Personal information

Name:	Geert van den Bogaart
Birth:	August 12, 1980; Utrecht, the Netherlands
Work address:	Department of Molecular Immunology Groningen Biomolecular Sciences and Biotechnology Institute (GBB) University of Groningen Nijenborgh 7, 9747 AG, Groningen, the Netherlands
Home address:	Van Houtenlaan 7, 9722GR, Groningen, the Netherlands
Phone:	+31 (0) 50 363 5230
E-mail:	G.van.den.Bogaart@rug.nl
Website:	http://www.membranetrafficking.com/
ResearcherID:	A-1089-2014
ORCID:	0000-0003-2180-6735

Scientific progress increasingly requires the crossing of the borders between scientific disciplines. Therefore, I positioned my laboratory at the interface of chemistry, microscopy and immunology. A common thread in my research is the combination of advanced microscopy techniques and chemical tools to solve problems in biology. My laboratory uses an interdisciplinary combination of bottom-up approaches with precisely definable reconstituted systems and top-down approaches in (preferentially primary) cells. In order to be able to develop interdisciplinary approaches to research, I studied different fields during various phases of my career: from biophysics of (mainly) bacterial transporters, to the molecular mechanisms of neurotransmitter release, to immune cell biology. These changes enabled me to apply the insights and techniques from my previous field to a new field in biology, and fostered several important discoveries and the development of new techniques. My research focuses in particular on the cellular mechanisms that lead to antigen uptake and presentation by phagocytes of the immune system, and aims to understand and ultimately tailor membrane trafficking pathways in immune cells to cure and prevent disease, mainly autoimmune disease and infections.

Education and work experience

2018 – present Full Professor at the University of Groningen, the Netherlands
- Research department: Molecular Immunology
- Research topic: Membrane trafficking in immune cells
- My research group currently consists of 4 post-docs, 6 PhD students and 1 technician

2012 – present Assistant Professor at the Radboud Institute for Molecular Life Sciences, Nijmegen, the Netherlands
- Research department: Tumor Immunology
- Research topic: Membrane trafficking in immune cells
- My satellite lab currently consists of 2 PhD students

2008 – 2012 Postdoctoral fellow at the Max Planck Institute for Biophysical Chemistry, Göttingen, Germany
Funded by a long-term postdoctoral fellowship of the Human Frontier Science Program (HFSP)
- Research group: Neurobiology
- Group leader: Prof. Dr. Reinhard Jahn

2004 – 2008 PhD degree in biochemistry at the University of Groningen, *cum laude* (top 5%)
- Research group: Biochemistry / Membrane Enzymology
- Group leader: Prof. Dr. Bert Poolman
- Thesis: *On the mobility of biomolecules: a fluorescence microscopy approach*

1999 – 2004 MSc degree in molecular biology at the University of Groningen, *cum laude* (top 5%)

Publications (selection)

Total publications: 72; total citations: >4500; h-index: 31 (Google Scholar). Full publication list.

2021 E.M. Muntjewerff, K. Tang, L. Lutter, G. Christoffersson, M.J.T. Nicolasen, H. Gao Gajanan, G.D. Katkar, S. Das, M. ter Beest, W. Ying, P. Ghosh, S. El Aidy, B. Oldenburg, B., G. van den Bogaart, & S.K. Mahata. Chromogranin A regulates gut permeability via the antagonistic actions of its proteolytic peptides. (2021) *Acta Physiol*. e13655. (**shared corresponding author**)

Discovery of a new mechanism of how the gut barrier is regulated by the two opposing actions of Catestatin and Pancreastatin, two cleavage products of the prohormone Chromogranin A (CgA).

2020 P.T.A. Linders, E. Gerretsen, A. Ashikov, M.A. Vals, N.H. Revelo, R. Arts, M. Baerenfaenger, F. Zijlstra, K. Huijben, K. Raymond, K. Muru, O. Fjodorova, S. Pajusalu, K. Õunap, M. ter Beest, D. Lefeber, & G. van den Bogaart. (2020) New genetic disorder caused by starting site-specific variant in syntaxin-5. *MedRXiv* preprint. (**shared corresponding author**)

Identification of the first genomic disorder caused by a mutation in an alternative translation start codon.

