Curriculum Vitae
Professor Bengt J. F. Nordén

PhD 1971
Education: Univ. of Lund MSc 1968 in Mathematics, Theoretical Physics and (Major) Chemistry, PhD 1971 (Polarized light Spectroscopy studies on cobalt(III) ammine outer-sphere complexes).

Present position: The Chair Professorship of Physical Chemistry of Chalmers University of Technology, Gothenburg (appointment by the Swedish Government 1979).

Positions formerly held: Associate Prof (Docent) of Inorganic Chemistry at University of Lund 1972-78; Acting Chair Professor of Inorganic Chemistry, University of Lund 1978-79. Leave of absence for military service (Chemical, Biological & Nuclear Defense Officer) during 1972. Sabbatical leaves: Visiting Professor of Oregon University, Eugene, and Univerity of Utah, Salt Lake City (1978 c/o Dr J. Schellman and Dr J. Michl), H.C. Orsted Institute, Copenhagen University (1990 c/o Dr O. Buchardt) and 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 Scientiarium Fennica) 2008
- The Academy of Sciences for the Developing World (TWAS) 2009

Major Awards:

- The Fabian Gyllenborg's Prize for best PhD thesis in Lund, 1972 (the first time the prize was awarded).
- The Goran Gustafsson Prize for Chemistry 1992 (350,000 EUR, the second time the prize was awarded).
- 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 5th year to a Chemist or a Physicist by the Royal Swedish Academy of Sciences)

Numerous plenary and named lectures (see below)

- Honorary Anniversary Fellow of the Australian National University 1996
- Honorary Professor of University of Sichuan (Chengdu) 2006
- Honorary Fellow of the Chemical Research Society of India 2009.
- Honorary Fellow of the Chinese Chemical Society, 2009.
- Permanent Visiting Scholar of Pembroke College, Cambridge, 2009-

Number of students brought to PhD:
33 (10 women), of whom 11 are now full professors in Sweden or abroad. See http://www.chalmers.se/chem/EN/divisions/physical-chemistry/nordenlab/former-members.

Number of postdocs and sabbatical professors: 27 (6 women).

Publications:
Author of more than 400 scientific original papers in journals with high-class reviewing systems, 17 review articles, 98 encyclopedia and popular science articles and 3 monographs.
Science H-index: 65

National and International Commissions of Trust (Present):

- Member of the 4th Class of the Royal Swedish Academy of Sciences awarding the Nobel Prize in Chemistry, 1991-
- Founder and Director of the Molecular Frontiers Foundation, a global organization with the objectives: (1) to early 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 The Minister of Education) Singapore 2007-
- Member of the Board of Directors of the Hasselblad Foundation 1997-
- Director of Linnaeus Excellence Centre "Bioinspired Supramolecular Function and Design" 2008-

Editor and Editorial Boards:

- Editor in Chief of the Quarterly Reviews of Biophysics 2006-.
- Editorial boards: Chemical Physics Letters 2005- , Chemistry Central Journal 2008-
- Editor of Chemistry for the 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 (CERC) 2006-2007.
- 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 Governing Board of the Nobel Foundation 2004-2010.

- Science Counselor to Science Minister Per Unckel and Swedish Government 1992-1994.
- Chairman of the Chemistry Section of the Swedish Research Council 1998-2003.
- Chairman of International Evaluations:
    - Theoretical Chemistry in Sweden (1988)
    - Synchrotron Research in Sweden (1990)
    - Chemistry Centre of University of Lund (1989)
    - H.C. Orsted Institute of University of Copenhagen (2004)
    - Chemistry Department at the University of Karlstad (2005)
    - Chemistry Institution of University of Lund (2007)
    - Physics & 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 20 research groups supported by the Swedish Foundation for Strategic Research.
- Expert reviewer of 41 appointments to Chair Professorships in Sweden and abroad.
- Chairman of the Final Selection Committee for the European Young Investigator Awards (EURYI) Awards of the European Science Foundation (2004-2006).

Scientific interests.
Mechanisms of molecular recognition, specifically of nucleic acids and role of water for selective hydrogen-bonding in hydrophobic environment. Catalytic effects at hydrophobic surfaces on folding, assembly and ligand association/dissociation. DNA-supramolecular structures with chiral substitution-inert metal complexes and peptide nucleic acids. Spectroscopy with polarized light (flow dichroism) addressing biomolecular structure, e.g. 3D structure of DNA-recombinase complex in solution. Membrane translocation and mechanisms of cell-entering pepides and peptide-nucleic acid complexes.

