

CURRICULUM VITAE (March 2022)

Tao Pan

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Education:

1981-86	Universität des Saarlandes, Saarbrücken, Germany.	B.S., M.S. (Diplom) (Chemistry)	1986
1986-90	Yale University	Ph.D. (Molecular Biophysics & Biochemistry)	1990

Professional Training and Academic Positions:

2009 - present:	Professor, Department of Biochemistry and Molecular Biology, and The College, The University of Chicago.
2001 - 2008:	Associate Professor, Department of Biochemistry and Molecular Biology, and The College, The University of Chicago.
1994 - 2000:	Assistant Professor, Department of Biochemistry and Molecular Biology, and The College, The University of Chicago.
1990 - 1993:	Postdoctoral Fellow, University of Colorado at Boulder, Professor Olke C. Uhlenbeck, advisor.
1987 - 1990:	Doctoral Research, Yale University, Professor Joseph E. Coleman, advisor.
1985 - 1986:	M.S. thesis (Diplomarbeit), Universität des Saarlandes. Professor Istvan Halasz, advisor.

Awards and Fellowships:

1991 - 1993:	Postdoctoral Fellowship, Damon Runyon-Walter Winchell Cancer Research Fund.
1994:	Cancer Research Foundation, Raymond F. Zelko Young Investigator.
1995 - 1997:	American Cancer Society, Junior Faculty Research Award.

2009 - 2013: NIH EUREKA award.
2011 - 2016: NIH Director's Pioneer award.
2015: Elected American Association for the Advancement of Science (AAAS) Fellow

Membership in Professional Organizations:

1995 - present: American Chemical Society.
1995 - present: The RNA Society.

Teaching experience:

1994 – 2017, 2020: *BMB 30600*: Nucleic acids structure and function.
1998 – 2006: *BioSci20239 (new course)*, *BioSci20234*, *BioSci20235*: Molecular Biology I.
2007 – 2009: *Bio28400 (new course)*: Introductions to Systems Biology I.
2010: *ISTP30400 (new course)*: Systems approaches to cell signaling.
2010 – present (*new course*): Grant writing workshop.
2018 – present: *Bio21360 (new course)*: Advanced Molecular Biology.

Other activities:

Journal guest editor:

Guest Associate Editor: *PLoS Genetics* (2013).
Guest Associate Editor: *PLoS Computational Biology* (2013).

Journal Editorial Board member:

RNA, 2019 - present

Meeting organizer:

Gordon Research Conference, elected vice Chair 2019, Chair 2023, “Translational Machinery in Health and Disease”

Grant review, non-federal:

HHMI predoctoral fellowship stage 2 reviewer (2013).
Beckman Young Investigator site visit committee member (2015).
Chicago Biomedical Consortium, catalyst review panel member (2012-2015).
Stanford NIGMS P01 advisory visit (2016).
Keck foundation, phase II review (2017, 2020).

Grant review, federal:

NSF: (proposals) 1997, 1998, 2000, 2003, 2009, 2011, 2013, 2019, 2020.
(*CAREER*) 2004, 2005, 2017, 2018.

NIH:

Ad hoc study sections for R01: 1999, 2001, 2006, 2008.
Ad hoc NIH reviews of other proposals: 2013 (DP5), 2013 (K99), 2017 (DP2), 2020 (DP2), 2021

(P41).

Study sections attended:

5/2015: NIEHS SBIR/STTR Cell Differentiation study section member.

11/2015: NIH special emphasis panel for R01.

2/2016: NIDA SBIR/STTR RNA modification study section member.

7/2018: NIH ZRG1 IMST-H(15)B - SBIR/STTR: Cell and Molecular Biology study section member.

12/2018: NHGRI 019/01 ZHG1 HGR-N (J1) 1 Sequencing Technology review study section member.

Site visits:

12/2015: NIH P41 SUNY site visiting committee member.

3/2019: NCI site visit review committee of the Laboratory of Cell Biology.

Patents:

11/2021: PCT/US21/58258, "Hairpin Oligonucleotides and Uses Thereof", co-inventor.

Bibliography:

Google scholar citations: h-index: 80. # >80; ## >160; ### >320.

