Challenges in Thermal-Aware Computer Systems

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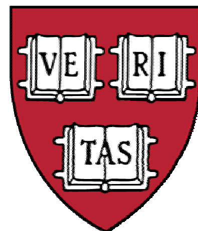
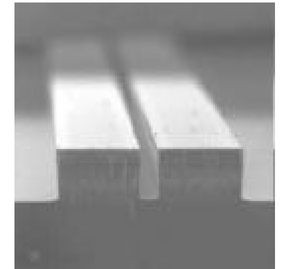


New challenges in Thermal Design

- **New frontiers in cooling technology**
  - **Currently, packaging/cooling technology follows chip designs.**
  - **What if chip designs follow cooling technology?**
- **Challenges:**
  - **Developing models for these future technologies**
  - **Understanding architectural design and floorplanning decisions**
    - **Better models for these as well**

Future Technologies?

- MEMS-based schemes
  - Purdue (Garimella): Microscale ion-driven airflow produced by 5nm electrodes, electrical charge
  - Stanford (Goodson): Si Microchannel heat sinks (via fluid transfer)



- Enerdyne's Polara
  - Thermoelectric "heat pump"
  - Allows directional heat transfer (for hotspots)

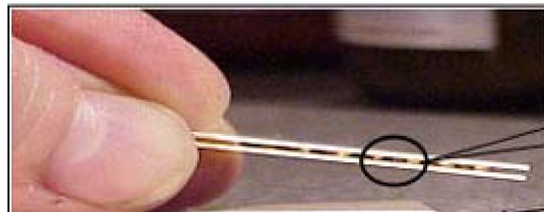


Figure 5