ARM Research

Prof. John Goodacre
University Engagements

Who am I….

- **Professor of Computer Architectures,**
  Advanced Processor Technologies Group, School of Computer Science
  University of Manchester

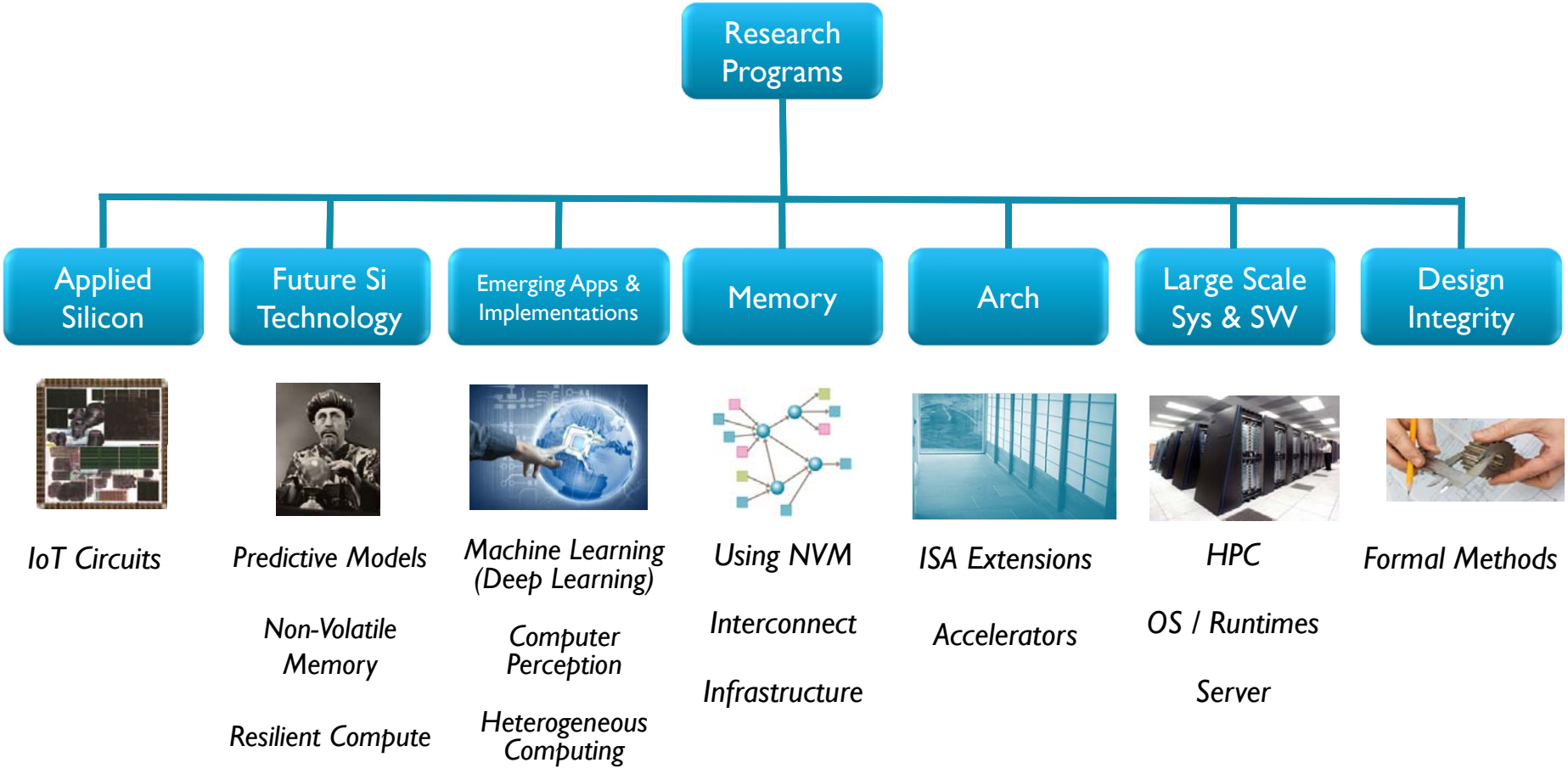
- **Co-Founder and Chief Scientific Officer,**
  KALEAO Limited, Cambridge