A. Peer-reviewed articles: (* = corresponding author)

(Graduate student)

1. ## **Tao Pan** & J. E. Coleman: Structure and function of the Zn(II) binding site within the DNA binding domain of the GAL4 transcription factor. *Proc. Natl. Acad. Sci. USA* 86, 3145-3149 (1989).
2. **Tao Pan**, D.P. Giedroc & J.E. Coleman: ¹H NMR studies of T4 gene 32 protein: effects of zinc removal and reconstitution. *Biochemistry* 28, 8828-8832 (1989).
3. **Tao Pan**, G.C.King & J.E. Coleman: Comparison of cooperative and isolated site binding of T4 gene 32 protein to ssDNA by ¹H NMR. *Biochemistry* 28, 8833-8839 (1989).
4. Roberts, W.J., **Tao Pan**, J.I. Elliot, J.E. Coleman & K.R. Williams: p10 Single-stranded nucleic acid binding protein from Murine Leukemia Virus binds metal ions via the peptide sequence C²⁶X₂C²⁹X₄H³⁴X₄C³⁹. *Biochemistry* 28, 10043-10047 (1989).
5. **Tao Pan** & J. E. Coleman: The DNA binding domain of GAL4 forms a binuclear metal ion complex. *Biochemistry* 29, 3023-3029 (1990).
6. ## **Tao Pan** & J. E. Coleman: GAL4 Transcription factor is not a 'zinc finger' but forms a Zn(II)₂Cys₆ binuclear cluster. *Proc. Natl. Acad. Sci. USA* 87, 2077-2081 (1990).
7. **Tao Pan**, L.P. Freedman & J.E. Coleman: ¹¹³Cd NMR studies of the DNA binding domain of the mammalian glucocorticoid receptor. *Biochemistry* 29, 9218-9225 (1990).
8. **Tao Pan**, Y.-D. Halvorsen, R.C. Dickson & J.E. Coleman: The transcription factor LAC9 from *K. lactis*-like GAL4 from *S. cerevisiae* forms a Zn(II)₂Cys₆ binuclear cluster. *J. Biol. Chem.* 265, 21427-21429 (1990).
9. **Tao Pan** & J. E. Coleman: Sequential assignments of the ¹H NMR resonances of Zn(II)₂- and ¹¹³Cd(II)₂-derivatives of the DNA binding domain of the GAL4 transcription factor reveal a novel structural motif for specific DNA recognition. *Biochemistry* 30, 4212-4222 (1991).

10. # Gardner, K., **Tao Pan**, S. Narula, E. Rivera & J.E. Coleman: Structure of the binuclear metal-binding site in the GAL4 transcription factor. *Biochemistry* 30, 11292-11302 (1991). (Post-doc)
11. ## **Tao Pan**, R.R. Gutell & O.C. Uhlenbeck: Folding of circularly permuted transfer RNAs. *Science* 254, 1361-1364 (1991).
12. ## **Tao Pan** & O.C. Uhlenbeck: In vitro selection of RNAs that undergo autolytic cleavage with Pb²⁺. *Biochemistry* 31, 3887-3895 (1992).
13. ## **Tao Pan** & O.C. Uhlenbeck: A small metalloribozyme with a two step mechanism. *Nature* 358, 560-563 (1992).
