



Niels de Jonge

Assistant Professor of Biophysics

Oak Ridge National Laboratory
1 Bethel Valley Rd.
Oak Ridge, TN 37831-6064
T +1-865-241-7315

or

Medical School
Vanderbilt University
813B Light Hall
2215 Garland Ave
Nashville, TN 37232-0615

E niels.de.jonge@vanderbilt.edu
U <http://www.ms.ornl.gov/>
Liquid3DSTEM

Profile

Physicist working on new electron microscopy techniques for biomedical research at Oak Ridge National Laboratory and Vanderbilt University.

Professional experience

Joint-faculty Assistant Professor, department of Molecular Physiology and Biophysics, Medical School of Vanderbilt University, Nashville — 2007-present.

Adjunct Assistant Professor, faculty of Physics and Astronomy, University of Tennessee, Knoxville — 2006-present.

Research Staff, strategic hire, Material Science and Technology Division, Oak Ridge National Laboratory, Oak Ridge — 2005-present.

Senior Scientist, Philips Research, Eindhoven, Netherlands — 2000-2005.

Post-doc, faculty of Biology, University of Freiburg, Germany — 1999.

Research Assistant, Brookhaven National Laboratory, Upton — 1995.

Education

Faculty of Biology, University of Freiburg, Germany — PhD in biophysics, 1999.

University of Amsterdam, Netherlands — Master's in experimental physics, 1994.

University of Leiden, Netherlands — Physics, 1988.

Research

Liquid STEM. Research on scanning transmission electron microscopy (STEM) of whole eukaryotic cells in liquid using a flow cell with electron transparent windows. Nanometer resolution was achieved on specific labels. Liquid STEM can also be used for *in situ* experiments in materials science.

3D STEM. Research on 3-dimensional aberration corrected STEM of biological samples based on the principles of confocal microscopy. 3D STEM is an alternative for electron tomography with potentially improved capabilities.

Electron source. Construction of a new high brightness electron source for STEM using nanowires, or carbon nanotubes. The new sources should result in much faster STEM imaging, as needed for time-resolved imaging.

Former research. At Philips Research I was project leader of research on carbon nanotubes as new electron sources for electron microscopes, involving electron microscopy instrumentation, science of electron sources and nanotechnology. I set-up a network of competence. My Ph.D. was on light-induced electron transfer in synthetic proteins. It involved laser spectroscopy, biological photosynthesis, molecular modeling, bioinformatics, biochemistry, and *de novo* protein synthesis.

Teaching and supervision

Teaching in the graduate seminar in molecular biophysics, and in the interdisciplinary graduate program in biomedical sciences, Medical School, Vanderbilt University, 2008.

Lectures on electron microscopy in the graduate class of Prof. D. C. Joy, University of Tennessee, Knoxville, 2006.

Teaching undergraduate students in Bioinformatics, 1998-1999. Teaching undergraduate students in radioactive labeling of DNA, 1998-1999.

Supervisor for 4 Master's students, 3 PhD students and 3 post-docs, 2001-present.

Awards

ORNL innovation award, 2007.

ORNL awards night, Esprit de Corps, community service category, 2008.

Press

Research work mentioned in several newspapers and journals, for example, "Financial Times", "Materials Today", "Nanotechweb.org", "Science News", "Technology review", "Berliner Zeitung", "European Semiconductors", "Frankfurter Allgemeine Zeitung", "NRC Handelsblad", "Philips Research Newsletter", "Technisch Weekblad".

Memberships

Member of the American Physical Society, the Biophysical Society, the Microscopy Society of America and the American Chemical Society.

Profession activities

Faculty fellow of Vanderbilt Institute for Integrative Biosystem Research and Education.

Symposium co-organizer of session E, "Science and Technology of Nanotubes and Nanowires" at the E-MRS 2006 Spring Meeting in Nice, France, 2006.

Regular reviewer for Applied Physics Letters, Advanced Materials, Nanoletters, Nanotechnology, Journal of Applied Physics and others.

