

Dr. Alexander Deiters

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Education (University of Münster, Germany)

2/1998-10/2000 Ph.D. studies under the supervision of Professor D. Hoppe
Ph.D. defense, grade: *summa cum laude* (10/2000)

4/1997-1/1998 Diploma thesis under the supervision of Professor D. Hoppe
Diploma exam, grade: *with highest honors*

9/1993-4/1997 Undergraduate chemistry studies
10/1995 Intermediate diploma exam, grade: *very good*

Professional and Teaching Experience

9/2009- Associate Professor (early tenure), North Carolina State University, Department of Chemistry

1/2008- Associate Member, North Carolina State University, Department of Molecular and Structural Biochemistry

1/2007- Member, Center for Comparative Medicine and Translational Research, North Carolina State University

7/2004-7/2009 Assistant Professor, North Carolina State University, Department of Chemistry

9/2002-6/2004 Postdoc, The Scripps Research Institute, with Professor P. G. Schultz on: "Synthesis of New Protein Functions by In Vivo Incorporation of Unnatural Amino Acids"

3/2001-8/2002 Postdoc, The University of Texas at Austin, with Professor S. F. Martin on: "Total and Formal Syntheses of Sarpagine, Corynantheane, and Oxindole Alkaloids"

2/1998-10/2000 Graduate Student, University of Münster, Germany, with Professor D. Hoppe on: "Enantioselective Intramolecular Allyllithium-Allylchloride Couplings – Synthesis of Three- to Nine-membered Carbocycles"

Awards and Fellowships

- Alumni Association Outstanding Research Award – North Carolina State University (2011)
- Research Scholar Grant – American Cancer Society (2010)
- Thieme Chemistry Journals Award (2010)
- Teva USA Scholar Grant – American Chemical Society (2009)
- Faculty Early Career Development (CAREER) Award – National Science Foundation (2009)
- Beckman Young Investigator Award – Arnold and Mabel Beckman Foundation (2007)

- Cottrell Scholar Award – Research Corporation (2007)
- Sigma Xi Faculty Research Award (2007)
- MJ Collins Award for Outstanding Young Innovator in Microwave Chemistry – CEM Corporation (2007)
- Basil O'Connor Scholar Award – March of Dimes Foundation (2006)
- Fall Symposium Lecture Award – The Scripps Society of Fellows (2003)
- Postdoctoral Fellowship – German Research Foundation (2002-2003)
- Award for the best dissertation at the Departments for Natural Sciences, Mathematics, and Computer Science in 2001 – University of Münster (2002)
- Feodor-Lynen Postdoctoral Fellowship – Alexander von Humboldt-Foundation (2001-2002)
- Fellowship for Travel Expenses, IKCOC-8, Kyoto/Japan – SmithKline Beecham Foundation (2000)
- Research Prize for Young Chemists '99 – German Chemical Society (1999)
- Pfizer-Award for an Outstanding Poster Presentation, Drug Discovery '99, Pfizer, Sandwich/UK (1999)
- Fellowship for Travel Expenses, 11th ORCHEM, Bad Nauheim/Germany – German Chemical Society (1998)
- Graduate Research Fellowship – Fund of the Chemical Industry (1998-2000)
- Fellowship – German National Academic Foundation (1996-1997)

Publications – Peer Reviewed (* denotes publications from graduate and postdoctoral work)

