



Dr. Nathan W. Luedtke

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Vita

Nathan Luedtke was born in the United States in 1973, and attended high school near Seattle, Washington. In 1996 he received his bachelor's degree from the University of Washington where he worked as a teaching assistant for the Department of Chemistry. During his studies at the University of Washington he conducted original research investigating DNA alkylation by anti-cancer agents with Paul Hopkins (Organic Chemistry), and DNA replication in *S. cerevisiae* with Walt Fangman (Genetics).

Nathan received his doctoral degree in 2003 from the University of California, San Diego where he studied small molecule – RNA binding interactions in the laboratory of Yitzhak Tor. During his PhD work he received numerous awards for teaching and research, as well as a doctoral fellowship from the State of California to investigate the anti-HIV potential of RNA ligands.

From 2003-2006 Nathan worked as an NIH Postdoctoral Fellow in the Laboratory of Alanna Schepartz (Yale University). During this time he investigated a variety of topics at the interface of chemistry and biology, including the application of small fluorescent molecules to study protein folding in living cells.

Since October 2006, Nathan has been an Assistant Professor of Organic Chemistry at the University of Zürich where he is investigating the chemistry and biology of unusual DNA structures.

Education

Ph.D. University of California, San Diego, Department of Chemistry and Biochemistry, 2003

M.Sc. University of California, San Diego, Department of Chemistry and Biochemistry, 1999

B.Sc. University of Washington, Seattle, Department of Chemistry and Biochemistry, 1997

Research Experience

Assistant Professor (Tenure Track): University of Zürich, Organic Chemistry Institute, October 2006-

NIH Postdoctoral Fellow: Yale University, Schepartz Laboratory (Chemical Biology), 2003-2006

Doctoral Research: University of California, San Diego, Tor Laboratory (Chemistry), 1997-2003

Undergraduate Research: University of Washington, Fangman Laboratory (Genetics), 1996-1997

Undergraduate Research: University of Washington, Hopkins Laboratory (Chemistry), 1995-1996

Awards, Honors, and Grants

N.I.H. Postdoctoral Fellowship, 2004-2006

Universitywide AIDS Research Program, Doctoral Fellowship, 2001-2002

Traylor Award for Outstanding Graduate Research, University of California, San Diego, 2001

Poster Presentation Award, Gordon Research Conference for Bioorganic Chemistry, 2001

Award for Outstanding Teaching Assistant, University of California, San Diego, 2000

N.I.H. Molecular Biophysics Trainee, University of California, San Diego, 1999-2001

Teaching Experience and Student Evaluations

ETH Hönggerberg, Switzerland, 2009, 529-0731-00L, Biological Chemistry I. Evaluation = no survey.
 University of Zürich, Switzerland, 2009, Chem. 209 Organic Chemistry II, Evaluation = 3.6 / 4.0
 University of Zürich, Switzerland, 2009, Chem. 434 Chemical Biology, Evaluation = 3.3 / 4.0
 University of Zürich, Switzerland, 2008, Chem. 434 Chemical Biology, Evaluation = 3.2 / 4.0
 University of Zürich, Switzerland, 2008, Chem. 730 Nucleic Acids, Evaluation = no survey.
 University of Zürich, Switzerland, 2007, Chem. 434 Chemical Biology, Evaluation = 3.6 / 4.0
 University of California, San Diego, 2001, Organic Chemistry 12, Evaluation = 3.6 / 4.0
 University of California, San Diego, 2000, Biochemistry 112 B, Evaluation = 3.7 / 4.0
 University of California, San Diego, 1999, Organic Chemistry 140 B, Evaluation = 3.6 / 4.0
 University of California, San Diego, 1998, Organic Chemistry 143 B, Evaluation = 3.7 / 4.0
 University of Washington, 1997, General Chemistry 141 BD, Evaluation = 4.1 / 5.0
 University of Washington, 1996, General Chemistry 161 BE, Evaluation = 4.2 / 5.0
 University of Washington, 1996, General Chemistry 141 AJ, Evaluation = 4.8 / 5.0

