Da Wei
魏达

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Summary

I am an experimentalist in biophysics. Initially, I was trained as a physicist in solid state systems, but I was then attracted to studying microbial motility, where the basic particles - the microbes - are more “intelligent” and display colorful dynamics. I appreciate and enjoy working with researchers from distinct backgrounds, from quantum physicist to fluid mechanician, from graphic designer to micro-engineers. With cross-disciplinary approach, my researches centers around the “how”s and “why”s about micron-scale motility of different types of cells exploring distinct environments.

Current Position

2020.12 – now | Postdoc fellow, International Young Scientist Fellowship | Institute of Physics, CAS

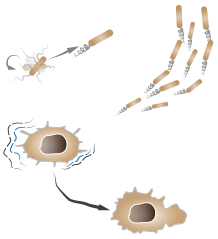
Education

2015 – 2020 | Ph.D. in biophysics | Delft University of Technology (TU Delft)
2011 – 2014 | M.Sc. in nano-electronics | University of Science and Technology of China
2007 – 2011 | B.Sc. in physics | University of Science and Technology of China

Research Experiences

2020.12 – now

Motility of bacteria and tissue cells



Institute of Physics, Chinese Academy of Science (IOP, CAS) Host advisor: Peng Yi

We study the single-cell motiltiy of bacteria and tissue cells as well as the collective motility of them. We show that the competition between the length scales of the cell, the collective, and the confinement shape the behaviors of bacterial collective swimming (bacterial turbulence). In studying the motility of microglia, an immune cell in the brain, we reveal that the motion is governed by run-and-tumble dynamics, strikingly analogous to bacteria exploring the fluidic environments.

2015.08 – 2020.08

Flagellar/ciliary motility of green algae

Delft University of Technology (TU Delft) Superviors: Marie-Eve Aubin-Tam & Daniel Tam

We studied the swimming of green algae faciliated by flagellar beating. In a cross-disciplinary effort, I built optical tweezers to resolve the dynamic flow field created by the algae, and found the flows to differ fundamentally from how they were commonly modelled. We further investigated the interaction between flagella and applied flow and uncovered a new flagellar asymmetry. Lastly, when studying flagellar ultrastructure, we refute a decades-old hypothesis that the flagellar hairs boost swimming speed.

2011.08 – 2014.08

Graphene nano-electronics

University of Science and Technology of China (USTC) Supervior: Guo-Ping Guo

We investigated into the potential of graphene quantum dots (QDs) in serving as quantum bits (qubits). I designed, fabricated, and tested various graphene devices, e.g., graphene single electron transistors, charge detectors, and hybrid devices wherein distant graphene QDs communicate via a superconducting resonator. With such devices, we were able to characterize the electron-photon coupling, electron tunneling, and charge state dephasing in graphene devices.

Publications

In submission

[1] Y.Y. Zhang*, **D. Wei*** (equal contribution), X.C. Wang, B.Y.Wang, M. Li, H.P. Fang, Y. Peng, Q.H. Fan, and F.F. Ye. "Run-and-tumble dynamics and mechanotaxis discovered in microglial migration". In submission.

[2] **D. Wei**, F.L. Meng, Y.Peng. "Competition between length scales in bacterial turbulence: the cell, the collective, and the confinement". In submission.

[3] **D. Wei**, G. Quaranta, M.-E. Aubin-Tam, and D.S.W. Tam. "The *cis* coordinates the flagellar beating of *C. reinhardtii*". In submission.

Published, biophysics

[4] **D. Wei***, P.G. Dehnavi* (equal contribution), M.-E. Aubin-Tam, and D.S.W. Tam."Measurements of the unsteady flow field around beating cilia". Journal of Fluid Mechanics, 915, A70, 2021.

[5] G. Amador*, **D. Wei*** (equal contribution), M.-E. Aubin-Tam, and D.S.W. Tam. "Mastigonemes of C.reinhardtii do not enhance flagellar thrust". Biophysical Journal, 118, 2914–2925, 2020.

[6] P.G. Dehnavi, **D. Wei**, M.-E. Aubin-Tam, and D.S.W. Tam. "Optical tweezers-based velocimetry: a method to measure microscale unsteady flows". Experiments in Fluid, 61:202, 2020

[7] **D. Wei**, P.G. Dehnavi, M.-E. Aubin-Tam, and D.S.W. Tam. "Is the zero Reynolds number approximation valid for ciliary flows?" Physics Review Letters,122:124502, 2019.

