

# Curriculum Vitae -- YI TANG

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## **PROFESSIONAL EXPERIENCES**

### **University of California, Los Angeles**

Member, California NanoSystems Institute (CNSI)	2009 to current
Member, Jonsson Comprehensive Cancer Center, Cancer Cell Biology Program	2008 to current
Associate Professor, Department of Chemical and Biomolecular Engineering	2008 to current
Assistant Professor, Department of Chemical and Biomolecular Engineering	2004 to 2008

## **EDUCATION**

<b>NIH Postdoctoral Fellow</b> , Stanford University	2002-2004
<b>Ph.D., Chemical Engineering</b> , California Institute of Technology	1997-2002
<b>B.Sc., Chemical Engineering, Material Science and Engineering</b> , Pennsylvania State University	1994-1997

## **AWARDS AND HONORS**

AICHE Allan P. Colburn Award (2009)  
Sloan Research Fellowship (2009)  
Department of Defense Breast Cancer Research Program (BCRP) Concept Award (2008)  
The Camille Dreyfus Teacher Scholar Award (2008)  
The David and Lucile Packard Foundation Fellowship (2007)  
UCLA Faculty Career Development Award (2007)  
Presidential Early Career Award in Science and Engineering (PECASE) (2006)  
National Science Foundation CAREER Award (2006)  
UCLA AIChE Student Chapter Professor of the Year Award (2005, 2006)  
American Heart Association National Scientist Development Grant Award (2005-2009)  
National Research Service Award, National Institute of Health (2002-2004)  
Whitaker Graduate Research Fellowship in Biomedical Engineering (1997-2002)  
Caltech 10K Business Plan Competition Winner (2000)  
Constantin Economou Award for Excellency in Graduate Research (1999)  
Elizabeth and Holmes Memorial Scholarship (1993-1997)  
Dow Chemical Co. Outstanding Student in Material Science and Engineering (1995)  
The 1934 Penn State Alumni Scholarship Award (1995)

## **PUBLICATIONS**(<sup>†</sup>: Corresponding Author; \*: Equal Contribution)

- Pickens, L. B., Kim, W., Wang, P., Zhou, H., Watanabe, K., Gomi, S., Tang, Y.<sup>†</sup> "Biochemical Analysis of the Biosynthetic Pathway of an Anticancer Tetracycline SF2575." *J. Am. Chem. Soc.* **2009**, *in press*.
- Gu, Z., Yan, M., Hu, B., Joo, K., Biswas, A., Lu, Y.<sup>†</sup>, Wang, P.<sup>†</sup>, Tang, Y.<sup>†</sup> "Protein Nanocapsules Weaved by an Enzymatically Degradable Polymer Network." *Nano. Lett.* **2009**, *in press*.
- Gao, X., Xie, X., Pashkov, I., Sawaya, R. M., Liadmen, J., Zhang, W., Cacho, R., Yeates, T. O.<sup>†</sup>, Tang, Y.<sup>†</sup> "Directed Evolution and Structural Characterization of a Simvastatin Synthase." *Chem. Biol.* **2009**, *in press*.
- Ma, S. A., Li, J., Choi, J. W., Zhou, H., Lee, M., Moorthie, V., Xie, X., Kealey, J. T., Da Silva, N. A., Vederas, J. C.<sup>†</sup>, Tang, Y.<sup>†</sup> "Complete Reconstitution of a Highly-Reducing Iterative Polyketide Synthase." *Science* **2009**, 326, 589-592.

