

Epilogue

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An old Chinese saying

In book is there beauty like jade



In the Institute talks are there beauties like jade

Another old Chinese saying

If you believe everything in a book, you would be better off without the book.



If you believe everything in **my remarks**, you would be better off without **them**.

Caveat: imperfect and incomplete

Applications – Quantum Technology

- i. Quantum computing – common goal
- ii. Quantum information
- iii. Simulation – atom lattices for real solids,
- iv. Q metrology
 - a. Sensor – Wrachtrup, Yacoby, Hollenberg, Ren-Bao Liu/Jiangfeng Du
 - b. Phase estimate: Interferometry – Dowling, Zhenyu Wang (poster), Mankei Tsang (poster)
 - a. Neutron (DFS) – Pushin et al., PRL 2011
 - c. Photonic devices – Chang-Pu Sun
- v. Other quantum technological applications?
 - a. Advances in small steps
 - b. New innovators needed

Reasons for Including Applications in Research

- i. \$ for research
- ii. Industrial development
- iii. One way to define direction of research (basic and applied)
 - a. Otherwise, phase space too large
 - b. Or nobody cares

Special features in q tech research

- i. Collaborations esp. between experimentalists and theorists. To improve communication:
 - a. Suggestions for neophytes
 - 1. Read semi-popular journals*
 - 2. Talk to the other side with patients
 - b. Suggestions for seniors – be patient because E and T speak different dialects
- ii. Quantum fundamentals are important
 - i. Composite states
 - ii. Measurements

Semi-popular journals

- i. Review of modern physics colloquia
- ii. Am J Phys
- iii. Physics Viewpoint (APS)
- iv. Physics Today
- v. Physics World
- vi. Contemporary Physics
- vii. Perspectives in Science or Nature

Systems for initialization, quantum operations and measurements

1. Diamond NV (Theory and Experiment) - Awschalom, Wrachtrup, Hoi Chun Po (poster), E Wu (poster)
2. Gated quantum dots – Awschalom, Yacoby, van der Sar (poster), Loss
3. SAQD – Sham, Das Sarma, Baoquan Sun (poster)
4. Superconducting qubits – Nori
5. Misc – Awschalom (SiC, graphene, ZnO), Das Sarma (Si), Klinovaja (CNT), Zidan Wang (superconductivity, spin orbit), Dajun Wang (polar molecules), Guangcun Shan (graphene nanoribbon), Hongqi Xu (InSb nanowire), Loss (wires, hole)
6. Exploring new materials - Awschalom

Scaling

1. Spin-photon-spin quantum network
 - a. Photon-photon measurement based entanglement – Wrachtrup
 - b. Gated dots connected by transmission line – Loss
 - c. Pulse controlled dot/cavity – waveguide – dot/cavity – Yao, Liu, Sham (2005, not talked in Institute)
2. Coupled gated quantum dots – Yacoby
3. Quantum error correction and scalability – Hollenberg
4. Architecture of gated dots – Loss

Understanding decoherence

1. Theory (in order of appearance)

Sham, Das Sarma, Wang Yao, Renbao Liu, Loss

2. Experiments

Steel (in Sham's talk), Awschalom, Wrachtrup, Jiangfeng Du, Yacoby

Maintenance of Spin Coherence

1. Dynamic Decoupling
 - a. Theory: Uhrig, Dowling, Jiangbin Gong, Ren-Bao Liu, Hoi Chun Po (poster), van der Sar (poster)
 - b. Experiment: Jiangfeng Du, Yacoby,
2. Feedback driven by steady pumping
 - a. Optical – Steel (in Sham's talk)
 - b. Microwave – Yacoby

Thank you!

Miss Ho

And her colleagues

The students who helped

The members of the Organization

And last but the least,

Renbao Liu

Bon Voyage!



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A view of Shatin from CUHK

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