

# Professor Bengt Nordén

## Curriculum Vitae

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For full CV, see home page: [www.chalmers.se/nordenlab](http://www.chalmers.se/nordenlab)

### PhD 1971

Education: University of Lund MSc 1968 in Mathematics, Theoretical Physics and Chemistry,  
PhD 1971 (Inorganic Chemistry) at University of Lund

**Present position:** The Chair Professorship of Physical Chemistry of Chalmers University of Technology, Gothenburg.

**Positions formerly held:** Associate Prof (Docent) of Inorganic Chemistry at University of Lund 1972-78; Acting Chair Professor of Inorganic Chemistry, University of Lund 1978. Leave of absence for military service 1972. Sabbatical leaves: Visiting Prof: Oregon Univ. Eugene (in 1978 c/o Dr J. Schellman), Univ. Utah (in 1978 c/o Dr J. Michl), Copenhagen Univ. (1990 c/o Dr O. Buchardt) and at California Institute of Technology (2004 c/o Dr A.H. Zewail).

### Honors and awards

#### Elected to Academies:

- The Royal Swedish Academy of Sciences 1991
- The Royal Physiographic Society (Lund) 1992
- The Royal Society of Arts and Sciences (Gothenburg) 1984
- The Royal Swedish Academy of Engineering Sciences 2005
- Academia Europaea 2003
- The National Academy of Sciences of Germany (Deutsche Akademie der Naturforscher Leopoldina) 2006
- The Swedish Academy of Engineering Sciences in Finland 2006
- The Norwegian Academy of Sciences 2007
- The Academy of Sciences and Letters of Finland (Societas Scientiarum Fennica) 2008
- The Academy of Sciences for the Developing World (TWAS) 2009

#### Honors:

- Honorary Anniversary Fellow of the Australian National University (ANU) 1996
- Honorary Professor of the University of Sichuan in Chengdu 2006-
- Honorary Fellow of the Chemical Research Society of India 2009-
- Honorary Fellow of the Chinese Chemical Society, 2009-
- Visiting Scholar of Pembroke College, Cambridge, 2009-
- Elected 2014 Honorary Fellow of the Royal Society of Chemistry (HonFRSC) 2014-

#### Five selected prizes:

- The Fabian Gyllenberg's Prize "for the best chemistry PhD thesis in the past three years" Lund 1972 (the first time the prize was awarded).

- The Goran Gustafsson's Prize for Chemistry 1992 (research award of 350,000 EUR, the second time the prize was awarded).
- The Arrhenius Plaque 1994 (awarded by the Swedish Chemical Society).
- King Abdullah University of Science and Technology Award of 2008, including a research grant of 10 M USD.
- The Svante Arrhenius Gold Medal of 2009 (awarded every 5<sup>th</sup> year to a Chemist or a Physicist by the Academy)

**Number of students brought to PhD (with BN as main advisor):** 39 (14 women), of whom 9 are now full professors in Sweden or abroad.

**Publications:** author of more than 400 scientific original papers in high-class journals, 17 review articles, 98 encyclopedia and popular science articles and 3 monographs.

**Science H-index:** 75 (January 2016).

**Highest cited single paper:** 1851 citations (January 2016).

#### **National and International Commissions of Trust (Present):**

- Member of the 4th Class of the Royal Swedish Academy of Sciences awarding the Nobel Prize for Chemistry, 1991-
- Founder and Chairman of the Molecular Frontiers Foundation, a global organization with objectives: (1) to early on identify breakthroughs in science and (2) to stimulate young people's interests in science by entry through molecular sciences, 2006-
- Chairman of the Nanyang Technology University Research Council (c/o Minister of Education) Singapore 2007-
- Director of The Linnaeus Excellence Centre "Bioinspired Supramolecular Function and Design – SUPRA" 2008-
- Member of the Board of Directors and Science Advisor of the Hasselblad Foundation 1997-
- Chairman of the Committee for Physics, Chemistry, Mathematics and Material Sciences of *Science Europe* (succeeding the European Science Foundation) representing the collective interests of 51 Research Funding and Research performing Organisations of the European nations, 2012-

#### **Editor and Editorial Boards:**

- Editor in Chief of the Quarterly Reviews of Biophysics (Q.R.B.) 2006-.
- Editorial boards: Chemical Physics Letters 2005- , Chemistry Central Journal 2008-
- Chemistry Editor of Swedish National Encyclopedia (+ author of 92 articles and notes) 1988-

#### **National & International Commissions of Trust (Previous):**

- Chairman of the Nobel Committee for Chemistry 2001-2003

- Chairman of the Council of the European Research Councils' Chemistry Committees (CERC3)
- Member of the Governing Board of the Royal Swedish Academy of Sciences 2003-2009.
- Member of the Nobel Committee for Chemistry 1994-2005
- Member of the Prize Committee of the Millennium Technology Prize (Finland) 2006-2008.
- Member of the Board of Trustees of the Nobel Foundation 2004-2010.
- Science Counselor of Science Minister Per Unckel and the Swedish Government 1992-1994.
- Chairman of Swedish Research Council's Chemistry Section 1998-2003.