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43. Yan, M., Du, J., Zhen, G., Liang, M., Hu, Y., Zhang, W., Priceman, S., Wu, L., Segura, T.<sup>†</sup>, Liu, Z.<sup>†</sup>, Tang, Y.<sup>†</sup>, Lu, Y.<sup>†</sup> "A Novel Protein Delivery Platform Based on Single Protein Nanocapsules." *Nat. Nanotech* **2009**, *in press*.
42. Wang, M., Zhou, H., Wirz, M., Tang, Y., Boddy, C. N.<sup>†</sup> "A Versatile Thioesterase from an Iterative Fungal Polyketide Synthase." *Biochemistry* **2009**, 48, 6288-6290.
41. Xie, X., Meehan, M. J. Xu, W., Dorrestein, P. C., Tang, Y.<sup>†</sup> "Acyltransferase Mediated Polyketide Release From Fungal Megasyntase." *J. Am. Chem. Soc.* **2009**, 131, 8388-8389.
40. Wang, P., Zhang, W., Zhan, J., Tang, Y.<sup>†</sup> "Identification of OxyE as an Ancillary Oxygenase During Tetracycline Biosynthesis." *ChemBioChem* **2009**, 10, 1554-1550.
39. Zhan, J., Qiao, K., Tang, Y.<sup>†</sup> "Investigation of Post-PKS Tailoring Modifications in Pradimicin Biosynthesis." *ChemBioChem* **2009**, 10, 1447-1452.
38. Ma, S. M., Pickens, L. B., Tang, Y.<sup>†</sup> "Antibiotics, Polyketides." *Encyclopedia of Industrial Biotechnology*. **2009**, *in press*.
37. Zhang, W., Tang, Y.<sup>†</sup> "In vitro Analysis of Type II Polyketides." *Methods in Enzymology Volume: Complex Enzymes in Microbial Natural Product Biosynthesis*. **2009**, 459, 367-393.
36. Pickens, L. B., Tang, Y.<sup>†</sup> "Decoding and Engineering Tetracycline Biosynthesis." *Metab. Eng.* **2009**, 11, 69-75. (Cover article)
35. Xie, X., Pashkov, I., Xue, G., Guerrero, J., Yeates, T., Tang, Y.<sup>†</sup> "Rational Improvement of Simvastatin Synthase Solubility in *Escherichia coli* Leads to Higher Whole-cell Biocatalytic Activity." *Biotechnol. Bioeng.* **2009**, 102, 20-28.
34. Zhang, W., Li, Y., Tang, Y.<sup>†</sup> "Engineered Biosynthesis of Bacterial Aromatic Polyketides in *Escherichia coli*." *Proc. Natl. Acad. Sci. USA.*, **2008**, 105, 20683-20685.
33. Zhou, H., Xie, X., Tang, Y.<sup>†</sup> "Engineering Natural Products Using Combinatorial Biosynthesis and Biocatalysis." *Curr. Opin. Biotechnol.* **2008**, 19, 590-596.
