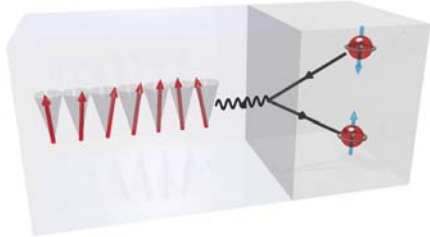
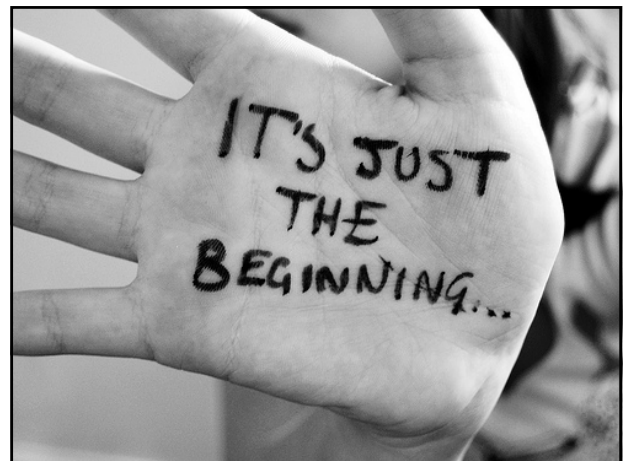


The Kavli Institute for Theoretical Physics
University of California, Santa Barbara

Concepts in Spintronics




Yaroslav Tserkovnyak
Leon Balents, Gerrit Bauer, Allan MacDonald, Stuart Parkin



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Workshops

KITP-UCSB: Spintronics (2006)
Yukawa Institute Kyoto: Spin Transport in Condensed Matter (2008)
KITP-China: Progress in Spintronics and Graphene Research (2010)
KITP-UCSB: Spintronics: Progress in Theory, Materials, and Devices (2013)



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Weather improved



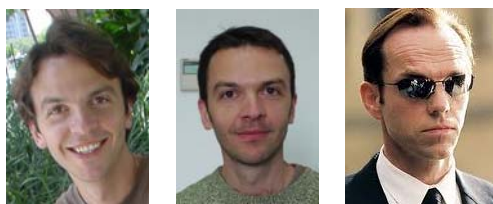
2006



2013

Time flies

2006 2009 2013



Old & New

Spring 2006	Autumn 2013
Spin Hall effect (semiconductors)	SHE in metals, (I)SHE as detector, mag. switching
Current-induced magnetization dynamics (adiabatic vs. non-adiabatic torques)	Magnetization dynamics in bilayers, spin orbit torques
Spin pumping (phenomenon)	Spin pumping for spin current generation
Quantum spin Hall effect	Topological insulators
Single spin qubits	Multiple qubits, Majorana's
Optical spin manipulation (semiconductors)	Spins in diamond, optical magnetization switching
Magnetic semiconductors	Magnetic semiconductors as model systems
Electric spin injection (semiconductors)	-
Molecular spintronics	-
-	Topology (skyrmion lattices etc.)
-	Spin caloritronics, spin Seebeck effect
-	Antiferromagnetic spintronics
-	Magnetic insulators, magnonics
-	Spintronics of cold atoms and excitons

Survey

- ❑ Spintronics is currently the most dynamic, exciting, and useful field of condensed matter physics.
- ❑ Theory has a proven record of major discoveries in spintronics.
- ❑ The time span in spintronics from discovery to commercial application is of the order of a decade.
- ❑ Long term workshops as started by the KITP Santa Barbara provide essential knowledge transfer.

Diversity in theoretical spintronics



vs.



- Beauty
- Universality
- Mathematical rigor
- Intellectual challenge

vs.

- Experiments
- Materials
- Devices
- *Real* applications

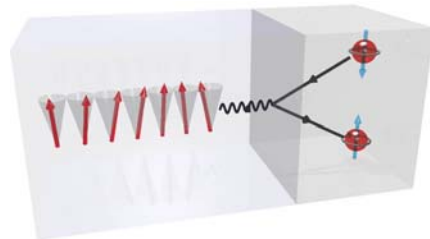
Spin Hall effect
TIs

Spin transfer torque

Let us come together



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