2019 M.V. Baranov, F. Bianchi, A. Schirmacher, M.A.C. van Aart, S. Maassen, E.M. Muntjewerff, I. Dingjan, M. ter Beest, M. Verdoes, S.G.L. Keyser, C.R. Bertozzi, U. Diederichsen, & G. van den Bogaart. The phosphoinositide kinase PIKfyve promotes cathepsin-S mediated MHC class II antigen presentation. *iScience*. 11: 160-177. (**corresponding author**)

Development of a novel universal MHC-II presentation assay based on bio-orthogonal chemistry. This study revealed a key role of the phosphoinositide kinase PIKfyve in the processing and presentation of antigens.

2018 Verboogen, D.R.J., Revelo, N.H., Ter Beest, M., & van den Bogaart, G. (2018) Interleukin-6 secretion is limited by self-signaling in endosomes. *J. Mol. Cell. Biol*. 11: 144-157. (**corresponding author**)

Demonstration that intracrine signaling of newly-synthesized interleukin-6 limits production of inflammatory cytokines by macrophages

2017 D.R.J. Verboogen, N. González Mancha, M. ter Beest, & G. van den Bogaart. Fluorescence lifetime imaging microscopy reveals rerouting of SNARE trafficking driving dendritic cell activation. *eLife*. 6: e23525. (**corresponding author**)

Development of FRET-FLIM for quantitative visualization of SNARE complexes with organellar resolution. TLR4 stimulation of DCs resulted in increased SNARE complex formation of Stx4 with VAMP3 at the plasma membrane.

I. Dingjan, P.T. Linders, L. van den Bekerom, M.V. Baranov, P. Halder, M. ter Beest, & G. van den Bogaart. Oxidized phagosomal NOX2 is replenished from lysosomes. *J. Cell Sci*. 130: 1285–1298. (**corresponding author**)

Mechanism of recruitment of the NADPH oxidase NOX2 to phagosomes. NOX2 is recruited from the plasma membrane during formation of the phagocytic cup and replenished from a lysosomal pool by the SNAREs VAMP8 and Stx7.

2016 M.V. Baranov, N.H. Revelo, I. Dingjan, R. Maraspini, M. ter Beest, A. Honigmann, & G. van den Bogaart. SWAP70 organizes the actin cytoskeleton and is essential for phagocytosis. *Cell Rep*. 17: 1518–1531. (**corresponding author**)

Mechanism of tethering of actin to phagosomes by the Rac1 adapter protein SWAP70.

I. Dingjan, D.R. Verboogen, L.M. Paardekooper, N.H. Revelo, S.P. Sittig, L.J. Visser, G.F. Mollard, S.S. Henriet, C.G. Figdor, M. ter Beest, & G. van den Bogaart. Lipid peroxidation causes endosomal antigen release for cross-presentation. *Sci. Rep.* 6: 22064. (**corresponding author**)

New mechanism for MHC-I antigen cross-presentation. NOX2-produced oxygen radicals rupture endo/phagosomal membranes causing leakage of antigen into the cytosolic MHC-I pathway.

Z. Farsi, J. Preobraschenski, G. van den Bogaart, D. Riedel, R. Jahn, & A. Woehler. Single-vesicle imaging reveals different transport mechanisms between glutamatergic and GABAergic vesicles. *Science.* 351: 981–984.

Imaging of single vesicles showed that, in contrast to glutamate, filling of synaptic vesicles with γ-aminobutyric acid (GABA) only requires only the proton gradient and no other ions.