- [76] Gardner, L.; Zou, Y.; Mara, A.; Cropp, T.A.; Deiters, A. "Photochemical Control of Bacterial Signal Processing using a Light-Activated Erythromycin", submitted.
- [75] Govan, J. M.; Lively, M. O.; Deiters, A. "Light-Activation of Oligonucleotide Triplex Formation in Mammalian Cells", submitted.
- [74] Chou, C.; Deiters, A. "Light-Activated Gene Editing with a Photocaged Zinc-Finger Nuclease", *Angew. Chem. Int. Ed.* **2011**, *50*, accepted.
- [73] Zou, Y.; Lin, H.; Maggard, P. A.; Deiters, A. "A Novel Copper-Complex with an Unusual Geometry and High Catalytic Activity for C-N Coupling Reactions", *Eur. J. Org. Chem.* **2011**, accepted.
- [72] Dush, M.; Parr, M.; Young, D. D.; Mciver, A. L.; Deiters, A.; Nascone-Yoder, N. "Heterotaxin: a TGF- β Signalling Inhibitor Identified in an In Vivo Screen for Left-right Asymmetric Organ Defects", *Chem. Biol.* **2011**, *18*, 252-263. *Highlighted in the cover of Chemistry & Biology.*
- [71] Chou, C.; Uprety, R.; Davis, L.; Chin, J. W.; Deiters, A. "Genetically Encoding an Aliphatic Diazirine Amino Acid in Escherichia coli and Mammalian Cells for Protein Photocrosslinking", *Chem. Sci.* **2011**, 480-483.
- [70] Gautier, A.; Deiters, A.; Chin, J. W. "Light-Activated Kinases Enable Temporal Dissection of Signaling Networks in Living Cells", *J. Am. Chem. Soc.* **2011**, *133*, 2124–2127. *Highlighted in Chemical & Engineering News.*
- [69] Karginov, A. V.; Zou, Y.; Shirvanyants, D.; Kota, P.; Dokholyan, N. V.; Young, D. D.; Hahn, K. M.; Deiters, A. "Light-Regulation of Protein Dimerization and Kinase Activity in Living Cells Using Photocaged Rapamycin and Engineered FKBP", *J. Am. Chem. Soc.* **2011**, *133*, 420-423.
- [68] Bilbille, Y.; Harris, K.; Lusic, H.; Kaiser, R.; Delaney, M. O.; Deiters, A.; Agris, P. F. "The Human Mitochondrial tRNA^{Met}: Structure of Anticodon Stem and Loop Containing the Unique Post-transcriptional 5-Formylcytidine Modification", *J. Mol. Biol.* **2011**, *406*, 257-274.
- [67] Deiters, A.; Garner, R. A.; Lusic, H.; Govan, J.; Dush, M.; Nascone-Yoder, N. M.; Yoder, J. A. "Photocaged Morpholino Oligomers for the Light-Regulation of Gene Function in Zebrafish and Xenopus Embryos", *J. Am. Chem. Soc.* **2010**, *132*, 15644-15650. *Highlighted as 'recommended' by Faculty of 1000 Biology.*
- [66] Hancock, S.; Uprety, R.; Deiters, A.; Chin, J. W. "Expanding the Genetic Code of Yeast for Incorporation of Diverse Unnatural Amino Acids via a Pyrrolysyl-tRNA Synthetase/tRNA Pair", *J. Am. Chem. Soc.* **2010**, *132*, 14819-14824.