14. Dichtl, B., **Tao Pan**, A.B. DiRenzo & O.C. Uhlenbeck: Replacement of non-essential RNA hairpins with tetranucleotides. *Nucl. Acids Res.* 21, 531-535 (1993).
15. Gott, J.M., **Tao Pan**, K. LeCuyer & O.C. Uhlenbeck: Using Circular Permutation Analysis to redefine the R17 coat protein binding site. *Biochemistry* 32, 13399-13404 (1993).
16. ## **Tao Pan**, B. Dichtl & O.C. Uhlenbeck: Properties of an *in vitro* selected Pb²⁺ cleavage motif. *Biochemistry* 33, 9561-9565 (1994).
17. Peterson, E.T., **Tao Pan**, J.H. Coleman & O.C. Uhlenbeck: In vitro selection of small RNAs that bind to *E. coli* phenylalanyl-tRNA synthetase. *J. Mol. Biol.* 242, 186-192 (1994). (Assistant Professor)
18. **Tao Pan*** & K. Zhong: Selection of circularly permuted ribozymes from *Bacillus Subtilis* RNase P by substrate binding. *Biochemistry* 33, 14207-14212 (1994).
19. ## **Tao Pan***: Higher order structure and domain analysis of the ribozyme from *Bacillus Subtilis* RNase P. *Biochemistry* 34, 902-909 (1995).
20. **Tao Pan***: Novel RNA substrates for the ribozyme from *Bacillus Subtilis* ribonuclease P identified by in vitro selection. *Biochemistry* 34, 8458-8464 (1995).
21. ## **Tao Pan***, A. Loria & K. Zhong: Probing tertiary interactions in RNA: 2'OH-Base contacts between the RNase P RNA and pre-tRNA. *Proc. Natl. Acad. Sci. USA* 92, 12510-12514 (1995).
22. **Tao Pan*** & M. Jakacka: Multiple substrate binding sites in the ribozyme from *Bacillus subtilis* RNase P. *EMBO J.* 15, 2249-2255 (1996).
23. ## Loria, A. & **Tao Pan***: Domain structure of the ribozyme from eubacterial ribonuclease P. *RNA* 2, 551-563 (1996).
24. ## Loria, A. & **Tao Pan***: Recognition of the T Stem-loop of a pre-tRNA substrate by the ribozyme from *Bacillus Subtilis* ribonuclease P. *Biochemistry* 36, 6317-6325 (1997).
25. ## **Tao Pan*** & T.R. Sosnick*: Intermediates and kinetic traps in the folding of a large ribozyme revealed by CD spectroscopy and catalytic activity. *Nature Str. Mol. Biol.* 4, 931-938 (1997). PMID: 9360610
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27. Odell, L., V. Huang, M. Jakacka & **Tao Pan***: Interaction of structural modules in substrate binding by the ribozyme from *Bacillus subtilis* RNase P. *Nucl. Acids Res.* 26, 3717-3723 (1998).
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29. # **Tao Pan***, X-W. Fang & T.R. Sosnick*: Pathway modulation, circular permutation and

