

# 振動誘起流れによる卵子の搬送と機械的特徴量計測



NAGOYA UNIVERSITY

○学 中原 康正 佐久間 臣耶 正 早川 健正 新井史人

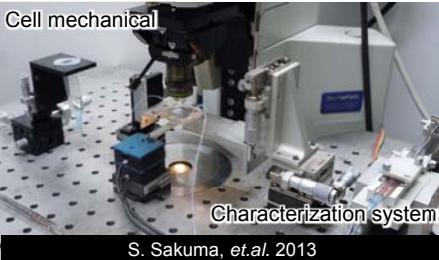
名古屋大学大学院工学研究科マイクロ・ナノシステム工学専攻



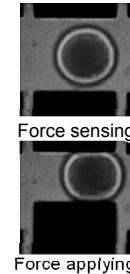
## ポンプを使わないマイクロ流体チップの在り方

### On-chip mechanical characterization

#### Robot-integrated microfluidic chip

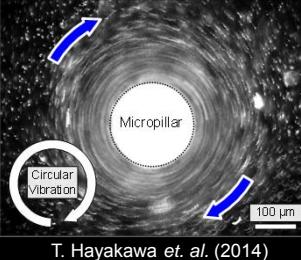


S. Sakuma, et.al. 2013

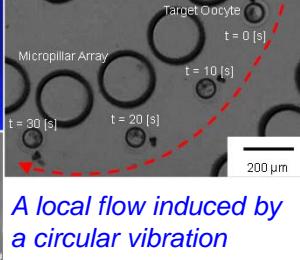


### Pump-free transportation

#### Vibration-induced flow



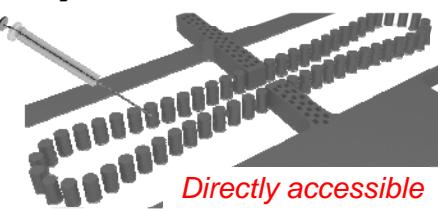
T. Hayakawa, et al. (2014)



