The University of Sydney

COLLABORATION IN RESEARCH – MY WAY!

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Dean of Graduate Studies

The University of Sydney

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Why Australia ?

- **Safe Destination**
- **Value for money**
- **English is the national language**
- **Ideal study environment**
- **Friendly, warm people**
- **Beautiful beaches, unique landscapes**
- **Native flora and fauna**
- **Cultural diversity**

Facts and figures on Australian universities

- Number of Public universities 37
- Number of private universities 3

- Total number of students 940,000
- Total number of overseas students 220,000

- Total staff numbers 89,000

Research training in Australia

- Honours (1 year after 3 years UG)
- Research Masters (~1.5-2 yrs)
- PhD (~3-4 yrs)
  - Emphasis on advancement of knowledge & research training
  - Usually research only (no or very little coursework)
  - Thesis is examined independently by international experts

Research training in Australia

- No tuition for Australian citizens & residents
- Total government funding for domestic research students (Research Training Scheme – RTS) is about 50 billion Yen per annum
  - RTS is allocated to universities: %50 completions of research students, %40 research income & %10 publications
- International research students pay tuition (about 2-3 million Yen per annum)

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Australia's First University

A view over the Main Campus

The Quadrangle

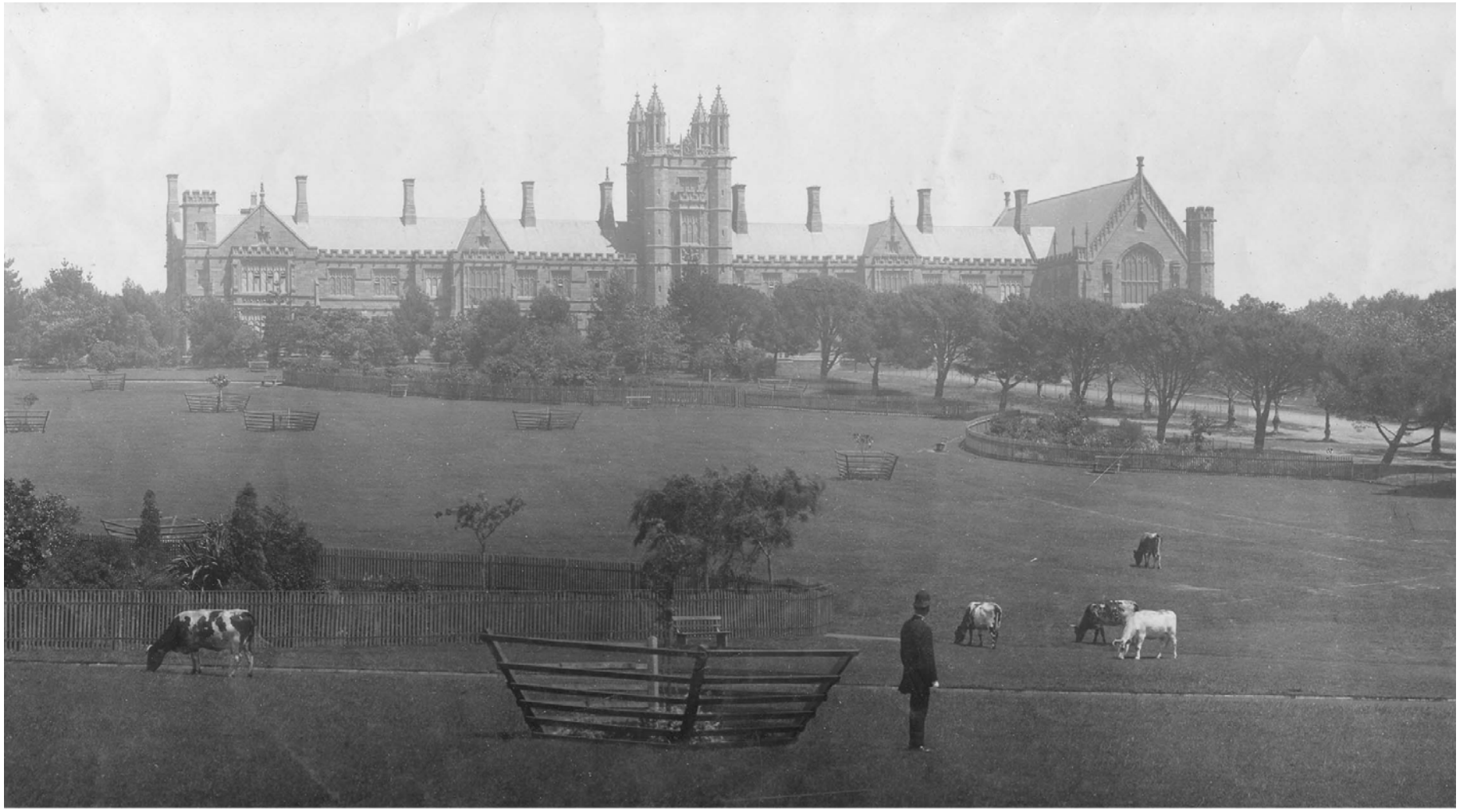
Sydney University profile

- **Australia's First University established in 1850 - (155 years)**
- **First choice university for Australian students**
- **Australia's widest range of courses**
- **Largest University library system in the Southern hemisphere**
- **Vibrant student life**
- **Member of the Group of Eight (Australia's major research intensive universities)**

Some Statistics – Sydney Univ.

- Over 45,000 students
- ~ 9,000 international students
- ~ 3,500 research students
- ~ 11,000 postgraduate coursework students

Way back then - Sydney University circa 1878



The first PhD student

at

The University of Sydney

was

Dr Eleanor Gyarfas

1951

More than 10,000 PhD graduates

University of Sydney Faculties

