

**Kevin M. Weeks, Ph.D.**

Kenan Distinguished Professor  
Department of Chemistry  
University of North Carolina  
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**Curriculum Vitae**

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**Professional Experience**

Department of Chemistry, University of North Carolina – Chapel Hill	1996-
Founder, Ribometrix	2015-
Postdoctoral Fellow, with Thomas R. Cech; University of Colorado – Boulder	1992-96
Ph.D., Biophysical Chemistry, advisor Donald M. Crothers; Yale University	1987-92
Fulbright Scholar in Chemistry; Universität Göttingen, Germany	1986-87
B.A., Chemistry; The College of Wooster, Wooster, OH	1982-86

*RNA is the central conduit of information transfer in all cells and viruses. A core **vision of our research laboratory** is to use chemical principles to create high-content molecular microscopes for understanding the central role of RNA in biology. Our focus spans fundamental basic science chemistry and extends to addressing real-world problems and understanding human disease. To this end, we have developed, validated, and broadly applied information-rich RNA structure analysis technologies. SHAPE technologies, developed in our laboratory, are now in use worldwide.*

*We then **apply the technologies** invented in our laboratory to address compelling, and otherwise intractable, problems in biology. Current projects focus on (i) RNA folding and protein assembly reactions central to the replication of human viruses, including HIV and Dengue, (ii) function of biomedically important RNA–protein complexes inside living cells, and (iii) discovery of small molecule ligands, potential drugs, targeted against medically important RNAs.*

**Honors**

Life Member, Clare Hall, University of Cambridge, UK (2014); Kenan Senior Faculty Competitive Research and Scholarly Leave (2013); Fellow, American Association for the Advancement of Science (2012); NIH EUREKA Award (2011-15); Kenan Distinguished Professorship (2011); North Carolina Health & Life Sciences Promise for Tomorrow Award (2009); Visiting Scholar, National Institutes of Health – NIEHS (2002-03); NSF Career Award (2000-05); Searle Scholar, Chicago Community Trust (1998-2001); Research Innovation Award, Research Corporation (1997); Fellow of the Jane Coffin Childs Memorial Fund for Medical Research (1992-95); Richard Wolfgang Prize for the Most Distinguished Dissertation in Chemistry, Yale University (1992); Fulbright Scholar, Göttingen, Germany (1986-87); B.A. with Honors, Departmental Honors in Chemistry, The College of Wooster (1986); Phi Beta Kappa (1985).

**Active Support**

*Discovery and Function of Higher-Order RNA Structure (NIH R35 GM122532); Structure of the HIV-1 Genome (NIH R01 AI068462); Predicting the Causative SNPs in LD Blocks by Allele-specific Structural Analysis (NIH R01 HG008133); RNA-Directed Therapeutics (NIH, private foundation, and biotechnology company support).*

**University Affiliations**

Department of Chemistry; Biological and Biomedical Sciences Program; Integrative Program for Biological and Genome Sciences (Director, RNA Biology); Curriculum in Bioinformatics & Computational Biology; Undergraduate Transcriptome Project; Medical Scientist M.D.-Ph.D. Training Program; Program in Molecular and Cellular Biophysics; UNC Center for AIDS Research; Virology Training Program; Lineberger Comprehensive Cancer Center (Molecular Therapeutics).

**Teaching**

I mentor students in the *Undergraduate Transcriptome Project*, an NSF-supported project, unique to my laboratory, designed to help undergraduates explore their potential for independent creativity, to fuel their passion for science, and to be a model for engaging undergraduates in a research university. This work has resulted in multiple scientific papers, published in first-rank journals, with all undergraduate co-authors. I also lead and contribute to numerous programs designed to enrich the undergraduate experience at UNC, including First Year Undergraduate Fellows, Honors Carolina, Morehead Planetarium, Women in Science, and Science in the Media.

Formal teaching emphasizes critical thinking and intellectual vision, both in *graduate seminars* and in *large-format, first-year chemistry*. I currently teach graduate courses in Chemical Biology that focus on the contemporary literature. I have had the privilege of teaching thousands of UNC students first year chemistry and emphasize engagement, numerous real world examples, and multi-step problem solving.

**National Service, selected**

- Study Section Reviewer, National Institutes of Health (*ad hoc*, continuous), 2008-  
AARR, MSFB, MSFC, BCMB, SBIR, MIRA and Special Emphasis Review Panels  
Reviewer, National Science Foundation (*ad hoc*), Molecular Biochemistry, Biophysics, 2007-  
Chemistry, and International Research Experiences