- [65] Georgianna, W. E.; Lusic, H.; McIver, A. L.; Deiters, A. "Photocleavable Polyethylene Glycol for the Light-Regulation of Protein Function", *Bioconjugate Chem.* **2010**, *21*, 1404-1407.
- [64] Riggsbee, C. W., Deiters, A. "Recent Advances in the Photochemical Control of Protein Function", *Trends Biotechnol.* **2010**, *28*, 468-475.
Invited review article
- [63] Zou, Y.; Deiters, A. "Total Synthesis of Cryptocetamide", *J. Org. Chem.* **2010**, *75*, 5355-5358.
- [62] Young, D. D.; Connelly, C. M.; Grohmann, C.; Deiters, A. "Small Molecule Modifiers of MicroRNA miR-122 Function for the Treatment of Hepatitis C Virus Infection and Hepatocellular Carcinoma", *J. Am. Chem. Soc.* **2010**, *132*, 7976-7981.
Highlighted as 'must read' by Faculty of 1000 Biology.
- [61] Young, D. D.; Lively, M. O.; Deiters, A. "Activation and Deactivation of DNAzyme and Antisense Function with Light for the Photochemical Regulation of Gene Expression in Mammalian Cells", *J. Am. Chem. Soc.* **2010**, *132*, 6183-6193.
- [60] Gautier, A.; Nguyen, D. P.; Lusic, H.; An, W.; Deiters, A.; Chin, J. "Genetically Encoded Photocontrol of Protein Localization in Mammalian Cells", *J. Am. Chem. Soc.* **2010**, *132*, 4086-4088.
Highlighted in ChemBioChem 2010, 11, 1825.
- [59] McIver, A. L.; Deiters, A. "Tricyclic Alkaloid Core Structures Assembled by a Cyclotrimerization Coupled Intramolecular Nucleophilic Substitution Reaction", *Org. Lett.* **2010**, *12*, 1288-1291.
- [58] Chou, C.; Young, D. D.; Deiters, A. "Photocaged T7 RNA Polymerase for the Light-Activation of Transcription and Gene Function in Pro- and Eukaryotic Cells", *ChemBioChem* **2010**, *11*, 972-977.
- [57] Wilkins, B. J.; Marionni, S.; Young, D. D.; Liu, J.; Wang, Y.; Di Salvo, M. L.; Deiters, A.; and Cropp, T. A. "Site-specific Incorporation of Fluorotyrosines into Proteins in E. coli by Photochemical Disguise", *Biochemistry* **2010**, *49*, 1557-1559.
- [56] Lusic, H.; Uprety, R.; Deiters, A. "Improved Synthesis of the Two-Photon Caging Group 3-Nitro-2-ethylidibenzofuran and its Application to a Caged Thymidine Phosphoramidite", *Org. Lett.* **2010**, *12*, 916-919.
- [55] Miyake-Stoner, S. J.; Refakis, C. A.; Hammill, J.T.; Lusic, H.; Hazen, J. L.; Deiters, A.; Mehl, R. A. "Generating Permissive Site-specific Unnatural Aminoacyl-tRNA Synthetases", *Biochemistry* **2010**, *49*, 1667-1677.
- [54] Georgianna, W. E.; Deiters, A. "Reversible Light-Switching of Cell Signalling by Genetically Encoded Protein Dimerization", *ChemBioChem* **2010**, *11*, 301-303.
Invited highlight article.
- [53] Deiters, A. "Principles and Applications of the Photochemical Control of Cellular Processes", *ChemBioChem* **2010**, *11*, 47-53.
Invited review article.
- [52] Deiters, A. "Small Molecule Modifiers of the MicroRNA and RNA Interference Pathway", *AAPS J.* **2009**, 51-60.
Invited review article for a special issue.
- [51] Young, D. D.; Teske, J. A.; Deiters, A. "Open-Vessel Microwave-Mediated [2+2+2] Cyclotrimerization Reactions", *Synthesis* **2009**, *22*, 3785-3790.
- [50] Deiters, A. "Light Activation as a Method of Regulating and Studying Gene Expression", *Curr. Opin. Chem. Biol.* **2009**, *13*, 678-686.
Invited review article for a special issue.
- [49] Chou, C.; Young, D. D.; Deiters, A. "A Light-Activated DNA Polymerase", *Angew. Chem. Int. Ed.* **2009**, *48*, 6064-6067.
- [48] Nguyen, D. P.; Lusic, H.; Neumann, H.; Kapadnis, P. B.; Deiters, A.; Chin, J. "Genetic Encoding and Labeling of Aliphatic Azides and Alkynes in Recombinant Proteins via a Pyrrolysyl-tRNA Synthetase/tRNA_{CUA} Pair and Click Chemistry", *J. Am. Chem. Soc.* **2009**, *131*, 8720-8721.
- [47] Edwards, W. F.; Young, D. D.; Deiters, A. "Light-Activated Cre Recombinase as a Tool for the Spatial and Temporal Control of Gene Function in Mammalian Cells", *ACS Chem. Biol.* **2009**, *4*, 441-445.
- [46] Bereman, M. S.; Young, D. D.; Deiters, A.; Muddiman, D. C. "Development of a Robust and High Throughput Method for Profiling N-linked Glycans Derived from Plasma Glycoproteins by Nano LC FT-ICR Mass Spectrometry", *J. Proteome Res.* **2009**, *8*, 3764-3770.
- [45] Young, D. D.; Govan, J. M.; Lively, M. O.; Deiters, A. "Photochemical Regulation of Restriction Endonuclease Activity", *ChemBioChem* **2009**, *10*, 1612-1616.

