Alexander J. Ruthenburg

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ACADEMIC APPOINTMENTS

2010 - Assistant Professor, Department of Molecular Genetics and Cell Biology, The University of Chicago

2011 - Assistant Professor (Secondary), Department of Biochemistry and Molecular Biology, The University of Chicago

Ph.D.-Granting Committee, Program, Institute, and Center Appointments

2010 - Trainer, Graduate Program in Cell and Molecular Biology (CMB)
2010 - Trainer, NIH Molecular and Cellular Biology Training Grant
2010 - Trainer, NIH Genetics & Regulation Training Grant
2011 - Trainer, Graduate Program in Biochemistry and Molecular Biophysics (BMB)
2011 - Trainer, Chemistry Biology Interface Program (CBI)
2011 - Trainer, Biophysics
2013 - Trainer, Committee on Genetics, Genomics & Systems Biology (GGSB)

ACADEMIC TRAINING

1995 - 1999 B.A., Chemistry, Carleton College, Northfield, MN
1999 - 2005 Ph.D., Chemistry and Chemical Biology, Harvard University, Cambridge, MA
2006 - 2010 Postdoctoral Fellow, The Rockefeller University, New York City, NY

SCHOLARSHIP

Peer-reviewed publications in the primary literature

times cited

1. **Ruthenburg, A.J.**, Graybosch, D.G., Huetsch, J.C. and Verdine, G.L. 2005. A superhelical spiral in the Escherichia coli DNA gyrase A C-terminal domain imparts unidirectional supercoiling bias. **J. Biol. Chem**. 280: 26177-21184. *hyperlink* — 51

2. Wei, H., **Ruthenburg, A.J.**, Bechis, S.K. and Verdine, G.L. 2005. Nucleotide-dependant domain movement in the ATPase domain of a type IIA DNA topoisomerase. **J. Biol. Chem.** 280: 37041-37047. *hyperlink* — 64

3. Losey, H.C., **Ruthenburg, A.J.** and Verdine, G.L. 2006. Crystal structure of Staphylococcus aureus tRNA adenosine deaminase TadA in complex with RNA. **Nat. Struct. Mol. Biol.** 13: 153-159. *hyperlink* — 52

4. Dou, Y., Milne, T.A., **Ruthenburg, A.J.**, Lee, S., Lee J-W, Verdine, G.L., Allis, C.D., and Roeder, R.G. 2006. Regulation of MLL1 H3 K4 Methyltransferase Activity by its Core Components. **Nat. Struct. Mol. Biol.** 13: 713-719. *hyperlink* — 235

5. **Ruthenburg, A.J.**, Wang, W., Graybosch, D.M., Li, H., Allis, C.D., Patel, D.J. and G.L. Verdine. 2006. Histone H3 recognition and presentation by the WDR5 module of the MLL1 complex. **Nat. Struct. Mol. Biol.** 13: 704-712. *hyperlink* — 103

6. Milne, T.A., Kim, J., Wang, G.G., Stadler, S., Whitcomb, S.J., Basrur, V., **Ruthenburg, A.J.**, Elenitoba-Johnson, K.S., Roeder, R.G. and C.D. Allis. 2010. Multivalent interactions of the MLL1 PHD fingers and CXXC domain control recruitment and stable binding of MLL1 and MLL1 fusion proteins to the HOXA9 locus in leukemogenesis. **Mol. Cell** 38: 853-863. — 52