Major achievements
Pioneered polarized-light spectroscopy (LD) for studying transition moment directions in small molecules in anisotropic media as a tool for elucidating binding geometries and interaction mechanisms of bio-macromolecules. "Site Specific Linear Dichroism by Molecular Replacement" 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.

Outreach & Popular Science Activities
Chemistry expert and co-editor of the Swedish National Encyclopedia (NE) 1989-. Chairman for the Molecular Frontiers Foundation, hosted by the Royal Swedish Academy of Sciences. The Scientific Advisory Board of MF consists of 29 eminent chemists, physicists and mathematicians (including 12 Nobel Laureates) - see www.MolecularFrontiers.org and youth: www.MoleClues.org. Interview with Nordén by Nature Editor *Joanne Kotz: Nature Chemical Biology* **3**, 79 (2007). www.chalmers.se/chem/EN/divisions/physical-chemistry/nordenlab/bengt-norden/scientific-leadership/downloadFile/attachedFile_f0/Molecular_Frontiers.pdf?nocache=1327399505.37

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 based on PNA and electrophoresis*" US Patent 6020126

Inventors B. Nordén, R Zare, C. Carlsson, P. Nielsen, J. Noolandi, Issued 2000

4. "*Shear flow device and methods of use*" US 2011 pat 61361165
Inventors B. Nordén, Johan Lundahl. Issued 2011.

Latest plenary talks. Plenary Lecture of the 2008 Bourke Research Frontiers Symposium, Aspen April 5. Intl. Symposium on Protein Structure and Function, Shanghai, December 2009. Installation talk in the Academy of Sciences for the Developing World, Hyderabad February 2010. Plenary talk "Chemistry for Health and Life" Euro-Chemistry Summit, EU Parliament, Strasbourg - December 2011.

Organisation of International conferences. B.N. has initiated and been the moderator of many international conferences some of which, according to 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

Nobel Centennial Symposium, 2001 "*Frontiers of Molecular Science*"
December 4-7, Friibergs Manor, Stockholm.

Alfred Nobel Symposium: *"Energy in Cosmos, Molecules and Life"*
June 18-22, 2005, Sånga Säby 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 - Sånga-Säby, near Stockholm, c/o The Royal Swedish Academy of Sciences

Molecular Frontiers Symposum "*The Chemistry of Materials*"
February 2-3, 2009, Bangalore, India. (http://www.youtube.com/watch?v=ektjiXV89CQ)

Molecular Frontiers Symposum "*The Machinery of Our Senses and Emotions*" June 4-5, 2009, at the Royal Swedish Academy of Sciences in Stockholm, Sweden.

Molecular Frontiers Symposum "*Alternative energy & Molecules*" June 3-4, 2010
at the Royal Swedish Academy of Sciences in Stockholm, Sweden.

Molecular Frontiers Symposum "*The Origin of Life and Molecular Evolution*" May 23-25, 2011

at the Royal Swedish Academy of Sciences in Stockholm, Sweden.

Molecular Frontiers Symposum "*Emerging Technologies in Bio-Medicine*" April 21-22, 2012 at Nanyang technological University, Singapore.

Molecular Frontiers Symposum "*How Chemical Cycles Shape our Planet: The Global Change*" May 29-30, 2012 at the Royal Swedish Academy of Sciences in Stockholm, Sweden.

Major research grants including past 10 years

The National Swedish Research Council (VR):
LD spectroscopy of anisotropic molecular systems 1990-2007, ca 1.2 MSEK/year.
Charge separation in donor/acceptor systems with nucleic acids 1999-2004, 0.5 M SEK/year
Manipulation of DNA for genome analysis and transfection 2002-2006, 4 M SEK
LD spectroscopy of anisotropic molecular systems 2008-2011, ca 1.8 MSEK/year.

Leader of the Linnéus Grant of 2008: Bioinspired Supramolecular Nanotechnology, 7 MSEK/year x 10 years

King Abdullah University of Science and Technology 2008
Individual Investigator Award 2 M USD/year x 5 years

European Research Council (EU)
ERC grant 2008-2013: "Supramolecular Motive Power" ca 2 M EUR/year x 5 years

Swedish Cancer Foundation Sequence-specific DNA targeting for cancer therapy 1997-2007, 0.8 M SEK/year.

