

Ronald N. Zuckermann

The Molecular Foundry
Lawrence Berkeley National Laboratory
1 Cyclotron Rd.; MS 67-5110
Berkeley, CA 94720
(510) 486-7091

e-mail: rnzuckermann@lbl.gov
web: foundry.lbl.gov, www.ronznet.com

Education

- 1984 - 1989 Ph.D. in Organic Chemistry, Dept. of Chemistry, University of California, Berkeley, CA 94720. Advisor: Dr. Peter Schultz.
- 1980 - 1984 B.S. in Chemistry with honors and distinction, Harvey Mudd College, Claremont, CA 91711.

Research

- 2011 – present Sr. Scientist & Facility Director, Biological Nanostructures Facility, The Molecular Foundry, Lawrence Berkeley National Laboratory, Berkeley, CA
- 2008 – 2011 Facility Director, Biological Nanostructures Facility, The Molecular Foundry, LBNL
- 2006 – 2008 Lead Scientist, Biological Nanostructures Facility, The Molecular Foundry, LBNL
- 2003 – 2005 Research Fellow, Chiron Corp.
- 1996 – 2003 Director of Bioorganic Chemistry, Chiron Corp.
- 1993 – 1996 Associate Director, Bioorganic Chemistry, Chiron Corp.
- 1991 – 1993 Senior Scientist, Bioorganic Chemistry, Chiron Corp. Emeryville, CA.
- 1989 – 1991 Research Scientist, New Technologies, Protos Corp., Emeryville, CA.
- 1984 - 1989 Design and synthesis of hybrid sequence-specific ribonucleases (graduate research). Advisor: Dr. Peter Schultz, University of California, Berkeley.
- Summer 1984 Free-radical ring-opening polymerizations: synthesis of new copolymers (Resident Research Program). Advisor: Dr. Harry Cripps, Central Research and Development Department, E.I. Du Pont de Nemours and Company, Experimental Station, Wilmington, DE 19898.
- 1982 - 1984 Synthesis of 2-fluoro-2-alkenes as terminators for biomimetic polyene cyclizations (summer 1982, junior year, and senior thesis project). Advisor: Dr. G. William Daub, Harvey Mudd College, Claremont, CA 91711.
- Summer 1983 Synthesis of retinal analogs: investigation of the cis-trans isomerization of retinal in bacteriorhodopsin (Summer Student Program). Advisor: Dr. Stanley Seltzer, Dept. of Chemistry, Brookhaven National Laboratory, Upton, NY 11973.

Editorial Duties

1995 - 2003 Editorial Board: *Molecular Diversity*
1996 - 2004 Editorial Board: *Combinatorial Chemistry and High Throughput Screening*
1998 - 2003 Editorial Board: *Journal of Combinatorial Chemistry*
Ongoing Reviewer for: *J. Org. Chem.*, *JACS*, *J. Med Chem.*, *J. Comb. Chem.*, *Org. Lett.*, *Biorg. Med. Chem. Lett.*, *Chemistry & Biology*, *Chem. Comm.*, *Mol. Biosys.*, *Nat. Chem.*

Awards

2009 LBNL Outstanding Performance Award
2003 Chiron Research Fellow
1985-86 University of California Regents Fellowship.
1984 Nomination to Sigma Xi Society.
1984 Student Award of the American Institute of Chemists Student Research and Recognition Foundation.

Research Interests

Molecular biomimicry with peptoid polymers.
Atomically-defined soft nanostructured materials.
Methods and technologies for rapid combinatorial discovery.
Materials science applications of sequence-specific heteropolymers.
Design and synthesis of functional artificial proteins.

Biographical

Born 1962 in California.
Graduated from Berkeley High School, Berkeley, CA; June, 1980.

Issued U.S. Patents

1. Charych, D.; Beausoleil, E.; Zuckermann, R.N. Microarrays on mirrored substrates for performing proteomic analyses. US 7,153,682, **2007**.
2. Horn, T.; Zuckermann, R.N. Peptoids incorporating Chemoselective Functionalities. US 7,030,216, **2006**.
3. Suich, D.J.; Zuckermann, R.N. Fluorogenic Dyes. US 7,026,166, **2006**.
4. Zuckermann, R.N.; Huang, C.-Y.; Murphy, J.E.; Uno, T. Method of Complexing a Nucleic Acid with a Lipid-Conjugated Polyamide. US 6,982,092 B2, **2006**.

