

## Peng Xu, Ph.D.

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Chemical Engineering, 56-422, Massachusetts Institute of Technology, Cambridge, MA 02139

### EDUCATION

- 2013 PhD in Chemical Engineering, Rensselaer Polytechnic Institute, Troy, USA
- 2006 MS in Biochemical Engineering, Jiangnan University, Wuxi, China
- 2003 BS in Biotechnology, Jiangnan University, Wuxi, China

### RESEARCH PROJECTS

#### Postdoctoral research project (Advisor: Prof. Gregory N. Stephanopoulos)

- Engineering *Yarrowia lipolytica* biorefinery platform for production of commodity chemicals and fuels;
- Integrating regulatory control and metabolic circuit for metabolic pathway optimization;
- Inferring genetic intervention targets based on structural kinetic modeling of metabolic network;

#### PhD research project (Advisor: Prof. Mattheos A.G. Koffas)

- Modular optimization of multi-gene pathway for improving fatty acids production in *E. coli*;
- Engineering malonyl-CoA responsive toggle switch for dynamic tuning of metabolic flux in *E. coli*;
- Engineer versatile gene assembly platform ePathBricks for rapid design and construction of metabolic pathways in *E. coli*;
- Identification of genetic modifications to improve cellular malonyl-CoA availability using a constraint-based flux balance model in *E. coli*;

#### Master research project (Advisor: Prof. Ke-Chang Zhang)

- Kinetic modeling and optimization of terpenoids production using filamentous fungi *Ganoderma lucidum* in shake-flasks and bioreactors.

### TEACHING AND MENTORSHIP

#### Postdoc Fellow in Chemical Engineering, Massachusetts Institute of Technology 06/2013-Present

- Supervise and coordinate safety and purchasing for a lab with 30 members.
- Conduct lab specific hygiene/safety training for lab members.

#### Research Assistant in Chemical & Biological Engineering, Rensselaer Polytechnic Institute 1/2011-05/2013

- Mentor multiple undergraduate and junior PhD students.

#### Teaching Assistant in Chemical & Biological Engineering, University at Buffalo 01/2009-08/2010

- Assist teaching undergraduate courses: biochemical engineering and metabolic engineering.

#### Lecturer in Department of Biological Engineering, Dalian Polytechnic University 07/2006-08/2008

- Teaching undergraduate courses: biochemical kinetics and bioreaction engineering, enzyme engineering, brewing chemistry and fermentation technology.
- Supervising multiple undergraduates and master students conducting research in metabolic engineering, bioprocess engineering and enzyme chemistry.

## PUBLICATIONS

Please refer to [Google Scholar](#) for [full list of publications and citations](#) (Total citation: 270; H-index: 10)

1. **Xu P**, Li L, Zhang F, Linhardt RJ, Stephanopoulos GN and Koffas MA. (2013) Engineering malonyl-CoA responsive toggle switch for dynamic tuning of metabolic flux in *E. coli*. In preparation.
2. **Xu P**, Wang W, Li L, Zhang F, Bhan N and Koffas MA. (2013) Design and kinetic analysis of a hybrid promoter-regulator system for malonyl-CoA sensing in *E. coli*. *ACS Chemical Biology*, Accepted. [\[link\]](#)
3. Lim GC, Wong L, Dvora H, **Xu P**, Venkiteswaran S and Koffas MA. (2013) Engineering of recombinant *Escherichia coli* for high-yield anthocyanin biosynthesis. Submitted to *Metabolic Engineering*.
4. Wang W, Englaender J, **Xu P**, Linhardt RJ, Koffas MA. (2013) Expression of low endotoxin 3-O-sulfotransferase in *B. subtilis* and *B. megaterium*. *Applied Biochemistry and Biotechnology*, Accepted. [\[link\]](#)
5. Bhan N, **Xu P** and Koffas MA. (2013) Pathway and protein engineering approaches to produce novel and commodity small molecules. *Current Opinion in Biotechnology*, Accepted. [\[link\]](#)
6. **Xu P**, Gu Q; Wang W, Wong L, Bower A, Collins CH and Koffas MA. (2013) Modular optimization of multi-gene pathway for fatty acids production in *E. coli*. *Nature Communications*, 4: 1409. [\[link\]](#)
7. **Xu P**, Vansiri A, Bhan N and Koffas MA. (2012) ePathBrick: A synthetic biology platform for engineering metabolic pathways in *E. coli*. *ACS Synthetic Biology*, 1 (7):256–266. [\[link\]](#)
8. **Xu P**, Bhan N and Koffas MA. (2013) Engineering plant metabolism into microbes: from systems biology to synthetic biology. *Current Opinion in Biotechnology*. 24(2): 291-299. [\[link\]](#)
9. Bhan N, **Xu P**, Khalidi O and Koffas MA. (2013) Redirecting carbon flux into Malonyl-CoA to improve Resveratrol titers: Proof of concept for genetic interventions predicted by OptForce computational framework. *Chemical Engineering Science*, 103: 109-114. [\[link\]](#)
10. **Xu P** and Koffas MA. (2013) Assembly of multi-gene pathways and combinatorial pathway libraries through ePathBrick vectors. *Methods in Molecular Biology: Synthetic Biology*. [\[link\]](#)
11. **Xu P**, Ranganathan S, Fowler Z, Maranas CD and Koffas MA. (2011) Genome-scale metabolic network modeling results in minimal interventions that cooperatively force carbon flux towards malonyl-CoA. *Metabolic Engineering*, 13(5): 578-587. [\[link\]](#)
12. **Xu P**, Ranganathan S, Maranas CD and Koffas MA. (2011) An integrated computational and experimental study to increase the intra-cellular malonyl-CoA: Application to flavanone synthesis. *Bioengineering Conference (NEBEC)*, 2011 IEEE 37th Annual Northeast, 1-2. [\[link\]](#)
13. Zhang L, Ding Z, **Xu P** et al. (2011) Methyl lucidenate F isolated from the ethanol-soluble-acidic components of *Ganoderma lucidum* is a novel tyrosinase inhibitor. *Biotechnology and Bioprocess Engineering*, 16(3): 457-461. [\[link\]](#)
14. **Xu P** and Koffas MA. (2010) Metabolic engineering of *Escherichia coli* for biofuel production, *Biofuels*, 1(3): 493-504. [\[link\]](#)
15. **Xu P**, Ding Z, Qian Z, Zhang K and Zhao C. (2008) Improved production of mycelial biomass and ganoderic acid by submerged culture of *Ganoderma lucidum* SB97 using complex media. *Enzyme and Microbial Technology*, 42(4): 325-331. [\[link\]](#)

