Bio-inspired Micro/Nano Fluidic Systems

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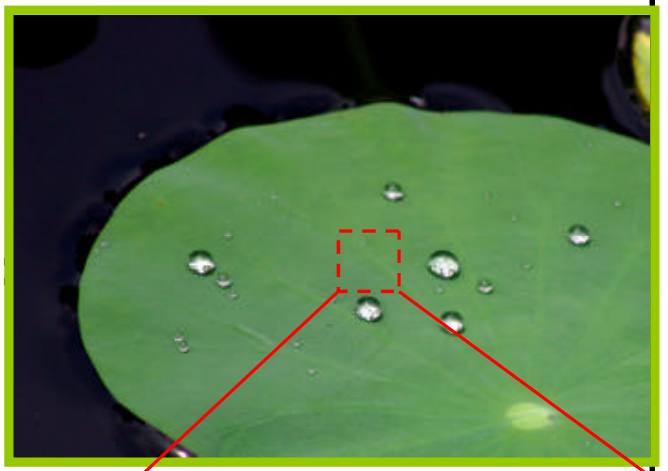
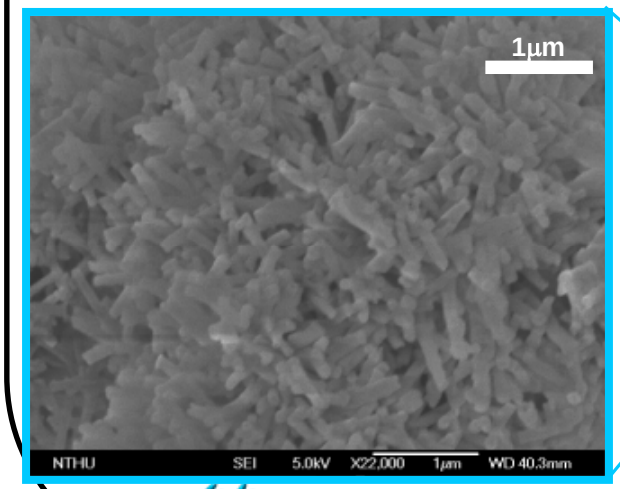
4.16.2009

