Nano boubles and more …

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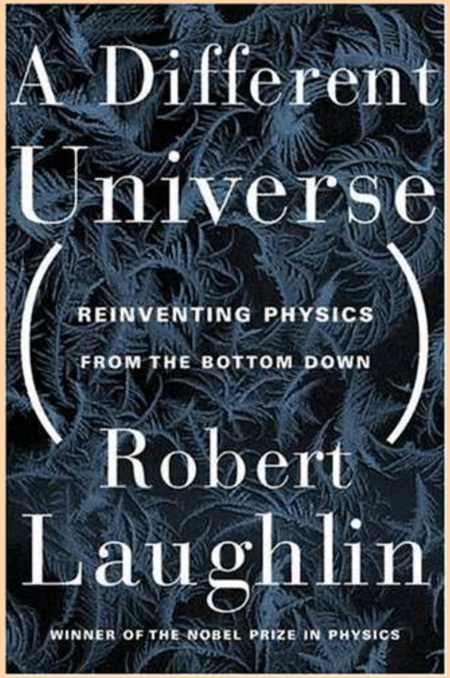
The Hitchhikers Guide to the Scientific Universe



$14.99 Amazon.com

Working title: ‘no strings attached’

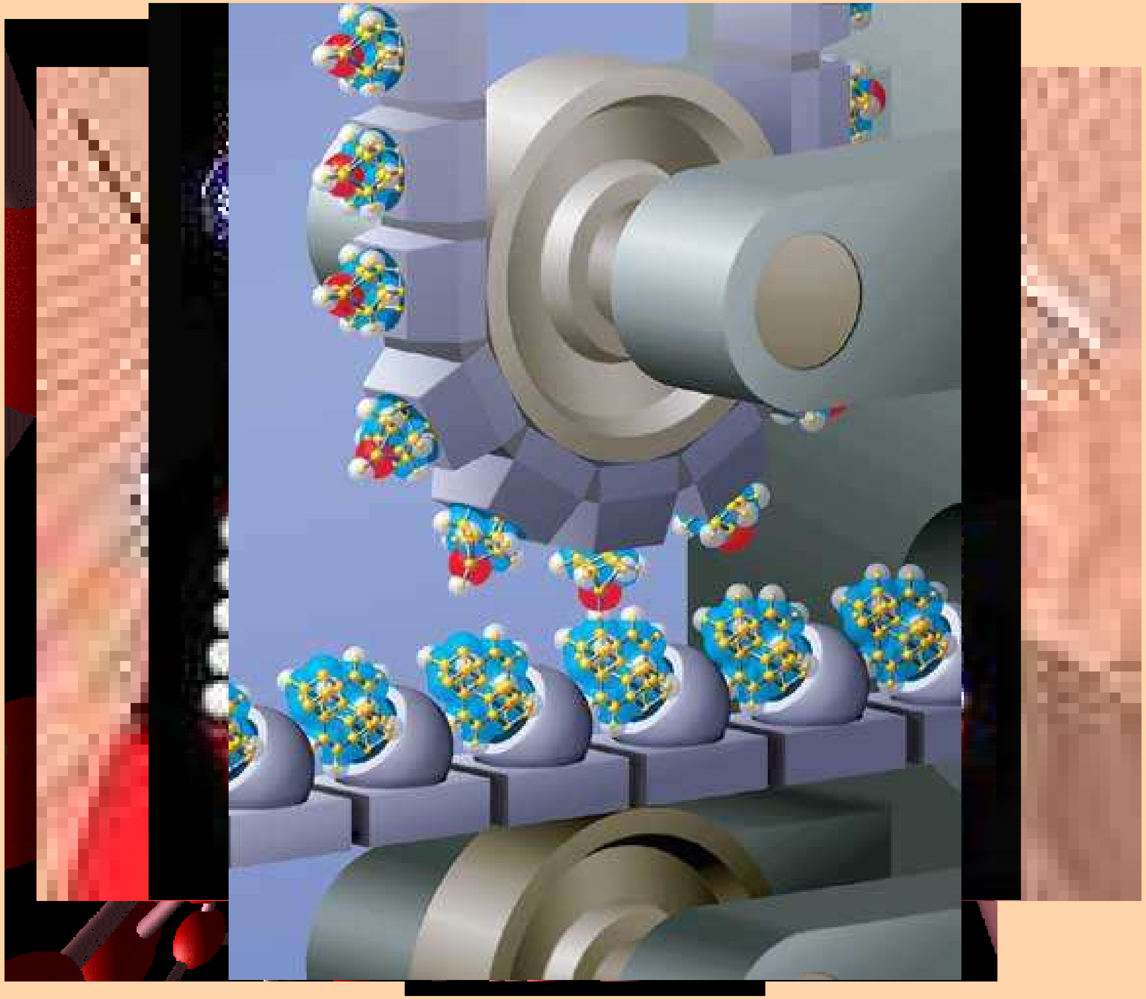
Nano boubles

Boubles =

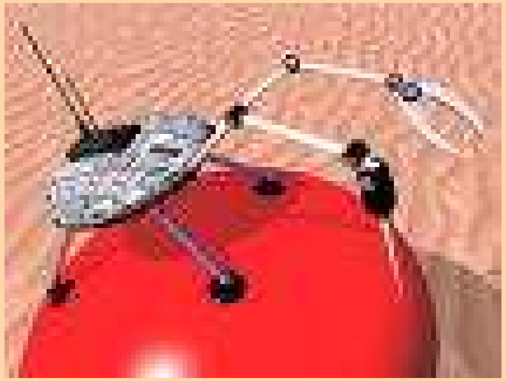
Nano = This Meeting ??