Journal Articles

1. J. Alzeer, N. W. Luedtke, Electrostatic interactions in G-quadruplex - phthalocyanine binding. **2009**, *In review*.
2. M. S. Seyfried, B. Lauber, N. W. Luedtke, Mild and selective ¹⁸O-labeling of Fmoc- and Boc-protected amino acids. *Org. Lett.*, **2009**, published on-line DOI: 10.1021/ol902519g.
3. M. Paramasivam, A. Membrino, S. Cogoi, J. Alzeer, N. W. Luedtke, L. E. Xodo, Cellular uptake and binding of guanidine-modified phthalocyanines to KRAS/HRAS G-quadruplexes. *Chem. Commun.*, **2010**, published on-line DOI: 10.1039/b918964e.
4. J. Alzeer, B. R. Vummidi, P. J. C. Roth, N. W. Luedtke, Guanidinium-modified phthalocyanines as high affinity G-quadruplex fluorescent probes and transcriptional regulators. *Angew. Chem. Intl. Ed.* **2009**, *48*, 9362-9365; *Angew. Chem. Ger. Ed.* **2009**, *121*, 9526-9529.
5. J. Alzeer, P. J. C. Roth, N. W. Luedtke, An efficient two-step synthesis of metal-free phthalocyanines using a zinc(II) template. *Chem. Commun.*, **2009**, 1970-71.
6. N. W. Luedtke, Targeting G-quadruplex DNA with small molecules. *Chimia*, **2009**, 134-39.
7. N. W. Luedtke, D. Fried, R. Dexter, A. Schepartz, Surveying the conformation and association of polypeptides and protein domains in live cells with FIAsh and ReAsH. *Nature Chemical Biology*, **2007**, *3*, 779-84.
8. N. W. Luedtke, A. Schepartz, Lanthanide-mediated phosphoester hydrolysis and phosphate elimination from phosphopeptides. *Chem. Commun.* **2005**, *43*, 5426-5428.
9. J. A. Kritzer, N. W. Luedtke, E. A. Harker, A. Schepartz, Rapid library screen for tailoring β -peptide structure and function. *J. Am. Chem. Soc.* **2005**, *127*, 14584-14585.
10. J. A. Kritzer, N. W. Luedtke, Chemical biology: innovative solutions for diverse challenges. *Chem. Biol.* **2005**, *12*, 617-620.
11. N. W. Luedtke, Q. Liu, Y. Tor, On the electronic structure of ethidium. *Chem. Eur. J.* **2005**, *11*, 495-508.

12. J. Boer, K. F. Blount, N. W. Luedtke, L. Elson-Schwab, Y. Tor, RNA-selective modification by a platinum(II) complex conjugated to amino- and guanidinoglycosides. *Angew. Chem. Intl. Ed.* **2005**, *44*, 927-932.
13. J. Aldrich-Wright, C. Brodie, E. C. Glazer, N. W. Luedtke, L. Elson-Schwab, Y. Tor, Symmetrical dinuclear complexes based on $[\text{Ru}(\text{dpq})_2(\text{phen})]^{2+}$ with high DNA affinity. *Chem. Commun.* **2004**, *8*, 1018-1019.
14. N. W. Luedtke, P. Carmichael, Y. Tor, Cellular uptake of aminoglycosides, guanidinoglycosides, and poly-arginine. *J. Am. Chem. Soc.*, **2003**, *125*, 12374-12375.
15. N. W. Luedtke, Y. Tor, Fluorescence-based methods for evaluating the RNA affinity and specificity of HIV-1 Rev-RRE inhibitors. *Biopolymers*, **2003**, *70*, 103-119.
16. N. W. Luedtke, Q. Liu, Y. Tor, RNA-ligand interactions: affinity and specificity of aminoglycoside dimers and acridine conjugates to the HIV-1 Rev response element. *Biochemistry*, **2003**, *42*, 11391-11403.
17. N. W. Luedtke, J. S. Hwang, E. C. Glazer, D. Gut, M. Kol, Y. Tor, The DNA and RNA specificity of eilatin Ru(II) complexes as compared to eilatin and ethidium. *Nucleic Acids Res.*, **2003**, *31*, 5732-5740.
18. N. W. Luedtke, Q. Liu, Y. Tor, Synthesis, photophysical properties, and nucleic acid binding of phenanthridinium derivatives based on ethidium. *Bioorg. Med. Chem.*, **2003**, *11*, 5235-5247.
19. K. Fineberg, T. Fineberg, A. Graessmann, N. W. Luedtke, Y. Tor, R. Lixin, D. A. Jans, A. Loyter, Inhibition of nuclear import mediated by the Rev-arginine rich motif by RNA molecules. *Biochemistry*, **2003**, *42*, 2625-2633.
20. N. W. Luedtke, J. S. Hwang, E. C. Glazer, D. Gut, M. Kol, Y. Tor, Eilatin Ru(II) complexes display anti-HIV activity and enantiomeric diversity in the binding of RNA. *Chembiochem*, **2002**, *3*, 766-771.
21. S. R. Kirk, N. W. Luedtke, Y. Tor, 2-Aminopurine as a real-time probe of enzymatic cleavage and inhibition of hammerhead ribozymes. *Bioorg. Med. Chem.*, **2001**, *9*, 2295-2301.
22. Q. Liu, N. W. Luedtke, Y. Tor, A simple conversion of amines into monosubstituted ureas in organic and aqueous solvents. *Tetrahedron Lett.*, **2001**, *42*, 1445-1447.
23. A. Friedler, D. Friedler, N. W. Luedtke, Y. Tor, A. Loyter, C. Gilon, Development of a functional backbone cyclic mimetic of the HIV-1 Tat arginine-rich motif. *J. Biol. Chem.*, **2000**, *275*, 23783-23789.
24. N. W. Luedtke, T. J. Baker, M. Goodman, Y. Tor, Guanidinoglycosides: A novel family of RNA ligands. *J. Am. Chem. Soc.*, **2000**, *122*, 12035-12036.
25. N. W. Luedtke, Y. Tor, A novel solid-phase assembly for identifying potent and selective RNA ligands. *Angew. Chem. Intl. Ed.*, **2000**, *39*, 1788-1790.
26. S. R. Kirk, N. W. Luedtke, Y. Tor, Neomycin-acridine conjugate: A potent inhibitor of Rev-RRE binding. *J. Am. Chem. Soc.*, **2000**, *122*, 980-981.
27. T. J. Baker, N. W. Luedtke, Y. Tor, M. Goodman, Synthesis and anti-HIV activity of guanidinoglycosides. *J. Org. Chem.*, **2000**, *65*, 9054-9058.