	times cited
hyperlink	78
7. **Ruthenburg, A.J.**, Li, H., Milne, T.A., Dewell, S., McGinty, R.G., Yuen, M., Ueberheide, B., Dou, Y., Muir, T.W., Patel, D.W. and C.D. Allis. 2011. Recognition of a mononucleosomal histone modification pattern by BPTF via multivalent interactions. **Cell** 145: 692-706. *hyperlink*	1
8. Mohrig J.R., Beyer, B.G., Fleischhacker, A.S., **Ruthenburg, A.J.**, John, S.G., Snyder, D.A., Nyffeler, P.T., Noll, R. J., Penner, N. D., Phillips, L.A., Hurley, H.L.S., Jacobs, J.S., Treitel C., James, T.L. and M.P Montgomery. 2012. Does Activation of the Anti Proton, Rather than Concertedness, Determine the Stereochemistry of Base-Catalyzed 1,2-Elimination Reactions? Anti Stereospecificity in E1cB Eliminations of beta-3-Trifluoromethylphenoxy Esters, Thioesters, and Ketones. **J. Org. Chem.** 77: 2819–2828. *hyperlink*	1
9. Hattori T., Taft, J. M., Swist, K. M., Luo, H., Witt, H., Slattery, M., Koide, A., **Ruthenburg, A.J.**, Krajewski K., Strahl, B.D., White, K. P., Farnham, P.J., Zhao, Y., and S. Koide. 2013. Renewable, recombinant antibodies to histone post-translational modifications. **Nat. Methods.** *10*:992-5, 2013. *hyperlink*	
10. Chen, Z., Gryzbowski, A., and **Ruthenburg, A.J**. 2014. Traceless semisynthesis of a set of histone 3 species bearing specific lysine methylation marks. **ChemBioChem.** 15: 2071-2075. *hyperlink*	
11. Gryzbowski, A., Chen, Z., and **Ruthenburg, A.**J. 2015. Calibrating ChIP-seq with nucleosomal internal standards to measure histone modification density genome-wide. **Mol. Cell**. 58:886-99. *hyperlink,* featured in *Nature Chemical Biology, Science Life, SFARI*	
12. Werner, M.S. and **Ruthenburg A.J.** 2015. Nuclear Fractionation Reveals Thousands of Chromatin-Tethered Noncoding RNAs Adjacent to Active Genes. **Cell Reports**. 12:1089-98.	
13. Rothbart SB, Dickson BM, Raab JR, Grzybowski AT, Krajewski K, Guo A, Shanle EK, Josefowicz SZ, Fuchs SM, Frye SV, Allis CD, Magnuson T, **Ruthenburg AJ**, Strahl BD. 2015. An interactive database for the assessment of histone antibody specificity. **Mol Cell.** 59:502-11.	
Book chapters	
1. Malecek, K. and **A. J. Ruthenburg**. 2012. Validation of histone-binding partners by peptide pull-downs and isothermal titration calorimetry. In **Methods in Enzymology,** 512: 187-220. 13 Chapters, 337 pp., Academic Press, Waltham, MA. *hyperlink*	
Reviews (Peer-reviewed)	
1. **Ruthenburg, A.J.**, Allis, C.D. and J. Wysocka. 2007. Methylation of lysine 4 on histone H3: intricacy of writing and reading a single epigenetic mark. **Mol. Cell** 25: 15-30. *hyperlink*	459
2. Taverna, S.D., Li, H., **Ruthenburg, A.J.**, Allis, C.D. and D.J. Patel. 2007. How chromatin-binding modules interpret histone modifications: lessons from professional pocket pickers. **Nat. Struct. Mol. Biol.** 14: 1025-40. *hyperlink*	576
3. **Ruthenburg, A.J.**, Li, H., Patel, D.J. and C.D. Allis. 2007. Multivalent engagement of chromatin modifications by linked binding modules. **Nat. Rev. Mol. Cell Biol.** 8: 983-94. With accompanying print poster: "Readout of histone marks by chromatin binding modules." *hyperlink*	420
Reviews & Previews (not peer-reviewed)	
1. Werner, M. and **A.J. Ruthenburg.** 2011. The United States of histone ubiquitylation and	3

methylation. **Mol. Cell** 43: 5–7. *hyperlink*

Works in review, in preparation, etc.

1. Chen, Z., Notti R. Q., Ueberheide, B., Banaszynski, L. and **Ruthenburg, A.J**. A quantitative and structural assessment of methyllysine analog engagement by methyllysine binding proteins. Manuscript in preparation**.**

2. Malecek, K.M. Sullivan M. and **Ruthenburg, A.J**. Biochemical characterization of oxidized methylcytosine binding activities in the mammalian brain. Manuscript preparation**.**

FUNDING

Past

1. Cancer Research Institute-- Irvington Institute Fellow. PI: A. Ruthenburg. My role: PI.
   Annual salary recovery or effort: 100%.
   Project period: 1/1/07-1/1/10.

