

# CURRICULUM VITAE on EDUCATION

Prof. dr. ir. Caspar H. van der Wal  
(Applied) Physics and NanoScience - FMNS - RuG

Version 13 Nov. 2014

## UTQ candidate

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## UTQ coach

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## Education and academic employment

1983-1989 High school (VWO-B) at O.S.G. Bataafse Kamp (Hengelo O.).  
1989-1990 NACEE-Fulbright scholarship, one year study at Slippery Rock University, USA. Majoring in fine arts and philosophy.  
1990-1996 Master's degree in Applied Physics.  
Delft University of Technology, the Netherlands.  
1996 Student research internship at Stanford University, USA  
1997-2001 PhD degree, *Cum Laude* (highest honors).  
Delft University of Technology, the Netherlands.  
Supervisor: Prof. dr. ir. J. E. Mooij.  
Thesis: Quantum superpositions of persistent Josephson currents.  
2001-2003 Postdoctoral research fellow,  
Harvard University, Department of Physics, USA,  
Quantum Optics Group of Prof. M. D. Lukin.  
2004-2009 Assistant professor in Physics of Nanodevices (*Tenure-Track*),  
University of Groningen, the Netherlands,  
Zernike Institute for Advanced Materials and Department of Physics.  
2009-present Associate professor in Physics of Quantum Devices,  
University of Groningen, the Netherlands,  
Zernike Institute for Advanced Materials.

## Awards and distinctions in education

- 2012 Recipient of the Education Prize of the Faculty of Mathematics and Natural Sciences, University of Groningen  
(*FWN Facultaire Onderwijsprijs 2011-2012*).  
For the development of using Peer Instruction in the teaching of Science, and giving workshops to colleagues on this topic.

## Direct teaching experience (excl. supervision of PhD students)

*For undergraduate courses taught at the FMNS-RuG (listed below in bold) the results of evaluations were always good to very good throughout the period 2004-2014.*

- 1989-1990 Tutor for bachelor students in Physics, part time position at the Tutor Center of Slippery Rock University, USA.
- 1997-2000 Teaching tutorial sessions for the course ***Kwantumfysica en Vaste Stoffysica*** for 2<sup>nd</sup> year students Electrical Engineering, TU Delft.
- 1997-2001 Supervising the MSc research project for 5 students, Applied Physics, TU Delft.
- 1999-2000 Design and supervise practicum projects for 3<sup>rd</sup> year BSc students in Applied Physics, TU Delft.
- 2001-2003 Supervised 6 MSc research projects, Department of Physics, Harvard University, USA.
- 2001-2003 Guest lecturer in courses for MSc and PhD students on Quantum Computing, in courses by Prof. S. Lloyd (MIT, USA), and Prof. M. D. Lukin (Harvard University, USA).
- 2004-present NAKF1-11 Quantum Physics 1**  
Course coordinator and main lecturer, coordinator of the 4 parallel problem sessions with this course.  
Obligatory course for all (now ~125) 2<sup>nd</sup> year bachelor (Applied) Physics and Astronomy students.
- 2004-2010 Guest lecturer for (Top)Master course at FMNS, related to the expertise area Physics of Nanodevices.
- 2004-present Supervised about 60 individual bachelor- and master-research projects (in collaboration with PhD students and postdocs in my team).
- 2010-present Co-developer and teacher for part of the lectures for introducing the Track NanoScienc for the BSc in Physics.

- 2010-present NAITEN-10 Physics of Modern Technology**  
(a newly designed course for the 1st-year bachelor track Applied Physics). Teacher for 1/3 of the course.
- 2010-present NS000 Top Master NanoScience: Guided self-study**  
Course coordinator and teacher for 1/2 of the course for the incoming chemistry students (topic Quantum Physics).
- 2010-present NS003a Top Master NanoScience: Fundamental and functional properties of nano-materials.**  
Course coordinator and since 2013 teacher for ~1/6 of the course (topic Optical Properties). Includes: TV lecture series on NanoScience in collaboration with Osaka University.
- 2010-present NS194 Top Master NanoScience: Short research projects and student symposium.**  
Course coordinator.
- 2011-present NS202 Top Master NanoScience: Research proposal.**  
Course coordinator (2x *ad interim*).