- **Agriculture**
- **Architecture**
- **Arts and Humanities**
- **Dentistry**
- **Economics and Business**
- **Education & Social Work**
- **Engineering**
- **Health Sciences**
- **Law**
- **Music**
- **Nursing**
- **Pharmacy**
- **Medicine**
- **Science**
- **Veterinary Science**
- **Visual Arts**

Research funding in 2006

The University of Sydney - 15%

The Australian National University - 12%

The University of Melbourne - 8%

The University of Queensland - 11%

The University of New South Wales - 9%

Monash University - 8%

The University of Western Australia - 5%

University of Adelaide - 4%

All other universities - 33%

Collaboration – NOT to do list?

- CAN NOT:
  - Force people (staff & students)
  - Be short sighted – good things take time!
  - Be willing to only receive (or send) students & staff
  - Be inflexible (culturally & scientifically)
  - Stereotype

Collaboration – NOT enough list?

- NOT ENOUGH TO HAVE:
  - Memorandum of Understanding (MOU)
  - High level senior management exchanges
  - Undergraduate student exchanges
  - Good management of programs & exchanges

Collaboration – to do list?

- We need good innovative projects
- Grass root contacts & collaboration
- Respect for and understanding of cultures
- Flexibility in project development and direction
- Support for PG students
- The value proposition is not only in research finding but networking and friendship
- Develop joint degrees (cotutelle)

Funding for collaboration

- JSPS
- Australian Research Council
- Various research grants
- University internal funding
- COE
- Cotutelle
  - This is a joint PhD (between two universities), therefore its completion counts for RTS funding

Cotutelle at Sydney University

- The prime intent of such agreements is that they form part of an ongoing or developing cooperative research collaboration between a department or research group in the University and one elsewhere.
- A cotutelle agreement must be drawn up between the two participating institutions in respect of each candidate, detailing the particular arrangements pertaining to that particular candidature. The agreement lists the two supervisors who are to undertake the joint supervision.
- The candidature is to be divided between the two countries and a minimum of 30% in each country.