A local flow induced by a circular vibration

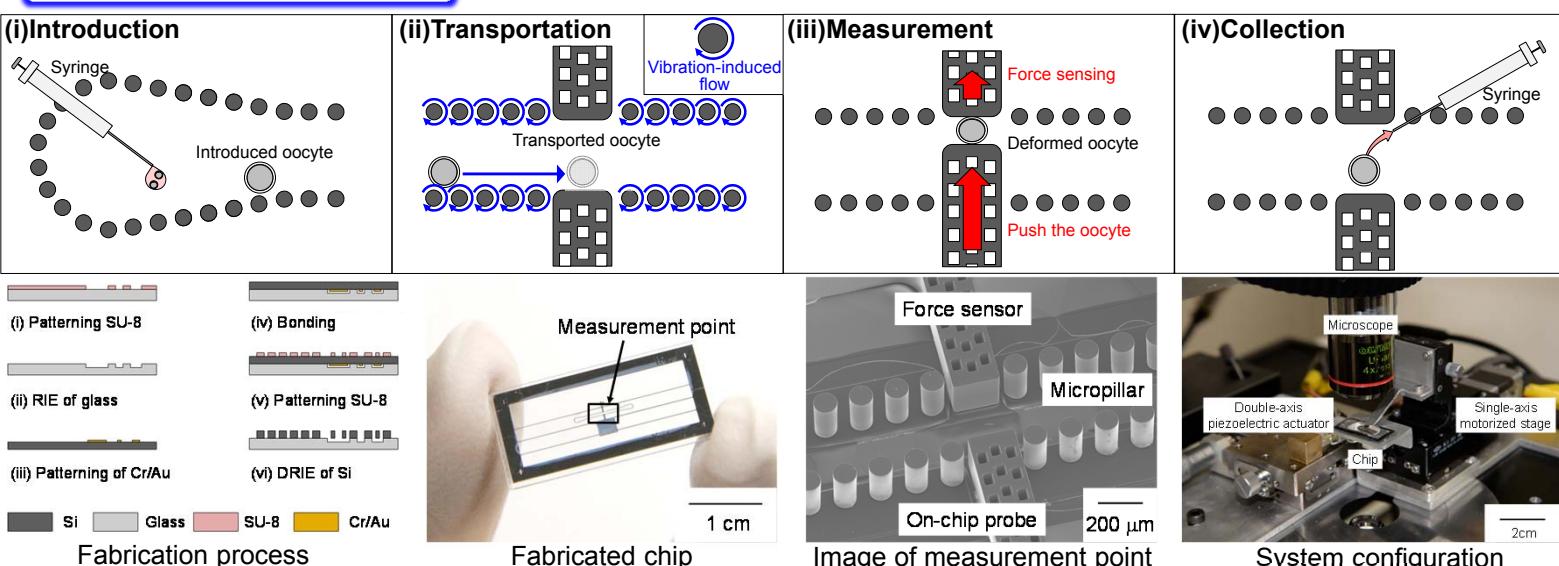
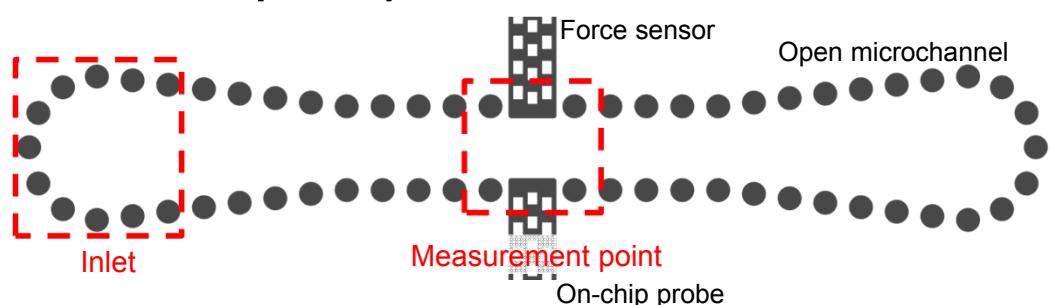
### Transportation and measurement in an open environment

#### Oocyte mechanical characterization with open-chip



Directly accessible

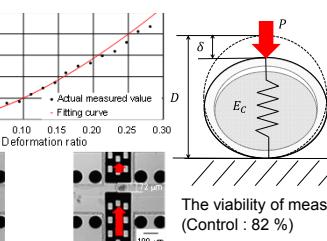
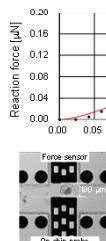
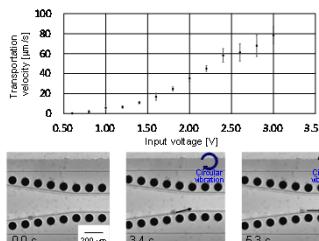
- Bubble-free measurement
- Easy to introduce/collect



### Experiment

### Conclusion

#### Transportation velocity Mechanical characterization



$$P = \frac{4(D/2)^{1/2}}{3} \cdot \frac{E_C}{1-\nu^2} (\delta/2)^{3/2}$$

Definitions:  
 $E_C$ : Young's modulus of oocyte  
 $\nu$ : Poisson's ratio of oocyte  
 $P$ : Applied force  
 $D$ : Original diameter of oocyte  
 $\delta$ : Deformation amount of oocyte  
 $E_C = 203.2 \text{ Pa}$   
 Mouse oocyte after 1 hour thawed

The viability of measured oocytes: 78 % (N=9)  
 (Control : 82 %)

Contact person: Kou Nakahara  
 E-mail: nakahara@biorobotics.mech.nagoya-u.ac.jp,  
 URL: http://www.biorobotics.mech.nagoya-u.ac.jp/  
 TEL: 052-789-5026, FAX : 052-789-5027

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### Reference

Nakahara K, Sakuma S, Hayakawa T, and Arai F. "On-chip transportation and measurement of mechanical characteristics of oocytes in an open environment" Micromachines 6.6 (2015): 648-659

