

## Jennifer Franzen Kugel, Ph.D.

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### Educational Background and Academic Positions

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|------------------------|---|
| Aug. 1992 – May 1996   | Bachelor of Arts, Summa Cum Laude<br>St. Olaf College, Northfield, MN<br>Major: Chemistry<br>Concentration: Molecular Biology |
| Aug. 1996 – Jan. 2001  | Ph.D. Chemistry<br>Department of Chemistry and Biochemistry<br>University of Colorado, Boulder, CO                            |
| Feb. 2001 – Dec. 2003  | Research Associate<br>Department of Chemistry and Biochemistry<br>University of Colorado, Boulder, CO                         |
| Jan. 2004 – April 2006 | Senior Research Associate<br>Department of Chemistry and Biochemistry<br>University of Colorado, Boulder, CO                  |
| May 2006 – June 2012   | Assistant Research Professor<br>Department of Chemistry and Biochemistry<br>University of Colorado, Boulder, CO               |
| July 2012 – present    | Associate Research Professor<br>Department of Biochemistry<br>University of Colorado, Boulder, CO                             |
| June 2020 – present    | Research Professor<br>Department of Biochemistry<br>University of Colorado, Boulder, CO                                       |

### Publications (chronological order, the underlined DOI will link to the article)

1. Nemecek Marshall, M., MacDonald, M., **Franzen, J.J.**, Wojciechowski, C.L., and Fall, R. (1995) Methanol emission from leaves. *Plant Phys.* 108:1359-1368.
2. Chakravarti, D., Mailander, P., **Franzen, J.**, Higginbotham, S., Cavalieri, E.L., and Rogan, E.G. (1998) Detection of dibenzo[*a,l*]pyrene-induced H-ras codon 61 mutant genes in preneoplasitic SENCAR mouse skin using a new PCR-RFLP method. *Oncogene* 16:3203-3210.
3. **Kugel, J.F.** and Goodrich, J.A. (1998) Promoter escape limits the rate of transcription from the adenovirus major late promoter on negatively supercoiled templates. *Proc. Natl. Acad. Sci. USA.* 95:9232-9237. [pnas.95.16.9232](https://doi.org/10.1073/pnas.95.16.9232)
4. **Kugel, J.F.** and Goodrich, J.A. (2000) A kinetic model for the early steps of RNA synthesis by human RNA polymerase II. *J. Biol. Chem.* 275:40483-40491. [10.1074/jbc.M006401200](https://doi.org/10.1074/jbc.M006401200)  
(Highlighted in: Valda, V. (2000) First Step to Commitment. *Science.* 289:2243.)

