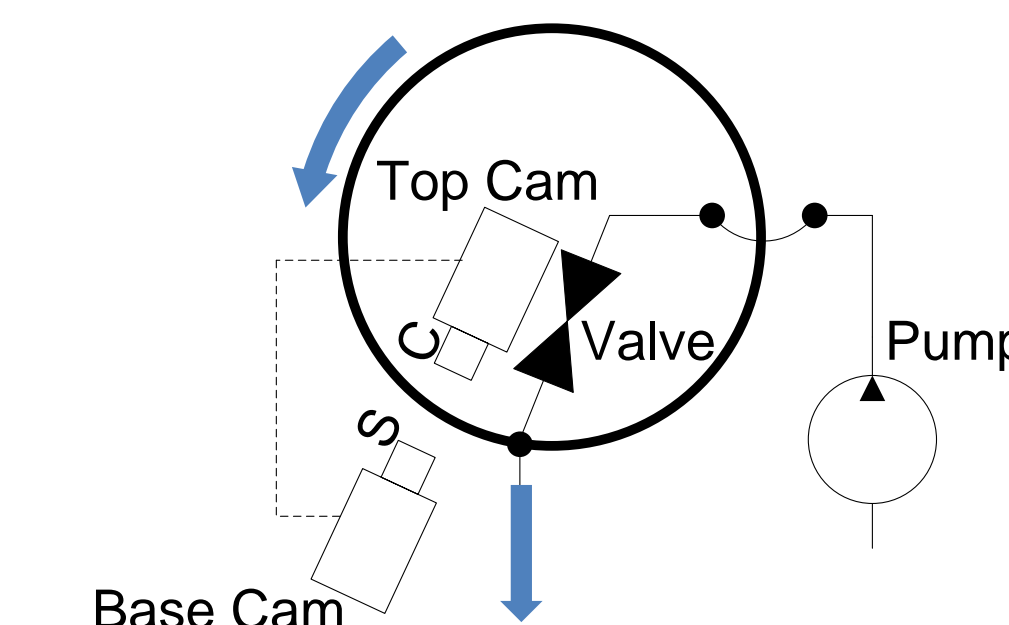


Flow cytometer for unlabeled large cells and particles

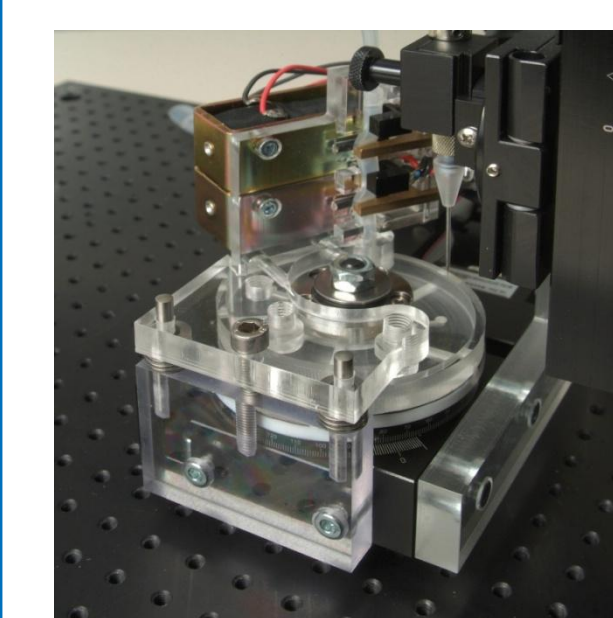
- No cell adhesion
- Continuous motion



- Delivery on demand
- Quality control
  - Vision system checking
    - size
    - shape
    - contrast
    - defects



## Immobilization, Injection, Release, Collection



Automated microinjection system

- Quality control
  - Vision system does
    - needle localization
    - oocyte localization
    - guiding the manipulator
    - controlling injection's success

- High throughput
  - Parallel tasks possible due to carousel system
    - immobilization
    - injection
    - release

