

# **PROPOSAL TO EPSRC**

## **Multi-phase Transport Phenomena in Micro-systems**

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# The Challenges - 1

- Classical thermal & fluid dynamic theories routinely applied at the macro-scale are invalid at the micro-scale
- Increasing capabilities of micro-manufacturing techniques, with enhancement features in channels even at the nano-scale further complicate modelling of these systems
- Thermal demands, typified by computer chips, necessitate multi-phase thermal control methods

# The Challenges - 2

- Flow & heat transfer in multi-channel micro-systems, including reactors, and manifolding problems
- Specific areas include condensation at the micro-scale, flow boiling, and surface tension and interface curvature consideration
- ‘Micro’ covers: 1-3 mm, 1 mm to 50 microns, <50 microns characteristic dimensions

# Potential Applications

- Thermal management of electronics (e.g. computers, telecommunications)
- Thermal management of avionics
- Control of micro-reactors (conventional & biochemical)
- Refrigeration & heat pumping (including CO<sub>2</sub> systems) in automotive & aerospace uses
- Other intensified heat exchangers

# The Interested Parties:

## Academic

- Edinburgh University
- Heriot-Watt
- Newcastle
- Nottingham Trent
- Oxford
- Queen Mary London
- South Bank
- University College London
- Scottish Microelectronics Centre
- Microsystems Technology Lab., RAL

# Potential Industrial Collaborators

- BAE Systems
- Thermacore Europe
- AEA Technology
- Future Energy Solutions
- Sun Microsystems
- Scottish Enterprise
- Honeywell
- Amcor
- Epsilon (F)
- Marconi Applied Technologies
- Avecia
- PIN & HEXAG
- **Others welcome**

# Budget & Next Stage

- Budget £1.5 million + industrial (cash or in kind)
- Submit full proposal to EPSRC  
August/September
- More industry very welcome - contact;
- DAReay@aol.com