5. Ferguson, H.A., **Kugel, J.F.**, and Goodrich, J.A. (2001) Kinetic and mechanistic analysis of the RNA polymerase II transcription reaction at the human interleukin-2 promoter. *J. Mol. Biol.* 314:993-1006. [10.1006/jmbi.2000.5215](https://doi.org/10.1006/jmbi.2000.5215)
6. **Kugel, J.F.** and Goodrich, J.A. (2002) Translocation after synthesis of a four nucleotide RNA commits RNA polymerase II to promoter escape. *Mol. Cell. Biol.* 22:762-773. [10.1128/MCB.22.3.762-773.2002](https://doi.org/10.1128/MCB.22.3.762-773.2002)
7. **Kugel, J.F.** and Goodrich, J.A. (2003) In vitro studies of the early steps of RNA synthesis by human RNA polymerase II. *Meth. Enzymol.* 370:687-701. [10.1016.S0076-6879](https://doi.org/10.1016.S0076-6879)
8. Allen, T.A., Von Kaenel, S., Goodrich, J.A., and **Kugel, J.F.** (2004) The SINE encoded mouse B2 RNA represses mRNA transcription in response to heat shock. *Nat. Struct. Mol. Biol.* 11: 816-821. [10.1038/nsmb813](https://doi.org/10.1038/nsmb813)
9. Espinoza, C.A., Allen, T.A., Hieb, A. R., **Kugel, J.F.**, and Goodrich, J.A. (2004) B2 RNA binds directly to RNA polymerase II to repress transcript synthesis. *Nat. Struct. Mol. Biol.* 11: 822-829. [10.1038/nsmb812](https://doi.org/10.1038/nsmb812)  
(References 8 and 9, which were published back-to-back were: Cover articles; Highlighted in News and Views: Wassarman, KM (2004) RNA regulators of transcription. *Nat. Struct. Mol. Biol.* 11:803-804.; and Highlighted in: Heinrichs, A. (2004) A non-starter. *Nat. Rev. Mol. Cell Biol.* 5:682.)
10. Weaver, J.R., **Kugel, J.F.**, Goodrich, J.A. (2005) The sequence at specific positions in the early transcribed region sets the rate of transcript synthesis by RNA polymerase II in vitro. *J. Biol. Chem.* 280: 39860-39869. [10.1074/jbc.M509376200](https://doi.org/10.1074/jbc.M509376200)
11. Hieb, A.R., Baran, S., Goodrich, J.A., and **Kugel, J.F.** (2006) An 8 nt RNA triggers a rate-limiting shift of RNA polymerase II complexes into elongation. *EMBO J.* 25: 3100-3109. [10.1038/sj.emboj.7601197](https://doi.org/10.1038/sj.emboj.7601197)
12. **Kugel, J.F.** and Goodrich, J.A. (2006) Beating the heat: A translation factor and an RNA mobilize the heat shock transcription factor HSF1. *Mol. Cell* 22:153-154. [10.1016/j.molcel.2006.04.003](https://doi.org/10.1016/j.molcel.2006.04.003)
13. Goodrich, J.A. and **Kugel, J.F.** (2006) Non-coding RNA regulators of RNA polymerase II transcription. *Nat. Rev. Mol. Cell Biol.* 87: 612-616. [10.1038/nrm1946](https://doi.org/10.1038/nrm1946)
14. Goodrich, J.A. and **Kugel, J.F.** (2007) Binding and Kinetics for Molecular Biologists. Cold Spring Harbor Laboratory Press. Cold Spring Harbor, NY. 182 pages.
15. **Kugel, J.F.** and Goodrich, J.A. (2007) An RNA transcriptional regulator templates its own regulatory RNA. *Nat. Chem. Biol.* 3: 89-90. [10.1038/nchembio0207-89](https://doi.org/10.1038/nchembio0207-89)
16. Espinoza, C.A., Goodrich, J.A., and **Kugel, J.F.** (2007) Characterization of the structure, function and mechanism of B2 RNA, an ncRNA repressor of RNA polymerase II transcription. *RNA* 13: 783-596. [10.1261/rna.310307](https://doi.org/10.1261/rna.310307)
17. Weaver, J.R., Good, K., Walters, R.D., **Kugel, J.F.**, and Goodrich, J.A. (2007) Characterization of the sequence and architectural constraints of the regulatory and core regions of the human interleukin-2 promoter. *Mol. Immunol.* 44: 2813-2819. [10.1016/j.molimm.2007.01.027](https://doi.org/10.1016/j.molimm.2007.01.027)
18. Hieb, A.R., Halsey, W.A., Betterton, M., Perkins, T., **Kugel, J.F.**, and Goodrich, J.A. (2007) TFIIA changes the conformation of the DNA in TBP/TATA complexes and increases their kinetic stability. *J. Mol. Biol.* 372: 619-632. [10.1016/j.jmb.2007.06.061](https://doi.org/10.1016/j.jmb.2007.06.061)

19. Wager, S.D., **Kugel, J.F.**, and Goodrich, J.A. (2008) The role of non-coding RNAs in controlling mammalian RNA polymerase II transcription. Chapter 9 in RNA and the Regulation of Gene Expression, Editor K. Morris, Horizon Scientific Press, Norwich, UK.
20. Mariner, P.D., Walters, R.D., Espinoza, C.A., Drullinger, L.F., Wagner, S.D., **Kugel, J.F.**, and Goodrich, J.A. (2008) Human Alu RNA is a modular transacting repressor of mRNA transcription during heat shock. *Mol. Cell* 29: 499-509. [10.1016/j.molcel.2007.12.013](https://doi.org/10.1016/j.molcel.2007.12.013) (Highlighted in: Shamovsky, I and Nudler, E. (2008) Modular RNA heats up. *Mol. Cell* 29:415-417.)
21. **Kugel, J.F.** (2008) Using FRET to measure the angle at which a protein bends DNA. *Biochem. Mol. Biol. Educ.* 36: 341-346. [10.1002/bmb.20202](https://doi.org/10.1002/bmb.20202)
22. Goodrich, J.A. and **Kugel, J.F.** (2009) From bacteria to humans, chromatin to elongation, and activation to repression: the expanding roles of noncoding RNAs in regulating transcription. *Crit. Rev. Biochem. Mol. Biol.* 44: 3-15. [10.1080/10409230802593995](https://doi.org/10.1080/10409230802593995)
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26. Walters, R.D., **Kugel, J.F.**, and Goodrich, J.A. (2009) InvAluable junk: the cellular impact and function of Alu and B2 RNAs. *IUBMB Life.* 61: 831-837. [10.1002/iub.227](https://doi.org/10.1002/iub.227)
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29. Ponicsan, S.L., **Kugel, J.F.**, and Goodrich, J.A. (2010) Genomic gems: SINE RNAs regulate mRNA production. *Curr. Opin. Gen. Dev.* 20: 149-155. [10.1016/j.gde.2010.01.004](https://doi.org/10.1016/j.gde.2010.01.004)
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31. Goodrich, J.A. and **Kugel, J.F.** (2010) Genome-wide insights into eukaryotic transcriptional control. *Genome Biol.* 11:305. [10.1186/gb-2010-11-6-305](https://doi.org/10.1186/gb-2010-11-6-305)
32. Nguyen, T.N., Kim, L.J., Walters, R.D., Drullinger, L.F., Lively, T.N., **Kugel, J.F.**, and Goodrich, J.A. (2010) The C-terminal region of human NFATc2 binds cJun to synergistically activate interleukin-2 transcription. *Mol Immunol.* 47: 2314-2322. [10.1016/j.molimm.2010.05.287](https://doi.org/10.1016/j.molimm.2010.05.287)
33. Yakovchuk, P., Goodrich J.A., and **Kugel, J.F.** (2011) B2 RNA represses TFIIF phosphorylation of RNA polymerase II. *Transcription.* 2:45-49. [10.4161/trns.2.1.14306](https://doi.org/10.4161/trns.2.1.14306)