5. Barron, A.E.; Zuckermann, R.N.; Wu, C.W. Polypeptoid pulmonary surfactants. US 6,887,845, **2005**.
6. Innis, M.A.; Reinhardt, C.J.; Zuckermann, R.N. Chimeric antisense oligonucleotides and cell transfecting formulations thereof. US 6,846,921, **2005**.
7. Innis, M.A.; Reinhardt, C.J.; Zuckermann, R.N. Chimeric antisense oligonucleotides and cell transfecting formulations thereof. US 6,677,445, **2004**.
8. Zuckermann, R.N.; Beausoleil, E.; Wachowicz, M.; Kothakota, S. Biological sample component purification and differential display. US 6,783,929, **2004**.
9. Zuckermann, R.N.; Huang, C.-Y.; Murphy, J.E.; Uno, T. Lipid-conjugated polyamide compounds and related compositions and methods thereof. US 6,572,881, **2003**.
10. Zuckermann, R.N.; Huang, C.-Y.; Murphy, J.E.; Uno, T. Lipid-conjugated polyamide compounds and related compositions and methods thereof. US 6,569,450, **2003**.
11. Zuckermann, R.N.; Dubios-Stringfellow, N.; Dwarki, V.; Innis, M.A.; Murphy, J.E.; Cohen, F.E.; Uno, T. Compositions and methods for polynucleotide delivery. US 6,468,986, **2002**.
12. Zuckermann, R.N.; Dubios-Stringfellow, N.; Dwarki, V.; Innis, M.A.; Murphy, J.E.; Cohen, F.E.; Uno, T. Polycationic Polymers. US 6,251,433, **2001**.
13. Zuckermann, R.N.; Huang, C.-Y.; Murphy, J.E.; Uno, T. Lipid-conjugated polyamide compounds and related compositions and methods thereof. US 6,197,332, **2001**.
14. Zuckermann, R.N.; Truong, K.; DeRose-Juarez, S.; Kuey, K.S.; Owings, M.G.; Steeg, B.J.V.; Chin, H. Synthesizer with reagent recycling. US 6,033,631, **2000**.
15. Zuckermann, R.N.; Kerr, J.M.; Kent, S.B.H.; Moos, W.H.; Simon, R.J.; Goff, D.A. Synthesis of N-Substituted Oligomers. US 5,977,301, **1999**.
16. Zuckermann, R.N.; Goff, D.A.; Ng, S.; Spear, K.; Scott, B.O.; Siegmund, A.C.; Goldsmith, R.A.; Marlowe, C.K.; Pei, Y.; Richter, L.; Simon, R. Synthesis of N-substituted oligomers. US 5,877,278, **1999**.
17. Zuckermann, R.N.; Huebner, V.D.; Santi, D.V.; Siani, M.A. Method and apparatus for biopolymer synthesis. US 5,705,610, **1998**.
18. Zuckermann, R.N.; Kerr, J.M.; Kent, S.B.H.; Moos, W.H.; Simon, R.J.; Goff, D.A. Synthesis of N-Substituted Oligomers. US 5,831,005, **1998**.
19. Zuckermann, R.N.; Huebner, V.D.; Santi, D.V.; Siani, M.A. Method and apparatus for biopolymer synthesis. US 5,840,841, **1998**.

20. Ng, S.; Warne, R.L.; Zuckermann, R.N.; Martin, E.J.; Simon, R.J. Opiate receptor ligands. US 5,605,932, **1997**.
21. Ng, S.; Warne, R.L.; Zuckermann, R.N.; Martin, E.J.; Simon, R.J. Opiate receptor ligands. US 5,481,020, **1996**.
22. Ng, S.; Warne, R.L.; Zuckermann, R.N.; Martin, E.J.; Simon, R.J. Opiate receptor ligands. US 5,536,868, **1996**.
23. Spellmeyer, D.C.; Moos, W.H.; Martin, E.J.; Zuckermann, R.N.; Stauber, G. Peptoid alpha-1 adrenergic receptor ligands. US 5,480,871, **1996**.
24. Spellmeyer, D.C.; Moos, W.H.; Martin, E.J.; Zuckermann, R.N.; Stauber, G.; Shoemaker, K.R.; Goff, D. Opiate receptor ligands. US 5,536,853, **1996**.
25. Spellmeyer, D.C.; Moos, W.H.; Martin, E.J.; Zuckermann, R.N.; Stauber, G. Peptoid alpha-1 adrenergic receptor ligands. US 5,447,916, **1995**.
26. Zuckermann, R.N.; Banville, S. Automated apparatus for use in peptide synthesis. US 5,240,680, **1993**.
27. Zuckermann, R.N.; Huebner, V.D.; Santi, D.V.; Siani, M.A. Method and apparatus for biopolymer synthesis. US 5,252,296, **1993**.

