

# Cooperating Faculty Member (CFM) outside CNAS

DEPARTMENT OF BOTANY & PLANT SCIENCES (requesting department)

## Cooperating Faculty Appointment/Reappointment

Instructions: Please complete the following.

1. Attach a current CV of potential CFM.
2. Statement of Anticipated or Past Involvement in the department referenced above.

Please provide or attach a statement that describes your anticipated or past involvement as a CFM in the department referenced above.

3. My signature below (or attached emailed approval) indicates my willingness to accept an appointment as a CFM in the department referenced above.

Printed Name: Yanran Li

Signature:



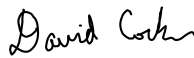
Date:

4. Approval by Cooperating Faculty Member's Home Department Chair

As Chair of the Department of Chemical & Environmental Engineering, my signature below (or attached emailed approval) indicates my approval of Yanran Li participating as a CFM in the department referenced above.

Printed Name: David Cocker

Signature:



Date: 3/16/2022

**HOST DEPARTMENT VOTE:** FOR, AGAINST, UNAVAILABLE

**DATES OF APPOINTMENT:** 04/01/2022 TO 03/31/2024

5. Approval by CFM's Host Department Chair

As Chair of the Department referenced above, my signature below (or attached emailed approval) indicates my approval of Yanran Li participating in the department referenced above.

Printed Name: Patricia Springer

Signature:

Date:

### CNAS DEAN'S APPROVAL:

Date:

### BCOE DEAN'S APPROVAL:

Printed Name:

Signature:

Date:

Appointments/reappointments are for 2 years for Asst. and Assoc. Professors, and 3 years for full Professors

- To add electronic signatures, unprotect the document.
- Once approved, please send a copy of the host department's appointment letter to the appropriate analyst in the CNAS Dean's office, to the other College's analyst and to Amanda Wong in the Graduate Division.

## **Anticipated Involvement with BPSC**

I work in the field of synthetic biology and natural products. More specifically, I am interested in how nature synthesizes complex functional molecules of structural complexity and diversity; understanding the function of these molecules in nature and investigating their significance to pharmaceutical and agricultural industry; utilizing and engineering natural synthetic capability to achieve microbial bioproduction of costly natural products and valuable unnatural natural products, to which are normally of very limiting or no access.

Plant is one of the major sources of natural products, and plant natural products span a large and diverse class of compounds with critical ecological functions and important therapeutic niches. The medicinal utilization of plant natural products by the human society starts as early as new stone age, when people use opium poppy as ancient pain killer. However, to date, the investigation, discovery and utilization of plant functional molecules are not as comprehensive, compared with those of microbial natural products. This is mainly due to three major challenges: 1) biosynthetic enzymes responsible for the synthesis of plant functional molecules are normally scattered on the plant genome (in contrast, in microbes, they are normally clustered on the genome); 2) difficult biochemical characterization in plants; 3) extremely low abundance of most plant bioactive molecules. The recent developments in DNA technology, next-generation sequencing, and synthetic biology technology enable us to utilize synthetic biology in yeast to help solve these challenges.

I propose to incorporate my background and expertise in natural products and synthetic biology to advance our understanding and utilization of plant functional molecules in pharmaceutical and agricultural industry. My efforts are mainly in three specific fields:

- 1) Incorporate synthetic biology tools in yeast with conventional plant biochemical characterization to understand the biosynthesis of certain plant functional molecules, such as the plant hormone, brassinosteroids (BRs) and strigolactones (SLs).
- 2) Utilize synthetic biology in yeast to achieve efficient microbial production of certain plant functional molecules, especially those that are of no or limiting access currently, to advance the investigation the natural functions and potential utilization of these molecules by plant biologists.
- 3) Engineer the yeast bioproduction platform to synthesize libraries of derivatives of plant functional molecules to advance the utilization of related molecules in pharmaceutical and agricultural industry.
- 4) Engineering plant immune receptors in yeast and implement them back to plant to discover novel secondary metabolites in plant.

## **Past Involvement with BPSC**

I've been mentoring graduate students from the plant biology graduate program, and serve as committee member in the PhD candidacy exam. Several ongoing project in my laboratory are in close collaboration with BPSC faculty members.

**YANRAN LI**

Department of Chemical and Environmental Engineering,  
 University of California, Riverside  
 900 University Avenue, Bourns Hall, A217, Riverside, CA 92521  
 Phone: (951) 824-1480  
 Email: [liyanran@engr.ucr.edu](mailto:liyanran@engr.ucr.edu)  
 Website: <https://liyanranlab.weebly.com/>

**PROFESSIONAL POSITION****University of California, Riverside**

Assistant Professor, Department of Chemical & Environmental Engineering	2016-present
Assistant Professor, Institute for Integrative Genome Biology	2016-present
Cooperating Faculty, Department of Botany & Plant Sciences	2016-present
Cooperating Faculty, Department of Biochemistry	2017-present

