# Magnetism of a single atom

Otte, A.F.

# Curriculum Vitae

Alexander F. (*Sander*) Otte was born on November 24, 1979 in Ede, The Netherlands, where in 1998 he finished his secondary education at the Marnix College Gymnasium. In that same year he went to Leiden to start his studies in physics. After completing the undergraduate courses he studied the formation of metallic nanowires under the mentorship of Prof. Dr. J. M. van Ruitenbeek. He also spent several months in Prof. Dr. C. Dekker's research group at Delft Technical University, where he investigated carbon nanotubes by means of a low-temperature Scanning Tunneling Microscope (STM). In 2003 he received his MSc. degree from Leiden University averaging an 8.0 out of 10.

From June 2003 he was affiliated to Leiden University as a PhD student. Here he joined the research group of his promotor Prof. Dr. J. M. van Ruitenbeek, where he worked on the development of an STM that can be cooled down to liquid $^3$He temperatures. Additionally he was involved – in cooperation with Prof. Dr. Yu. A. Kolesnichenko from the University of Kharkov, Ukraine – in the theoretical groundwork for several experiments on conductance fluctuations in metallic point-contacts. During this period he also lectured in the exercise classes belonging to an undergraduate course on quantum mechanics.

Starting November 2006 he spent six months in San Jose, CA, visiting the group of Dr. A. J. Heinrich, also copromotor, at the IBM Almaden Research Center. Using a $^3$He STM he performed spin excitation experiments on individual magnetic atoms. Central theme of these experiments is the influence of crystal-field anisotropy, spin-coupling and the Kondo effect on the spins of these atoms.

# List of Publications

- A. F. Otte, C. F. Hirjibehedin, K. von Bergmann, M. Ternes, C. P. Lutz, H. Brune and A. J. Heinrich – *The role of magnetic anisotropy in the Kondo effect of an atom with large spin* – Manuscript in preparation.

- C. F. Hirjibehedin, C.-Y. Lin, A. F. Otte, M. Ternes, C. P. Lutz, B. A. Jones and A. J. Heinrich – *Large magnetic anisotropy of a single atomic spin embedded in a surface molecular network* – Science **317**, 1199 (2007).

- Ye. S. Avotina, Yu. A. Kolesnichenko, A. F. Otte and J. M. van Ruitenbeek *Magneto-quantum oscillations of the conductance of a tunnel point contact in the presence of a single defect* – Phys. Rev. B **75**, 125411 (2007).

- W. H. A. Thijssen, D. Djukic, A. F. Otte, R. H. Bremmer and J. M. van Ruitenbeek – *Vibrationally induced two-level systems in single-molecule junctions* – Phys. Rev. Lett. **97**, 226806 (2006).

- Ye. S. Avotina, Yu. A. Kolesnichenko, A. F. Otte and J. M. van Ruitenbeek *Signature of Fermi-surface anisotropy in point contact conductance in the presence of defects* – Phys. Rev. B **74**, 085411 (2006).

- Ye. S. Avotina, Yu. A. Kolesnichenko, A. N. Omelyanchouk, A. F. Otte and J. M. van Ruitenbeek – *Method to determine defect positions below a metal surface by STM* – Phys. Rev. B **71**, 115430 (2005).

- A. I. Mares, A. F. Otte, L. G. Soukiassian, R. H. M. Smit and J. M. van Ruitenbeek – *Observation of electronic and atomic shell effects in gold nanowires* – Phys. Rev. B **70**, 073401 (2004).

# Acknowledgements

First and foremost I am very thankful to the IBM Research Division for enabling me to use their facilities and resources at the Almaden Research Center between November 2006 and April 2007. In particular I would like to thank A. J. Heinrich for his generous hospitality and C. F. Hirjibehedin for the excellent advice I received from him, both during and after my rewarding visit to IBM. To M. Ternes and C. P. Lutz I am very grateful for their top quality scientific contributions and to B. Melior for his expert technical assistance. For their efforts in providing density functional calculations to help interpreting our observations I thank C.-Y. Lin and B. A Jones.

In developing and running the $^3$He STM system in Leiden I received much help from W. H. A. Thijssen, F. Galli, R. W. A. Hendrikx and J. Aarts. Special thanks go to M. J. Rost for sharing his knowledge and expertise in designing the STM scanner and to C. G. A. Pen, R. van Egmond and J. Mesman for their excellent craftsmanship in building it. I also thank G. J. C. van Baarle and R. H. M. Smit for their efforts in this project prior to my involvement.

Many people have been extremely helpful through general scientific discussions. These include, but are certainly not limited to: K. von Bergmann, H. Brune, D. M. Eigler, M. F. Crommie, J. E. Moore, A. C. Hewson, J. A. Stroscio, M. Bode, D. Rugar, S. S. P. Parkin, W.-D. Schneider, F. J. Giessibl, J. Zaanen, J. van den Brink, J. van Wezel, M. B. S. Hesselberth and many (former) members of the AMC research group, of which I would like to mention in particular Yu. A. Kolesnichenko, Ye. S. Avotina, S.-J. van der Molen, O. Tal, A. I. Yanson and M. Krieger. For granting me financial support for my visit to California I would like to acknowledge the Leiden University Fund (LUF).