

# Optimal design for MEMS based on multi-physics-based parallel CAE

## Collaboration Partners

Korea ▪ Korea Adv. Inst. of Sci. & Tech.(KAIST), Prof. Byung Man Kwak

Korea ▪ Samsung Adv. Inst. of Tech.(SAIT), Dr. Byeong C. Koh

Korea ▪ Korea Inst. of Sci. & Tech.(KIST), Dr. Hyoung Gon Kim

## AIST side

RICS: Akira Tezuka

Takeshi Suzuki

Osamu Okuda

Akira Sasamoto

Yoshihiro Nishimura

IMSE: Koichi Ozaki

Sohei Matsumoto

Introduction of **RICS**, **AIST** (<http://unit.aist.go.jp/rics/index-e.html>)

**RISC**=Research Institute of Computational Science

**AIST**=National Institute of Advanced Industrial Science & Technology

23 researchers, 5 groups (MD\*4+FEM)



# ■ Parallel computers at AIST ■

## Tsukuba Advanced Computing Center (TACC)

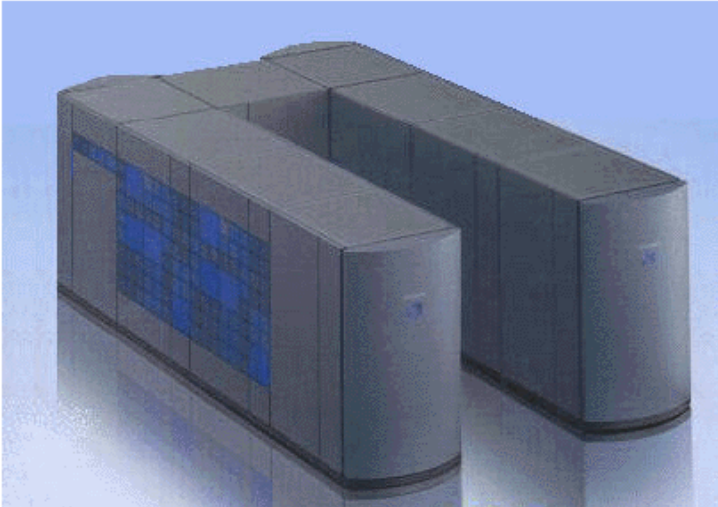
### 1. Hitachi SR8000 with 64 nodes

Half model of U of Tokyo's

8G FLOPS/node at peak

Memory 8GM/node

Disk 1898GB



### 2. IBM RS/6000-SP with 128 nodes

200Mhz Power3 processor x 2 /node

1.6G FLOPS/node at peak

Memory 2GM/node

Disk 800GB



## ■ A.Tezuka's Korean network ■

### 1. University of Michigan related network

MS of Mech. Eng. at University of Michigan (1987.9–1989.3)

More than 75% of graduate students are Korean

Many Korean Ph.D holders at Computational Mechanics Lab.

I met directly Korean people/culture there at that time.



Engineering campus, U of M

## 2. KAIST related network

Collaboration on finite element analysis, optimal design, etc

1996. 2: Grad. student stayed for 2 months in “Winter Institute”

1996.11: A.Tezuka was invited at KAIST to provide a seminar

1997. 7: Prof. Kwak (KAIST) was invited at AIST

1998. 1: KAIST RA stayed for 1 year on metal forming CAE

1998.10: International project has been proposed with KAIST

2000. 7: KAIST RA was invited for 2 weeks on optimal design

2001. 3: A.Tezuka was invited at KAIST to provide a seminar

2001. 5: Two KAIST RA stayed for 2/3 months on h-adaptatin, etc

2001.10: A.Tezuka was invited at KAIST to provide a seminar

2001.11: A.Tezuka presented at Korea–Japan Science Forum

(「Physics based new media by massively parallel computations」)