28. J. T. Millard, N. W. Luedtke, R. J. Spencer, The 5'-GNC preference for mustard cross-linking is preserved in a restriction fragment. *Anti-Cancer Drug Des.*, **1996**, *11*, 485-492.

Book Chapter

1. N. W. Luedtke, Y. Tor, Targeting HIV RNA with Small Molecules. In: *DNA and RNA Binders Vol. 1*, **2002**, Wiley-VCH, 18-40.

Patents

1. N. W. Luedtke and J. Alzeer, "Preparation and uses of guanidium-modified porphyrins and phthalocyanines." (**2008**) European Patent Application No. EP 08/015814.
2. N. W. Luedtke and A. Dumas, "Preparation and uses of 8-substituted deoxyguanosines." (**2008**) European Patent Application No. EP 08/015890.
3. Y. Tor and N. W. Luedtke, "Guanidinium derivatives for improved cellular transport." PCT Intl. Appl. (**2005**) WO2005025513.
4. Y. Tor and N. W. Luedtke, "Preparation of phenanthridine derivatives as anti-viral agents." PCT Intl. Appl. (**2005**) WO2005016343.
5. M. Goodman, Y. Tor, T. Baker, and N. W. Luedtke, "Preparation of guanidino-glycosides via guanidinylation of glycosides and methods of assaying their antiviral and antibacterial activities." U.S. (**2003**) 6,525,182 and 6,833,445.

Invited Lectures

1. "Diverse DNA structures as potential anticancer targets." *Clinical Biochemistry Colloquium*, May **2008**, hosted by Prof. Alexandre Arcaro.
2. "Small-molecule fluorescent probes for detecting biopolymer folding in living cells." *European Molecular Biology Laboratory, Heidelberg*, April **2009**, hosted by Prof. Carsten Schultz.
3. "Metal-mediated DNA binding and cellular localization of G-quadruplex-specific fluorescent probes." *COST Action D39/002/09 meeting*, Zurich, May **2009**, headed by Prof. Michael Hannon.
4. "Fluorescent probes for G-quadruplex DNA." *University of Hong Kong Chemical Biology Symposium*, May **2009**, hosted by Prof. Julian Taner.
5. "Fluorescent probes for G-quadruplex DNA." *Osaka University*, Sept. **2009**, hosted by Prof. Kazuhiko Nakatani.
6. "G-quadruplex fluorescent probes as transcriptional regulators." *Switzerland-Japan Biomolecular Chemistry Symposium*, Sept. **2009**, hosted by Prof. Hiroaki Suga.
7. "Modified nucleotides and phthalocyanines as structure-selective probes for nucleic acids." *Organic Chemistry Colloquium, ETH Zurich*, Oct. **2009**, hosted by Prof. Ryan Gilmour.