Overview of Projects for Collaboration

Research Areas

- Key Thermo-Fluids Research Areas
  - Combustion (experimental and numerical work, turbulent premixed, spray, emissions)

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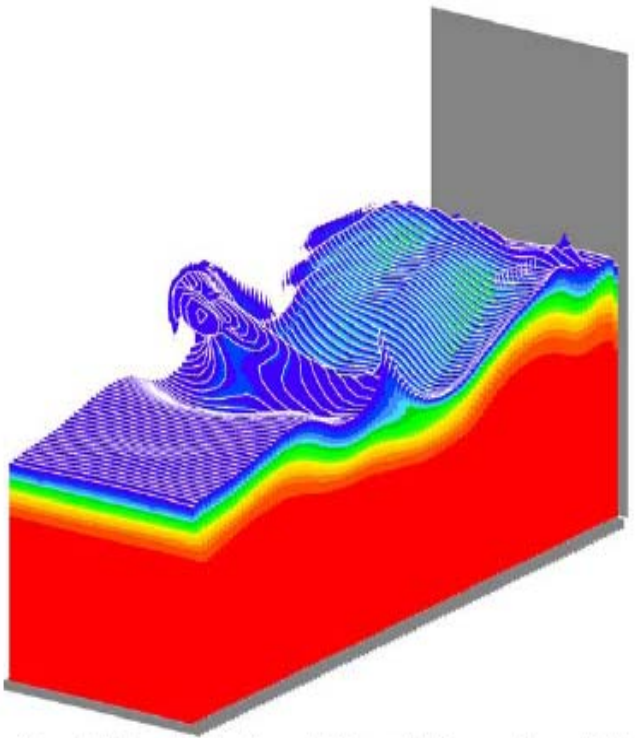

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- Key Thermo-Fluids Research Areas
  - Combustion (experimental and numerical work, turbulent premixed, spray, emissions)
  - Fluid Dynamics (Natural convection, environmental flows, turbulence modeling..)
  - Aerospace Engineering (stability, control, DSMC, Evolutionary Optimisation)

Overview of Projects for Collaboration

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- Key Thermo-Fluids Research Areas
  - Combustion (experimental and numerical work, turbulent premixed, spray, emissions
  - Fluid Dynamics (Natural convection, environmental flows, turbulence modeling …)
  - Aerospace Engineering (stability, control, DSMC, Evolutionary Optimisation)
- Other Research Groups
  - Materials and Rheology, Biomedical
  - Mechatronics and autonomous vehicles
  - Manufacturing and vehicle design …

Overview of My Projects for Collaboration

- Major Themes – Convection & Radiation Heat Transfer Studies
  - Fundamental
  - Applications

-Natural convection
-Combined convection-radiation
-Cooling towers
-Cooling of electronics
-Laputa project
-Dynamic LES simulation