Published, graphene QDs

[8] G.W. Deng, L.Henriet, **D. Wei**, S.X.Li, H.O.Li, G. Cao, M. Xiao, G.C.Guo, M. Schiro, K. Le Hur, and G.P.Guo. "Kondo induced π-phase shift of microwave photons in a circuit quantum electrodynamics architecture". Physical Review B, 104, 125407, 2021

[9] G.W. Deng*, **D. Wei*** (equal contribution), S.X. Li, J.R. Johansson, W.C. Kong, H.O. Li, G. Cao, M. Xiao, G.C. Guo, F. Nori, H.W. Jiang, and G.P. Guo. "Coupling two distant double quantum dots with a microwave resonator". Nano Letters, 15(10):6620–6625, 2015.

[10] G.W. Deng, **D. Wei**, J. R. Johansson, M.L. Zhang, S.X. Li, H.O. Li, G. Cao, M. Xiao, T. Tu, G.C. Guo, H.W. Jiang, F. Nori, G.P. Guo. "Charge number dependence of the dephasing rates of a graphene double quantum dot in a circuit QED architecture". Physical Review Letters, 115:126804, 2015.

[11] T.Y. Han, G.W. Deng, **D. Wei**, and G.P. Guo. "Multiplexing read-out of charge qubits by a superconducting resonator". Chinese Physics Letters, 33(4):047301, 2015.

[12] M.L. Zhang, **D. Wei**, G.W. Deng, S.X. Li, H.O. Li, G. Cao, T. Tu, M. Xiao, G.C. Guo, H.W. Jiang, and G.P. Guo. "Measuring the complex admittance of a nearly isolated graphene quantum dot". Applied Physics Letters, 105(7):073510, 2014.

[13] H.O. Li, G. Cao, M. Xiao, J. You, **D. Wei**, T. Tu, G.C. Guo, H.W. Jiang, and G.P. Guo. "Fabrication and characterization of an undoped GaAs/AlGaAs quantum dot device". Journal of Applied Physics, 116(17):174504, 2014.

[14] **D. Wei**, H.O. Li, G. Cao, G. Luo, Z.X. Zheng, T. Tu, M. Xiao, G.C. Guo, H.W. Jiang, and G.P. Guo. "Tuning inter-dot tunnel coupling of an etched graphene double quantum dot by adjacent metal gates". Scientific reports, 3:3175, 2013.

[15] L.J. Wang, G.P. Guo, **D. Wei**, G. Cao, T. Tu, M. Xiao, G.C. Guo, and A.M. Chang. "Gates controlled parallel-coupled double quantum dot on both single layer and bilayer graphene". Applied Physics Letters, 99(11):112117, 2011.

Teaching

2018.02 – 2018.06 Supervising the bachelor thesis of Kabir Razack.
"Preparing demembranated *C. reinhardtii* cell models for the study of flagellar flow"

2018.02 – 2018.06 Supervising the bachelor thesis of Mats van Tongeren.
"Convolutional neural networks for flagellar recognition in *C. reinhardtii*"

2017.05 – 2017.08 Supervising the bachelor thesis of Maarten den Hollander.
"Response of captured *C. reinhardtii* to aspiration pressure"

2016.12 – 2017.07 Supervising the master thesis of Vinesh Badloe.
"Role of calcium on flagellar intrinsic beating frequency in *C. reinhardtii*"

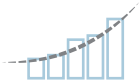
2015.12 – 2017.03 Teaching assistant in the research practicum "Building An Optical Trap"
I introduce the theory of optical traps to bachelor students, train them to build optical traps from scratch, and supervise them in the self-designed research projects.

2011.02 Coaching the team #10649 in the 2011 Mathematical Contest in Modeling (MCM), Meritorious Winner (top 15%).

Internship

2014.11 – 2015.05 **Modeling epidemics of multiple myeloma in East-Asia countries**

Navigant Consulting, Inc.



I collected data of the prevalence of multiple myeloma in East-Asian countries and regions. A Markovian model is built to estimate the patient number and hence the market size for a new drug. The estimation is proved to be accurate by later interview of local KOLs in Hongkong and Taiwan.

Expertise

Image processing
Signal processing
GUI design
Instrument programming
Nano- / micro-fabrication
Graphic design