Year Round X-mas Shops

Nano boubles



Nano HOAX



Nanobot =

Mechanical machine

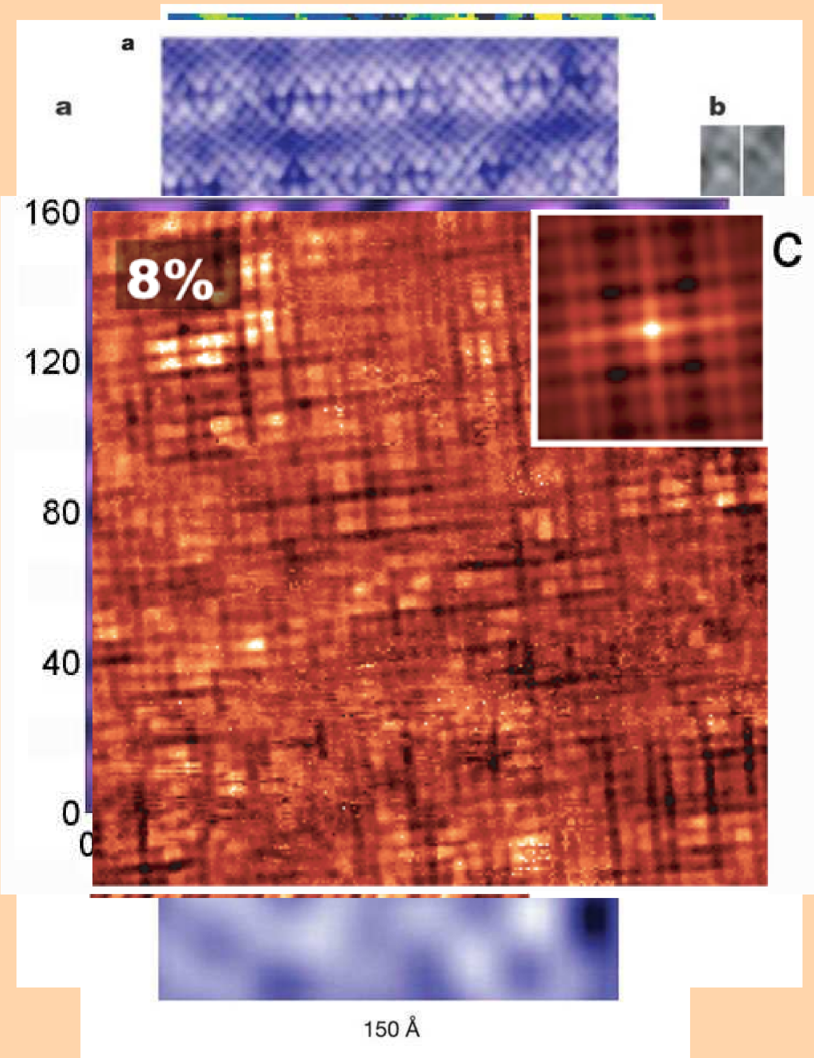
Mechanical machines need RIGIDITY

RIGIDITY = EMERGENT = absent on nanoscale

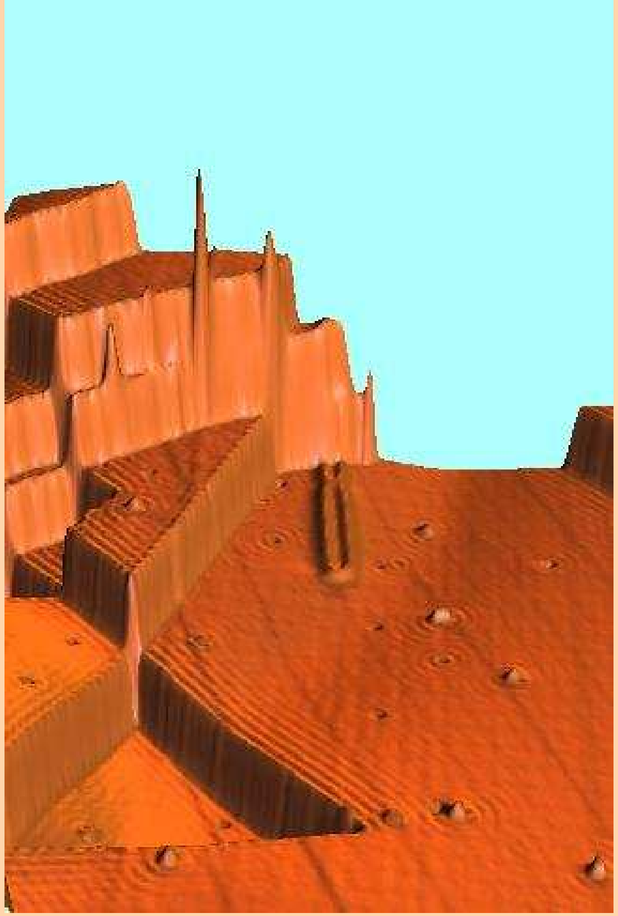
Cash


YOUR NEW WORK ON GLOBAL WARMING SEEMS TO HAVE GONE DOWN WELL WITH THE TABLOIDS
COR WHAT A SCORCHER

Correlation boubles …



Freshly tenured …



Meaningful meeting

Compliments to organizers:

Interdisciplinary with focus and a good taste!

Compliments to the speakers:

Review order well executed!

Big Picture

Correlated

Cuprates, Manganites, Organics, 2-DEG MIT

“Competing Phases” “Intrinsic Glassiness”

Semiconductors

DMS Spin Hall

Specials

Ruthenates (Honerkamp ?), Kondo dots, Brazovksi…

Cross fertilization: semiconductors to correlated

Bossing experimentalists around: these semiconductor devices are ingenious!!

Pushing domain walls around (Ohno)

Spin transport (spin Hall, Schliemann) -- somehow great potential in correlated …

Personal highlight: Mannhart, Okamoto !

Devices <=> interfaces: lots of correlated life!!

Cross fertilization: correlated to semiconductors

Inhomogeneity !!

Theorists be aware, it is elusive …

Go out and have a look: STM (Koenraad, Yazdani)

Good or bad for the holy grail (high Tc)??

Joe Moore: Tc can go up by having high Tc island in a low Tc sea

Resistance maximum at Tc:

Lesson of manganites: big peak requires large scale electronic reorganization.