Publications

Bookchapters

3. de Jonge, N., Carbon nanotube electron sources for electron microscopes. in Advances in Imaging & Electron Physics, book series, ed. Hawkes, P.W., 156, Elsevier, Amsterdam, in press, 2009.
2. de Jonge, N., Sougrat, R., Peckys, D.B., Lupini, A.R. & Pennycook, S.J., 3-dimensional aberration corrected scanning transmission electron microscopy for biology. in Nanotechnology in Biology and Medicine, ed. Vo-Dinh, T., CRC Press, 2007.
1. Lupini, A.R., Rashkeev, S.N., Varela, M., Borisevich, A.Y., Oxley, M.P., van Benthem, K., Peng, Y., de Jonge, N., Veith, G.M., Chisholm, M.F. & Pennycook, S.J., Scanning transmission electron microscopy, in Nanocharacterization, ed. Kirkland, E.J. & Hutchison, J.L., Royal Society of Chemistry, Cambridge, 2007.

Publications in refereed journals - total h-factor = 12

26. de Jonge, N., Peckys, D.B., Kremers, G.J. & Piston, D.W., Electron microscopy of whole cells in liquid with nanometer resolution. Proc. Natl. Acad. Sci., in press, 2009.
25. Peckys, D.B., de Jonge, N., Simpson, M.L. & McKnight, T.E., End-specific strategies of attachment of long double stranded DNA onto gold-coated nanofiber arrays. Nanotechnology 19, in press, 2008.
24. Edgcombe, C. J. & de Jonge, N., Deduction of work function of carbon nanotube field emitter by use of curved-surface theory. J. Phys. D: Appl. Phys. 40, 4123-4128, 2007.
23. Heeres, E.C., Bakkers, E.P.A.M., Roest, A.L., Kaiser, M., Oosterkamp, T.H.. & de Jonge, N., Electron emission from individual indium arsenide semiconductor nanowires. Nano Lett. 72, 536-540, 2007.
22. Kaiser, M., Doytcheva, M., Verheijen, M.A. & de Jonge, N., In-situ transmission electron microscopy of individual free-standing carbon nanotubes. Ultramicroscopy 106, 902-908, 2006.
21. Milne, W.I., Teo, K.B.K., Mann, M., Bu, I.Y.Y., Amaratunga, G.A.J., de Jonge, N., Allioux, M., Oostveen, J.T. , Legagneux, P., Minoux, E., Gangloff, L., Hudanski, L., Schnell, J.P., Dieumegard, L.D., Peauger, F., Wells, T. & El-Gomati, M., Carbon nanotubes as electron sources. Phys. Stat. Sol. 203, 1058-1063, 2006.
20. Doytcheva, M., Kaiser & de Jonge, N., In-situ transmission electron microscopy investigation of the structural changes in carbon nanotubes during electron emission at high currents. Nanotechnology 17, 3226-3233, 2006.
19. Edgcombe, C. J. & de Jonge, N., Properties of a field emitter deduced from curvature of its Fowler-Nordheim plot. J. Vac. Sci. Technol B 24, 869-873, 2006.
18. Edgcombe, C. J. & de Jonge, N., Preparation of a carbon nanotube field emitter and deduction of its properties from curvature the Fowler-Nordheim plot. J. Phys. Conf. S. 26, 315-318, 2006.
17. de Jonge, N., Allioux, M., Oostveen, J.T., Teo, K. B. K & Milne, W. I, Low noise and stable emission from carbon nanotube electron sources. Appl. Phys. Lett. 87, 133118-1-3, 2005.
16. de Jonge, N., Allioux, M., Oostveen, J.T., Teo, K. B. K & Milne, W. I, The optical performance of carbon nanotube electron sources. Phys. Rev. Lett. 94, 186807-1-4, 2005.