Chairman of International Science Research Evaluations:

Theoretical Chemistry in Sweden (1988)

Synchrotron Research in Sweden (1990)

Chemistry Dept of University of Lund (1989)

Chemistry at University of Copenhagen (2004)

University of Karlstad (2005)

Chemistry Department of University of Lund (2007)

Physical Biology Center for Ultrafast Science & Technology, Caltech 2008.

Director of EU Biomedical Gene Targeting program (1995-2000).

Director of "Strategic Nucleic Acids" - a national research program of the Foundation for Strategic Research.

Expert reviewer of some 50 appointments to Chair Professorships and University Presidents in Sweden and abroad.

Chair of Final Selection Committee of European Young Investigator (EURYI) Awards of the European Science Foundation (2004-2006).

### **Major science achievements**

Pioneered polarized-light spectroscopy for studying transition moment directions in small molecules in anisotropic media as a tool for elucidating binding geometries and interaction mechanisms of bio-macromolecules. Invented "Site Specific Linear Dichroism by Molecular Replacement" (SSLD-MR) a methodology for 3-D solution-structure determination of protein-DNA complexes and membrane proteins in membranes. Developed novel DNA-binding ligands, including bis-intercalating ruthenium compounds and peptide nucleic acids (PNA). Proposed and demonstrated "hydrophobic catalysis" and a recognition mechanism due to kinetic (in contrast to thermodynamic) selection with possible biological significance. Discovered a new conformation of stretched double-stranded nucleic acid potentially related to the origin of gene recombination and genetic code.

### **Outreach & Popular Science Activities**

Chemistry expert and co-editor of the Swedish National Encyclopedia (NE) 1989-. Founder and Chairman of the Molecular Frontiers Foundation, hosted by the Royal Swedish Academy of Sciences. The Scientific Advisory Board of MF consists of 29 eminent chemists, molecular biologists, physicists and mathematicians (including 13 Nobel Laureates) - see

www.MolecularFrontiers.org and youth: [www.MoleClues.org](http://www.MoleClues.org). Interview of Nordén by Nature Editor Joanne Kotz: <http://www.nature.com/nchembio/journal/v3/n2/full/nchembio0207-79.html>

### **Granted patents.**

Inventor of gene-targeting molecules, including the peptide nucleic acids (PNA).

1. “*Double-stranded peptide nucleic acid (PNA)*” 2001 US Patent 6228982 B1 Inventors: B. Nordén, P. Wittung, M. Egholm, P. Nielsen, R. Berg and O. Buchardt. Issued 2001.
2. “*Binuclear complex*” US pat 6440971, AU 735157 (Australia), WO99/15535 (World) Inventors P Lincoln & B Nordén, Issued 2002
3. “*Rapid genetic screening method*” US Patent 6020126 Inventors B. Nordén, R Zare, C. Carlsson, P. Nielsen, J. Noolandi Issued 2000
4. “*Shear orientation flow device and methods of use*” US 2011 pat 61361165 Inventors B. Nordén, Johan Lundahl
5. Conversion of carbon dioxide to methanol using visible light U.S. Provisional Application No.: 61/650,787
6. Functionalization of carbon-nanotubes, methods of use. Provisional Patent Application (U.S.)

### **Major research grants since 2000**

#### The National Swedish Research Council (VR):

Molecular spectroscopy of biological systems 2000-2015, on average 1.5 MSEK/year. Nucleic acids projects 7 M SEK. “Physical and biological impacts of Stretched DNA” 2016-2020.

Leader and PI of Linnéus Grant: “Bioinspired Supramolecular Nanotechnology”, 7 MSEK/year 2008-2018.

King Abdullah University of Science and Technology: Award of 10 M USD for research 2008-2015

European Research Council, Advanced senior grant 2008-2013: “Supramolecular Motive Power” 1.8 M Euro

Swedish Cancer Foundation Sequence-specific DNA targeting for cancer therapy 1997-2007, 8 M SEK.

#### Foundation for Strategic Research (SSF)

Strategic Nucleic Acid Research (director of network 1998-2004, total 20 M SEK). Senior Individual Grant: 2006-2008 photo-active molecular systems aiming towards solar energy, 6 M SEK.

European Commission (EU): in total 19 M SEK as coordinator or participant of 6 projects during 1997-2008, of particular relevance to this proposal: AMNA, Addressable Molecular Node Assembly 2004-2007, 2.5 MEUR

#### Big instrument grants to BN as Principal Investigator since 1998:

Sub-picosecond laser KAW 3.8 M SEK, and Erna & Victor Hasselblad Foundation 3 M SEK. Infrared spectrometer: KAW 2 M SEK, Light scattering and CD instruments: KAW 2 M SEK. AFM instrument VR 2.8 M SEK, 2007.