- [44] Edwards, W. F.; Young, D. D.; Deiters, A. "The Effect of Microwave Irradiation on DNA Hybridization", *Org. Biomol. Chem.* **2009**, *7*, 2506–2508.
Highlighted as 'recommended' by Faculty of 1000 Biology.
- [43] Young, D. D.; Lusic, H.; Lively, M. O.; Deiters, A. "Restriction Enzyme-Free Mutagenesis via the Light Regulation of DNA Polymerization", *Nucl. Acids Res.* **2009**, *37*, e58.
Highlighted as 'recommended' by Faculty of 1000 Biology.
- [42] Young, D. D.; Garner, R. A.; Yoder, J. A.; Deiters, A. "Light Activation of Gene Function in Mammalian Cells via Ribozymes", *Chem. Commun.* **2009**, 568-570.
- [41] Young, D. D.; Lusic, H.; Lively, M. O.; Yoder, J. A.; Deiters, A. "Gene Silencing in Mammalian Cells with Light-Activated Antisense Agents", *ChemBioChem* **2008**, *9*, 2937-2940.
- [40] Zou, Y.; Young, D. D.; Cruz, A.; Deiters, A. "Synthesis of Anthracene and Azaanthracene Fluorophores via [2+2+2] Cyclotrimerization Reactions", *Org. Lett.* **2008**, *10*, 4661-4664.
- [39] Young, D. D.; Torres-Kolbus, J.; Deiters, A. "Microwave-Assisted Synthesis of Unnatural Amino Acids", *Bioorg. Med. Chem. Lett.* **2008**, *18*, 5478-5480.
- [38] Lusic, H.; Estella M. Gustilo, Vendeix, F.; Kaiser, R.; Delaney, M. O.; Graham, W. D.; Moye, V. A.; Cantara, W. A.; Agris, P. F.; Deiters, A. "Synthesis and investigation of the 5-formylcytidine modified, anticodon stem and loop of the human mitochondrial tRNA^{Met}", *Nucl. Acids Res.* **2008**, *36*, 6548-6557.
- [37] McIver, A. L.; Young, D. D.; Deiters, A. "A General Approach to Triphenylenes and Azatriphenylenes: Total Synthesis of Dehydrotylophorine and Tylophorine", *Chem. Commun.* **2008**, 4750-4752.
- [36] Gumireddy, K.; Young, D. D.; Xiong, X.; Hogenesch, J. B.; Huang, Q.; Deiters, A. "Small Molecule Inhibitors of MicroRNA miR-21", *Angew. Chem. Int. Ed.* **2008**, *47*, 7482-7484.
Highlighted as a 'Hot Paper' by Angewandte Chemie.
- [35] Young, D. D.; Nichols, J.; Kelly, R. M.; Deiters, A. "Microwave Activation of Enzymatic Catalysis", *J. Am. Chem. Soc.* **2008**, *130*, 10048-10049.
Highlighted in Nature 2008, 454, 257. Highlighted as 'exceptional' by Faculty of 1000 Biology.
- [34] Teske, J.; Deiters, A. "A Cyclotrimerization Route to Cannabinoids", *Org. Lett.* **2008**, *10*, 2195-2198.
- [33] Lusic, H.; Lively, M. O.; Deiters, A. "Light-Activated Deoxyguanosine: Photochemical Regulation of Peroxidase Activity", *Mol. BioSys.* **2008**, *4*, 508-511.
Invited contribution for a special issue.
- [32] Young, D. D.; Deiters, A. "Light-regulated RNA–Small Molecule Interactions", *ChemBioChem* **2008**, *9*, 1225-1228.
- [31] Sripada, L.; Teske, J. A.; Deiters, A. "Phenanthridine Synthesis via [2+2+2] Cyclotrimerization Reactions", *Org. Biomol. Chem.* **2008**, 263-265.
- [30] Young, D. D.; Edwards, W. F.; Lusic, H.; Lively, M. O.; Deiters, A. "Light-Triggered Polymerase Chain Reaction", *Chem. Commun.* **2008**, 462-464.
Highlighted in Chemical Biology 2008, 3, B11.
- [29] Teske, J. A.; Deiters, A. "Microwave-mediated Nickel-catalyzed Cyclotrimerization Reactions: Total Synthesis of Illudinine", *J. Org. Chem.* **2008**, *73*, 342-345.
- [28] Senaiar, R. S.; Teske, J. A.; Young, D. D.; Deiters, A. "Synthesis of Indanones via Solid-Supported [2+2+2] Cyclotrimerization", *J. Org. Chem.* **2007**, *72*, 7801-7804.
- [27] Young, D. D.; Sripada, L.; Deiters, A. "Microwave-Assisted Solid-Supported Alkyne Cyclotrimerization Reactions for Combinatorial Chemistry", *J. Comb. Chem.* **2007**, *9*, 735-738.
- [26] Young, D. D.; Deiters, A. "Photochemical Activation of Protein Expression in Bacterial Cells", *Angew. Chem. Int. Ed.* **2007**, *46*, 5187-5190.
- [25] Young, D. D.; Deiters, A. "A General Approach to Chemo- and Regioselective Cyclotrimerization Reactions", *Angew. Chem. Int. Ed.* **2007**, *46*, 5187-5190.
- [24] Lusic, H.; Young, D. D.; Lively, M. O.; Deiters, A. "Photochemical DNA Activation", *Org. Lett.* **2007**, *9*, 1903-1906.
- [23] Young, D. D.; Deiters, A. "Photochemical Control of Biological Processes", *Org. Biomol. Chem.* **2007**, *5*, 999-1005.
Invited contribution for an emerging area report.
- [22] Deiters, A.; Yoder, J. "Conditional Transgene and Gene Targeting Methodologies in Zebrafish", *Zebrafish* **2006**, *3*, 415-429.