32. Zhan, J., Watanabe, K., Tang, Y.<sup>†</sup> "Synergistic Actions of Monooxygenase and Cyclases in Aromatic Polyketide Biosynthesis." *ChembioChem* **2008**, 9, 1710 – 1715.
31. Zhang, W., Watanabe, K., Cai, X., Jung, M. E., Tang, Y.<sup>†</sup>, Zhan, J. "Identifying the Minimal Enzymes Required for Anhydrotetracycline Biosynthesis." *J. Am. Chem. Soc.* **2008**, 130, 6068-6069.
30. Zhou, H., Zhan, J., Watanabe, K., Xie, X., Tang, Y.<sup>†</sup> "A Polyketide Macrolactone Synthase from the Filamentous Fungus *Gibberella zeae*." *Proc. Natl. Acad. Sci. USA*, **2008**, 105, 6249-6254.
29. Ames, B., Korman, T., Zhang, W., Smith, P., Vi, T., Tang, Y., Tsai, S-C. "Crystal Structure and Functional Analysis of Tetracenomycin ARO/CYC: Implications for Cyclization Specificity of Aromatic Polyketides." *Proc. Natl. Acad. Sci. USA* **2008**, 105, 5349-5354.
28. Ma, S. M., Zhan, J., Xie, X., Watanabe, K., Tang, Y.<sup>†</sup>, Zhang, W. "Redirecting the Cyclization Steps of Fungal Polyketide Synthase." *J. Am. Chem. Soc.* **2008**, 130, 38-39.
27. Zhang, W., Tang, Y.<sup>†</sup>, "Combinatorial Biosynthesis of Natural Products" *J. Med. Chem.* **2008**, 51, 2629-2633.
26. Ma, S. M., Zhan, J., Watanabe, K., Xie, X., Zhang, W., Wang, C. C. C., Tang, Y.<sup>†</sup> "Enzymatic Synthesis of Novel Polyketide using PKS4 from *Gibberella Fujikuroi*." *J. Am. Chem. Soc.* **2007**, 129, 10642-10643.
25. Zhang, W., Wilke, B. I., Zhan, J., Watanabe, K., Boddy, C. N., Tang, Y.<sup>†</sup> "A New Mechanism for Benzopyrone Formation in Aromatic Polyketide Biosynthesis." *J. Am. Chem. Soc.* **2007**, 129, 9304-9305.
24. Zhang, W., Watanabe, K., Wang, C. C. C., Tang, Y.<sup>†</sup> "Investigation of Unique Early Tailoring Reactions in the Oxytetracycline Biosynthetic Pathway." *J. Biol. Chem.* **2007**, 282, 25717-25725.
23. Xie, X., Wong, W. W., Tang, Y.<sup>†</sup> "Improving Simvastatin Bioconversion in *Escherichia coli* by Deletion of *bioH*." *Metab. Eng.* **2007**, 9, 379-386.
22. Ma, S. M., Tang, Y.<sup>†</sup> "Biochemical Characterization of the Minimal Polyketide Synthase Domains in the Lovastatin Nonaketide Synthase LovB." *FEBS J.* **2007**, 274, 2854-2864.