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).
Gene Probes 1997-2000, 2.1 MSEK, BASECONV 2000-2003, 2.6 MSEK, Marie Curie Fellowship 2002-2004 ca 3 M SEK, SNIPER: Sequence Specific Oligomers for in vivo DNA repair 2002-2005, 3 MSEK, ZNIP: Therapeutic in vivo DNA repair 2005-2007, 3 MSEK , NEONUCLEI: Self-assembly of synthetic nuclei 2004-2008, 3 MSEK, AMNA: Addressable Molecular Node Assembly 2004-2007, 2.5 MEUR

Big instrument grants to B.N. as Principal Investigator since 1998:
Sub-picosecond laser equipment (Part1): K & A Wallenberg Foundation 3.8 M SEK, 1998, Sub-picosecond laser equipment (Part2): Erna & Victor Hasselblad's Foundation 3 M SEK, 1998, Infrared spectrometer: K & A Wallenberg Foundation 2 M SEK, 2001, Light scattering and CD instruments: K & A Wallenberg Foundation 2 M SEK, 2002, AFM and STM equipment: National Research Council 2.8 M SEK, 2007.

Ten representative publications

1. Hiort, C., Lincoln, P. and Nordén B* *DNA Binding of D and L [Ru(phen)$_2$DPPZ]$^{2+}$* J. Am Chem. Soc. **115** (1993) 3448-3454
(471 citations)

2. Egholm, M., Buchardt, O., Christensen, L., Behrens, C., Freier, S.M., Driver, D. A., Berg, R.H., Kim, S.K., Nordén, B.* and Nielsen, P.E.* *PNA Hybridizes to Complementary Oligonucleotides Obeying the Watson-Crick Hydrogen Bonding Rules*. Nature, **365** (1993) 566-568 (1015 citations)

3. Wittung, P., Nielsen P.E., Buchardt, Ole., Egholm, M. and Nordén, B.* *DNA-like Double Helix formed by Peptide Nucleic Acid* Nature, **368** (1994) 561-563 (265 citations)

4. Thorén, P.E.G., Persson, D., Isakson, P., Goksar, M., Önfelt, A., Nordén, B.* *Uptake of Analogs of Penetratin, Tat(48-60) and Oligoarginine in Live Cells* Biochem. Biophys. Res. Comm. **307** (2003) 100-107. (163 citations)

5. Wilhelmsson, L.M., Westerlund, F., Lincoln, P. and Nordén, B. *DNA-Binding of Semi-Rigid Binuclear Ruthenium Complex* Delta-Delta *[mu-11,11'-bidppz)(phen)$_4$Ru$_2$]^4:Extremely Slow Intercalation Kinetics* J.Am.Chem.Soc.**124** (2002)12092-12093.(89 citations)

6. Tumpane J, Sandin P, Kumar R, Powers V, Lundberg E, Gale N, Baglioni P, Lehn J-M, Albinsson B, Lincoln P, Wilhelmsson M, Brown T and Nordén B* *Addressable High-Information-Density DNA Nanostructures* Chem. Phys. Letters. **440** (2007) 125-129. (25 citations)

7. Tumpane J, Kumar R, Lundberg E, Sandin P, Gale N, Nandhakumar I, Albinsson A, Lincoln P, Wilhelmsson M, Brown T and Nordén B* *Triplex Addressability as a Basis for Functional DNA Nanostructure Devices* Nano Letters **7** (2007) 3832-3839. (23 citations)

8. Reymer A, Frykholm K, Morimatsu K, Takahashi M and Norden B *Structure of human Rad51 protein filament from molecular modeling and site-specific linear dichroism spectroscopy* Proc. Natl. Acad. Sci (US) **106** (2009) 13248-13253; see also Commentary by M Cox ibid. "A new look at the human Rad51 protein" (9 citations)

9. Beke-Somfai T,* Lincoln P, Nordén B *A double lock ratchet mechanism revealing the role of aSER344 in FoF1 ATP Synthase* Proc.Nat.Ac.Sci. 108 (2011) 4828-4833. (3 citations)

10. Erik P. Lundberg, Calin Plesa, L. Marcus Wilhelmsson, Per Lincoln, Tom Brown and Bengt Nordén *Nano-fabrication yields. Hybridization and click-fixation of polycyclic DNA nano-assemblies* American Chemical Society NANO. **5** (2011) 7565-7575.