2. Chicago Biomedical Consortium - Junior Investigator. PI: A. Ruthenburg. My role: PI.
   Total direct costs: $500,000
   Annual salary recovery or effort: 17%.
   Project period: 8/1/10-7/31/13.

3. American Cancer Society - Institutional Research Grant. PI: A. Ruthenburg. My role: PI.
   Title: "The role of noncoding RNA in MLL1 complex function"
   Total direct costs: $35,000.
   Annual salary recovery or effort: 0%.
   Project period: 12/01/10-11/30/11.

4. NIH R21HG007426. PI: A. Ruthenburg. My role: PI.
   Title: "Calibrated ChIP-seq: a novel approach to determine local histone modification density."
   Total direct costs: $266,750
   Annual salary recovery or effort: 30%.
   Project period: 8/22/2013-5/31/2015

Current

1. Ellison Medical Foundation AG-NS-1118-13. PI: A. Ruthenburg. My role: PI.
   Title: "Discovery of new epigenetic pathways involved in stem cell maintenance".
   Total direct costs: $400,000.
   Annual salary recovery or effort: 13%.
   Project period: 8/1/13-8/1/17.
2. Neubauer Family Foundation endowed Assistant Professorship. PI: A. Ruthenburg. My role: PI.
   Total direct costs: $85,000
   Annual salary recovery or effort: 0%.
   Project period: 8/1/10-7/31/15.

3. NIH R01-12345. PI: S. Koide. My role: co-investigator.
   Title: "Genetically encoded designer inhibitors for functional epigenomics".
   Total direct costs: $2,199,127 for whole grant.
   Annual salary recovery or effort: 5 %.
   Project period:

4. Chicago Biomedical Consortium-- Catalyst Award

Total direct costs: $200,000

Project period: 8/1/15-7/31/17.

HONORS, PRIZES AND AWARDS

1995	Bausch & Lomb Science Award
1995	William Carleton Scholar
1996 - 1997	Dean's List
1997 - 1998	Dean's List
1999	Magna cum laude, Distinction in Senior Thesis, Distinction in Major
1999	Franz Exner Award for Excellence in Chemistry
2000 - 2004	National Science Foundation Graduate Research Fellow, Harvard University
2007 - 2010	Cancer Research Institute / Irvington Institute Research Fellowship
2010 - 2012	Chicago Biomedical Consortium Junior Investigator
2010 - 2015	Neubauer Family Foundation Endowed Assistant Professorship
2011	Kavli Fellow of the National Academy of Sciences
2013 - 2017	New Scholar in Aging, Ellison Medical Foundation

INVITED SPEAKING

2007	Invited speaker, 'Frontiers in Epigenetics and Chromatin Signaling' Symposium, University of Toronto, Canada
2009	Invited speaker, Genome Integrity meeting of the New York Academy of Sciences, NY
2010	Invited speaker, 'the Molecular Basis for Chromatin Structure and Regulation', Keystone Symposium in Taos, NM
	Research seminar, The University of Chicago, Department of Molecular Genetics and Cell Biology, IL
	Research seminar, Yale University, Department of Molecular Biophysics and Biochemistry, CT
	Research seminar, California Institute of Technology, Division of Biology, CA
2011	Debate Panelist, 'Histone Code: Fact or Fiction?' Keystone Symposium in Midway, UT.
	Research seminar, Northwestern Medical School, Tumor Cell Biology Seminars, IL
	Invited Speaker, Physical Sciences Approaches to Cancer Research Symposium at Northwestern University, Evanston, IL
	Invited speaker, The Rockefeller University, Deciphering the Allis Code: A scientific symposium in honor of David Allis' 60th Birthday, NY
	Invited speaker, National Academy of Sciences Kavli Frontiers of Science Symposium, CA
	Research Seminar, University of North Carolina, Chapel Hill, Department of Biochemistry and Biophysics, NC
	Research Seminar, Loyola School of Medicine, IL