- [21] Lusic, H.; Deiters, A. "A New Photocaging Group for Aromatic *N*-Heterocycles", *Synthesis* **2006**, 2147-2150.
Invited contribution for a special issue.
- [20] Young, D. D.; Senaiar, R. S.; Deiters, A. "Solid-Supported [2+2+2] Cycloadditions", *Chem. Eur. J.* **2006**, *12*, 5563-5568.
- [19] Young, D. D.; Deiters, A. "Photochemical Activation of a Hammerhead Ribozyme", *Bioorg. Med. Chem. Lett.* **2006**, *16*, 2658-2661.
Top 25 Bioorg. Med. Chem. Lett. most downloaded articles in 2006.
- [18] Senaiar, R. S.; Young, D. D.; Deiters, A. "Pyridines via Solid-Supported [2+2+2] Cycloadditions", *Chem. Commun.* **2006**, 1313-1315.
- [17*] Deiters, A.; Petterson, M.; Martin, S. F. "General Strategy for the Syntheses of Corynanthe, Tacaman, and Oxindole Alkaloids", *J. Org. Chem.* **2006**, *71*, 6547-6561.
- [16*] Deiters, A.; Groff, D.; Xie, J.; Schultz, P. G. "A Genetically Encoded Photocaged Tyrosine", *Angew. Chem. Int. Ed.* **2006**, *45*, 2728-2731.
Highlighted as a 'Very Important Paper' by Angewandte Chemie.
- [15*] Summerer, D.; Chen, S.; Wu, N.; Deiters, A.; Chin, J. W.; Schultz, P. G. "A Genetically Encoded, Fluorescent Amino Acid", *Proc. Nat. Acad. Sci.* **2006**, *103*, 9785-9789.
Highlighted in the NCSU News Release (6/27/2006) and the NCSU Technician (7/06/2006).
- [14*] Deiters, A.; Schultz, P. G. "In Vivo Incorporation of an Alkyne into Proteins in *E. coli*", *Bioorg. Med. Chem. Lett.* **2005**, *15*, 1521-1524.
- [13*] Deiters, A.; Geierstanger, B.; Schultz, P. G. "Site-specific In Vivo Labeling of Proteins for NMR Studies", *ChemBioChem* **2004**, *5*, 55-58.
- [12*] Deiters, A.; Cropp, T. A.; Summerer, D.; Mukherji, M.; Schultz, P. G. "Site-Specific PEGylation of Therapeutic Proteins Containing Unnatural Amino Acids", *Bioorg. Med. Chem. Lett.* **2004**, *14*, 5743-5745.
- [11*] Wu, N.; Deiters, A.; Cropp, A.; King, D.; Schultz, P. G. "A Genetically Encoded Photocaged Amino Acid", *J. Am. Chem. Soc.* **2004**, *126*, 14306-14307.
- [10*] Deiters, A.; Martin, S. F. "Ring-Closing Metathesis Reactions in the Synthesis of Heterocycles", *Chem. Rev.* **2004**, *104*, 2199-2238.
Highlighted as a 'Fast Breaking Paper' by THOMSON-ISI in April 2005.
- [9*] Deiters, A.; Cropp, T. A.; Mukherji, M.; Chin, J. W.; Anderson, J. C.; Schultz, P. G. "Adding Amino Acids with Novel Reactivity to the Genetic Code of *Saccharomyces Cerevisiae*", *J. Am. Chem. Soc.* **2003**, *125*, 11782-11783.
- [8*] Deiters, A.; Chen, K.; Eary, T.; Martin, S. F. "Biomimetic Synthesis of the Sarpagan Skeleton – Total Synthesis of the Indole Alkaloids (+)-Geissoschizine and (+)-*N*-Methylvellosimine", *J. Am. Chem. Soc.* **2003**, *125*, 4541-4550.
- [7*] Deiters, A.; Martin, S. F., "Stereoselective Total Synthesis of Dihydrocorynantheol", *Org. Lett.* **2002**, *4*, 3243-3245.
- [6*] Deiters, A.; Mück-Lichtenfeld, C.; Fröhlich, R.; Hoppe, D. "Planar-Chiral (2*E*,7*Z*)- and (2*Z*,7*E*)-Cyclonona-2,7-dien-1-yl Carbamates by Asymmetric, Bis-Allylic α,α' -Cycloalkylation - Studies on Their Conformational Stability", *Chem. Eur. J.* **2002**, *8*, 1833-1842.
- [5*] Deiters, A.; Hoppe, D. "Asymmetric Synthesis of *cis*-1,2-Dialkenyl-Substituted Cyclopentanes via (–)-Sparteine-Mediated Lithiation and Cycloalkylation of a 9-Chloro-2,7-nonadienyl Carbamate", *J. Org. Chem.* **2001**, *66*, 2842-2849.
- [4*] Deiters, A.; Wibbeling, B.; Hoppe, D. "Enantio- and Diastereoselective Synthesis of a 3,4-Divinylpyrrolidine via Asymmetric Deprotonation and Cyclization of a 9-Chloro-5-aza-2,7-nonadiene", *Adv. Synth. Catal.* **2001**, *1*, 181-183.
- [3*] Deiters, A.; Fröhlich, R.; Hoppe, D. "Enantioselective Synthesis of Functionalized 1,5-Cyclononadienes by Intramolecular Cycloalkylation by Means of an Diallylcoupling", *Angew. Chem. Int. Ed.* **2000**, *39*, 2105-2107.
- [2*] Deiters, A.; Mück-Lichtenfeld, C.; Fröhlich, R.; Hoppe, D. "Asymmetric Synthesis of a (2*Z*,7*E*)-Cyclononadiene by an Intramolecular Cycloalkylation and Insight to Its Conformational Properties", *Org. Lett.* **2000**, *2*, 2415-2418.
- [1*] Deiters, A.; Hoppe, D. "Chiral Induction by Elimination-Coupled Lithium-Ene Reaction: Synthesis of (+)-(3*R*,4*R*)-1,2-Dihydromultifidene", *Angew. Chem. Int. Ed.* **1999**, *38*, 546-548.