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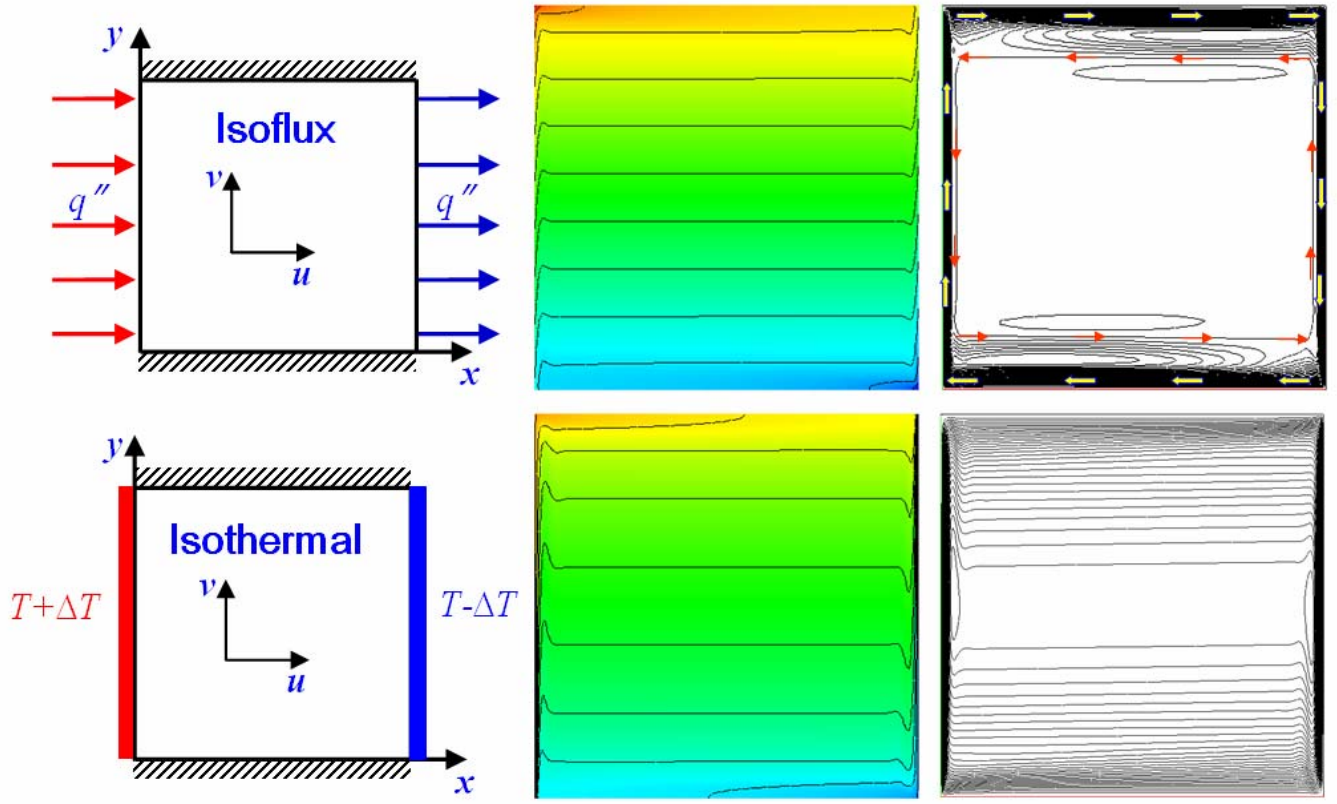
Natural Convection Flow in Isoflux Heated Cavity

- Investigate the flow behavior, the scaling results, stability characteristics and compare to those of the isothermal cavity.



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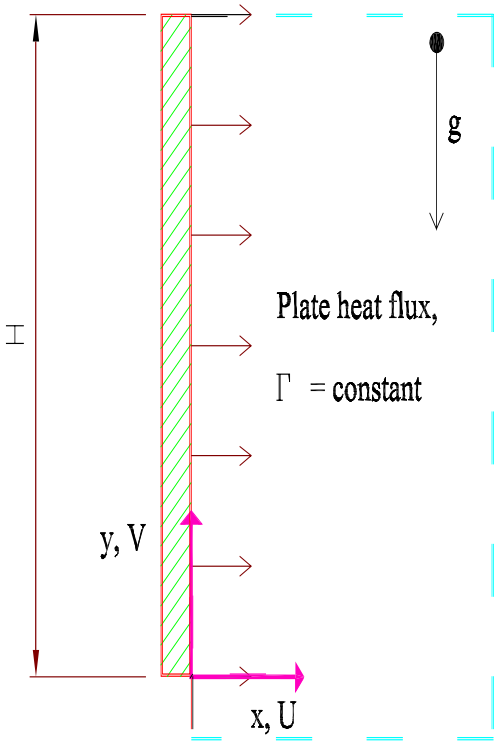
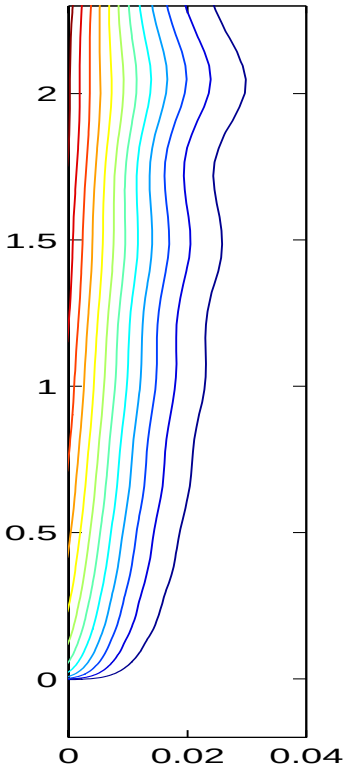
Boundary Layer Stability Analysis of Natural Convection on a Vertical Plate Using DNS