INVITED, ELECTED OR APPOINTED EXTRAMURAL SERVICE

2012	Invited speaker, Fermilab Public Lecture Series, IL
	Illinois Math and Science Academy, Great Minds Lecture Series, IL
2014	Invited Speaker, Midwest Chromatin and Epigenetics Meeting, UW Madison, WI
	Invited Speaker, University of Chicago Comprehensive Cancer Center Symposium: Epigenwetic Modifications: From the Laboratory to the Clinic , Chicago, IL
	Research Seminar, Loyola School of Medicine, IL
	Research Seminar, University of North Carolina, Chapel Hill, Department of Biochemistry and Biophysics, NC
2015	Keynote speaker, Northwestern Developmental Biology Research Symposium, Chicago, USA
2008	Epigenetics panel member, "Diabetic Complications And Chromatin Biology Workshop" at the Juvenile Diabetes Research Foundation (JDRF).
2009	Served as a referee for Netherlands Organization for Scientific Research (NWO) Innovational Research Incentives Scheme grant proposals.
2011	Session Chair, 'Histone Code: Fact or Fiction?' Keystone Symposium in Midway, UT.
2011	Epigentics Session Chair, National Academy of Sciences Kavli Frontiers of Science Symposium, CA
2012	Meeting co-organizer, Chicago Biomedical Consortium Symposium: "Epigenomics"
2012 -	External Thesis Committee member, Salman Anjum-- Biochemistry candidate. Cambridge University, UK.
2014	Ad Hoc reviewer, SBIR grants for NIEHS
2015	Ad Hoc reviewer, P01 grant for NIAID
2012 - 2014	Served as a referee on Chicago Biomedical Consortium Catalyst grant review panel.
2014	Served as an Ad Hoc member of a NIEHS SIBR review panel for RFA ES13-009
	Served as an Ad Hoc Scientific Reviewer for the MRC Clinical Sciences Centre (CSC), Imperial College London,
2015	P01 peer reviewer, NIAD.
Various	Manuscript reviewer for Nature, Nature Structural and Molecular Biology, Nature Chemical Biology, Nature Methods, Cell, Molecular Cell, EMBO, EMBO reports, Chemistry & Biology, PLoS Computational Biology, PNAS, Nucleic Acids Research, Epigenetics & Chromatin, TiBS and TiGS.
2015	External advisor for thesis project, University of Vienna, Austria.

EDUCATION (TEACHING AT THE UNIVERSITY OF CHICAGO)

The College (B.A., B.S.)

2011 - * BIOS 20234: Molecular Biology of the Cell. Co-taught with Michael Glotzer. Fall Quarter, 8 (2011) or 9 (2012-2013) lectures (80 minutes) and one exam for 48, 52, and 37 students, respectively.

Graduate programs (Ph.D.):

2011 - * MGCB 31300: Molecular Biology II: Co-taught with Jon Staley. Spring Quarter, 2 (2011), 6 (2012) then 9 (2013), then 11 (2014) lectures (50 minutes) and two research proposals for 15, 15, 11 and 16 students.

2012 -2013 Guest Lecturer, CABI 40600: Epigenetics and Cancer. Presented two lectures. Winter quarter.

2012 - Guest Lecturer, BCMB 30600: Nucleic Acids Structure and Function. Presented one lecture. Fall quarter.

2014 Guest Lecturer, Stem Cells.

*Please see description of this course in the Education Statement

RESEARCH TRAINEES

High school students and teachers

2013 Grace Di Cecco, IMSA high school student volunteer for the summer.

Undergraduate (B.A., B.S.)

2011 - Shufei "Ryan" Wang, University of Chicago class of 2014. 2011 BCSD summer research fellow.

2011 - 2012 Joey Glynn, University of Chicago class of 2014.

2012 - 2013 Nick Popp, University of Chicago class of 2013. Katen Fellow (award winner, accepted), 2012 BCSD summer research fellow (declined).