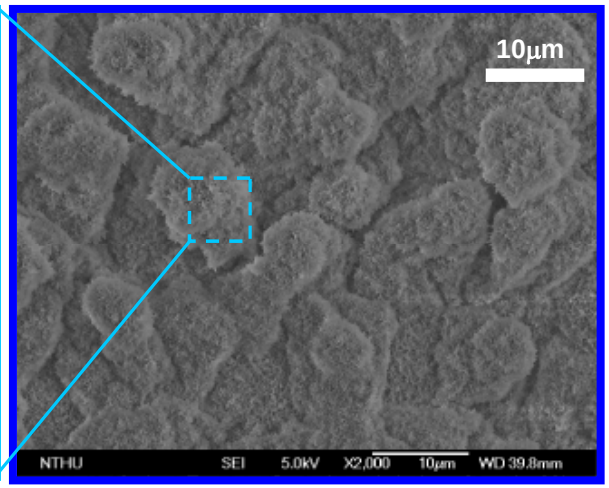
Micro Fluidic Surface

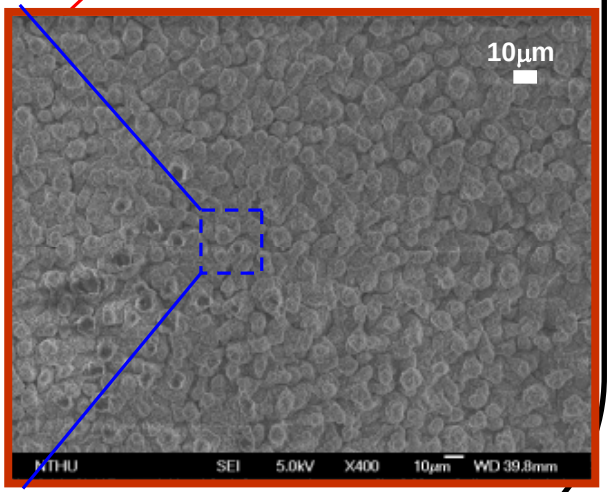
Lotus Leaf Surface

- **Lotus effect: means "self-cleaning"**
  1. superhydrohobic surface (CA>150^{o} & θ_{hys}<10^{o})
  2. with μm / nm composite stucture
  2. prevent slush stiction and droplet stay on
- **Our purpose to prepare a lotus-like surface**
  1. reduce the hysteresis in droplet manipulation
  2. prevent biomolecule stiction on LOC's surface