**PROFESSIONAL PREPARATION**

<b>B.S., Chemistry</b> , Nankai University	2003-2007
<b>B.E., Chemical Engineering</b> , Tianjin University	2003-2007
<b>Ph.D, Chemical Engineering</b> , UCLA (Advisor: Yi Tang)	2008-2012
<b>Postdoc, Chemistry and Chemical Engineering</b> , Caltech (Advisor: Rustem Ismagilov)	2012-2013
<b>Postdoc, Bioengineering</b> , Stanford University (Advisor: Christina D. Smolke)	2013-2016

**PUBLICATION**

(† indicates equal contribution and \* indicates corresponding author)

- Xu, S.†, Wu, S.†, Li, Y.\*, "Investigating Plant Biosynthetic Pathways Using Heterologous Gene Expression: Yeast as a Heterologous Host", *Methods Enzymol.*, in press.
- Wu, S., Li, Y.\*, A unique sulfotransferase-involving strigolactone biosynthetic route in Sorghum, *Front Plant Sci*, **2021**, doi: 10.3389/fpls.2021.793459.
- Wu, S.†, Ma, X.†, Zhou, A., Valenzuela, A., Zhou, K.\*, Li, Y.\*, "Establishment of Strigolactone-Producing Bacteria-Yeast Consortium for Functional Mapping of Downstream Biosynthetic Enzymes", *Sci. Adv.*, **2021**, doi: 10.1126/sciadv.abh4048.
- Chiu, T., Behari, A., Chartron, J., Putman, A., Li, Y.\*, "Engineering of Polygalacturonase-Inhibiting Protein as an Ecological, Friendly, and Non-toxic Pest Control Agent", *Biotechnol. Bioeng.*, **2021**, doi:10.22541/au.161392445.58588668/v1.
- Zhou, A., Zhou, K\*, Li, Y.\*, "Functional Reconstitution of Plant Cytochrome P450s in Microbial Systems", *Curr. Opin. Plant Biol.*, **2021**, 60, 102005.
- Xu, P., Dai, Q., Gao, H., Liu, H., Zhang, M., Chen Y., An, K., Meng, Y. S., Liu, P. Li, Y., Spangenberg, J.S., Gaines, L., Lu, J., Chen, Z.\*, "Efficient Direct Recycling of Lithium-Ion Battery Cathodes by Targeted Healing", *Joule*, **2020**, 2609-2626.
- Chen, C., Xu, S., Li, Y.\*, "Explore the Potential of a Plant Phospholipase as an Antimicrobial", *BioRxiv*, **2020**. doi: 10.1101/2020.10.17.343541. (CC is a high school student working in Li Laboratory and this is his science fair project.)
- Xu, S., Chen, C., Li, Y.\*, "Engineering of Phytosterol-Producing Yeast Platforms for Functional Reconstitution of Downstream Biosynthetic Pathways", *ACS Syn. Biol.* **2020**, 9(11), 3157-3170.

- Xu, S., Li, Y.\*, "Yeast as a promising heterologous host for steroid bioproduction", *J. Ind. Microbiol. Biot.* **2020**, Jul 13: 1–15.
- Worland, A. M., Czajka, J. J., Li, Y., Wang, Y., Tang, Y. J., Su W. W.\*, "Biosynthesis of terpene compounds using the non-model yeast *Yarrowia lipolytica*: grand challenges and a few perspectives", *Curr. Opin. Biotech.* **2020**, 64, 134-140.
- Kotopka, B.†, Li, Y.†, Smolke, C.D.\*, "Synthetic Biology Strategies for Heterologous Phytochemical Production", *Nat. Prod. Rep.* **2018**, 35, 902-920.
- Li, Y.†, Li, S.†, Thodey, K., Trenchard, I., Cravens A., Smolke, C.D.\*, "Complete Biosynthesis of Noscapine and Halogenated Alkaloids in Yeast", *Proc. Natl. Acad. Sci. U. S. A.* **2018**, 115, E3922–E3931.
- Li, S.†, Li, Y.†, Smolke, C.D. \*, Strategies for microbial synthesis of high-value phytochemicals, *Nat. Chem.* **2018**, 10, 395-404.
- Li, Y., Smolke, C.D.\*, "Engineering and Elucidating Biosynthesis of the Anticancer Alkaloid Noscapine in Yeast", *Nat. Commun.* **2016**, 7, 12137.
- Chooi, Y.H., Wang, P., Fang, J. Li, Y., Wu, K., Wang, P., Tang, Y. \*, "Discovery and Characterization of a Group of Fungal Polycyclic Polyketide Prenyltransferases", *J. Am. Chem. Soc.* **2012**, 134, 9428-9437.
- Liu, Q., Yao, F., Kang, Q., Chooi, Y.-H., Xu, W., Li, Y., Shi, Y., Deng, Z., Tang, Y.\*, You, D.\*, "Elucidation of Piericidin A1 Biosynthetic Locus Revealed a Thioesterase-dependent Mechanism of  $\alpha$ -Pyridone Ring Formation", *Chem. Bio.* **2012**, 19, 243-253.
- Li, Y., Chooi, Y.-H., Sheng, Y., Valentine, J. S., Tang, Y. \*, "Comparative Characterization of Fungal Anthracenone and Naphthacenedione Biosynthetic Pathways Reveals an  $\alpha$ -Hydroxylation-Dependent Claisen-Like Cyclization Catalyzed by a Dimanganese Thioesterase.", *J. Am. Chem. Soc.* **2011**, 133, 15773-15785.
- Li, Y., Xu, W., Tang, Y. \*, "Classification, Prediction and Verification of the Regioselectivity of Fungal Polyketide Synthase Product Template Domains." *J. Biol. Chem.* **2010**, 285, 22762-22771. (*Highlighted by Nat. Chem. Biol.*)
- Zhou, H.†, Li, Y.†, Tang, Y. \*, "Cyclization of Aromatic Polyketides from Bacteria and Fungi." *Nat. Prod. Rep.* **2010**, 27, 839-868.
- Zhang, W., Li, Y., Tang, Y. \*, "Engineered Biosynthesis of Bacterial Aromatic Polyketides in *Escherichia coli*." *Proc. Natl. Acad. Sci. U. S. A.* **2008**, 105, 20683-20685.