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21. Xie, X., Tang, Y.<sup>†</sup> "Efficient Synthesis of Simvastatin Using Whole-Cell Biocatalysis." *Appl. Environ. Microb.* **2007**, 73, 2054-2060.
20. Zhang, W., Watanabe, K., Wang, C. C. C., Tang, Y.<sup>†</sup> "Heterologous Biosynthesis of Amidated Polyketides with Novel Cyclization Regioselectivity from Oxytetracycline Polyketide Synthase" *J. Nat. Prod.*, **2006**, 69, 1633-1636.
19. Xie, X., Watanabe, K., Wojcicki, W. A., Wang, C. C. C., Tang, Y.<sup>†</sup> "Biosynthesis of lovastatin analogs with a broadly specific acyltransferase." *Chem. Biol.*, **2006**, 13, 1161-1169.
18. Zhang, W. J., Ames, B., Tsai, S-C., Tang, Y.<sup>†</sup>, "Engineered Biosynthesis of a Novel Amidated Polyketide Using the Malonamyl-specific Initiation Module from the Oxytetracycline Polyketide Synthase." *Appl. Environ. Microbiol.* **2006**, 72, 2573-2580.
17. Tang, Y. Lee, H.Y., Tang, Y., Kim, C-Y., Mathews, I. and Khosla, C. "Structural and Functional Studies on SCO1815: A -Ketoacyl-Acyl Carrier Protein Reductase from *Streptomyces coelicolor* A3(2)." *Biochemistry*, **2006**, 45, 14085-14093.
16. Lee, T. S.\*, Khosla, C., Tang, Y.\* "Orthogonal Protein Interactions in Spore Pigment Producing and Antibiotic Producing Type II Polyketide Synthases." *J. Antibiotics*, **2005**, 10, 663-666.
15. Lee, T. S.\*, Khosla, C., Tang, Y.\* "Engineered Biosynthesis of Aklanonic Acid Analogs." *J. Am. Chem. Soc.*, **2005**, 127, 12254-12262.
14. Khosla, C., Tang, Y., "Chemistry. A new route to designer antibiotics." *Science* **2005**, 308, 367-368.
13. Tang, Y., Koppisch, A., Khosla, C. "The Acyltransferase Homolog Found in Initiation Modules of Type II PKS is an Acetyl-ACP Thiolase that Suppresses Acetate-Priming of the KS-CLF." *Biochemistry* **2004**, 43, 9546-9555.
12. Tang, Y., Lee, T. S., Lee, H. Y., Khosla, C. "Exploring the Biosynthetic Potential of Bimodular Aromatic Polyketide Synthases." *Tetrahedron*, **2004**, 7659-7671.
11. Kumar, P.\*, Khosla, C., Tang, Y.\* "Manipulation and Analysis of Polyketide Synthases." *Methods in Enzymology Volume 388: Protein Engineering* **2004**, 269-293.
10. Tang, Y., Lee, T. S., Khosla, C. "Engineered Biosynthesis of Regioselectively Modified Aromatic Polyketides Using Bimodular Polyketide Synthases." *PLoS Biol.* **2004**, 2, 227-237.
9. Tang, Y., Tsai, S. C., Khosla, C. "Polyketide Chain Length Control by Chain Length Factor." *J. Am. Chem. Soc.* **2003**, 125, 12708-12709.
8. Tang, Y., Lee, T. S., Kobayashi, S., Khosla, C. "Ketosynthases in the Initiation and Elongation Modules of Aromatic Polyketide Synthases Have Orthogonal Acyl-Carrier Protein Specificity." *Biochemistry* **2003**, 42, 6588-6595.
7. Tang, Y., Wang, P., Van Deventer, J. A., Link, A. J. "Introduction of an Aliphatic Ketone into Recombinant Proteins in a Bacterial Strain that Overexpresses an Editing-Impaired Leucyl-tRNA Synthetase." *ChembioChem* **2009**, in press.
6. Cirino, P.C , Tang, Y., Takahashi, K., Tirrell, D. A., Arnold, F. H. "Global Incorporation of Norleucine in Place of Methionine in Cytochrome P450 BM-3 Heme Domain Increases Peroxygenase Activity." *Biotechnol Bioeng.* **2003**, 20, 729-734.
5. Wang, P., Tang, Y., Tirrell, D. A., "Incorporation of Trifluoroisoleucine into Proteins In Vivo." *J. Am. Chem. Soc.* **2003**, 125, 6900-6906.
4. Tang, Y., Tirrell, D. A. "Attenuation of Leucyl-tRNA Synthetase Proofreading Activity in Escherichia coli Allows Introduction of An Array of Unnatural Amino Acids in vivo." *Biochemistry* **2002**, 41, 10635-10645.
3. Tang, Y., Tirrell, D. A. "Biosynthesis of Highly Stable Coiled-coils Containing Hexafluoroisoleucine Using an Engineered Bacterial Host." *J. Am. Chem. Soc.* **2001**, 123, 11089-11090.
2. Tang, Y., Ghirlanda, G., Petka, W. A., Nakajima, T., W. A., DeGrado, W. F., Tirrell, D. A. "Fluorinated Coiled-coils Prepared in vivo Display Enhanced Thermal and Chemical Stability." *Angew. Chem. Int. Ed.* **2001**, 40, 1494-1497.
1. Tang, Y., Ghirlanda, G., Vaidehi, N., Kua, J., Mainz, D. T., Goddard, W. A., DeGrado, W. F., Tirrell, D. A. "Stabilization of Leucine Zipper Coiled-coils using Trifluoroisoleucine." *Biochemistry* **2001**, 40, 2790-2796.