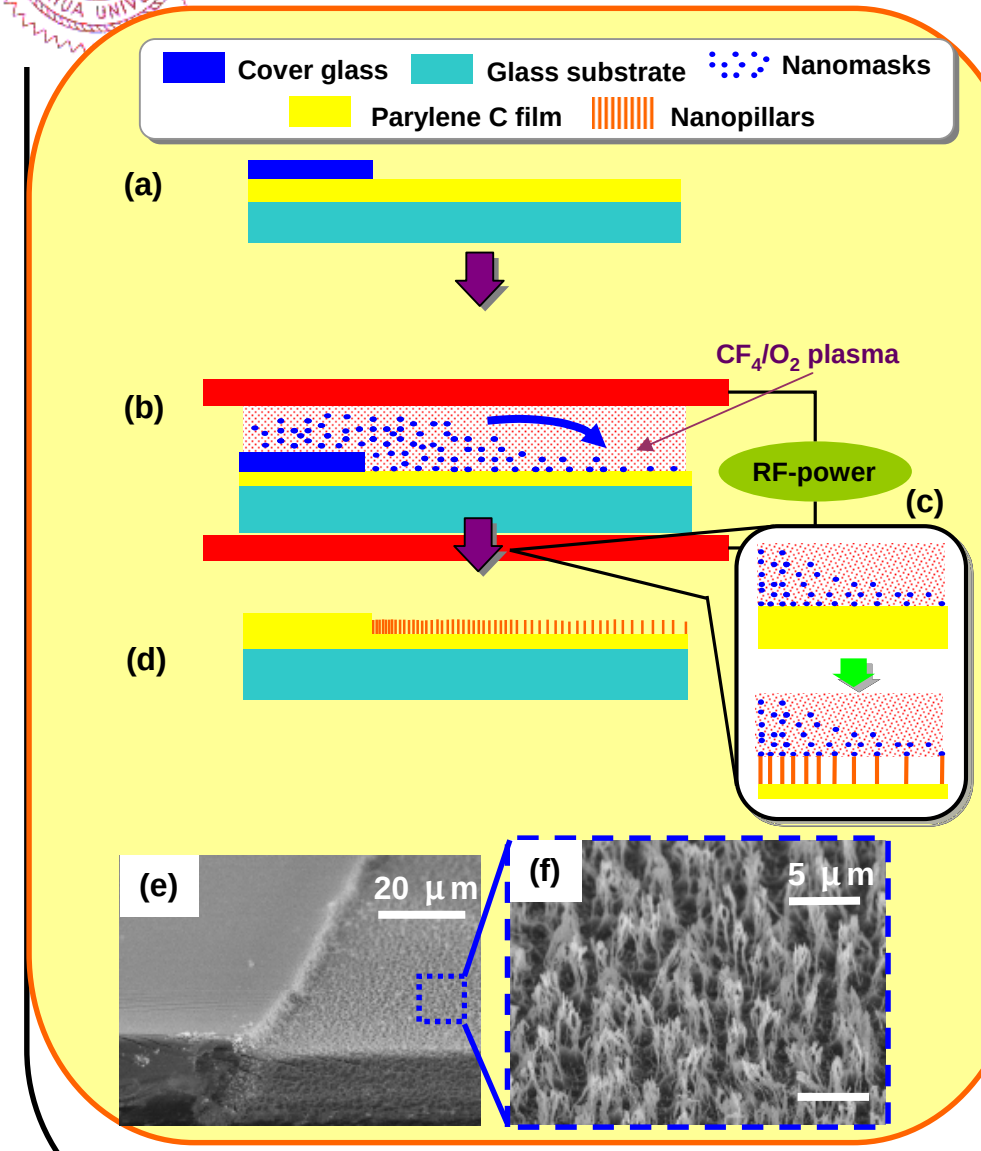






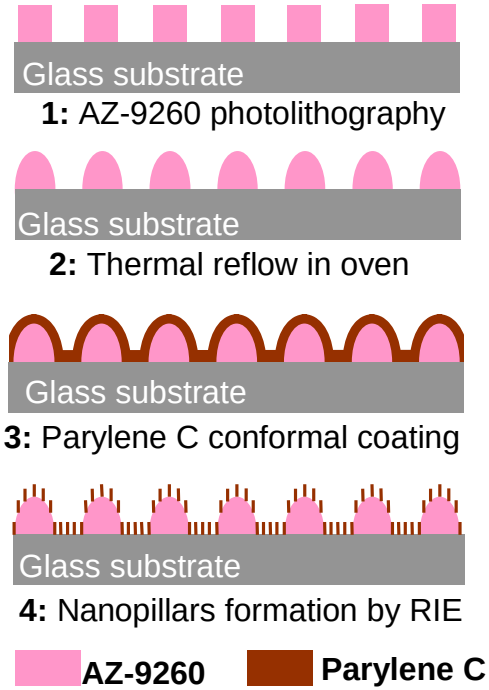


"Artificial" Lotus Leaf

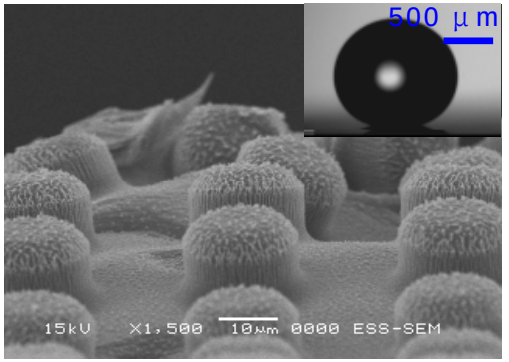


[M.-H. Chen et al., Nanotechnology 19, 2008]

(a)