15. de Jonge, N., Doytcheva, M., Allioux, M., Kaiser, M., Mentink, S.A.M., Teo, K. B. K, Lacerda, R. G. & Milne, W. I, Cap closing of thin carbon nanotubes. *Adv. Mater.* 17, 451, 2005.
14. de Jonge, N., Oostveen, J.T., van Rooij, T., Allioux, M., Doytcheva, M., Kaiser, M., Teo, K.B.K., Lacerda, R.G. & Milne, W.I., Carbon Nanotube Electron Sources for Electron Microscopes, in Functional Carbon Nanotubes, edited by D.L. Carroll, B. Weisman, S. Roth, and A. Rubio, Mater. Res. Soc. Symp. Proc. 858E, HH9.1., 2005.
13. de Jonge, N. & Bonard, J. M., Carbon nanotube electron sources and applications. Invited review paper, *Phil. Trans. R. Soc. Lond. A* 362, 2239-2266, 2004.
12. Doytcheva, M., Kaiser, M., Verheijen, M. A., Reyes-Reyes, M., Terrones, M. & de Jonge, N., Electron emission from individual nitrogen-doped multi-walled carbon nanotubes. *Chem. Phys. Lett.* 396, 126-130, 2004.
11. de Jonge, N., Allioux, M., Doytcheva, M., Kaiser, M., Teo, K.B.K., Lacerda, R.G. & Milne, W.I. , Field emission from individual thin carbon nanotubes, *AIP Conference Proceedings* N723, 485-489, 2004.
10. De Jonge, N. Allioux, M., Doytcheva, M., Kaiser, M., Teo, K. B. K, Lacerda, R. G. & Milne, W. I, Characterization of the field emission properties of individual thin carbon nanotubes, *Appl. Phys. Lett.* 85, 1607-1609, 2004.
9. de Jonge, N., The brightness of carbon nanotube electron emitters. *J. Appl. Phys.* 95, 673-681, 2004.
8. de Jonge, N., Lamy, Y., & Kaiser, M., Controlled mounting of individual multi-walled carbon nanotubes on support tips. *Nano Lett.* 3, 1621-1624, 2003.
7. de Jonge, N. & van Druten, N. J., Field emission from individual multiwalled carbon nanotubes prepared in an electron microscope. *Ultramicroscopy* 95, 85-91, 2003.
6. de Jonge, N., Lamy, Y., Schoots, K., & Oosterkamp, T. H., High brightness electron beam from a multi-walled carbon nanotube. *Nature* 420, 393-395, 2002. **Times cited: 106**
5. Rau, H. K., de Jonge, N., & Haehnel, W., Combinatorial synthesis of four-helix bundle hemoproteins for tuning cofactor properties. *Angew. Chem. Int. Ed.* 39, 250-253, 2000.
4. de Jonge, N., Rau, H. K., & Haehnel, W., Light induced electron transfer in synthetic metalloproteins. *Z. Phys. Chem.* 213, 175-180, 1999.
3. Rau, H. K., de Jonge, N., & Haehnel, W., Modular synthesis of de novo-designed metalloproteins for light-induced electron transfer. *Proc. Natl. Acad. Sci.* 95, 11526-11531, 1998. **Times cited: 70**
2. van den Brink, H. B. et al., Neutral-pion electroproduction on the proton near threshold. *Phys. Rev. Lett.* 74, 3561-3564, 1995.
1. Bobeldijk, I. et al., High-momentum protons in /sup 208/Pb. *Phys. Rev. Lett.* 73, 2684-2687, 1994.

Conference proceedings

12. de Jonge, N. & Stokes, D.J., ESEM, STEM-in-ESEM and 200 kV STEM Imaging of Soft Matter and Liquid-State Specimens. *Proceedings of Microscopy & Microanalysis*, Albuquerque, USA, 2008.
11. de Jonge, N., Peckys, D.B. & Piston, D.W., Electron microscopy of whole cells in liquid with nanometer resolution. *Proceedings of ACMM-20 & IUMAS-IV*, Perth, Australia, 2008.