### **Participation in management and development of education, and other education activities, for the period 2004-present**

- 2004, 2008 Initiative for temporary education committees for improving the connection between various quantum physics and solid-state physics courses.
- 2004-heden Collaboration with "Betasteunpunt" (educational group for stimulating interaction between scientific academic research and schools), for hosting in our group short research internships for high school students (projects on observing quantized conductance at room temperature in metallic break junctions and improvised STMs).  
Derived from this effort, my team supports high school students that do a project on building their own STM from scratch with very cheap materials (less than 100 Euro).  
In particular successful in 2005 with Maarten Koster (3<sup>rd</sup> prize and audience prize Jan Kommandeurprijs (Groningen); 2<sup>nd</sup> prize in follow up competition at European level; 1<sup>st</sup> prize for high school project in national initiative via [www.natuurkunde.nl](http://www.natuurkunde.nl)).
- 2004-present Frequent speaker at events for academic students, or students or teachers from schools. About 4 times per year, for example popular presentations on nanoscience and nanotechnology, quantum mechanics.
- 2005-2006 Participate in writing grant proposals (Gratama Stichting) with "Betasteunpunt" for projects on promoting scientific academic studies via demonstrations and school projects about nanoscience and quantum mechanics.

- 2006 Co-developer of a new system for so-called "FIT stages" for bachelor students Applied Physics.
- 2006-2008, 2014-present Tutor for small groups of Physics students, aimed at improving study skills and avoiding study delays .
- 2007-heden Member of committee that monitors and develops the Applied Physics educational program (with Erik van der Giesen).
- 2007-heden Contribute to *Science Linx* (public science exhibition at the University about local research). Realization (with supervision of educational task by PhD students Eek Huisman and Frank Bakker) of public exhibit where the audience can control and observe room-temperature quantized conductance by breaking a metal wire. Coordinate using this setup for projects with visiting high school students (see also publications).
- 2008 Member of expert panel and student mentor for course *Science, Ethics, Technology and Society*.
- 2008 Member of committee for developing a Honors Trajectory for the FMNS bachelor programmes.
- 2008-present Chair (till 2010 member) of the Admissions Board for the Top Master in Nanoscience.
- 2009-present Participant and for the years 2009, 2010, 2013 co-organizer of the yearly "Weidag" for Physics teachers of RuG-FMNS, with workshops aimed at improving the education.
- 2009-2010** **Chair of the curriculum committee** (later task group Core-curriculum committee) for the major re-organization of the Physics and Applied Physics Bachelor Programmes into the *Track-based programmes*.
- 2010-present Presenter of tutorials and workshops over the use of *Peer-Instruction*, presented at (selection):
- UTQ/BKO-course RuG FMNS 2009-2010
  - Docenten lunch Physics 14 June 2010
  - Co-organizer, speaker (peer instruction for quantum physics) for a three-day workshop with Eric Mazur on interactive teaching (FMNS-RuG, 9-11 May 2012)
  - Co-organizer, speaker (peer instruction for quantum physics) and workshop leader (interactive teaching) (conference Innovatie Centra Academisch Betaonderwijs, Nijkerk, 22 May 2013).

- 2010-present Programme director/Chair of the Top Master Programme in NanoScience** of the Zernike Institute for Advanced Materials (per 1-11-2010, renewed for the period 1-7-2014 till 1-7-2017). For the period till mid 2014 this included **chairing the Programme Committee and Board of Examiners.**
- 2011-present Co-initiator and main developer the NanoScience TV Lectures: shared specialized lectures in NanoScience (master level) in collaboration with Osaka University (Japan) that use a live TV connection between two remote teaching locations.
- 2012 Presenter and developer of outreach activity on nanoscience and – technology at LowLands Music Festival 2012.
- 2012 Chair of the self-study and hosting of the official Programme Assessment (QANU) of the Top Master Programme in NanoScience, where the programme was assessed as excellent on all aspects and got its accreditation continued.
- 2013-2014 Programme coordinator (*ad interim*) Top Master NanoScience.
- 2014 Participant in the self-study and hosting of the official Programme Assessment (QANU) for the Groningen programmes in (Applied) Physics.
- 2014 Coordinator for re-organization of the Top Master NanoScience programme.**  
Changes in the rules and regulations from the university required a re-organization of the management structure for this programme. I supervised this process. In particular, per Summer 2014:
- My position changed to the format of programme director.
  - I initiated a new Programme Committee and fully independent Board of Examiners, in agreement with modernized rules and regulations on this from the university.
  - In collaboration with the Department, we hired a professional coordinator with secretarial support (in total 0.5 fte) per 1 Sept. 2014.
- 2014 Participant from FMNS in the Strategy Meetings for the 2015 University's Strategic Plan on Education.
- 2014 Representative from FMNS - Top Master NanoScience Programme for participating in *Rondetafelgesprekken Inspectie van het Onderwijs (Ministerie van Onderwijs, Cultuur en Wetenschap)* concerning the functioning of Boards of Examiners.

