WEITAO WANG

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EDUCATION

Carnegie Mellon University *Aug. 2019 - expecting July. 2023*
Ph.D. candidate in Mechanical Engineering *Advisor: Rebecca E. Taylor, Xi Ren*
· Thesis: Structural DNA nanotechnology for cell membrane engineering

University of Notre Dame *Jan. 2018 - May. 2019*
Master of Science in Mechanical Engineering *Advisor: Zhangli Peng*
· Thesis: Coarse-grained molecular simulations of erythrocyte membrane skeleton

Shanghai Jiao Tong University *Sept. 2013 - Jun. 2017*
Bachelor of Science in Mechanical Engineering

HONORS AND AWARDS

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

ORAL AND POSTER PRESENTATIONS

1. Carnegie Mellon University, Department of Mechanical Engineering Research Symposium (2023), *Membrane binding-enhanced cellular uptake of DNA nanostructures*

2. 19th Annual Conference on the Foundations of Nanoscience (2022), *A DNA nanoshell for encapsulation and protection for cells*

3. Carnegie Mellon University, Department of Mechanical Engineering Research Symposium (2022), *A DNA nanoshell for encapsulation and protection for cells*

4. Carnegie Mellon Forum on Biomedical Engineering (2021), *A DNA nanoshell for encapsulation and protection for cells*

5. Carnegie Mellon Forum on Biomedical Engineering (2019), *DNA Nanostructures for Mechanosensation*

PUBLICATIONS

JOURNAL ARTICLES, * denotes equal contribution

1. **Wang, W.**, Haynes, P., Ren, X., & Taylor, R. E. Synthetic cell armor made of DNA origami. (*preprint on bioRxiv, in revision at Nano letters.*) [link]

- *We demonstrated a modular and programmable approach to build temporal nanoshells by assembling DNA nanorods on living cell membranes. The nanoshell served as protective cellular armor to rescue cell viability against challenging environment. For the first time, we showed that DNA origami-enabled cell encapsulation was able to modulate the biophysical properties of plasma membranes by enhancing membrane stiffness and lowering lipid fluidity.*

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. (*preprint on bioRxiv, under review at Nano letters.*) [link]

- *We comprehensively demonstrated the strategy of tethering DNA nanostructures onto cell surface for enhanced uptake. DNA nanostructures were recruited to lipid membranes via cholesterol tags and cell-surface glycocalyx via click chemistry, and their uptake was enhanced up to 8-fold. The study investigated a range of DNA nanostructures with different shapes (nanospheres, nanorods and nanotiles), various valency and placement of membrane binding motifs on DNA nanostructures to show the general appliance of the strategy.*

3. 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]

4. 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]

- *We showed that glycocalyx presented steric hindrance that prevented DNA origami from binding to cell membranes. This finding provided an effective functional measure of the glycocalyx integrity.*

5. 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]

6. **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]

- *The review introduced 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.*

ADDITIONAL RESEARCH EXPERIENCE

1. Fluorescence microscopy image noise reduction using morphological transformations

- Combined morphological transformations and adaptive thresholding to effectively reduce the background fluorescence signal noise caused by the nonspecific uptake of fluorophores.
- Developed a computational pipeline capable of processing large quantities of images in a few minutes.
- Applied to research projects and resulted in publications at *Nano Letters* and *Biomaterials*.

2. Classifying the scaffold routing of computed DNA origami designs using convolutional neural networks (CNNs)

- Applied simulated annealing to stochastically generate images with scaffold routing information
- Developed custom CNN networks to classify 1100 images into two categories (fully encapsulated and not fully encapsulated) with higher than 95% accuracy.

REFERENCES

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