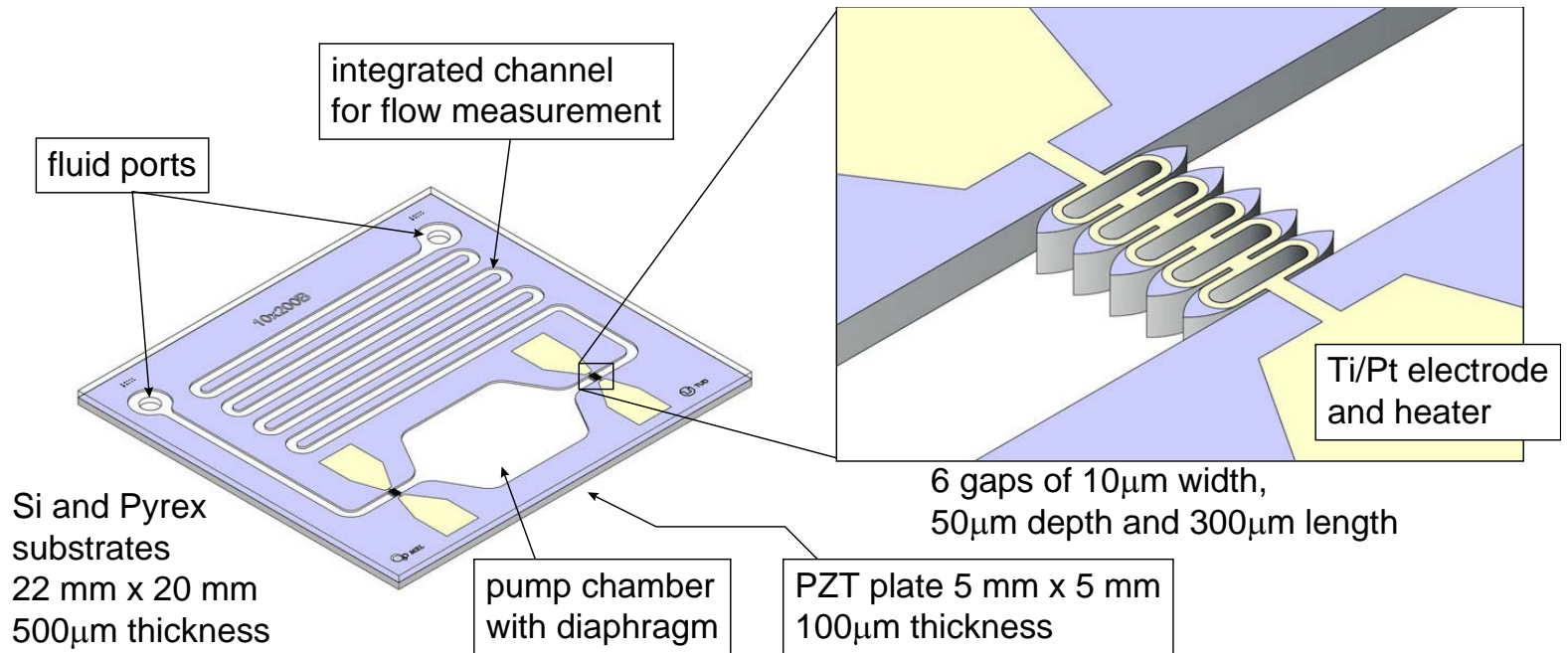
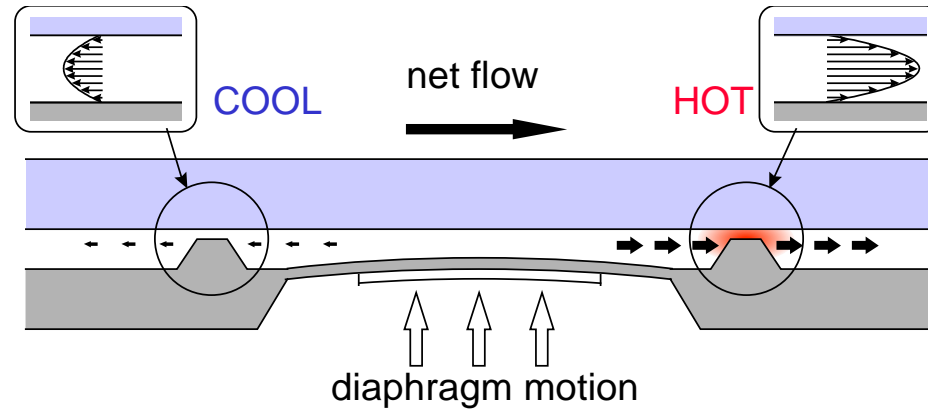
2002.01:KAIST RA stayed for 3 months on X-FEM for optimal design

2002.02:KAIST PD stayed for 3 months on optimal design for micro-pump

2002.03: Prof. Kwak (KAIST) was invited at AIST

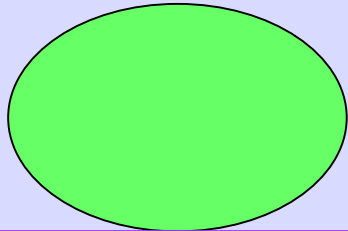


# Micro Pump



# International collaborations

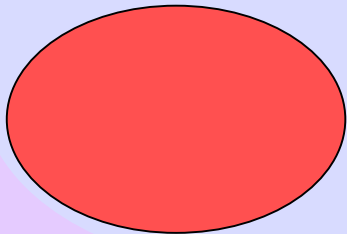
RICS & IMSE, AIST



Large-scale parallel computation  
Fluid-structure coupled FEM  
Evaluation on hardware

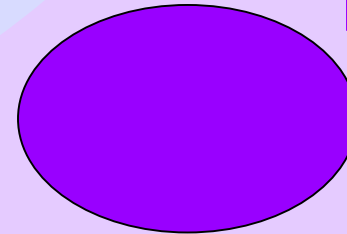
KAIST

Japan-Korea Science & Technology Agreement



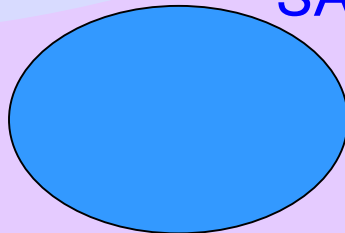
Optimal design  
Real problem application

KIST



VR based  
design tool

SAIT



MEMS hardware

Korea-Japan Science Forum(2001)