Publications

1. Zuckermann, R.N., Protein Mimicry with Bioinspired Peptoid Polymers. In *Proc. 22nd Amer. Pep. Symp.*, Lebl, M., Ed. American Peptide Society: San Diego, **2011**; pp 174-175.
2. Zuckermann, R.N., Peptoid Origins. *Pept. Sci.* **2011**, *96*, 545-555.
3. Yam, A.Y.; Wang, X.; Gao, C.; Connolly, M.D.; Zuckermann, R.N.; Bleua, T.; Halla, J.; Fedynyshyn, J.; Allauzen, S.; Peretz, D.; Salisbury, C.M., A universal method for detection of amyloidogenic misfolded proteins. *Biochemistry* **2011**, *50*, 4322-4329.
4. Seo, J.; Lee, B.-C.; Zuckermann, R.N., Peptoids - Synthesis, Characterization, and Nanostructures. In *Comprehensive Biomaterials*, Ducheyne, P.; Healy, K.E.; Hutmacher, D.W.; Grainger, D.W.; Kirkpatrick, C.J., Eds. Elsevier: **2011**; *Vol. 2*, pp 53-76.
5. Sanii, B.; Kudirka, R.; Cho, A.; Venkateswaran, N.; Oliver, G.K.; Olson, A.M.; Tran, H.; Harada, R.M.; Tan, L.; Zuckermann, R.N., Shaken, not stirred: Collapsing a peptoid monolayer to produce free-floating, stable nanosheets. *J. Am. Chem. Soc.* **2011**, *133*, 20808-20815.

6. Robinson, D.B.; Buffleben, G.M.; Langham, M.E.; Zuckermann, R.N., Stabilization of nanoparticles under biological assembly conditions using peptoids. *Pept. Sci.* **2011**, *96*, 669-678.
7. Lee, B.-C.; Zuckermann, R.N., Protein Side-Chain Translocation Mutagenesis via Incorporation of Peptoid Residues. *ACS Chem. Biol.* **2011**, *6*, 1367-1374.
8. Kudirka, R.; Tran, H.; Sanii, B.; Nam, K.T.; Choi, P.H.; Venkateswaran, N.; Chen, R.; Whitelam, S.; Zuckermann, R.N., Folding of a Single-Chain, Information-Rich Polypeptoid Sequence into a Highly-Ordered Nanosheet. *Pept. Sci.* **2011**, *96*, 586-595.
9. Gelain, F.; Silva, D.; Villa, O.; Taraballi, F.; Natalello, A.; Caprini, A.; Nam, K.T.; Zuckermann, R.N.; Doglia, S.M.; Vescovi, A., BMHP1-derived self-assembling peptides: hierarchically assembled structures with self-healing propensity and potential for tissue engineering applications. *ACS Nano* **2011**, *5*, 1845-1859.
10. Chen, C.-L.; Qi, J.; Zuckermann, R.N.; DeYoreo, J.J., Engineered Biomimetic Polymers as Tunable Agents for Controlling CaCO₃ Mineralization. *J. Am. Chem. Soc.* **2011**, *133*, 5214-5217.
11. Utku, Y.; Rohatgi, A.; Yoo, B.; Kirshenbaum, K.; Zuckermann, R.N.; Pohl, N.L., Rapid Multistep Synthesis of a Bioactive Peptidomimetic Oligomer for the Undergraduate Laboratory. *J. Chem. Ed.* **2010**, *87*, 637-639.
12. Seo, J.; Barron, A.E.; Zuckermann, R.N., Novel Peptoid Building Blocks: Synthesis of Functionalized Aromatic Helix-Inducing Submonomers. *Org. Lett.* **2010**, *12*, 492-495.
13. Rosales, A.M.; Murnen, H.K.; Zuckermann, R.N.; Segalman, R.A., Control of Crystallization and Melting Behavior in Sequence Specific Polypeptoids. *Macromolecules* **2010**, *43*, 5627-5636.
14. Nam, K.T.; Shelby, S.A.; Marciel, A.B.; Choi, P.C.; Chen, R.; Tan, L.; Chu, T.K.; Mesch, R.A.; Lee, B.-C.; Connolly, M.D.; Kisielowski, C.; Zuckermann, R.N., Free-floating ultra-thin two-dimensional crystals from sequence-specific peptoid polymers. *Nature Mater.* **2010**, *9*, 454-460.
15. Murnen, H.K.; Rosales, A.M.; Jaworski, J.N.; Segalman, R.A.; Zuckermann, R.N., Hierarchical Self-Assembly of a Biomimetic Diblock Copolypeptoid into Homochiral Super Helices. *J. Am. Chem. Soc.* **2010**, *132*, 16112-16119.
16. Lee, B.-C.; Zuckermann, R.N., Templated display of biomolecules and inorganic nanoparticles by metal ion-induced peptide nanofibers. *Chem. Comm.* **2010**, *46*, 1634-1636.
17. Gao, C.M.; Yam, A.Y.; Wang, X.; Magdangal, E.; Salisbury, C.; Peretz, D.; Zuckermann, R.N.; Connolly, M.D.; Hansson, O.; Minthon, L.; Zetterberg, H.; Blennow, K.;

