

1(b) Curriculum Vitae

Prof. dr Huib Johan Bakker
Department Head *Molecular Nanophysics*
Scientific Group Leader *Ultrafast Spectroscopy*
Full Professor of Physical Chemistry, University of Amsterdam



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Personal details

Date of birth: March 2, 1965
Place of birth: Haarlem, The Netherlands
Nationality: Dutch

Scientific education

1991 PhD Thesis: *Time-resolved vibrational spectroscopy with picosecond infrared pulses*,
cum laude (top 5%) Thesis advisor Prof. Dr. A. Lagendijk
1987 MSc Physics, Free University (The Netherlands)

Professional experience

2003-present Department Head, FOM Institute AMOLF in Amsterdam.
AMOLF is one of the research laboratories of the Foundation for Fundamental Research on Matter (FOM), the physics division of the Dutch National Science Foundation. With a yearly budget of 15 million euro, AMOLF employs about 150 research staff and 50 support staff.

2001-present Full Professor of Physical Chemistry, University of Amsterdam
1995-present Scientific Group Leader, FOM Institute AMOLF
2005 Visiting Professor Ecole Normale Supérieure, Paris, France
1991-1994 Scientific Assistant C1 (post-doc) Institute of Semiconductor Technology II
headed by Prof. Dr. H. Kurz (Aachen, Germany), RWTH Aachen, Germany
1987-1991 PhD researcher, FOM Institute AMOLF

Distinctions and awards

2005 Winner of the Gold Medal of the Royal Dutch Chemical Society
2000 Pionier in Chemistry of NWO (Netherlands Organization for Research)

Publications, citations and PhD theses

Over 170 publications in refereed international journals, including
2 in Nature
5 in Science
2 in Nature Chemistry
2 in Chemical Reviews
5 in The Journal of the American Chemical Society
3 in the Proceedings of the National Academy of Science
16 in Physical Review Letters

According to Web of Science the total number of citations is 5803 and the h-index is 39.

Advisor (promoter) of 12 completed and successfully defended PhD theses.

Research grants

2 FOM-Programmes (*Ultrafast Molecular Dynamics* (2003), *Proton mobility in Confinement* (2010))
2 Industrial Partnership Programs (with Wetsus (2010), with Michelin, Dutch Polymer Institute (2011))
8 FOM-Projectruimte (1994, 1995, 1996, 2000, 2003, 2004, 2008, 2010)
4 projects within open FOM-Programmes (1997, 1999, 2000, 2011)
4 NWO Chemical Sciences (JC 1999, Pionier 2000, Echo 2007, TOP 2010)
2 EU Marie Curie (2007, 2012)
1 DPG (1995)

Current funding

FOM-Programme 2010 *Proton mobility in confinement*
Industrial Partnership Programme 2010 *Spectroscopic analysis of particles in water* with Wetsus
Industrial Partnership Programme 2011 *Understanding the visco-elasticity of elastomer-based nanocomposites* with Michelin and Dutch Polymer Institute
FOM-Projectruimte 2010 *Slippery when wet: interfacial melting of ice*
FOM-Projectruimte 2008 *Why ducks don't need a towel or how water reacts to a hydrophobe*
NWO Chemical Sciences TOP 2010 *Cool molecules: unraveling the secret of anti-freeze proteins*
NWO Chemical Sciences ECHO 2007 *The role of water in the structural dynamics of proteins*
EU Marie Curie 2012 *Aqueous Proton Mobility near Ions and in Nano-Confined Geometries*

Scientific Leadership Profile

Huib Bakker is one of the pioneers of nonlinear femtosecond vibrational spectroscopy and was the first to use this technique to study the properties of liquid water (*Science* **278**, 658 (1997)). This first study opened up a new field and ever since many groups world-wide have used this technique to study the properties of water and other hydrogen-bonded systems via the time-resolved response of the molecular vibrations. Using femtosecond vibrational spectroscopy, Bakker was the first to show that the relaxation of the OH stretch vibrations of water slows down with increasing temperature, which is now one of the accepted anomalies of water (*PRL* **81**, 1106 (1998)). He also discovered that water molecules show extremely fast resonant (Förster) vibrational energy transfer, which plays an important role in the energy dissipation dynamics of water (*Nature* **402**, 507 (1999)). More recently, he studied the interactions between water and dissolved ions and molecules and discovered that particular combinations of cations and anions like Mg^{2+} and SO_4^{2-} can impede the motions of water over relatively long distances. This effect is highly cooperative, i.e. much larger than the sum of the effects of these ions when combined with other counter-ions (*Science* **328**, 1006 (2010)). However, for most ions he observed the effect on the dynamics of water to be limited to their first hydration shell, meaning that there are no long-range structure breaking or making effects of these ions on the structural dynamics of water (*Science* **291**, 2118 (2001); *Science* **301**, 347 (2003)). Bakker also studied the interaction between water and hydrophobic molecular groups and between water and hydrophilic molecular solutes like urea (*PRL* **99**, 148301 (2007); *PNAS* **103**, 18417 (2006)). His studies of the solvation dynamics of water have stimulated many groups world-wide to study the same systems with theoretical approaches, in particular with classical and quantum molecular dynamics simulations. Using femtosecond vibrational spectroscopy, Bakker also obtained the first experimental proof for the so-called Grotthuss conduction mechanism of protons in liquid water, and showed that this proton transfer involves the collective motion of »15 surrounding water molecules (*PRL* **96**, 138305 (2006); *PRL* **102**, 198303 (2009)). He also studied the dynamics of water in nanodroplets and found that the nano-confinement leads to a strong slowing down of the energy relaxation and the molecular reorientation ((*PRL* **94**, 178301 (2005); *PNAS* **103**, 15355-15358 (2006)).

Organization of International Conferences

- 1998 Ultrafast Phenomena XI, Garmisch-Partenkirchen, Germany, member organizing committee
- 2000 Ultrafast Phenomena XII, Charleston, USA, member organizing committee
- 2002 Ultrafast Phenomena XIII, Vancouver, Canada, member organizing committee
- 2008 International Workshop on THz spectroscopy, Amsterdam, Co-Chair
- 2011 Time-Resolved Vibrational Spectroscopy XV, Ascona, Switzerland, member organizing committee

Editorships of journals and proceedings

- Member of the Advisory Editorial Board of *Chemical Physics Letters* (since 2001)
- Member of the Editorial Advisory Board of *ChemPhysChem* (since 2004)
- Member of the Advisory Editorial Board of *Chemical Physics* (since 2006)

Memberships of Committees

- Member of the Advisory Committee *Atomic, Molecular, and Optical Physics* of FOM (2003-2004)
- Member of the Advisory Committee *Condensed Matter, Optical, and Molecular Physics* of FOM (since 2004)
- Member of the Programme Advisory Committee of FOM-Rijnhuizen (since 2003)
- Member of the International Organizing Committee of Time-Resolved Vibrational Spectroscopy