Publications – Non-Peer Reviewed

- [1] Deiters, A. "Book Review: Essentials of Chemical Biology: Structure and Dynamics of Biological Macromolecules. By Andrew D. Miller and Julian Tanner", *ChemBioChem* **2009**, *10*, 1568-1569.

Current Grants

Deiters (PI) 05/01/2011-10/31/2012

Reversion of HIV Latency by Small Molecule Inhibition of miRNA Function

Bill & Melinda Gates Foundation

This grant supports the development of small molecule inhibitors of microRNAs that are involved in HIV latency.

Deiters (PI) 1R21NS073068-01 09/01/2010-08/31/2012

High-Throughput Assay for the Discovery of Small Molecule Inhibitors of microRNA Function

National Institutes of Health

This grant supports the development of high-throughput assays for the discovery of small molecule inhibitors of miR-122 and miR-155 function.

Deiters (PI)/Huang (Co-PI) 01/01/2011-12/31/2015

Small Molecule Regulation of MicroRNAs to Understand and Treat Cancer

American Cancer Society

This grant supports the development of small molecule modifiers of microRNAs misregulated in cancer.

Nascone-Yoder (PI)/Deiters (Co-PI) 8/01/2010-7/31/2015

Pitx2 and Wnt/PCP Signaling in Left-Right Asymmetric Gut Morphogenesis

National Institutes of Health

This grant supports the investigation of asymmetric gut morphogenesis in *Xenopus* embryos using chemical genetics approaches.