**Professionalization and didactic schooling attended,  
incl. UTQ/BKO trajectory**

- 1997 Course "Goed werkcollege geven", at DidO, TU Delft (20 hrs.).
- 2006-2007 Participate in course for improving skills and approach to tutor system for Bachelor students (5 afternoons).
- 2009-2010 Participated in the required basic courses on teaching skills for the BKO/UTQ (**University Teaching Qualification**), by UOCG teachers L. E. J. Sierenberg-de Boer and Y. Beetsma (4 afternoons + preparations).
- 2014 Participated in a two-day writing session for finishing BKO/UTQ portfolio (July 2014, submitted to BKO/UTQ supervisor Nov. 2014).
- 2014 Presenting one workshop for the University of Groningen SKO/STQ course, on best practices from a highly ranked master programme.

## Undergraduate student projects supervised: students and subjects

In the years 2009 – 2014, the number of bachelor and (top) master research projects in my team was stable at about 5 students per year. There was a gradual increase in research projects by visiting exchange students from India, Spain and Brazil (4 in 2014). Since 2010, I supported for 3 (top)master students from my team a research exchange visits of 6 months to MIT (2 students) or Harvard (1 student) in the USA.

All student projects were in close collaboration with work of PhD students or the postdoc in my team.

The list below gives as examples all projects from the years 2004-2008.

- 2004 Bram Slachter (Bachelor research project), *Microwave control of spintronics*.
- 2004 Francesco Maddalena (Topmaster literature study with report), *Quantum dots*.
- 2004 Mikel Boute (Bachelor research project), *Ohmic contacts to GaAs heterostructures*.
- 2005 Gabi Visanescu (Master research project), *Microwave control of spintronics*.
- 2006 Friederich Limbach (Bachelor research project), *Ohmic contacts to GaAs heterostructures*.
- 2006 Xinglan Liu (Topmaster research project) *Quantum optics with semiconductors*.
- 2006 Bram Slachter (Topmaster research project, with Prof. Paul van Loosdrecht), *Optical probing of spin dynamics in GaAs heterostructures*.
- 2006 Bram Slachter (Topmaster literature study with report), *Solid-state single-photon sources*.
- 2006 Xinglan Liu (Topmaster literature study with report) *Quantum optics with BEC's*.
- 2006 Maksym Sladkov (Topmaster research project, with Prof. Bart van Wees), *Microwave control of spintronics*.
- 2007 Arjen van der Pal (Bachelor instrumentation project), *Control of quantized conductance demonstration setup*.
- 2007 Sander Kamerbeek (Bachelor instrumentation project), *Automated measurements on quantum dots with rapid data transfer*.
- 2007 Niels van der Kaap (Bachelor research project) *Polarization maintaining fibers for addressing spin in semiconductors with a cryogenic microscope*.
- 2008 Josbert Mulder (Bachelor research project) *Low-noise detection scheme for optical studies on spins in semiconductors*.
- 2008 Joost Flipse (Bachelor research project) *Spin relaxation in quantum dots*.
- 2008 Brian Smith (Topmaster literature study with report), *Solid-state quantum computing*.
- 2008 Sander Kamerbeek (Bachelor research project), *Optical waveguides in semiconductor heterostructures*.
- 2008 Andrii Rudavskiy (Topmaster research project), *Optical probing of spin dynamics in devices etched in GaAs heterostructures*.

## Grants with relation to education

- 2013 Co-applicant (main speaker for the interview, and currently programme supervisor):  
NWO Graduate Programme *Advanced Materials* (5 years, 4 PhD students [800 kEuro]). This concerns a graduate programme at the Zernike Institute for Advanced Materials and the Groningen Graduate School of Science, as a continuation of the Top Master in NanoScience (I am not PhD supervisor for one of the 4 PhD students).

## Publications with relation to education

- 1 *Public exhibit for demonstrating the quantum of electrical conductance*,  
E. H. Huisman, F. L. Bakker, J. P. van der Pal, R. M. de Jonge, C. H. van der Wal,  
*Am. J. Phys.* **79**, 856 (2011)  
[on an educational/outreach project in collaboration with Science Linx of FMNS RuG].
- 2 Veilig communiceren met quantummechanica [in Dutch],  
*Secure communication with quantum mechanics* (invited tutorial),  
Caspar van der Wal,  
*Nederlands Tijdschrift voor Natuurkunde* **80**, 186 (juni 2014).