2013 - Matthew Sullivan, University of Chicago class of 2016. 2013 and 2014 BCSD summer research fellow.

2013 - Sarah Watanaskul, University of Chicago class of 2016. 2013 and 2014 BCSD summer research fellow.

Various Undergraduate Thesis Reader – 2 students (Justin Demmerle 2011, David Gittin 2012). Phoenix Biology Undergraduate Research Panel 2011.

Graduate (Ph.D.)

2010 - Principal supervisor and thesis advisor for Michael Werner, CMB graduate program. 2010 Honorable Mention, NSF Predoctoral fellowship. 2013 Chicago Biomedical Consortium Scholar. Ph.D. expected in 2014.

2010 - Principal supervisor and thesis advisor for Zhonglei Chen, Chemistry graduate program. Chemistry Co-mentor: Chuan He. Ph.D. expected in fall 2013.

2011 - Principal supervisor and thesis advisor for Kate Malecek, Honorable Mention, NSF Predoctoral fellowship application, BMB graduate program, Ph.D. expected in 2015.

2012 - Principal supervisor and thesis advisor for Adrian Grzybowski, CMB graduate program. Dean's International Student Fellowship Ph.D. expected in 2016.

2013 - Principal supervisor and thesis advisor for William Richter, CMB graduate program, Ph.D. expected in 2017.

Additional graduate trainees

2011 - Thesis Committee member for Scott Brown, CMB graduate program.

2011 Laboratory Rotation Advisor for Kate Malecek (BMB graduate program), Yi Zeng (CMB graduate program), Noah Langowitz (Biophysics graduate program) & Adrian Grzybowski (CMB graduate program.)

2011 - 2012 Laboratory Rotation Advisor for Erika Hanson, CMB graduate program.

2012 Laboratory Rotation Advisor for Toshi Shida (CMB graduate program), Daniil Gataulin (CMB graduate program), Musetta Steinbach (BMB graduate program) & Sammy Thomas (MSTP graduate program).

2012 - Thesis Committee member for Connie Phong (CMB graduate program), & Yi Zeng (CMB graduate program).

2013 Laboratory Rotation Advisor for William Richter (CMB graduate program), Matt Tien, (BMB graduate program) & Yuxin Xie (CBI graduate program).

2013 - Thesis Committee member for Wesley Clark (BMB graduate program), Matt Hope (BMB graduate program), Daniil Gataulin (CMB graduate program) & Bryan Lenneman (GGSB graduate program), Sophiya Karki (Immunology graduate program), Louisa Aiken (BMB graduate program), Erika Hanson (CMB). Laboratory Rotation Advisor for Chris Craddock (CMB graduate program),

Various Preliminary exam committee member for CMB and BMB graduate programs.

Postdoctoral

2013- Jeff Vieregg, PhD (UC Berkeley), Fellow of the Institute of Molecular engineering

2014- Pallavi Thaplyal, PhD (Penn Sate)

SERVICE

University of Chicago

Committee membership:

2010 - Molecular Biosciences Graduate Admissions Committee (MGCB)

2010 - 2011 Ad Hoc member of BMB Faculty Candidate Search Committee

2011 - Member of MGCB Faculty Search Committee

2011 Preliminary Exam panels, BMB, 2 exams (Jenny Lin, Alex French)

2011 - Biophysics core facility instrumentation planning committee

2011 - Member of BMB Faculty Candidate Search Committee

2011 - Biophysics Graduate Admissions Committee, recruitment

2012 Preliminary Exam panels, 1 CMB exam (Kasey Day), chair for 1 BMB exam, (Wesley Clark).

2012 - 2014 Chicago Fellows Program Committee

2013 Preliminary Exam panel, chair for 1 BMB exam (Molly Evans), 1 for GGSB (Reitz)

2014 Preliminary Exam panel for 1 BMB exam (Gilvrey), 1 for CMB (Rich)

Other

2006 Served as a paid consultant for Enanta Pharmaceuticals, Watertown, MA. provided technical advice/assistance with regard to difficult recombinant protein production and assay development.

2015 Member of the EpiCypher Scientific Advisory Board.