**Organisation of International conferences.** B.N. has initiated and been the moderator of many international conferences some of which, according to the scientific media, have had a significant impact as inspiration source to research in chemistry, physics and medicine, e.g. the Nobel Centennial Symposium in 2001:

[http://www.nobelprize.org/nobel\\_organizations/nobelfoundation/symposia/chemistry/ncs-2001-2/about.html](http://www.nobelprize.org/nobel_organizations/nobelfoundation/symposia/chemistry/ncs-2001-2/about.html)

- Nobel Centennial Symposium, 2001 “*Frontiers of Molecular Science*” December 4-7, Friberg's Manor, Stockholm.

- Alfred Nobel Symposium: "*Energy in Cosmos, Molecules and Life*" June 18-22, 2005, Sångas Söby Conference Center, Sweden
- Nobel Workshop "*Fundamentals of Biomolecular Function: Nucleic Acids, Proteins and Membranes*". May 1st to 4th 2005 in Coimbra, Portugal
- Nobel Workshop in Chemistry "*On The Origin of Life*" June 8-10, 2006, c/o The Royal Swedish Academy of Sciences
- Molecular Frontiers 1st Symposium February 2-3, 2007 – Stockholm, c/o The Royal Swedish Academy of Sciences
- *Molecular Frontiers Symposium & Youth Forum* January 10-11, 2008 – Singapore, arranged by The Minister of Education of Singapore and the Institute of Bio- and Nano-technology (IBN) (<http://www.molecularfrontiers2008.com/>)
- Molecular Frontiers 3rd Symposium *A Multidisciplinary Workshop on "Energy and Nano: Emerging Molecular Science and Technology"*, May 30-31, 2008, Stockholm
- Nobel Symposium: *Single Molecule Spectroscopy in Chemistry, Physics and Biology* June 1-6 - Sångas Söby, near Stockholm, c/o The Royal Swedish Academy of Sciences
- Nobel Workshop "*Fundamentals of Biomolecular Function: Nucleic Acids, Proteins and Membranes*". May 1st to 4th 2005 in Coimbra, Portugal
- Molecular Frontiers Symposium "*The Chemistry of Materials*" February 2-3, 2009, Bangalore, India. (<http://www.youtube.com/watch?v=ektjiXV89CQ>)
- Molecular Frontiers Symposium "*The Machinery of Our Senses and Emotions*" June 4-5, 2009, at the Royal Swedish Academy of Sciences in Stockholm, Sweden.
- Molecular Frontiers Symposium "*Alternative energy & Molecules*" June 3-4, 2010 at the Royal Swedish Academy of Sciences in Stockholm, Sweden.
- Molecular Frontiers Symposium "*The Origin of Life and Molecular Evolution*" May 23-25, 2011 at the Royal Swedish Academy of Sciences in Stockholm, Sweden.
- Molecular Frontiers Symposium "*Emerging Technologies in Bio-Medicine*" April 21-22, 2012 at Nanyang Technological University, Singapore. <http://media.ntu.edu.sg/Pages/newsdetail.aspx?news=e824fe66-8214-4739-abda-4194192f43f3>
- Molecular Frontiers Symposium "*How Chemical Cycles Shape our Planet: The Global Change*" May 29-30, 2012 at the Royal Swedish Academy of Sciences in Stockholm, Sweden.
- Molecular Frontiers Symposium "*Molecular Frontiers for Human Frontiers: Life and Exploration in Extreme Conditions*" May 29-30, 2013 at the Royal Swedish Academy of Sciences in Stockholm, Sweden. <http://www.molecularfrontiers.org/symposia/stockholm-2013>
- Molecular Frontiers Symposium "*Creativity and scientific serendipity*" October 28-29, 2013, Seoul, Korea. <http://www.molecularfrontiers.org/symposia/korea-2013>, [http://www.arirang.co.kr/Player/TV\\_Vod.asp?HL=L&code=VOD&vSeq=71593](http://www.arirang.co.kr/Player/TV_Vod.asp?HL=L&code=VOD&vSeq=71593)
- Molecular Frontiers Symposium *The Brain: Achievements and Challenges* May 20-21, 2014 at the Royal Swedish Academy of Sciences in Stockholm, Sweden, <http://www.molecularfrontiers.org/symposia/stockholm-2014>
- Molecular Frontiers Symposium *Molecules for Energy* November 4, 2014, Chalmers University of Technology, Gothenburg, Sweden <http://www.molecularfrontiers.org/symposia/gothenburg-2014>
- "*Frontiers of Molecular Sciences*" – "*The Amazing Week*" 4<sup>th</sup>-8<sup>th</sup> May 2015 <http://www.molecularfrontiers.org/symposia/gothenburg-2015>