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38. Dridi, S., Hirano, Y., Tarallo, V., Kim, Y., Fowler, B.J., Ambati, B.K., Bogdanovich, S., Chiodo, V.A., Hauswirth, W.W., **Kugel, J.F.**, Goodrich, J.A., Ponicsan, S.L., Hinton, D.R., Kleinman, M.E., Baffi, J., Gelfand, B.D., and Ambati, J. (2012) ERK1/2 activation is a therapeutic target in age-related macular degeneration. *Proc. Natl. Acad. Sci. USA*. 109:13781-13786. [10.1073/pnas.1206494109](https://doi.org/10.1073/pnas.1206494109)
39. Blair, R.H., Goodrich, J.A., and **Kugel, J.F.** (2012) Single-molecule fluorescence resonance energy transfer shows uniformity in TATA binding protein-induced DNA bending and heterogeneity in bending kinetics. *Biochemistry* 51:7444-7455. [10.1021/bi300491j](https://doi.org/10.1021/bi300491j)
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42. Blair, R.H., Goodrich, J.A., and **Kugel, J.F.** (2013) Using FRET to monitor protein-induced DNA bending: the TBP-TATA complex as a model system. *Meth. Mol. Biol.* 977:203-215. [10.1021/bi300491j](https://doi.org/10.1021/bi300491j)
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63. Rivas, T., Goodrich, J.A., and **Kugel, J.F.** (2021) The herpes simplex virus 1 protein ICP4 acts as both an activator and repressor of host genome transcription during infection. *Mol. Cell. Biol.* 24:e0017121. [10.1128/MCB.00171-21](https://doi.org/10.1128/MCB.00171-21)
64. Voong C.K., Goodrich, J.A., and **Kugel, J.F.** (2021) Interactions of HMGB proteins with the genome and the impact on disease. *Biomolecules.* 11:1451. [10.3390/biom11101451](https://doi.org/10.3390/biom11101451)
65. Bosire, R., Fadel, L., Mocsár, G., Nánási, P., Sen, P., Sharma, A.K., Naseem, M.U., Kovács, A., **Kugel, J.**, Kroemer, G., Vámosi, G., and Szabó, G. (2022) Doxorubicin impacts the chromatin binding of HMGB1, Histone H1 and retinoic acid receptor. *Sci Rep.* [10.1038/s41598-022-11994-z](https://doi.org/10.1038/s41598-022-11994-z)
66. Singh, A., Miller, R.C., Archuleta, S.R., and **Kugel, J.F.** (2023) Evaluating two steps in transcription using a fluorescence-based electrophoretic mobility shift assay. *Biochem. Mol. Biol. Educ.* Online ahead of print. [10.1002/bmb.21708](https://doi.org/10.1002/bmb.21708)

## Classroom Teaching

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|---------|--|
| Ongoing | Advanced Topics in Signal Transduction and Cell Cycle Regulation<br>CHEM 5801, University of Colorado at Boulder<br>Guest Lecturer |
| Ongoing | Biochemistry Laboratory<br>CHEM 4761, University of Colorado at Boulder<br>Design and teach novel experimental modules             |

## Mentoring/Non-classroom teaching

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| Ongoing | Advisor for Ph.D. students (19); undergraduate researchers (36); post-doctoral researchers (8); professional research assistants (12) |
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## Select Professional Service

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| Ongoing | Reviewer for NSF and NIH grant applications   |
| Ongoing | Reviewer for research manuscripts submitted to:<br>Nature, Nature Structure and Molecular Biology, Nature Communications, EMBO Journal, eLife, PNAS, RNA, Review Commons, Journal of Molecular Biology, Nucleic Acids Research, |

EMBO reports, PLOS ONE, Gene, Genome Biology, Scientific Reports, Journal of Chemical Education, Methods, F1000 Biology Reports, Biochemistry, ACS Sensors, Integrative Biology, Biochimie, Technology in Cancer Research and Treatment, Mammalian Genome

**Select Outreach**

- Ongoing Member of FabFems. An online resource for connecting girls with female mentors that work in STEM fields.
- Ongoing Participate in a career days and one-on-one mentoring for middle school and high school students interested in biomedical research and careers.