Flow Schematics



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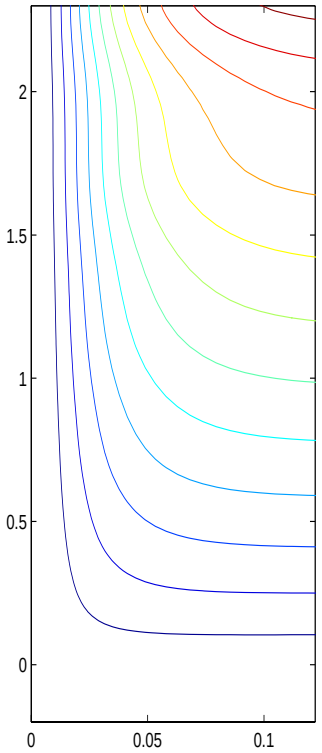

Streamlines

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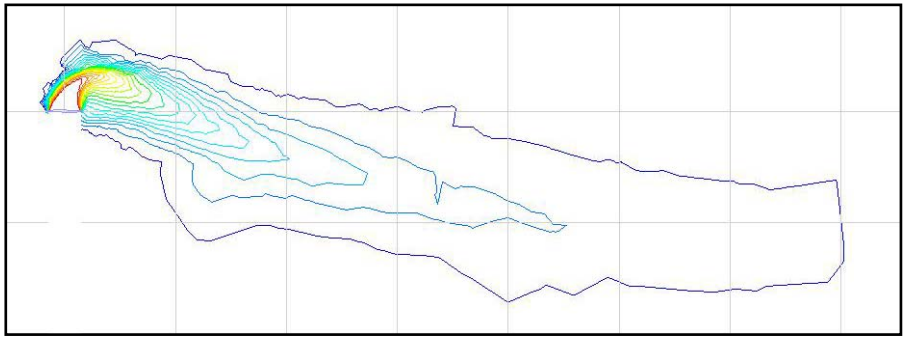
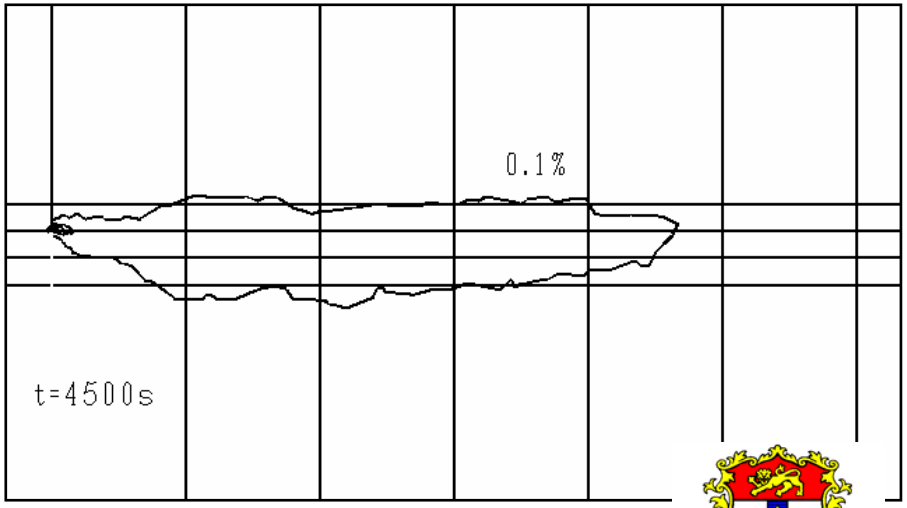
Nutrient transport from an artificial upwelling of deep ocean water (the Laputa Project)