10. de Jonge, N., Peckys, D.B., Veith, G.M., Mick, S., Pennycook, S.J. & Joy, D.C., Scanning transmission electron microscopy of biological specimens in water. *Microsc. Microanal.* 13(Suppl 2), 242-243, 2007.
9. Pennycook, S.J., Chisholm, M., Lupini, A.R., Peng, Y., Varela, M., van Benthem, K., Borisevich, A.Y., de Jonge, N. & Oxley, M.P., Aberration-Corrected STEM - More than just Higher Resolution. *Microsc. Microanal.* 12, 132-133, 2006.
8. de Jonge, N., Lupini, A.R., van Benthem, K., Borisevich, A.Y. & Pennycook, S.J., Depth-related Contrast in Aberration-Corrected Confocal STEM. *Microsc. Microanal.* 12, 1574-1575, USA, 2006.
7. van Benthem, K., de Jonge, N., Borisevich, A.Y., Oxley, M.P. & Pennycook, S.J., 3D Imaging with Single Atom Sensitivity using Confocal STEM. *Microsc. Microanal.* 12, 1562-1563, 2006.
6. Kaiser, M., Doytcheva, M., Verheijen, M.A. & de Jonge, N., High-resolution imaging and in-situ TEM emission experiments of individual freestanding carbon nano tubes. Proceedings of the NVvM (Dutch Microscopy Association) Symposium, 2004.
5. Creek, S. R., Edgecombe, C. J., N. de Jonge & Valdre, U., Properties of single field emitters deduced by use of spherical Fowler-Nordheim theory, Proceedings of the IVNC2004, Cambridge (MA), USA, 2004.
4. Kaiser, M., de Jonge, N. & Allioux, M., High-resolution transmission electron microscopy of individual multi-walled carbon nanotubes mounted on tungsten support tips. Proceedings of the 13th European Microscopy conference, Antwerpen, Belgium, vol II, 2004.
3. Rau, H. K., de Jonge, N., & Haehnel, W., Combinatorial synthesis of de novo metalloproteins with tuned redox properties. Proceedings of the 16th American Peptide Symposium, Minneapolis, USA, 1999.
2. Rau, H. K., de Jonge, N., & Haehnel, W., Modular synthesis of de novo-designed metalloproteins for light-induced electron transfer. Proceedings of the 25th European Peptide Symposium, Budapest, Hungary, 1998.
1. Rau, H. K., de Jonge, N., & Haehnel, W., De novo design and synthesis of a heme-binding four-helix TASP capable of light-induced electron transfer. Proceedings of the 15th American Peptide Symposium, Nashville, USA, 1997.

Patents

1. de Jonge, N., Bakkers, E.P.A.M., Feiner,L.F. & Calvosa, A.M., Electron source with low energy spread, US Patent, 7,288,773, 2005.

Thesis

Ph.D. thesis, de Jonge, N., Electron transfer in synthetic proteins, University of Freiburg, Germany, 1999.
Master's thesis, de Jonge, N., Proton detection in the $4\text{He}(e,e'pN)$ experiment at ELSA, University of Amsterdam, Netherlands, 1994.

Other scientific publications

8. Co-editor of *Physica E: Low-dimensional Systems and Nanostructures* 37, 1-298, 2007, ed., Ferrari, A.C., Hartschuh, A. & de Jonge, N., 2006.

Publications, Niels de Jonge

7. de Jonge, N., Liquid and 3D STEM. Web Page at Oak Ridge National Laboratory, 2007. <http://www.ms.ornl.gov/Liquid3DSTEM>
6. Edgcombe, C. J. & de Jonge, N., Properties of a field emitter deduced from curvature of its Fowler-Nordheim plot. Virtual Journal of Nanoscale Science & Technology 13, 2006.
5. de Jonge, N., Allioux, M., Oostveen, J.T., Teo, K. B. K & Milne, W. I, Low noise and stable emission from carbon nanotube electron sources. Virtual Journal of Nanoscale Science & Technology 12, 2005.
4. de Jonge, N., Allioux, M., Oostveen, J.T., Teo, K. B. K & Milne, W. I, The optical performance of carbon nanotube electron sources. Virtual Journal of Nanoscale Science & Technology 11, 2005.
3. De Jonge, N. Allioux, M., Doytcheva, M., Kaiser, M., Teo, K. B. K, Lacerda, R. G. & Milne, W. I, Characterization of the field emission properties of individual thin carbon nanotubes, Virtual Journal of Nanoscale Science & Technology 10, 2004.
2. de Jonge, N., Carbon nanotube field emitters. Web Page at Philips Research Home Page, 2002. <http://www.extra.research.philips.com/nanotubes>
1. Kurt, R. & de Jonge, N., The nanotube site. Angew. Chem. Int. Ed. 41, 999, 2002.