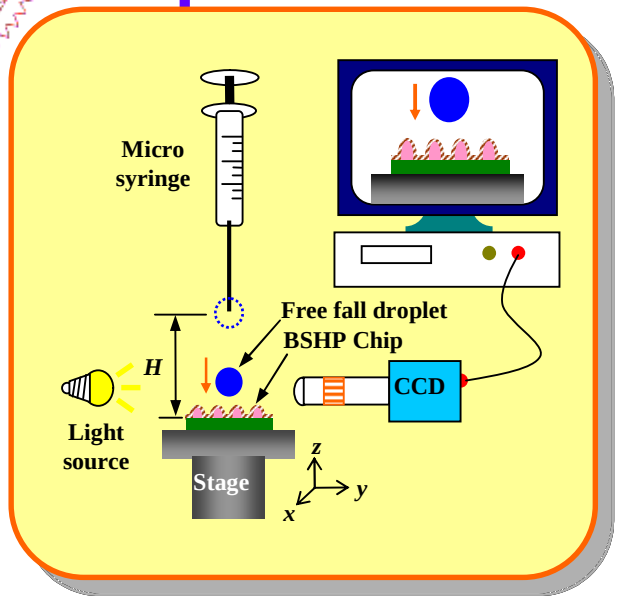


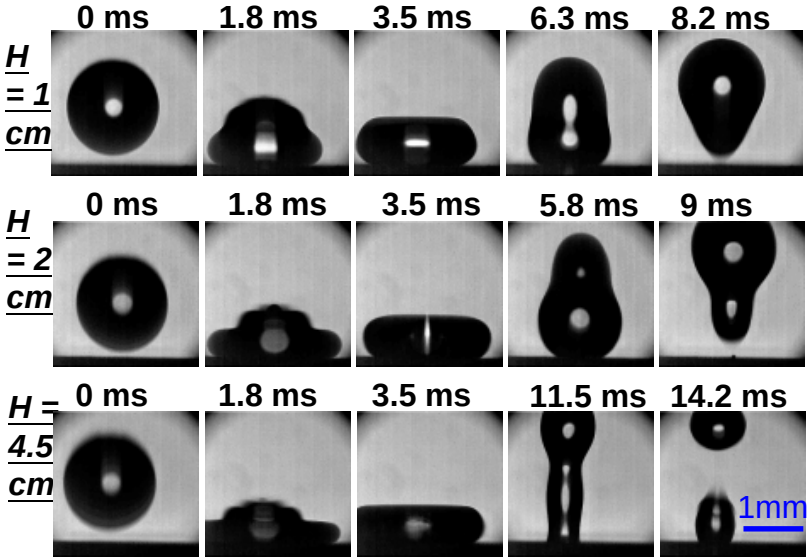
(b)



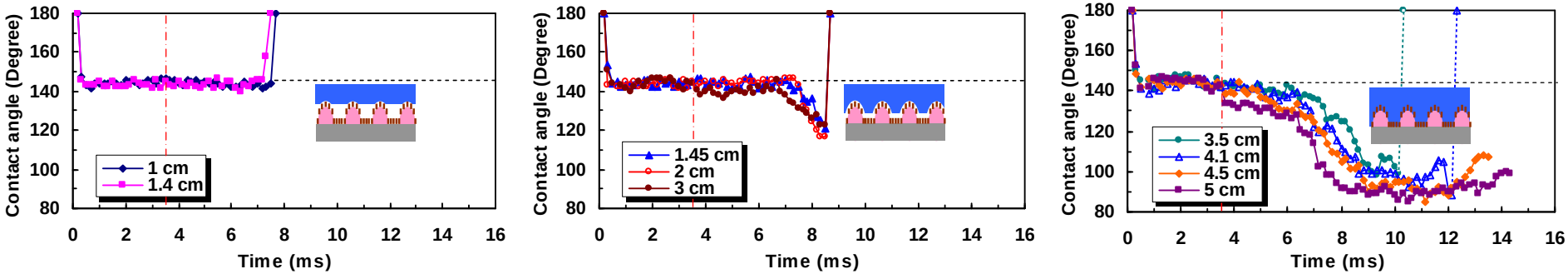
[M.-H. Chen et al., IEEE MEMS'09 conference]

Droplet bouncing on "Artificial" Lotus Leaf





Non-wetting | **Micro-wetting** | **Fully-wetting**



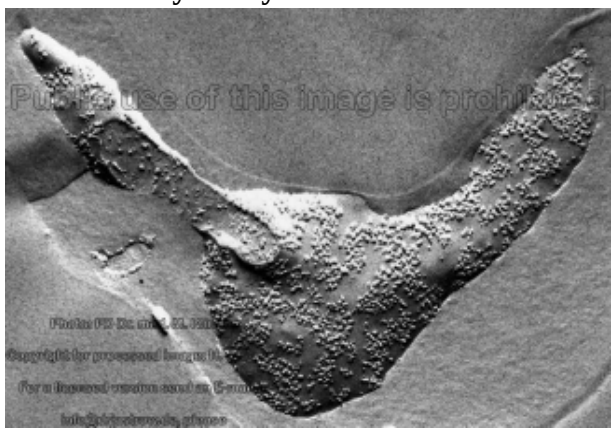
High contact angle (~160o) and low hysteresis (~2.7)