More resistance maximum

Where are the polarons in GaMnAs ???

Zarand: strong disorder, large scale stuff, but
Anderson localization at high T ??

Manganites: low T degenerate Fermi-liquid to high
T classical (polaron) liquid

Easily picked up by Thermopower (Palstra et al 1995):
S(classical liquid) = 1000 * S(Fermi liquid)

Competing orders

First order transition + Coulomb frustration + more difficult stuff
==> (dynamical) inhomogeniety + disorder ==> glassiness

2DEG-MIT (Fogler): Wigner X-tal vs. Fermi-liquid

Manganites (Argyriou,Perroni, …): Polaron liquid vs. Charge order vs. FM Fermi-liquid

Cuprates (Lee, Davis,Gorkov,Blumberg, …): superconductivity vs. Fermi-liquid vs. plain antiferromagnetism vs. stripe order vs. flux phases (??) vs. real d-density wave vs. topological order A vs topological order B vs ….

The 2DEG

The most basic: Coulomb, kinetic energy and a bit of dirt.

Why is this so underfunded?

Experimentally rather inaccessible (transport), however notice the compressibility scans (Fogler) ..

Manganites

Mature subject: basic rules are under controll

'Critical' electron-phonon interaction + double exchange + 'stripy' charge ordering physics

Surprises still happening, highlight Argyriou:

Classical liquid --> glass --> crystal (stripes)

--> FM fermi liquid

Ilya Vekhter: competing orders --> spontaneous glassiness, is this the clue??

This was actually a pretty good high Tc meeting …

Focus on disorder, timely ….