- rapid RNA folding under kinetic control. *J. Mol. Biol.* 286, 721-731 (1999).
30. Loria, A. & **Tao Pan***: The cleavage step of the ribonuclease P catalysis is determined by ribozyme-substrate interactions both distal and proximal to the cleavage site. *Biochemistry* 38, 8612-8620 (1999).
 31. ## **Tao Pan***, I. Artsimovitch, X-W. Fang, R. Landick & T.R. Sosnick*: Folding of a large ribozyme during transcription and the effect of the elongation factor NusA. *Proc. Natl. Acad. Sci. USA* 96, 9545-9550 (1999).
 32. Mobley, E.M. & **Tao Pan***: Design and isolation of ribozyme-substrate pairs using RNase P-based ribozymes containing altered substrate binding sites. *Nucl. Acids Res.* 27, 4298-4304 (1999).
 33. ## Fang, X-W., **Tao Pan*** & T.R. Sosnick*: Mg²⁺-dependent folding of a large ribozyme without kinetic traps. *Nature Str. Mol. Biol.* 6, 1091-1095 (1999).
 34. ## Shelton, V., T.R. Sosnick* & **Tao Pan***: The applicability of urea in the thermodynamic analysis of secondary and tertiary RNA folding. *Biochemistry* 38, 16831-16839 (1999).
 35. ## Fang, X-W., **Tao Pan*** & T.R. Sosnick*: A thermodynamic framework in the description of the tertiary folding of a Mg²⁺-dependent ribozyme. *Biochemistry* 38, 16840-16846 (1999).
 36. ## Fang, X-W., K.L. Littrell, X-J. Yang, S.J. Henderson, S. Seifert, P. Thiyagarajan, **Tao Pan*** & T.R. Sosnick*: Mg²⁺-dependent compaction and folding of the yeast tRNA^{Phe} and the catalytic domain of the *B. subtilis* RNase P RNA determined by Small-angle X-ray scattering. *Biochemistry* 39, 11107-11113 (2000).
 37. Loria, A. & **Tao Pan***: 3' substrate determinants for the catalytic efficiency of the *Bacillus subtilis* RNase P holoenzyme suggest autolytic processing of the RNase P RNA *in vivo*. *RNA* 6, 1413-1422 (2000).
- (Associate Professor)
38. Fang, X-W., X-J. Yang, K.L. Littrell, S. Niranjana Kumari, P. Thiyagarajan, C.A. Fierke, T.R. Sosnick & **Tao Pan***: The *Bacillus subtilis* RNase P holoenzyme contains two RNase P RNA and two RNase P protein subunits. *RNA* 7, 233-241 (2001).
 39. Shelton, V., T.R. Sosnick* & **Tao Pan***: Altering the intermediate in the equilibrium folding of unmodified yeast tRNA^{Phe} with monovalent and divalent cations. *Biochemistry* 40, 3629-3638 (2001).
 40. Fang, X-W., B.L. Golden, K. Littrell, V. Shelton, P. Thiyagarajan, **Tao Pan*** & T.R. Sosnick*: The thermodynamic origin of the stability of a thermophilic ribozyme. *Proc. Natl. Acad. Sci. USA* 98, 4355-4360 (2001).
 41. Loria, A. & **Tao Pan***: Modular construction for function of a ribonucleoprotein enzyme: the catalytic domain of *Bacillus subtilis* RNase P complexed with *B. subtilis* RNase P protein. *Nucl. Acids Res.* 29, 1892-1897 (2001).
 42. Qin, H., T.R. Sosnick* & **Tao Pan***: Modular construction of a tertiary RNA structure: the specificity domain of the *Bacillus subtilis* RNase P. *Biochemistry* 40, 11202-11210 (2001).
 43. # Fang, X-W., P. Thiyagarajan, T.R. Sosnick* & **Tao Pan***: The rate-limiting step in the folding of a large ribozyme without kinetic traps. *Proc. Natl. Acad. Sci. USA* 99, 8518-8523 (2002). [PMC124294](#)
 44. Barrera, A., X. Fang, J. Jacob, E. Casey, P. Thiyagarajan & **Tao Pan***: Dimeric and monomeric *Bacillus subtilis* RNase P holoenzyme in the absence and presence of pre-tRNA substrates. *Biochemistry* 41, 12986-12994 (2002).
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- to a thermophilic ribozyme. *J. Mol. Biol.* 330, 177-183 (2003).
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 50. Sosnick, T.R.* & **Tao Pan***: Reduced contact order and RNA folding rates. *J. Mol. Biol.* 342, 1359-1365 (2004).
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 61. ### Dittmar, K.A., J.M. Goodenbour & **Tao Pan***: Tissue specific differences in human transfer RNA expression. *PLoS Genetics* 2, 2107-2115 (e221, 2006). PMID:17194224 PMCID: PMC1713254
 62. # Dai, Q., R. Fong, M. Saikia, D. Stephenson, Y.-T. Yu, **Tao Pan*** & J.A. Piccirilli*: Identification of Recognition Residues for Ligation-Based Detection and Quantitation of Pseudouridine and N6-Methyladeonsine, *Nucl. Acids Res.* 35, 6322-6329 (2007).
 63. # Wong, T., T.R. Sosnick* & **Tao Pan***: Folding of non-coding RNAs during transcription facilitated by pausing-induced non-native structures, *Proc. Natl. Acad. Sci. USA* 104, 17995-18000 (2007).
 64. Smith, G.J., K.T. Lee, X-H. Qu, Z. Xie, J. Pesic, T.R. Sosnick, **Tao Pan** & N.F. Scherer: Discrete single molecule dynamics suggest relatively simple but rugged structure for a large collapsed-state RNA, *J. Mol. Biol.* 378, 941-951 (2008).
 65. Qu, X-H., G. J. Smith, K.T. Lee, T. R. Sosnick, **Tao Pan** & N. F. Scherer: Single-Molecule Non-equilibrium Periodic Mg^{2+} -concentration Jump Experiments Reveal Details of the