- Negatively buoyant plume in stratified environment under cross-flow conditions
- Cross flow is very strong compared to the upwelling
- Negatively buoyant plume in stratified environment under cross-flow conditions
- Rapid Diffusion of Heat and momentum



Nutrient contours 10m from pipe outlet
(2% of initial concentration)



Nutrient contours 50m from
(0.1% initial concentration)

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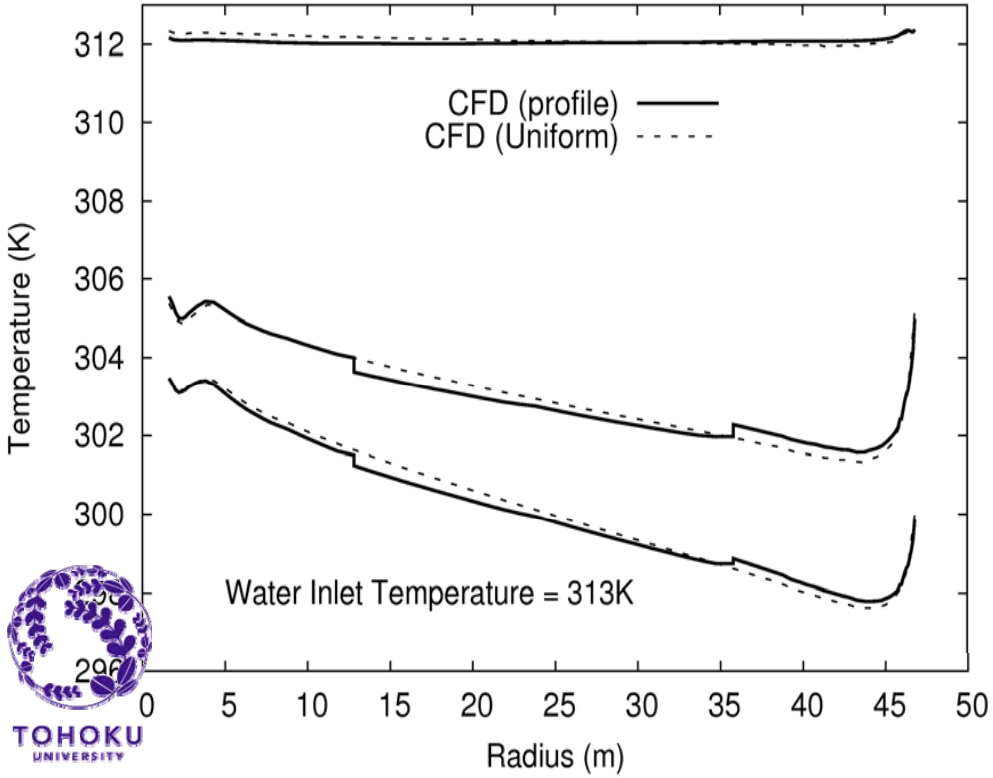
Optimisation of A Natural Draft Wet Cooling Tower

- Large Horizontal Gradient of Heat Transfer
- Annular Profile of Air flow and Water temperature
- Optimise fill depth and water distribution to achieve higher overall cooling