**Publications (selected, recent)**

130. E.A. Dethoff, M.A. Boerneke, N.S. Gokhale, B.M. Muhire, D.P. Martin, M.T. Sacco, M.J. McFadden, J.B. Weinstein, W.B. Messer, S.M. Horner SM and K.M. Weeks, Pervasive tertiary structure in the dengue virus RNA genome. *Proc. Natl. Acad. Sci. USA* **115**, 11513-11518 (2018).
126. E.M. Langdon, Y. Qiu, N.A. Ghanbari, G.A. McLaughlin, C.A. Weidmann, T.M. Gerbich, J.A. Smith, J.M. Crutchley, C.M. Termini, K.M. Weeks, S. Myong and A. Gladfelter, mRNA structure determines specificity of a polyQ-driven phase separation. *Science* **360**, 922-927 (2018).
125. M.J. Smola and K.M. Weeks, In-cell RNA structure probing with SHAPE-MaP. *Nature Prot.* **13**, 1181-1195 (2018).
124. A.M. Mustoe, S. Busan, G.M. Rice, C.E. Hajdin, B.K. Peterson, V.M. Ruda, N. Kubica, R. Nutiu, J.L. Baryza and K.M. Weeks, Pervasive regulatory functions of mRNA structure revealed by high-resolution SHAPE probing. *Cell* **173**, 181-195 (2018).
122. S. Busan and K.M. Weeks, Accurate detection of chemical modifications in RNA by mutational profiling (MaP) with ShapeMapper 2. *RNA* **24**, 143-148 (2018).
121. B. Williams, B. Zhao, A. Tandon, F. Ding, K.M. Weeks, Q. Zhang and N.V. Dokholyan, Structure modeling of RNA using sparse NMR constraints. *Nucl. Acids Res.* **45**, 12638-12647 (2017).
120. M. Corley, A. Solem, G. Phillips, L. Lackey, B. Ziehr, H.A. Vincent, A.M. Mustoe, S.B.V Ramos, K.M. Weeks, N.J. Moorman and A. Laederach, An RNA structure-mediated, posttranscriptional model of human  $\alpha$ -1-antitrypsin expression. *Proc. Natl. Acad. Sci. USA* **114**, E10244 (2017).
119. S. Busan and K.M. Weeks, Visualization of RNA structure models within the Integrative Genomics Viewer. *RNA* **23**, 1012-1018 (2017).
118. B.C. Larman, E.A. Dethoff and K.M. Weeks, Packaged and free STMV RNA genomes adopt distinct conformational states. *Biochemistry* **56**, 2175-2183 (2017).
115. M.J. Smola, T.W. Christy, K. Inoue, C.O. Nicholson, M. Friedersdorf, J.D. Keene, D.M. Lee, J.M. Calabrese and K.M. Weeks, SHAPE reveals transcript-wide interactions, complex structural domains, and protein interactions across the Xist lncRNA in living cells. *Proc. Natl. Acad. Sci. USA* **113**, 10322-10327 (2016).
112. M.J. Smola, J.M. Calabrese and K.M. Weeks, Detection of RNA-protein interactions in living cells with SHAPE. *Biochemistry* **54**, 6867-6875 (2015).
106. D.M. Mauger, M. Golden, D. Yamane, S. Willford, S.M. Lemon, D.P. Martin and K.M. Weeks, The functionally conserved architecture of hepatitis C virus RNA genomes. *Proc. Natl. Acad. Sci. USA* **112**, 3692-3697 (2015).
105. J.L. McGinnis, Q. Liu, C.A. Lavender, A. Devaraj, S.P. McClory, K. Fredrick and K.M. Weeks, In-cell SHAPE reveals that free 30S ribosome subunits are in the inactive state. *Proc. Natl. Acad. Sci. USA* **112**, 2425-2430 (2015).
99. P.J. Homan, O.V. Favorov, C.A. Lavender, O. Kursun, X. Ge, S. Busan, N.V. Dokholyan and K.M. Weeks, Single-molecule correlated chemical probing of RNA. *Proc. Natl. Acad. Sci. USA* **111**, 13858-13863 (2014).
98. N.A. Siegfried, S. Busan, G.M. Rice, J.A.E. Nelson and K.M. Weeks, RNA motif discovery by SHAPE and mutational profiling (SHAPE-MaP). *Nature Meths.* **11**, 959-965 (2014).
89. E.J. Archer, M.A. Simpson, N.J. Watts, R. O'Kane, B. Wang, D.A. Erie, A. McPherson and K.M. Weeks, Long-range architecture in a viral RNA genome. *Biochemistry* **52**, 3182-3190 (2013).
86. C.E. Hajdin, S. Bellaousov, W. Huggins, C.W. Leonard, D.H. Mathews and K.M. Weeks, Accurate SHAPE-directed RNA secondary structure modeling, including pseudoknots. *Proc. Natl. Acad. Sci. USA* **110**, 5498-5503 (2013).
85. J.K. Grohman, R.J. Gorelick, C.R. Lickwar, J.D. Lieb, B.D. Bower, B.M. Znosko and K.M. Weeks, A guanosine-centric mechanism for RNA chaperone function. *Science* **340**, 190-195 (2013).

**Reviews (selected)**

128. K.D. Warner, C.E. Hajdin and K.M. Weeks, Principles for targeting RNA with drug-like small molecules. *Nature Rev. Drug Discov.* **17**, 547-558 (2018)
127. A.M. Mustoe, M. Corley, A. Laederach and K.M. Weeks, mRNA structure regulates translation initiation: A mechanism exploited from bacteria to humans. *Biochemistry* **57**, 3537-3539 (2018).
102. K.M. Weeks, Toward all RNA structures, concisely. *Biopolymers* **103**, 438-448 (2015).
87. D.M. Mauger, N.A. Siegfried and K.M. Weeks, The genetic code as expressed through relationships between mRNA structure and protein function. *FEBS Lett.* **587**, 1180-1188 (2013).