- Fedynyshyn, J.P.; Allauzen, S., AB40 Oligomers Identified as a Potential Biomarker for the Diagnosis of Alzheimer's Disease. *PLoS ONE* **2010**, *5*, e15725.
18. Ding, B.; Deng, Z.; Yan, H.; Cabrini, S.; Zuckermann, R.N., Gold Nanoparticle Self-Similar Chain Structure Organized by DNA Origami. *J. Am. Chem. Soc.* **2010**, *132*, 3248-3249.
 19. Zuckermann, R.N.; Kodadek, T., Peptoids as Potential Therapeutics. *Curr. Op. Mol. Ther.* **2009**, *11*, 299-307.
 20. Thakkar, A.; Cohen, A.S.; Connolly, M.D.; Zuckermann, R.N.; Pei, D., High-Throughput Sequencing of Peptoids and Peptide–Peptoid Hybrids by Partial Edman Degradation and Mass Spectrometry. *J. Comb. Chem.* **2009**, *11*, 294-302.
 21. Dohm, M.T.; Seurnyck-Servoss, S.L.; Seo, J.; Zuckermann, R.N.; Barron, A.E., Close mimicry of lung surfactant protein B by "clicked" dimers of helical, cationic peptoids. *Peptide Sci.* **2009**, *92*, 538-553.
 22. Ding, B.; Cabrini, S.; Zuckermann, R.N.; Bokor, J., DNA directed assembly of nanoparticle linear structure for nanophotonics. *J. Vac. Sci. Technol. B* **2009**, *27*, 184-187.
 23. Ross, T.M.; Zuckermann, R.N.; Reinhard, C.; Frey, W.H., Intranasal administration delivers peptoids to the rat central nervous system. *Neuroscience Letters* **2008**, *439*, 30-33.
 24. Lee, B.-C.; Chu, T.K.; Dill, K.A.; Zuckermann, R.N., Biomimetic Nanostructures: Creating a High-Affinity Zinc-Binding Site in a Folded Nonbiological Polymer. *J. Am. Chem. Soc.* **2008**, *130*, 8847-8855.
 25. Chongsiriwatana, N.P.; Patch, J.A.; Czyzewski, A.M.; Dohm, M.T.; Ivankin, A.; Gidalevitz, D.; Zuckermann, R.N.; Barron, A.E., Peptoids that mimic the structure, function and mechanism of helical antimicrobial peptides. *Proc. Natl. Acad. Sci. U. S. A.* **2008**, *105*, 2794-2799.
 26. Ballister, E.R.; Lai, A.H.; Zuckermann, R.N.; Cheng, Y.; Mougous, J.D., In vitro self-assembly of tailorable nanotubes from a simple protein building block. *Proc. Natl. Acad. Sci. U. S. A.* **2008**, *105*, 3733-3738.
 27. Lee, B.-C.; Zuckermann, R.N., Bio-inspired Polymers for Nanoscience Research. *Proc. NSTI Nanotech. Conf.* **2007**, *2*, 28-31.
 28. Utku, Y.; Dehan, E.; Ouerfelli, O.; Piano, F.; Zuckermann, R.N.; Pagano, M.; Kirshenbaum, K., A peptidomimetic siRNA transfection reagent for highly effective gene silencing. *Mol. BioSyst.* **2006**, *2*, 312-317.