The Alloul paradigm (Bobroff, Ruillier-Albenque, Eisaki, in a way Broun, Gorkov):

Dirt is important

For low Tc (214) and (because of ?) stripes

For phase fluctuations/Nernst effect

To figure out spin-charge separation (Zn vs Ni impurities).

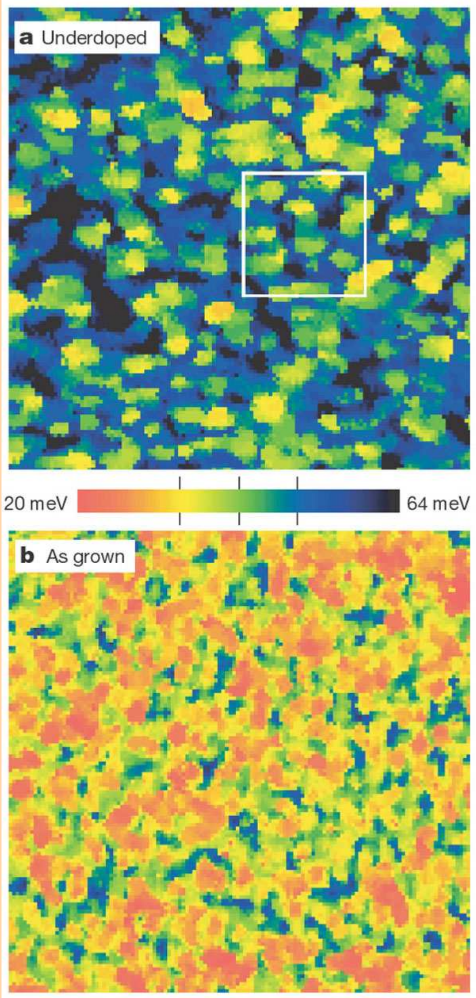
Out of plane (intrinsic) disorder is a killer

Quantum mayonaise

Davis: anti-correlation with dopants, inhomogeneity in gap maps, not in charge density

Nunner: Gap-map inhomogeneity due to disorderly pairing interaction!

Makes Devereaux happy: Eisaki's off-plane dirt talks to Thom's phonons



Quantum mayonaise cont.

If large gaps = pseudogaps are due to strong pairs

If pseudogap blobs are bad (super)conductors

These have to be blobs of orderly (stripy) charge

Phase dynamics at work!

Small pairs have a small kinetic energy and a large charging energy ==> phase disorders, charge orders

If so: Room temperature superconductivity would exist were it not that stripes spoil the fun …

A critical note

‘Spectroscopy from mixed-phase models’ (Mayr, Atkinson)

Use mean-field potentials derived from interesting static textures to reach conclusions regarding photoemission etc. spectra

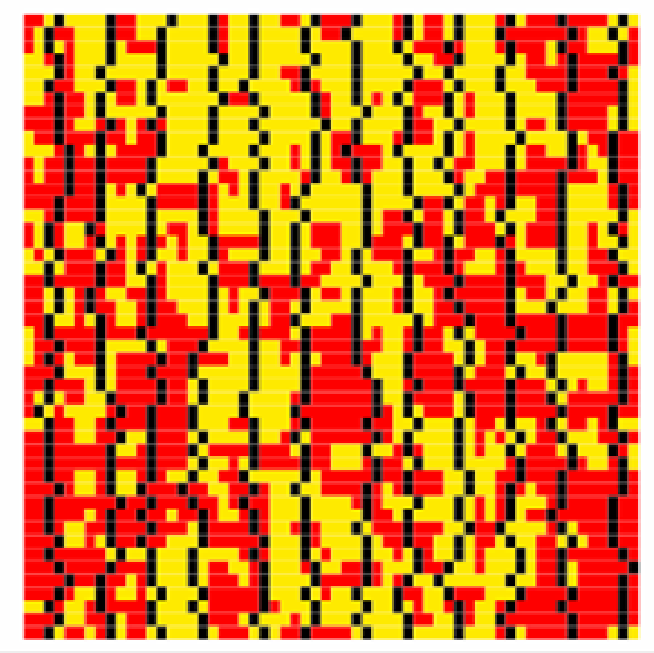
In cuprates: not quite right!

Reason: hbar is big, auxiliary fields time dependent as hell, especially so at high energies!

Theorist' bouble, by me …

Black lines: charge stripes as serious quantum strings (lines of tight binding particles)

Red, yellow: serious quantum Heisenberg spins



Movie: imaginary time cinema
Timeslices of quantum Monte Carlo simulations

Euclidean Movie: order out of disorder in stripe land

QuickTime™ and a
YUV420 codec decompressor
are needed to see this picture.

That is it

Looking forward seeing you again!

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