2015 D. Milovanovic, A. Honigmann, S. Koike, F. Göttfert, G. Pähler, M. Junius, S. Müllar, U. Diederichsen,

A. Janshoff, H. Grubmüller, H.J. Risselada, C. Eggeling, S.W. Hell, G. van den Bogaart, & R. Jahn. (2015) Hydrophobic mismatch sorts SNARE proteins into distinct membrane domains. *Nat. Commun.* 6: 5984. (**shared corresponding author**)

Different lengths of transmembrane helixes can drive lateral segregation of SNARE proteins in membranes and thereby contribute to the subcellular location of membrane fusion.

2014 M.V. Baranov, M. ter Beest, I. Reinieren-Beeren, A. Cambi, C.G. Figdor, & G. van den Bogaart. Podosomes of dendritic cells facilitate antigen sampling. *J. Cell Sci.* 127: 1052–1064. (**corresponding author**)

Discovery that dendritic cells use actin-rich protrusive structures that can penetrate through epithelial layers for sampling of antigen.

2013 A. Honigmann, G. van den Bogaart, E. Iraheta, H.J. Risselada, D. Milovanovic, V. Mueller, S. Müllar, U. Diederichsen, D. Fasshauer, H. Grubmüller, S.W. Hell, C. Eggeling, K. Kühnel, & R. Jahn. Phosphatidylinositol 4,5-bisphosphate clusters act as molecular beacons for vesicle recruitment. *Nat. Struct. Mol. Biol.* 20: 679–686. (**shared first author**)

Proof that clusters of SNARE proteins with phosphoinositide lipids form a molecular docking site for synaptic vesicles.

2011 G. van den Bogaart, K. Meyenberg, H.J. Risselada, H. Amin, K.I. Willig, B.E. Hubrich, M. Dier, S.W. Hell, H. Grubmüller, U. Diederichsen, & R. Jahn. Membrane protein sequestering by ionic protein-lipid interactions. *Nature.* 479: 552–555. (**first author**)

Proof that syntaxin-1 domains in the plasma membrane with roles in neurotransmitter release cluster together with phosphatidylinositol (4,5)-bisphosphate.

G. van den Bogaart, S. Thutupalli, J.H. Risselada, K. Meyenberg, M. Holt, D. Riedel, U. Diederichsen, S. Herminghaus, H. Grubmüller, & R. Jahn. Synaptotagmin-1 may be a distance regulator acting upstream of SNARE nucleation. *Nat. Struct. Mol. Biol.* 18: 805–812. (**first author**)

Identification of a novel mechanism on how the calcium-sensing protein synaptotagmin-1 mediates calcium-evoked exocytosis.

2010 G. van den Bogaart, M.G. Holt, G. Bunt, D. Riedel, F.S. Wouters, & R. Jahn. One SNARE complex is sufficient for membrane fusion. *Nat. Struct. Mol. Biol.* 17: 358–354. (**first author**)

Step-photobleaching of fluorescently-labeled SNAREs revealed that a single SNARE complex suffices for membrane fusion.

Academic staff supervision

Ph.D. students

2021 – present: Melina Ioannidis, Muwei Jiang; **2020 – present:** Myrthe Frans, Alexine de Wit; **2017 – present:** Sjors Maassen; **2018 – present:** Femmy Stempels; **2017 – present:** Elke Muntjewerff; **2016 – present:** Peter Linders; **2014 – 2018:** Dr. Maxim Baranov (now postdoc in my laboratory in Groningen); **2014 – 2019:** Dr. Laurent Paardekooper (now postdoc at Leiden University Medical Center, Netherlands); **2013 – 2018:** Dr. Danielle Verboogen (now Clinical Chemist, Tilburg, Netherlands); **2013 – 2018:** Dr. Ilse Dingjan (now postdoc at University Medical Center Utrecht, Netherlands); **2012 – 2016:** Dr. Malou Zuidscherwoude (co-supervisor; now postdoc at Birmingham University, UK); **2012 – 2015:** Dr. Zohreh Farsi (co-supervisor; Otto Hahn Medal for best PhD thesis; now postdoc at Max Delbrück Center, Germany); **2012 – 2015:** Dr. Dragomir Milovanovic (co-supervisor; now independent group leader at The German Center for Neurodegenerative Diseases, Germany)