29. Paulick, M.G.; Hart, K.M.; Brinner, K.M.; Tjandra, M.; Charych, D.H.; Zuckermann, R.N., A Cleavable Hydrophilic Linker for One-Bead-One-Compound Sequencing of Oligomer Libraries by Tandem Mass Spectrometry. *J. Comb. Chem.* **2006**, *8*, 417-426.
30. Huang, K.; Wu, C.W.; Sanborn, T.J.; Patch, J.A.; Kirshenbaum, K.; Zuckermann, R.N.; Barron, A.E.; Radhakrishnan, I., A Threaded Loop Conformation Adopted by a Family of Peptoid Nonamers. *J. Am. Chem. Soc.* **2006**, *128*, 1733-1738.
31. Lee, B.-C.; Zuckermann, R.N.; Dill, K.A., Folding a Nonbiological Polymer into a Compact Multihelical Structure. *J. Am. Chem. Soc.* **2005**, *127*, 10999-11009.
32. Lee, B.-C.; Dill, K.A.; Zuckermann, R.N., Synthesis of Long Non-natural Sequence-Specific Heteropolymers. *Polymer Preprints* **2005**, *46*, 174-175.
33. Patch, J.A.; Kirshenbaum, K.; Seuryneck, S.L.; Zuckermann, R.N.; Barron, A.E., Versatile Oligo(N-Substituted) Glycines: The Many Roles of Peptoids in Drug Discovery. In *Pseudo-Peptides in Drug Discovery*, Nielsen, P.E., Ed. Wiley-VCH: Weinheim, **2004**; pp 1-31.
34. Horn, T.; Lee, B.-C.; Dill, K.A.; Zuckermann, R.N., Incorporation of Chemoselective Functionalities into Peptoids via Solid-Phase Submonomer Synthesis. *Bioconj. Chem.* **2004**, *15*, 428-435.
35. Wu, C.W.; Kirshenbaum, K.; Sanborn, T.J.; Patch, J.A.; Huang, K.; Dill, K.A.; Zuckermann, R.N.; Barron, A.E., Structural and Spectroscopic Studies of Peptoid Oligomers with α -Chiral Aliphatic Side Chains. *J. Am. Chem. Soc.* **2003**, *125*, 13525-13530.
36. Lobo, B.A.; Vetro, J.A.; Suich, D.M.; Zuckermann, R.N.; Middaugh, R.C., Structure/Function Analysis of Peptoid/Lipitoid: DNA Complexes. *J. Pharm. Sci.* **2003**, *92*, 1905-1918.
37. Burkoth, T.S.; Fafarman, A.T.; Charych, D.H.; Connolly, M.D.; Zuckermann, R.N., Incorporation of Unprotected Heterocyclic Side Chains into Peptoid Oligomers via Solid-Phase Submonomer Synthesis. *J. Am. Chem. Soc.* **2003**, *125*, 8841-8845.
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39. Burkoth, T.S.; Beausoleil, E.; Kaur, S.; Tang, D.; Cohen, F.E.; Zuckermann, R.N., Toward the Synthesis of Artificial Proteins: The Discovery of an Amphiphilic Helical Peptoid Assembly. *Chemistry & Biology* **2002**, *9*, 647-654.

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41. Wu, C.W.; Sanborn, T.J.; Huang, K.; Zuckermann, R.N.; Barron, A.E., Peptoid Oligomers with α -Chiral Side Chains: Sequence Requirements for the Formation of Stable Peptoid Helices. *J. Am. Chem. Soc.* **2001**, *123*, 6778-6784.
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46. Uno, T.; Beausoleil, E.; Goldsmith, R.A.; Levine, B.H.; Zuckermann, R.N., New Submonomers for Poly N-Substituted Glycines (Peptoids). *Tetrahedron Lett.* **1999**, *40*, 1475-1478.
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51. Kirshenbaum, K.; Barron, A.E.; Goldsmith, R.A.; Armand, P.; Bradley, E.K.; Truong, K.T.V.; Dill, K.A.; Cohen, F.E.; Zuckermann, R.N., Sequence-Specific Polypeptoids: A

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63. Richter, L.S.; Zuckermann, R.N., Synthesis of Peptide Nucleic Acids (PNA) by Submonomer Solid Phase Synthesis. *Bioorg. Med. Chem. Lett* **1995**, *5*, 1159-1162.
64. Miller, S.M.; Simon, R.J.; Ng, S.; Zuckermann, R.N.; Kerr, J.M.; Moos, W.H., Comparison of the Proteolytic Susceptibilities of Homologous L-Amino Acid, D-Amino Acid, and N-Substituted Glycine Peptide and Peptoid Oligomers. *Drug Dev. Res.* **1995**, *35*, 20-32.
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66. Goff, D.A.; Zuckermann, R.N., Solid-Phase Synthesis of Defined 1,4-Benzodiazepine-2,5-dione Mixtures. *J. Org. Chem.* **1995**, *60*, 5744-5745.
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