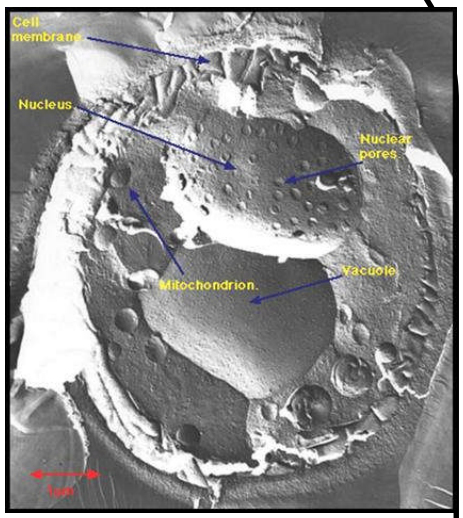
[M.-H. Chen et al., IEEE MEMS'09 conference]

Nano Reaction Chamber

Native Cell Membrane

Freeze fracture image of a human erythrocyte membrane

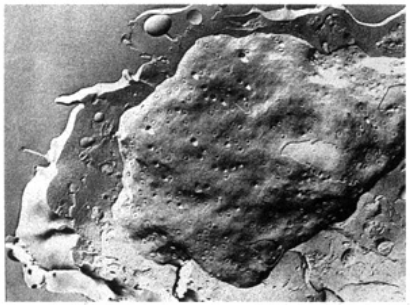




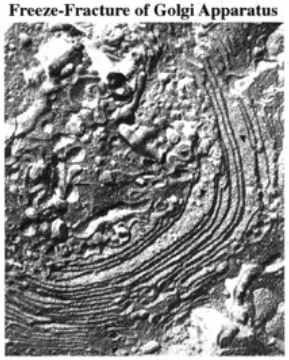
Freeze-Fracture Views of Organelles

Low temperature fracturing appears to preferentially expose extended en face views of membraneous organelles which are thus easily identified. Both face views and cross fractures of the nucleus golgi and mitochondria yield relatively unmistakable images.