Early Folding Pathways of a Large RNA, *Proc. Natl. Acad. Sci. USA* 105, 6602-6607 (2008).

(Professor)

66. Dai, Q., M. Saikia, N-S. Li, **Tao Pan*** & J.A. Piccirilli*: Efficient Chemical Synthesis of AppDNA by Adenylation of Immobilized DNA-5'-monophosphate, *Organic Letters* 11, 1067-1070 (2009).
67. Zhou, Y., J.M. Goodenbour, L.A. Godley, A. Wickrema* & **Tao Pan***: High levels of tRNA abundance and alteration of tRNA charging by bortezomib in multiple myeloma, *Biochem. Biophys. Res. Comm.* 385, 160-164 (2009).
68. # Zaborske, J.M., J. Narasimhan, L. Jiang, S.A. Wek, K.A. Dittmar, F. Freimoser, **Tao Pan*** & R.C. Wek*: Genome-wide analysis of tRNA charging and activation of the eIF2 kinase Gcn2p, *J. Biol. Chem.* 284, 25254-25267 (2009).
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70. ### Netzer, N., J.M. Goodenbour, A. David, K.A. Dittmar, R.B. Jones, J.R. Schneider, D. Boone, E.M. Eves, M.R. Rosner, J.S. Gibbs, A. Embry, B. Dolan, S. Das, H. Hickman, P. Berglund, J.R. Bennink, J.W. Yewdell*, **Tao Pan***: Innate Immune and Chemically Triggered Oxidative Stress Modifies Translational Fidelity, *Nature* 462, 522-526 (2009). PMCID: PMC2785853
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75. # Staschke, K.A., D. Souvik, J. M. Zaborske, L.R. Palam, J. N. McClintick, **Tao Pan**, H. J. Edenberg & R.C. Wek: Integration of general amino acid control and TOR regulatory pathways in nitrogen assimilation in yeast, *J. Biol. Chem.* 285, 16893-16911 (2010).
76. # Saikia, M., Y. Fu, M. Pavon-Eternod, C. He & **Tao Pan***: Genome-wide analysis of N1-methyl-adenosine modification in human tRNAs, *RNA* 16, 1317-1327 (2010).
77. Zaborske, J.M., X-C. Wu, R. C. Wek, **Tao Pan***: Selective control of amino acid metabolism by the GCN2 eIF2 kinase pathway in *Saccharomyces cerevisiae*, *BMC Biochemistry* 11:e29, 1-9 (2010).
78. # Fu, Y., Q. Dai, W. Zhang, J. Ren, **Tao Pan*** & C. He*: The AlkB domain of mammalian ABH8 catalyzes hydroxylation of 5-methoxycarbonylmethyluridine at the anticodon wobble base in tRNA, *Angewandte Chemie (Int)* 49, 8885-8888 (2010).
79. ## Reiter, N.J., Osterman, A., Torres-Larios, A., Swinger, K.K., **Tao Pan** & Mondragon, A.: Crystal structure of a bacterial ribonuclease P holoenzyme in complex with tRNA, *Nature* 468, 784-791 (2010).
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- Chem. Soc.* 132, 16352-16353 (2010). [PMC2988076](#)
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 82. Dai, Q., C-X. Song, **Tao Pan** & C. He: Syntheses of Two 5-Hydroxymethyl-20-deoxycytidine Phosphoramidites with TBDMS as the 5-Hydroxymethyl Protecting Group and Their Incorporation into DNA, *J. Org. Chem.* 76, 4182-4188 (2011).
 83. ### Jia, G-F., Y. Fu, X. Zhao, Q. Dai, G-Q. Zheng, Y. Yang, C-Q. Yi, T. Lindahl, **Tao Pan**, Y-G. Yang & C. He: N⁶-Methyladenosine in Nuclear RNA is a Major Substrate of the Obesity-Associated FTO, *Nature Chem. Biol.* 7, 885-887 (2011).
 84. Parisien, M., C-Q. Yi & **Tao Pan***: Rationalization and prediction of selective decoding of pseudouridine-modified nonsense and sense codons, *RNA* 18, 355-367 (2012). PMID: PMC3285925
 85. # Perdrizet, G.A., I. Artsimovitch, R. Furman, T. R. Sosnick*, **Tao Pan***: Transcriptional pausing coordinates folding of the aptamer domain and the expression platform of a riboswitch, *Proc. Natl. Acad. Sci. USA* 109, 3323-3328 (2012). PMID:22331895 PMID: PMC3295289
 86. ## Novoa, E.M., M. Pavon Eternod, **Tao Pan** & L. Ribas de Pouplana: Two anticodon modifications shaped tRNA gene populations and genome structure in bacteria and eukaryotes, *Cell* 149, 202-13 (2012).
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 88. # Wilttrout, E., J.M. Goodenbour, M. Frechin & **Tao Pan***: Misacylation of tRNA with Methionine in *Saccharomyces cerevisiae*, *Nucl. Acids Res.* 40, 10494-10506 (2012).
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 94. # Subramaniam, A.R., **Tao Pan** & P. Cluzel: Environmental perturbations lift the degeneracy of the genetic code in bacteria, *Proc. Natl. Acad. Sci. USA* 110, 2419-24 (2013).
 95. # Pavon-Eternod, M., S. Gomes, M.R. Rosner* & **Tao Pan***: Overexpression of Initiator Methionine tRNA Leads to Global Reprogramming of tRNA Expression and Increased Proliferation in Human Epithelial Cells, *RNA* 19, 461-6 (2013).
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