## PATENTS

- Yanran Li**, Sheng Wu, "Strigolactone-Producing Microbes and Methods of Making and Using the Same", U.S. Provisional Application No. 63/142,801, filed 2021.1.28.
- Christina D. Smolke, Staphanie Galanie, Isis J. Trenchard, Kate Thodey, **Yanran Li**, "Methods of Producing Epimerases and Benzylisoquinoline Alkaloids", U.S. Patent Application No. 62/174,475, filed 2015.06.11.
- Christina D. Smolke, **Yanran Li**, "Noscapinoid-producing Microbes and Methods of Making and Using the Same", U.S. Patent Application No. 62/080,610 and 62/107,238, filed 2014.11.17.

## ONGOING PROJECTS

- Investigation on strigolactone biosynthesis and evolution using microbial consortia. (January 2021-present, 1 Postdoc, 2 manuscripts in preparation)
- Establishment and engineering of yeast-based strigolactone bioproduction. (May 2018 -present, 1 PhD)
- Investigation and engineering of brassinosteroid, relating metabolism, and signaling using engineered phytosterol-producing yeast. (April 2020-present, 1 PhD, 1 Postdoc, 1 manuscript in preparation)
- Reprogramming plant perception for novel plant NP discovery. (September 2020-present, 1 PhD, 1 Postdoc)

## HONORS

1. NIH New Innovator's Award, 2020
2. LG Chem Global Innovation Contest Winner, 2019.
3. Delfino AgTech Research Initiative Award, 2017.
4. UC Riverside Academic Senate Omnibus Travel Award, 2017, 2020.
5. Chinese Government Award for Outstanding Self-Financed Students Abroad, 2010-2011.
6. Outstanding Student Scholarship, Nankai University, 2003-2004.

## PROFESSIONAL ACTIVITIES

- **Invited Talks:** 2014 Stanford-NIBR Symposium; 2015, 2017, 2019 SIMB; 2016 Tulane U seminar; 2016 Columbia U seminar; 2016 UMass Amherst seminar; 2016, 2017 UCR seminar; 2016 JHU seminar; 2016 Auburn U seminar; 2017 UCR CEPCEB Symposium; 2018 ACS BIOT; 2018 BUCT BBG Symposium; 2018 TJU seminar; 2019 AIChE; 2019 UCSD Plant SynBio Symposium; 2019 Plant 3D Symposium; 2019 SJTU seminar; 2020 HKUST seminar.
- **Conference Organizing:** Session chair of “*Engineering Natural Products Biosynthesis*” in the 2017 ACS BIOT Symposium on Upstream Processes, “*Next Generation Synthetic & Systems Biology Tools*” in the 2020 ACS BIOT Symposium on Upstream Processes, “*A new home for secondary metabolites: in microbes*” in the 2021 Metabolic Engineering Conference. Theme leader of 15C in the 2020 AIChE Annual Meeting.
- **Grants Reviewer:** Panel reviewer for National Science Foundation (NSF), USA. External reviewer for Innovation and Technology Support Programme (ITSP) and Research Grants Council (RGC), Hong Kong, China.
- **Editorial Boards:** *Synthetic and Systems Biotechnology*, *Scientific Reports*, *Frontiers in Plant Science*, *Biotechnology Notes*.
- **Journal Reviewer:** *Science*, *Nature Communications*, *Proceedings of the National Academy of Sciences of the United States of America*, *Metabolic Engineering*, *ACS Synthetic Biology*, *Microbial Cell Factories*, *Scientific Reports*, *Journal of Industrial Microbiology & Biotechnology*, *Biochemical Engineering Journal*, *Letters in Applied Microbiology*, *Engineering*, *Journal of Biological Engineering*.