Postdocs

2019 – present: Dr. Deepti Dabral; **2018 – present:** Dr. Harry M. Warner; **2018 – present:** Dr. Maxim Baranov; **2016 – present:** Dr. Frans Bianchi (funded by a VENI grant from the Netherlands Organisation for Scientific Research (NWO) and an Off Road grant from ZonMW); **2015 – 2021:** Richèl Bilderbeek (now postdoc at Uppsala University, Sweden); **2015 – 2021:** Dr. Natalia Revelo Nuncira (funded by a VENI grant from the Netherlands Organisation for Scientific Research (NWO))

Invited lectures (selection; last 5 years)

2020
- International ITU Molecular Biology and Genetic Student Congress 2020 (Istanbul, Turkey; online due to COVID-19)
- 23rd International Symposium on Regulatory Peptides (Acapulco, Mexico; postponed to 2022 due to COVID-19)
- 20th International Symposium for Chromaffin Cell Biology (Chennai, India)

2019
- QBI 2019 Quantitative BioImaging Conference (Rennes, France).
- World Health Forum (Beijing, China).

2018
- Vision talk at MPI Junior Group Symposium (Palac Brunow, Poland)

2018
- 12th Annual Graduate Student Association Symposium of the Medical Research Council Laboratory of Molecular Biology (MRC-LMB; Cambridge, UK)

2018
- 62nd Annual Meeting of the Biophysical Society (San Francisco, California, USA)

2017
- Sanquin Research Seminars (Amsterdam, the Netherlands)

2017
- 19th International Symposium on Chromaffin Cell Biology (Sheffield, UK)

2017
- The Jackson Laboratory for Genomic Medicine (Farmington, Connecticut, USA)

2016
- Invited chair for Biomembrane Days (Berlin, Germany)

2015
- Medical Biochemistry and Biophysics Seminar Series (Umea, Sweden)

Grants, fellowships and awards

2021 – 2026
- Open Competition Grant from ZonMW. Title: Engineering the next generation of dendritic cell vaccine immunotherapies (680,000€; with S.I van Kasteren, Leiden University; M. Verdoes, G. Schreibelt and I.J.M. de Vries, Radboud UMC)

2020 – 2025
- Consolidator Grant from the European Research Council (ERC). Title: Pathogen oriented SNARE trafficking for immune tailoring (2,000,000€)

2020 – 2021
- European Proteomics Infrastructure Consortium grant (EPIC-XS). Title: Phosphoproteomics for pathogen-induced rerouting of intracellular trafficking in antigen presenting cells (proteomics access; with H.M. Warner).

2018 – 2021
- Young Investigator Grant from the Human Frontier Science Program (HFSP). Topic: Active morphological colloids for probing and tailoring intracellular antigen processing (1,050,000USD; with S. Thutupalli (Tata Institute, India) and S. Sacanna (New York University))

2017 – 2021
- Junior Researcher Grant from Radboud UMC. Title: Unraveling the role of autophagy in antigen cross-presentation (1 fully funded PhD student)

2015 – 2020
- VIDI grant from the Netherlands Organisation for Scientific Research (NWO). Topic: Activation of the immune system (NWO; 800,000€)

2015 – 2018
- Awarded Young Principal Investigator (jPI) by the Radboud UMC (57,000€ / year)

2014 – 2018
- Research grant from the Institute for Chemical Immunology (ICI). Topic: etiology of systemic sclerosis (610,000€; with T. Radstake; Utrecht University)

2014 – 2017
- Career Development Award from the Human Frontier Science Program (HFSP). Topic: intracellular trafficking of MHC-antigen complex to the immunological synapse (300,000USD)

2013 – 2018
- Starting Grant from the European Research Council (ERC). Title: membrane partitioning of homologous proteins (1,500,000€)

