Institute for Theoretical Sciences – A Joint Institute of Argonne National Lab and the University of Notre Dame

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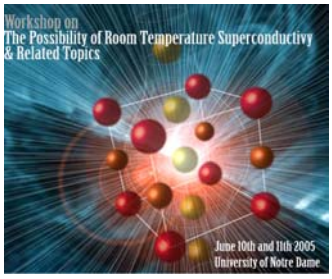
Benefits of a Theory Institute

- Most effective catalyst for novel research projects
- Scientific flexibility in topics and participants
- High Impact/Increased visibility for ANL & UND
- Promote host institutions

Workshop: Room Temperature Superconductivity



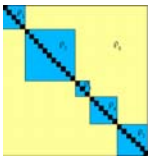
ITS' inaugural event brought together many great scientists to discuss the Possibility of Room Temperature Superconductivity & Related Topics. The RTS workshop featured talks by many leading theorists and experimentalist, such as Alexei Abrikosov, Mohit Randeria, Neil Ashcroft and Paul Chu.

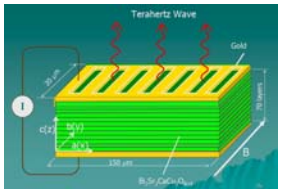
Recent ITS Guests

Anthony J. Leggett
Colloquium Title: ***The recent PSU "supersolid" experiments: some conceptual questions***

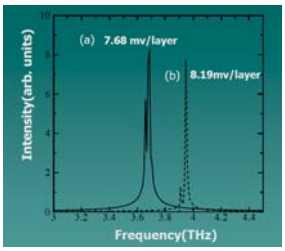
Susan N. Coppersmith
Colloquium Title: ***Comparing classical and quantum complex systems***

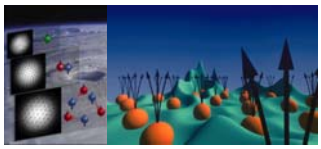
Results





Geometric and statistical analysis of market forces (KONDOR GROUP)
(Left) Geometrical interpretation of the Markowitz problem for $N = 3$
(Right) Structure of the market+sectors correlation matrix.





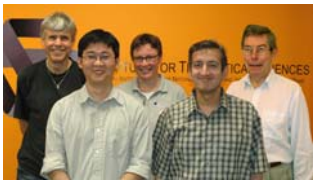
Mapping Rotating Superfluids (Left) onto Fractional Quantum Hall State (Right) (JAIN GROUP)
(Hurricane photo: Andre Schirotzek, MIT).

Surface THz Emission from Grated HTSC Mesa Device: (a) 0.12mW (b) 0.15mW based on EARTH Computer Simulation

2005 ITS Visiting Fellows

Team leader:
Jainendra K. Jain
2003 Buckley Prize Winner (APS)
Erwin W. Mueller Professor of Physics, Pennsylvania State University

TOPIC: **Emergence of fractional Hall type structures in rapidly rotating BEC systems**



Team members
Prof. Hans Hansson, Stockholm Univ.
Prof. Prof. Jon Magne Leinaas, Univ. Oslo
Prof. Susanne Viefers, Univ. Oslo
Chia-Chen Chang, Pennsylvania State Univ.

Team leader:
Imre Kondor
Rector of Collegium Budapest
Professor of Physics: Eötvös Loránd University (ELTE), Budapest

TOPIC: **Applying the methods of statistical physics to problems in quantitative finance, risk management and financial regulation**

Team members
- Dr. Szilard Pafka
- Agnes Lubloy
- István Varga-Haszonits
- Gabor Nagy

Team leader:
Masashi Tachiki (National Institute for Materials Science, NIMS, Tsukuba)

TOPIC:
Teraherz radiation emitted by Josephson vortices in HTSC

Team members
- *M. Tachiki (Japan)*
- *M. Iizuka (Japan)*
- *K. Kadowaki (Japan)*
- *U. Welp (ANL)*
- *A. Koshelev (ANL)*
- *W. Kwok (ANL)*

High Stakes: Terahertz
"the last frontier of the electromagnetic spectrum"

- Vibrational and rotational spectra of many important chemical and biomolecular materials
- Penetrating power through packaging materials, clothes, plastics, etc.
- Simulations at the Earth Supercomputer in Japan
- Demonstrated the possibility of surface emission of THz waves based on realistic experimental parameters.

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