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## **BOOK CHAPTERS**

4. Zhang, W., Ferreira, J. P., Tang, Y. "Regulation of Secondary Metabolism Biosynthesis." In: Smolke, C.D., ed. *Handbook for Metabolic Pathway Engineering*. CRC Press. **2009**.
3. Tang, Y.; Ma, S.M; Wojcicki, W. A. "Applications of Metabolic Engineering for Natural Drug Discovery." In: Smolke, C.D., ed. *Handbook for Metabolic Pathway Engineering*. CRC Press. **2009**.
2. Zhang, W., Tang, Y., "Engineering Starter Units in Aromatic Polyketides." In ACS Volume Based on *Polyketides: Biosynthesis, Biological Activity and Genetic Engineering*. eds S. R. Baerson; American Chemical Society, **2006**.
1. Tang, Y., Khosla, C., "Diversity from Mother Nature: natural and unnatural products." In *Exploiting Chemical Diversity for Drug Discovery*, eds P. Bartlett and M. Entzeroth; Royal Society of Chemistry, **2006**.

## **PATENT APPLICATIONS**

5. Zhen, G., Tang, Y. "Protease Assisted Native-Protein Delivery Approach (PANDA)" Provisional Patent Application, UCLA Case: 2009-531.
4. Zhou, H., Tang, Y. "Enzymatic Synthesis of Resorcylic Acid Lactone Compounds" Provisional Patent Application, UCLA Case: 2008-613.
3. Xie, X., Tang, Y. "A One Step Fermentation Process to Produce Simvastatin" PCT Int. Appl. WO2007/139871, **2007**
2. Tang, Y., Khosla, C. "Production of aromatic polyketides using recombinant polyketide synthases and recombinant acyl carrier protein priming module." PCT Int. Appl. WO2006/045063, **2006**.
1. Tirrell, D. A., Tang, Y. "Methods for Stabilization of Proteins Using Non-Natural Amino Acids." United States Patent 7,449,443, Issued: 11/11/2008.

## **INVITED TALKS**

28. *Department of Chemical Engineering and Material Science*, University of Southern California, Los Angeles, November, **2009**
27. *Department of Chemical Engineering and Material Science*, University of Minnesota, Minneapolis, October, **2009**
26. *Department of Chemical Engineering*, Massachusetts Institute of Technology, Boston, October **2009**
25. 15th International Symposium on The Biology of Actinomycetes, Shanghai, Aug, **2009** (Plenary)
24. *Society of Industrial Microbiology Annual Meeting*, Toronto, Aug, **2009**
23. *Department of Chemical Engineering*, University of Houston, Houston, April **2009**
22. *Shanghai Institute of Organic Chemistry*, Shanghai, China, March **2009**.
21. *Shanghai Jiaotong University*, Shanghai, China, March **2009**.
20. *Chemistry Department*, University of California, Los Angeles, Jan, **2009**.
19. 3<sup>RD</sup> Nagoya University-UCLA International Symposium, Nagoya, Japan, Dec. **2008**
18. RIKEN Conference on Chemical Biology, Tokyo, Japan, Nov **2008**
17. *College of Pharmacy*, University of Kentucky, Lexington, KY, Oct **2008**
16. *Society of Industrial Microbiology Annual Meeting*, San Diego, Aug, **2008**
15. 7<sup>th</sup> *US-Japan Natural Product Conference*, University of California, San Diego, June **2008**
14. *School of Chemical Engineering*, Purdue University, Mar **2008**
13. *Department of Chemical Engineering*, University of California, Irvine, Jan **2008**
12. *Department of Chemical Engineering*, California Institute of Technology, Dec **2007**
11. *Biomedical Engineering Society Annual Meeting*, Los Angeles, CA, Aug **2007**
10. *Iterative Polyketide Conference*, University of Alberta, July, **2007**
9. *School of Chemical Engineering*, Tianjin University, Tianjin, China, Jan, **2007**.
8. *Chemistry Department*, University of California, Los Angeles, Dec, **2006**.
7. *NSF workshop on the "Fundamentals of Transport, Pollution and Energy Processes"*, University of New Hampshire, Durham NH, Aug, **2006**.

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6. *Shanghai Jiaotong University*, Shanghai, China, Jun **2006**.
5. *Tongji University*, Shanghai, China, Jun, **2006**.
4. *New York Academy of Sciences Chemical Biology Discussion Group*, New York, Nov **2005**.
3. *Polyketide-NRPS Annual Meeting*, Santa Cruz, CA, **2005**.
2. *ACS 2005 Spring National Meeting*, San Diego, CA **2005**.
1. *Department of Material Science*, Nagoya Institute of Technology, Nagoya, Japan, **2000**.

### **REVIEWER**

Journal of the American Chemical Society, Proceedings of the National Academy of Sciences, Chemistry and Biology, FEBS Journal, Metabolic Engineering, Bioinformatics, Biotechnology Progress, Bioorganic and Medicinal Chemistry, Molecular Pharmaceutics, ChemBioChem, Biochemical Engineering Journal, Journal of Antibiotics, ACS Chemical Biology, Accounts of Chemical Research, Organic Letters, Biochemistry, Phytochemistry

NSF: SBIR, CAREER and CBET panels, MCB

NIH: Synthetic and Biological Chemistry B (SBCB) *ad hoc* member, Oct 2007, June 2009