- **And for today's talk, I'm…**

- **Director of Technology and Systems, ARM Ltd.**
  External Research Collaborations Group, Cambridge

ARM

Outline Structure of ARM Research Group



ARM

Key ARM Research Office Locations

~100 researchers worldwide

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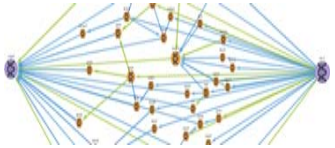
Research Focus Areas #1

Large Scale Sys & SW

High Performance Computing

- Enable the first ARM supercomputer



Data Intensive

- Improving system efficiency for analytics workloads

Design Integrity

Formal Verification

CPU µArch Models

- Verifying implementations against executable specifications

Deadlock Dependency Models

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Research Focus Areas #2

Memory & Interconnect

NVM in the System

Hybrid Memory Cube CONSORTIUM

Going Beyond Evolutionary DRAM

- 3D stacked memories
- Intent-based interfaces

Compute Near Memory

Arch

Next Generation Vector Architecture

Secure and Safety Architectures

Emerging computing architectures

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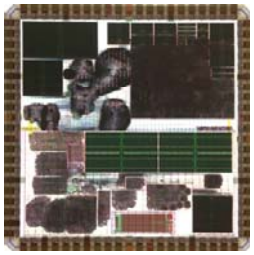
Research Focus Areas #3

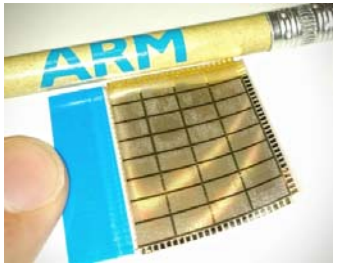
Applied Silicon



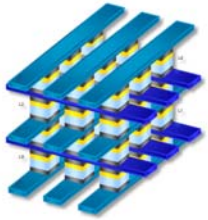
IoT Sensor Nodes
- Energy optimized mixed-signal
- Extreme power gating

Integrating everything
- Voltage regulators
- Energy harvesters
- Sensor interfaces

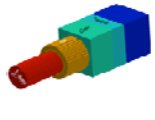
Printed Electronics
- Towards 1cent disposable MCUs

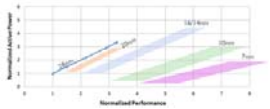


Future Si Technology

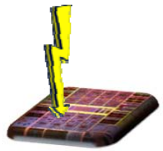


Disruptive technology
- Next Big Thing Memory
- What's after MOS?
- 3DIC technology





Predictive Technology Modeling
- Technology scaling entitlement
- Next node device, patterning, parasitics



Dependable Computing
- Detection, Correction, Security
- Robust power delivery

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Research Focus Areas #4

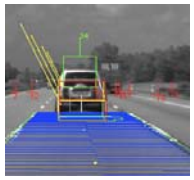
Emerging Applications & Implementations

Machine Learning

- Speech and image recognition
- Neural networks
- Kernel methods

Graphics System Architecture

- Accurate full-system modeling
- System / shared cache arch



Computer Vision

- Emphasis on automotive
- Depth perception, object and motion tracking

Mobile Systems

- Advanced workload analysis
- HW + SW heterogeneous system design
- Future devices

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External Collaboration Strategies

- Joint Collaborations
  - Framework agreements
  - Studentships
  - Internships
  - Non-Exclusive Royalty-Free ("NERF")
  - Driven by existing f2f relationships
- Technology Enablement
  - Product IP
  - Tools donation
  - Support letters on funding requests
  - Open to all requests

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Example Partnerships with UK Universities

Advanced CPU architectures and joint EC H2020 proposals

Heterogeneous architectures project and joint EC H2020 proposals

Compilers/tools for HPC and joint EC H2020 proposals

Advanced circuits and testchips

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Growing Internationally

- Extending USA contacts
- Growing across Europe
- Building connections into Asia

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Current EU Collaborative Research Projects

Mont-Blanc

- World's first ARM-based supercomputer
- Funded by EC H2020 programme

M2DC

- Modular Microserver Data Centre
- Funded by EC H2020 programme

TCLS

- First Radiation-tolerant ARM CPU system development
- Funded by EC H2020 programme