2012
- Heineken Young Scientist Award for Biochemistry and Biophysics. Personal early career achievement award from the Royal Dutch Academy of Sciences (KNAW; 10,000€)

2012 – 2017
- Hypatia Tenure-Track Research Fellowship from the Radboud UMC (800,000€)

2009 – 2012
- Long Term Postdoctoral Fellowship from the Human Frontier Science Program (HFSP; 3 years post-doc salary)

2009 ▪ H.G.K.Westenbrink Prize. Personal award for best Ph.D. thesis in biochemistry and molecular biology from the Dutch Society of Biochemistry and Molecular Biology (1,500€)

2004 ▪ Dutch Society Prize for Young Talent. Personal award for best master's research in biochemistry from the Royal Dutch Society of Sciences (10,000€)

Other academic and professional activities (selection)

2016 – 2020 Member of evaluation committee for Netherlands Organisation for Scientific Research (NWO) Chemical Sciences (TOP/ECHO and VENI)

2020 – present Editorial Board Member for *Membranes* and Review Editor for *Frontiers in Physiology*

2019 – present Valorization activity: guest lessons to primary school pupils. Topic: Infections

2019 Valorization activity: external expert in molecular biology for "Het Compendium de Geneeskunde" (Compendium of Medicine)

2016 – 2018 Member of the RIMLS internal advisory board (IAB). The IAB advises the RIMLS Scientific Director regarding short- and long-term research strategy, Ph.D. program, national and international collaborations and visibility of the institute.

2014 – 2020 Member of the Institute for Chemical Immunology (ICI) funded by a Gravitation Grant from the Netherlands Organisation for Scientific Research (NWO). The ICI aims to develop new chemical tools to combat disease.

2014 – present Ad-hoc reviewer for funding organizations: European Research Council (ERC), French National Research Agency (ANR); Deutsche Forschungsgemeinschaft (DFG); Marsden Fund Council, New Zealand; Flanders Research Foundation (FWO); Medical Research Council (MRC)

2012 – present Ad-hoc reviewer for various scientific journals: *Proc. Natl. Acad. Sci. USA., J. Lipid Res., Biophys. J., Sci. Rep., J. Inv. Med., J. Cell Sci., eLife, Cells, Nature Comm.*

2014 Guest editor of *Frontiers Mem. Phys. Biophys.* review topic issue "Membrane microdomains as new drug targets". See: *Front. Physiol.* 6: 172.

2009 – present Developer of IP3toICS software. This free software allows construction of fluorescence lifetime microscopy images from photon traces recorded with PicoQuant counting cards. This software is used by research groups worldwide (US, UK, Germany, France)

Memberships: the Dutch Society for Immunology (NVVI), the Netherlands Society for Biochemistry and Molecular Biology (NVBMB), Skepsis (Dutch organisation dedicated to the promotion and practice of scientific skepticism), Society Against Quackery (Vereniging tegen de Kwakzalverij)

Teaching (selection)

2019 – present Coordinator of 5 ECTS BSc course "Immunology", 6 ECTS BSc course "UCG Human Immunology"; 6 ECTS BSc course "Mammalian Cell Biology" and 5 ECTS BSc course "Human Immunology" at the University of Groningen

2016 Professional teaching qualification (BKO) for theoretical and practical education

2012 – present Lecturer in medicine and biology BSc and MSc programs at Radboud UMC and University of Groningen. Courses: cell biology, optical microscopy, immunology

2005 – present Supervision of a total of 34 internships (BSc and MSc students)

2016 – 2018 Member of the Radboud Interdisciplinary Honours Programme advisory board. The board advises the program director of the Radboud Honours Academy regarding short- and long-term education strategy.

2015 – 2018 Coordinator of 12 ECTS B.Sc. course "Visualizing Health and Disease: from Molecule to Man", 3 ECTS M.Sc. course "Molecular Biology 2: Edit your own gene", and extracurricular course "The rising costs of cancer therapies"