Freeze-Fracture of Entire Cell Exhbiting Nucleus and Nuclear Pores

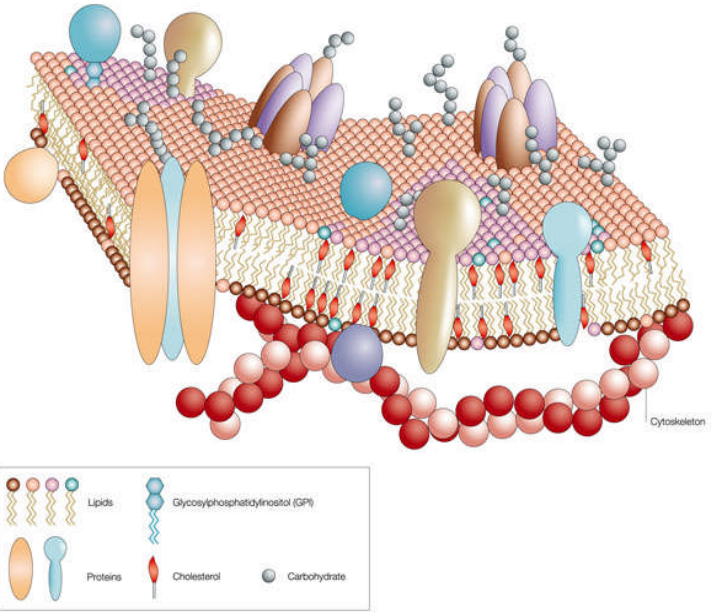


Freeze-Fracture of Golgi Apparatus



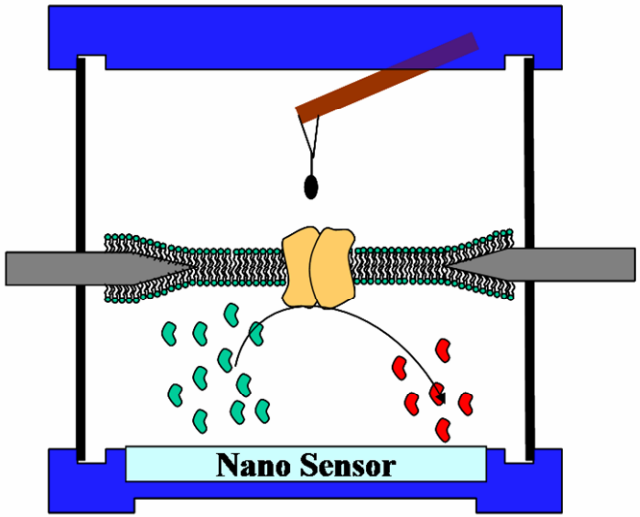
Cross-Fracture of Mitochondria

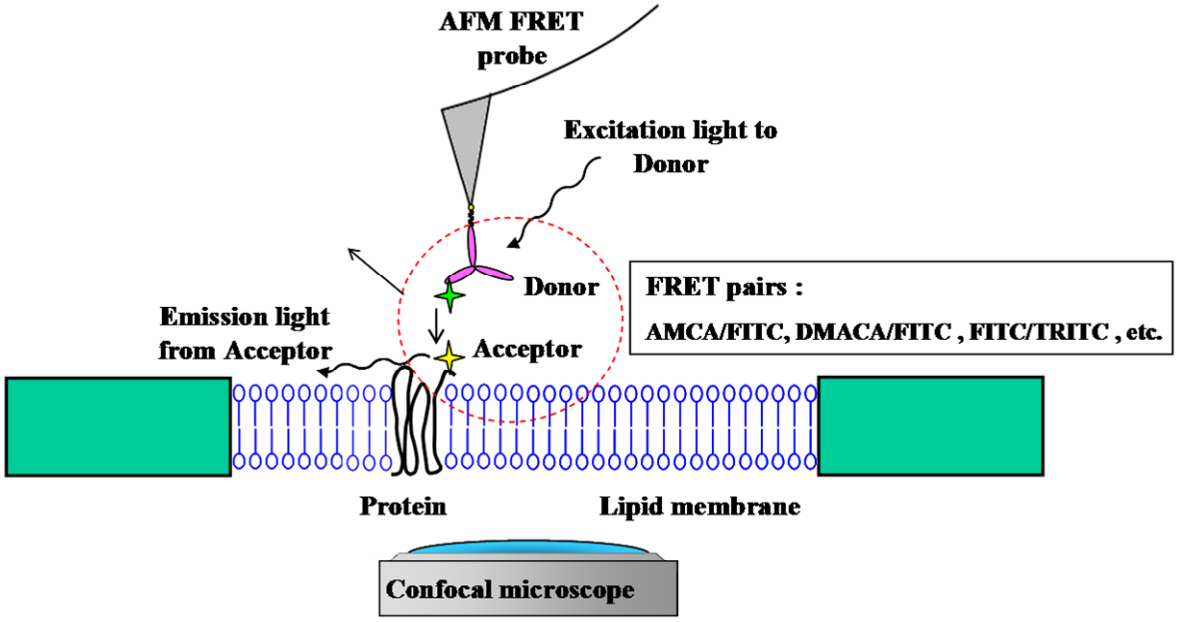
The Fluid-Mosaic-Model of the cell membrane



(http://www.udel.edu/biology/Wags/b617/ffe/ffe5.gif)

Artificial Cell Membrane and Reaction Chamber





FRET probe量測系統

Acknowledgements

- **The works were/are supported by National Science Council, Taiwan, through:**

1. National Nanotechnology Project Program, NSC, Taiwan
2. Biomedical and Pharmaceutical National Project Program, NSC, Taiwan
3. NSC Multi-discipline Research Program, Taiwan

- **Collaborators:**

Prof. R. L. Pan (潘榮隆), Life Science Dept., NTHU, Taiwan
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Prof. C. C. Fu (傅建中), NEMS Institute, NTHU, Taiwan

Thanks for Attention!!

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1. Nano/Micro fabrication Lab
2. Bio Nanophotonics Lab
3. Nano/Micro Fluidics Lab
4. Cell/Biochemistry Lab
5. AFM Lab
6. CFD/MD Simulation Lab