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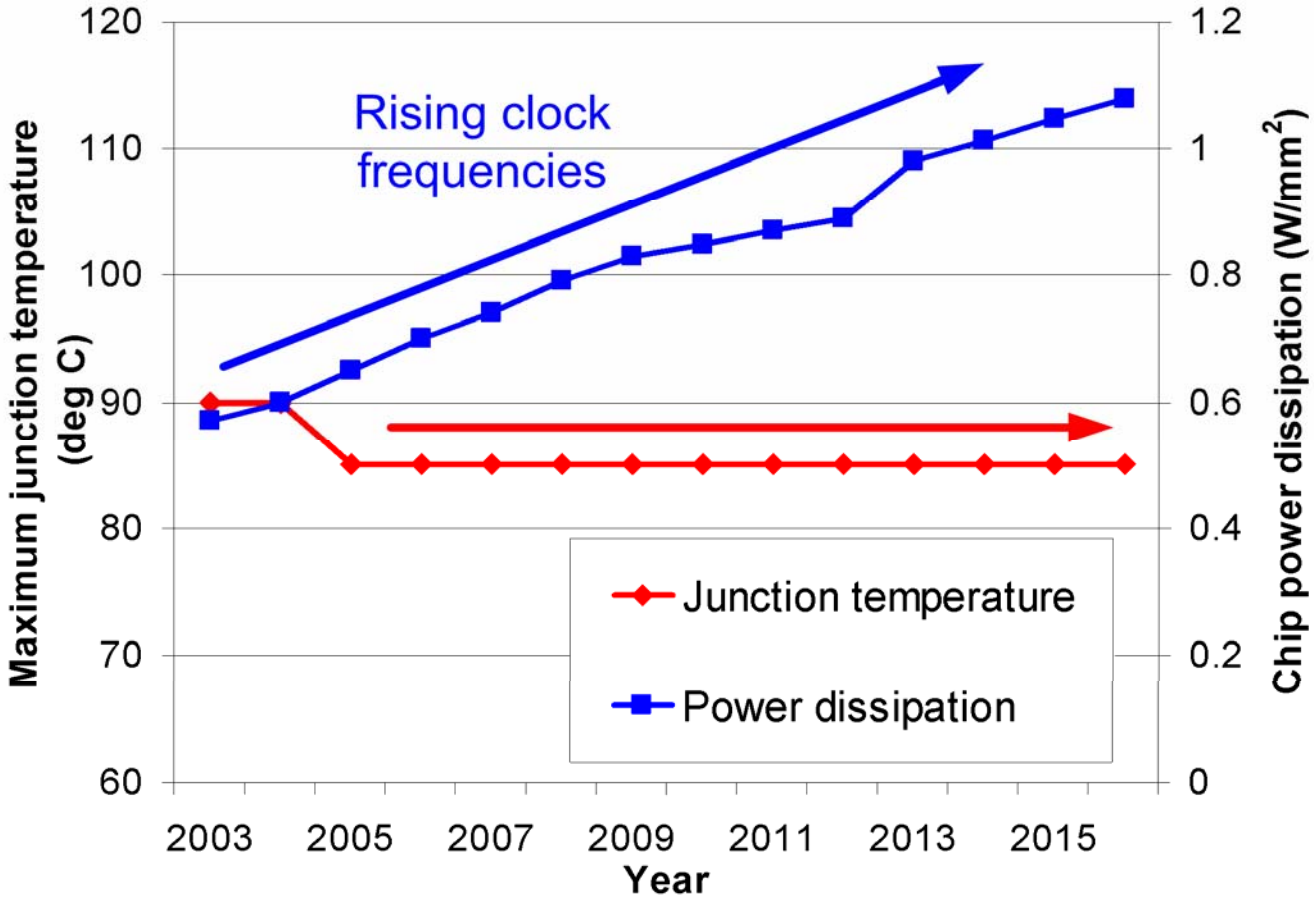
Cooling of Electronic Components