## SELECTED PRESENTATIONS

1. **Xu P** and Koffas MA. Engineering a synthetic malonyl-CoA controller for dynamic tuning metabolic flux in *E. coli*. 2013 AIChE annual meeting, San Francisco, CA (talk)
2. **Xu P**. Engineering tailor-made microbial cell factories for phytochemical and fuels production. Invited by School of Engineering, Case Western Reserve University, Cleveland, OH. September 10, 2013 (talk)
3. **Xu P** and Koffas MA. Expanding the synthetic biology toolbox for engineering metabolic pathways in *E. Coli*. 2012 AIChE annual meeting, Pittsburgh, PA (talk)
4. **Xu P** and Koffas MA. ePathBrick directed modular pathway engineering for improved fatty acids production in *E. Coli*. 2012 AIChE annual meeting, Pittsburgh, PA (talk)
5. **Xu P**, Ranganathan S, Maranas CD and Koffas MA. Genome-scale metabolic network modeling results in minimal interventions that cooperatively force carbon flux towards malonyl-CoA. 2011 AIChE annual meeting, Minneapolis, MN (talk)
6. **Xu P** and Koffas MA. Engineering synthetic malonyl-CoA sensor for dynamic tuning of metabolic flux in *E. coli*. The 1<sup>st</sup> Electrofuels Conference (2011), Society of Biological Engineering, Providence, RI (poster)
7. **Xu P**, Ranganathan S, Koffas MA and Maranas CD. An integrated computational and experimental study to increase the production rate of flavanones in *E. Coli*. 2010 AIChE annual meeting, Salt Lake City, UT (talk)

## RESEARCH SKILLS

### ➤ **Molecular biology & biochemical genetics**

Gene cloning, SLIC (sequence and ligation independent cloning), Gibson assembly, In-fusion PCR, Biobrick standard assembly, Yeast homologous recombination, *E. coli* and yeast chromosomal gene inactivation, *E. coli* chromosomal gene integration, promoter activity analysis, SDS-PAGE, Western blot, *in vitro* gene transcription/translation, quantitative RT-PCR, protein and nucleic acid electrophoresis

### ➤ **Cell Culture & Bioprocess optimization**

Fed-batch bioreactor/fermenter optimization, media design, pH/dissolved oxygen control, metabolites analysis (TLC, LC-MS, GC), statistics-based DOE (design of experiment) including orthogonal design, response surface design and simplex algorithm, kinetics-based biochemical process simulation and optimization, flux balance analysis

### ➤ **Analytical skills**

GC, HPLC, GC-MS, LC-MS, enzyme kinetics, ELISA, protein purification, TLC (thin layer chromatography), gel-exclusion chromatography, ion-exchange chromatography, Flash chromatography, electrochemical assays

## AWARDS AND HONORS

Chinese Government Scholarship for Outstanding Self-financed Students Studying Abroad* (*High distinction for top 0.3% Chinese PhD student studying in US)	2012
Travel grant for 1 <sup>st</sup> Electrofuels Conference (Providence, RI), Society of Biological engineering	2011
Danisco-Dupont Scholarship for Excellent Students in Biotechnology	2006

## ADDITIONAL

**Professional memberships:** American Institute of Chemical Engineers (AIChE); American Chemical Society (ACS), Society of Biological Engineering (SBE), International Metabolic Engineering Society (IMES)

**Software:** Origin 8.5, Matlab, Maple, Sigma plot, ChemDraw, Minitab, Vector NTI, BLAST, Pymol, Endnote X

**Languages:** Mandarin Chinese, English

## REFERENCES

***Prof. Mattheos A.G. Koffas (Advisor)***

Department of Chemical & Biological Engineering  
Rensselaer Polytechnic Institute, Troy, NY 12180  
Email: koffam@rpi.edu, Phone: 518-276-2220

***Prof. Robert J. Linhardt (PhD Committee)***

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***Prof. Costas D. Maranas (Collaborator)***

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***Prof. Stelios T. Andreadis (Collaborator)***

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