WEITAO WANG

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ACADEMIC POSITIONS

Post-doctoral researcher — *Oct. 2023 - Present*
Department of Mechanical Engineering, Carnegie Mellon University — *Advisor: Rebecca E. Taylor*

EDUCATION

Carnegie Mellon University — *Aug. 2019 - Spet. 2023*
– *Ph.D., Mechanical Engineering* — *Advisor: Rebecca E. Taylor, Xi Ren*
- Thesis: Cell membrane engineering with structural DNA nanotechnology
- Committee: Rebecca E. Taylor, Xi Ren, Markus Deserno, Philip LeDuc

University of Notre Dame — *Jan. 2018 - May. 2019*
– *M.S., Mechanical Engineering* — *Advisor: Zhangli Peng*
- Thesis: Coarse-grained molecular simulations of erythrocyte membrane skeleton

Shanghai Jiao Tong University — *Sept. 2013 - Jun. 2017*
– *B.S., Mechanical Engineering*

HONORS AND AWARDS

Philip and Marsha Dowd Fellowship (2022) — Carnegie Mellon University
Mechanical Engineering Collaborative Fellowship (2019, 2020) — Carnegie Mellon University
Department Fellowship (2018) — University of Notre Dame
Honor Degree, Bachelor (2017) — Shanghai Jiao Tong University
National Scholarship (2014, 2015) — Shanghai Jiao Tong University

PUBLICATIONS

1. **Wang, W.**, Ren, X., & Taylor, R. E.* Selective formation of a molecular barrier at impaired glycocalyx using DNA origami. (*In preparation*)
   - *We show that DNA origami can be programmed to target endothelium where the glycocalyx is injured, thereby restoring a physical barrier capable of modulating molecule permeability and subsequent cellular uptake through steric hindrance and electrostatic interactions.*
2. **Wang, W.**, Taylor, R. E.* Observation of DNA origami-cell membrane interactions using scanning ion conductance microscopy. (*In preparation*)
   - *We utilize scanning ion conductance microscopy to visualize the surface topology of DNA origami-attached cell membranes. We find that the DNA origami-induced endocytic pits appear to exhibit cooperative behavior.*
3. **Wang, W.**, Ren, X., & Taylor, R. E.* DNA origami assembly on cell surface induces membrane heterogeneity and phase separation. (*In preparation*)
   - *We show that higher order DNA origami assemblies trigger membrane phase separation and cytoskeleton reorganization, resulting in significant heterogeneity in membrane biophysical properties. It indicates the transmembrane coupling of cell membrane-attached DNA nanostructures and the cytoskeleton.*

4. **Wang, W.**, Chopra, B., Walawalkar V., Liang, Z., Adams, R., Deserno, M., Ren, X., & Taylor, R. E.* (2024) Cell-surface Binding of DNA Nanostructures for Enhanced Intracellular and Intranuclear Delivery. (*preprint on bioRxiv, accepted by* ***ACS Appl. Matter. Interfaces***) [Link]

    - *This work demonstrates a strategy to rapidly and significantly enhance the intracellular and intranuclear delivery of DNA nanostructures within a 0.5 hour timeframe, by attaching them to lipid membranes via cholesterol tags or to cell-surface glycocalyx via click chemistry.*

5. **Wang, W.**, Haynes, P., Ren, X.*, & Taylor, R. E.* (2023) Synthetic cell armor made of DNA origami. ***Nano Letters*** 23, 15, 7076–7085 [Link] [Nature Research Highlights]

    - *This work demonstrates a modular approach to build temporal nanoshells by assembling DNA nanorods on living cell membranes. The nanoshell serves as protective cellular armor to rescue cell viability against challenging environment and modulate membrane biophysics.*

6. Xing, Y., Yerneni, S. S., **Wang, W.**, Taylor, R. E.* & Ren, X.* (2022). Engineering pro-angiogenic biomaterials via chemoselective extracellular vesicle immobilization. ***Biomaterials*** 281:121357. [Link]

7. Wijesekara, P., Liu, Y., **Wang, W.**, Johnston, E. K., Sullivan, M. L., Taylor, R. E.*, & Ren, X.* (2021). Accessing and Assessing the Cell-Surface Glycocalyx Using DNA Origami. ***Nano Letters*** 21, 11, 4765–4773. [Link]

    - *This work shows that the glycocalyx presents steric hindrance that prevents DNA origami from accessing cell membranes, providing an effective functional measure of the glycocalyx integrity.*

8. Liu, Y., Wijesekara, P., Kumar, S., **Wang, W.**, Ren, X.*, & Taylor, R. E.* (2021). The effects of overhang placement and multivalency on cell labeling by DNA origami. ***Nanoscale*** 13(14), 6819-6828. [Link]

9. **Wang, W.**, Arias, D. S., Deserno, M., Ren, X.*, & Taylor, R. E.* (2020). Emerging applications at the interface of DNA nanotechnology and cellular membranes: Perspectives from biology, engineering, and physics. ***APL Bioengineering*** 4(4), 041507. [Link] [Featured Article]

    - *This review introduces the basics of structural DNA nanotechnology, the structure and biophysics of cell plasma membranes, programmed delivery of DNA nanostructures, emerging applications at the interface of DNA nanotechnology and cellular membranes, and challenges and opportunities.*

CONFERENCES AND SEMINARS

1. **Wang, W.**, Ren, X., & Taylor, R. E. Synthetic condensates of DNA origami induce membrane heterogeneity and phase separation. *68th Biophysical Society Annual Meeting*, Pennsylvania, PA, Feb, 2024.

2. **Wang, W.**, Chopra, B., Walawalkar V., Liang, Z., Adams, R., Deserno, M., Ren, X., & Taylor, R. E. Membrane and glycocalyx tethering of DNA nanostructures for enhanced uptake. *20th Annual Conference on the Foundations of Nanoscience*, Snowbird, UT, Apr, 2023.

3. **Wang, W.**, Hayes, P. R., Ren, X. & Taylor, R. E. A DNA origami nanoshell stabilizes cellular membranes. *19th Annual Conference on the Foundations of Nanoscience*, virtual, Apr, 2022.

4. **Wang, W.**, Ren, X. & Taylor, R. E. A DNA nanoshell for encapsulation and protection for cells. *Carnegie Mellon Forum on Biomedical Engineering*, virtual, Sept, 2021.

5. Liu, Y., Wijesekara, P., **Wang, W.**, Ren, X. & Taylor, R. E. The Effects of Overhang Placement and Multivalency on Cell Labeling by DNA Origami. *18th Annual Conference on the Foundations of Nanoscience: Self-Assembled Architectures and Devices (FNANO Oral Presentation)*. pp. 25, 2021.

6. Beltrán, S., **Wang W.**, McGaughey, A., LeDuc, P. R. & Taylor, R. E. DNA Nanostructures for Mechanosensation. *Society of Engineering Science*, Saint Louis, MO, Oct, 2019.

PATENTS

- Taylor, R., Ren, X. and **Wang, W**. "Modular DNA nanoshells for cell encapsulation and ruggedization" Intellectual Property Disclosure no. 2023-063 Provisional application date: 2022/09/06

INVITED TALKS AND WORKSHOP PRESENTATIONS

- *Molecular machines made of DNA*, guest lecturer invited by Prof. Tzahi Cohen-Karni for **Bionanotechnology: Princes and Applications**, Carnegie Mellon University, Pittsburgh, PA, Nov, 2023

REFERENCES

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