Advanced cooling methods required for low cost consumer applications

Chip power densities increase

Data shown is for cost-performance sector
[International Technology Roadmap for Semiconductors 2003]

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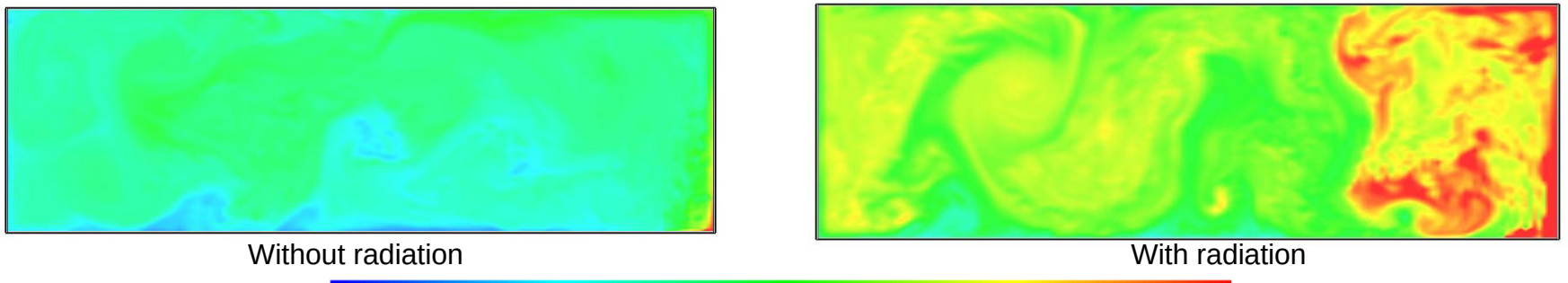
Turbulent Natural Convection and Radiative Heat Transfer



Effect of radiative heat transfer at fire room model

Simulation models

- Radiation element method for radiative heat transfer
- Large eddy simulation for turbulent natural convection

Presentations of the collaborated studies at international conferences

- Eurotherm 78, Computational Thermal Radiation in Participating Media II, Poitier, France, 2006.
- The International Symposium on Turbulence, Heat and Mass Transfer 5, Dubrovnik, Croatia, 2006.

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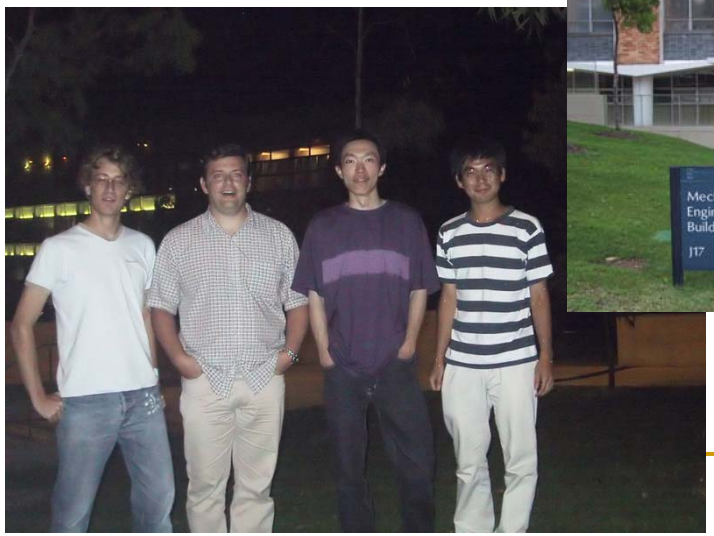
Collaboration - we have all benefited & enjoyed it!



Concluding Remarks

- **Our experience (Maruyama & Behnia) has proven that PhD student exchange is extremely valuable**
- **Benefits future academics/researchers: career development, networking, research approach, etc**
- **Preparation is critical**
- **Follow up is very important**
- **Student's administrative processes need to be efficient and play an important role in making exchange process a success**

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どうもありがとうございました。
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Thank you very much

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