The handle http://hdl.handle.net/1887/21759 holds various files of this Leiden University dissertation.

Author: Wijts, Geert
Title: Magnetic resonance force microscopy at milliKelvin temperatures
Issue Date: 2013-09-19
The prime challenge in measuring the force of a single electron spin with the setup described in this thesis is not in increasing the signal-to-noise ratio further, but in finding a sample which is sufficiently sparsely populated with unpaired electrons (chapters 6 and 7).

II

If one aims to measure the displacement of a cantilever using a superconducting detection coil, one should maximize the coupling between the cantilever magnet and the coil (chapters 3 and 4). However, if one aims to measure the force of a spin acting on the cantilever, there is an optimum in the cantilever-coil coupling strength.

III


IV

SQUID-based MRFM can be employed to study the structural parameters of crystals containing paramagnetic defects at unprecedented low temperatures (chapter 7).

V

There is not sufficient emphasis on the fact that, in order to reach single proton resolution in MRFM, exciting sufficiently few protons will be at least as challenging as reaching the desired measurement sensitivity.

VI

Excess MRFM cantilever damping due to interactions between the magnetic tip and paramagnetic defects in the sample can be quenched by reducing the sample temperature to the milliKelvin regime and applying a polarizing field of the order of 100 mT.
A commercially viable MRFM system should operate at liquid helium or higher temperatures and should not rely on aligning the cantilever with respect to the spin excitation source and the cantilever detector.

Because two magnetically tipped, quantum mechanical resonators might independently measure the $x$- and $z$-component of a spin, current gravity-induced waveform collapse theories and Heisenberg’s uncertainty principle are mutually incompatible.

It is erroneous to say that Schrödinger’s cat is simultaneously dead and alive. It is neither dead nor alive.

The free market is the most direct form of democracy. Therefore, a strict democrat should strive for a pure market economy.

A constitutional monarchy in which laws cannot be tested against the constitution, is just a monarchy.

In order to stay competitive in the long run, innovative companies should invest partly in fundamental research.

Individual freedom can be measured by the extent to which the state respects the privacy of its citizens.

Geert Wijts
Leiden, September 19, 2013