Tzer Han Tan

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Education

Ph.D. in Physics, Massachusetts Institute of Technology, Cambridge, MA — 2014 – 2020
Thesis: Symmetry, Topology and Geometry in Biological Active Matter
B.S. in Engineering Physics with Honors, *Summa Cum Laude*, Cornell University, Ithaca, NY — 2010 – 2014
Qbio Summer Course, KITP, University of California, Santa Barbara, CA — Summer 2016
Physiology Course, Marine Biological Laboratory, Woods Hole MA — Summer 2019

Positions

ELBE Postdoctoral Fellow @ Center for Systems Biology Dresden (CSBD) — Dec 2020 – current
NSF-Simons Independent Fellow @ Harvard Qbio Program (annual budget $20,000) — Fall 2020

Awards

March Meeting Speaker Award finalist, Group on Statistical & Nonlinear Physics, APS — 2022
Shirley Chan Student Travel Grants, Division of Biological Physics, APS — 2018
MIT Biophysics Retreat Best Poster Award — 2016
Dorothy and Fred Chau Award for undergraduate research, Cornell University — 2014
Perdana Scholar Award, Embassy of Malaysia — 2014
Undergraduate Research Grant, Engineering Learning Initiatives, Cornell University — 2013

Publications

Tan TH*, Mietke A*, Li J, Chen Y, Higinbotham H, Gokhale S, Foster PJ, Dunkel J, Fakhri N. "Odd dynamics of living chiral crystals." *Nature (2022), 607(7918), 287-293.* [link | News and Views | Nature Video | MIT news | sciencealert.com | New Scientist | Discover magazine]

Tan TH*, Liu J*, Grapin-Botton A. "Mapping and exploring the organoid state space using synthetic biology." *Seminars in Cell and Developmental Biology (2022). Academic Press.* [link]

Swartz SZ, **Tan TH**, Perillo M, Fakhri N, Wessel GM, Cheeseman IM, Wikramanayake I. "Polarized *Dishevelled* dissolution and condensation drives embryonic axis specification in oocytes." *Current Biology (2021).* 31(24), 5633-5641. [link | Prelights]

Wigbers M*, **Tan TH***, Brauns F, Liu J, Swartz Z, Frey E, Fakhri N. "A hierarchy of protein patterns robustly decodes cell shape information." *Nature Physics* (2021). 17(5), 578-584. [link | LMU news | phys.org]

Tan TH*, Liu J*, Miller PW*, Tekant M, Dunkel J, Fakhri N "Topological turbulence in the membrane of a living cell." *Nature Physics* (2020): 16(6), 657-662. [link | Cover art Nature Physics | MIT news | phys.org | physicsworld.com | Research highlight in Nature]

Tan TH*, Malik-Garbi M*, Abu-Shah E*, Li J, Sharma A, MacKintosh FC, Keren K, Schmidt CF, Fakhri N "Self-organized stress patterns drive state transitions in actin cortices." *Science Advances* (2018): 4(6), p.eaar2847. [link | F1000 article recommendation]

Cho WK, Jayanth N, Mullen S, **Tan TH**, Jung YJ, Cissé II "Super-resolution imaging of fluorescently labeled, endogenous RNA Polymerase II in living cells with CRISPR/Cas9-mediated gene editing." *Scientific Reports* (2016): 6, p.35949. [link]

Tan TH, Silverberg JL, Floss DS, Harrison MJ, Henley CL, Cohen I. "How grow-and-switch gravitropism generates root coiling and root waving growth responses in *Medicago truncatula*." *Proceedings of the National Academy of Sciences* (2015): 112(42), pp.12938-12943. [link | Research highlight in Nature Physics | Cornell news]

Preprint

Tan TH*, Watson GA*, Chao YC*, Li J, Gingrich TR, Horowitz JM, Fakhri N. "Scale-dependent irreversibility in living matter." *Submitted 2021, preprint on arXiv.*

Tan TH*, Amiri A*, Barandiaran IS*, Staddon M, Hermann A, Tomas S, Duclut C, Papovic M, Julicher F, Grapin-Botton A. "Emergent chirality in active solid rotation of pancreas spheres." *Submitted 2022, preprint on bioRxiv.*

*(*denotes co-first author)*

Invited talks

Odd Viscoelasticity Workshop, University of Amsterdam. *Odd dynamics of living chiral crystal* Mar 2022
Harvard NSF-Simmons Qbio Symposium. *Symmetries in biological active matter* Mar 2020
Max Planck Institute PKS-CBG ELBE Symposium. *Geometry, biochemical dynamics and hierarchical self-organization* Nov 2019
MIT Mechanical Engineering Lecture. *Geometry and mechanics of biological self-organization* Oct 2019
Harvard Squishy Physics Seminar. *Patterns make patterns: how hierarchical self-organization couples cell shape to biochemistry* Sep 2019
Princeton University CPBF Symposium. *Geometry and mechanics of biological self-organization* Apr 2019

Contributed Talks

Physics of Living Matter. *Emergent chirality in active solid rotation of pancreas spheres.* Oct 2022
American Physical Society March Meeting. *Development drives dynamics of chiral living crystals.* Mar 2021
German Physical Society (DPG) Spring Meeting. *A hierarchy of protein patterns robustly decodes cell shape information.* Mar 2021
American Physical Society March Meeting. *Patterns make patterns: how hierarchical self-organization couples cell geometry to biochemical dynamics* Mar 2019
New England Society of Microscopy Fall Symposium. *Emergence of topological turbulence in membrane spiral waves* Nov 2018
Mechanobiology Symposium 2017. *Beyond Turing: Mechanochemical basis of pattern formation in active biological materials* Dec 2017
EMBO Conference: Physics of Cells. *Non-equilibrium state transition in actomyosin cortices* Aug 2015

Teaching and Services

Graduate Teaching Assistant for Experimental Physics (MIT course 8.13) Spring 2019
MIT Kaufman Teaching Certificate Program Summer 2018
Undergraduate mentoring: Garrett Watson, Jiseok Kim, Junang Li May 2015 – May 2018
Peer Tutor for Engineering Learning Initiatives Spring – Fall 2013
Teaching Assistant for CS1112: Introduction to Computing Aug 2012 – May 2014

Professional Activities

Referee for Nature, Biophysical Journal 2018 – current
MIT Physics Graduate Student Council, Committee Member Sep 2014 – Jan 2016
MIT Malaysia Student Association, Vice President Sep 2014 – May 2015
Tau Beta Pi (Cornell Chapter), Membership Committee VP Aug 2013 – May 2014
4-H Summer Camp Outreach Program Volunteer (crystal radio building) Jul 2013