Uniserver

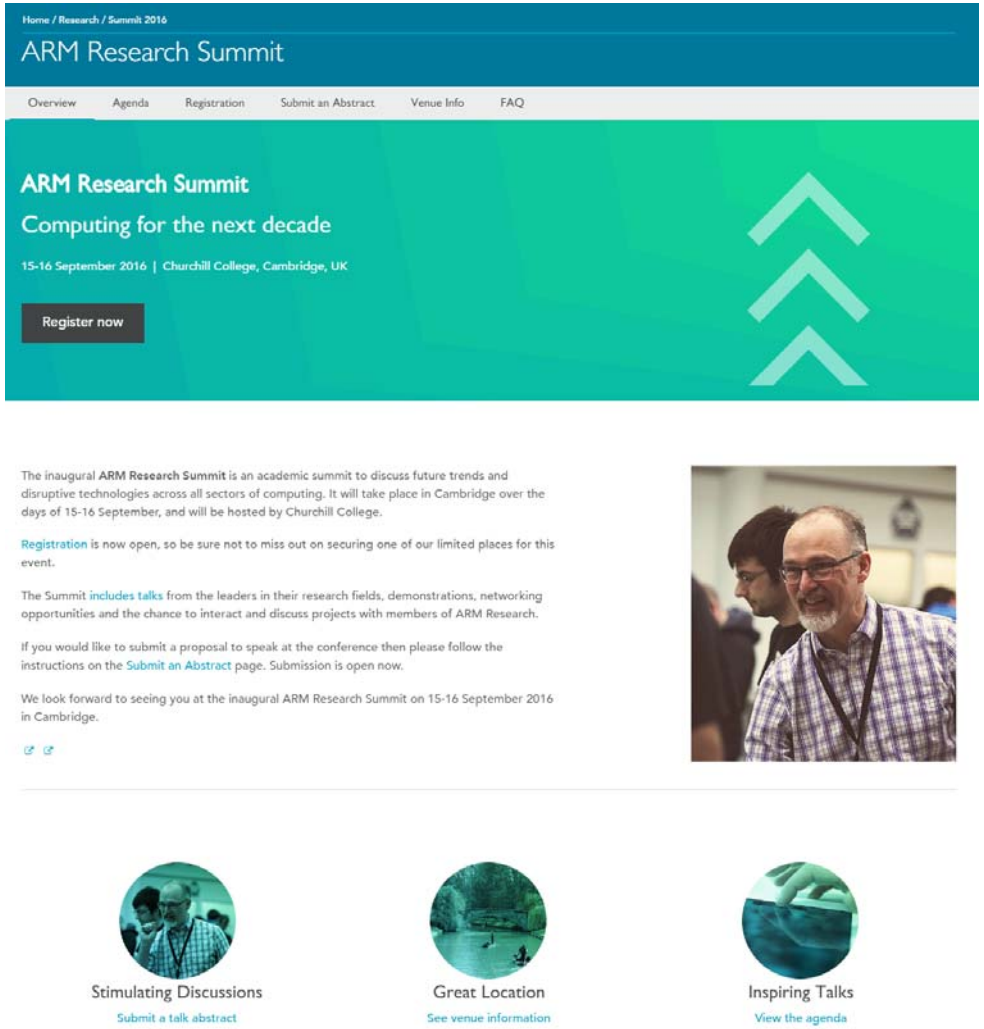
- Scalable Microserver Ecosystem
- Funded by EC H2020 programme

- Exanode

Hipeac

- Networking project of Computing Community in Europe
- Funded by EC H2020 programme

First ARM Research Summit



- The inaugural ARM Research Summit is an academic summit to discuss future trends and disruptive technologies across all sectors of computing. It will take place in Cambridge, hosted by Churchill College.
- Registration is now open, so be sure not to miss out on securing one of our limited places for this event.
- The Summit includes talks from the leaders in their research fields, demonstrations, networking opportunities and the chance to interact and discuss projects with members of ARM Research.
- If you would like to submit a proposal to speak at the conference then please follow the instructions on the Submit an Abstract page. Submission is open now.
- We look forward to seeing you at the inaugural ARM Research Summit on 15-16 September 2016 in Cambridge.

- http://www.arm.com/summit

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Thank you

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