Deiters (Co-PI)/Zebala (PI) 07/01/2009-06/30/2012

Development of Light-Activated DNA and Morpholino Based Antisense Agents

National Institutes of Health

This is an SBIR grant which supports the development of light-activatable morpholinos for commercial development by Syntrix Biosystems.

Deiters (PI) 9/01/2009-08/31/2012

Small Molecules as new Probes and Therapeutics for Liver Diseases

American Chemical Society – Teva USA Scholar Grant

This grant supports the development of small molecule modifiers of microRNAs involved in liver diseases.

Deiters (Co-PI) 06/01/2009-05/31/2012

Near-Natural Amino Acid Mutagenesis for the Study of Protein function

National Science Foundation

This grant supports the development of a near-natural amino acid mutagenesis methodology based on the incorporation of photocaged amino acids into proteins.

Deiters (PI) 06/01/2009-05/31/2014

CAREER: Solid-Supported Cyclotrimerizations - A Library Approach to Research and Teaching

National Science Foundation

This grant supports the development of chemo- and regioselective microwave-mediated cyclotrimerization reactions and their application in total synthesis and library synthesis.

Deiters (PI) 09/01/2007-08/31/2011
Photochemical Genomics: Controlling Genes with Light
Arnold & Mabel Beckman Foundation – Beckman Young Investigator Award
This grant supports the development of novel photochemical means to control gene function in pro- and eukaryotic cells. This will be achieved through a unique combination of organic chemistry, photo-chemistry, and RNA biology.

Deiters (PI) 07/01/2007-06/30/2011
A Library Approach to Cellular Light Receptors
Research Corporation – Cottrell Scholar Award
This grant supports the development of cells which respond to light.

Deiters (PI)/Yoder (Co-PI) 1R01GM79114 07/01/2007-06/30/2012
Switchable Systems for Spatio-Temporal Control of Gene Expression in Zebrafish
National Institutes of Health
This grant supports the development of photochemical expression systems in zebrafish. These new gene control tools are based on RNA and photoresponsive small organic molecules.

Completed Grants

Agris (PI)/Deiters (Co-PI) 1/01/2009-12/31/2010
Novel Peptide Intervention Targets a Critical Host-Retrovirus Molecular Interaction
NC Biotech Center
This grant supports the investigation of protein/RNA interaction crucial to HIV replication using small peptides.

Deiters (PI) 5-FY05-1215 01/02/2006-01/31/2009
Deciphering Genetic Disorders Using Light.
March of Dimes Foundation – Basil O'Connor Starter Scholar Research Award
This grant supports the development of photochemical gene switches on RNA basis. These gene switches will be incorporated in model organisms (e.g. zebrafish) to study the genetic causes of developmental disorders.

Deiters (PI)/Yoder (Co-PI) 1R01GM79114 09/01/2008
Supplement to: Switchable Systems for Spatio-Temporal Control of Gene Expression in Zebrafish
National Institutes of Health
This supplement supports the upgrade of a microscope with a flash-photolysis system.

Deiters (PI) PRF44130-G1 09/01/2006-08/31/2008
Solid-Supported Cyclotrimerization Reactions.
American Chemical Society – Petroleum Research Fund Type G Grant
This grant supports research expenses towards the development of new solid-supported cyclotrimerization reactions, especially solid-supported tandem reactions consisting of Nicholas reactions coupled with [2+2+2] cyclotrimerizations.

Deiters (Co-PI), Huang (PI) 08/01/2007-07/31/2008
Development of MicroRNA Inhibitors for the Treatment of Glioblastomas
Accelerate Brain Cancer Cure
This grant supports the synthesis and screening of small-molecule miRNA inhibitors for the treatment of brain cancers.

Deiters (Co-PI)/Huang (PI) 03/01/2007-02/29/2008
A Cell Based Screen for Small-Molecule Modulators of the miRNA Pathway
National Institutes of Health
This grant supports the development of cell based screens to discover small molecule modulators of the miRNA pathway.

Deiters (PI)/Agris (Co-PI)

CBI/RNA

01/01/2007-01/01/2008

Probing Mitochondrial tRNA Function through the Synthesis and Incorporation of 5-Formylcytidine.

NCSU Chemistry-Biology Interface / RNA Group

This grant supports the synthesis and biophysical analysis of modified tRNA molecules.