

Yu-Ting SUN

Ph.D. | *Single-Molecule Biophysics · DNA-Protein Interactions · Microfluidics*
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RESEARCH PROFILE

Biophysicist with 8+ years of experience in single-molecule fluorescence microscopy, specialising in quantitative kinetics of DNA-protein interactions. Career trajectory spans soft-matter polymer physics (PhD, ICS Strasbourg), DNA dynamics under confinement (Postdoc, SMART Singapore), and recombinase mechanisms in homologous recombination (Postdoc, NTU Taiwan). This progression reflects a deliberate convergence toward the physical principles that govern protein competition for DNA access in crowded, constrained environments — a question directly relevant to chromatin biology and genome regulation.

Core competencies: smFRET · CoSMoS · TIRF · RICM · AFM · Microfluidics · Multi-step kinetic modelling

RESEARCH EXPERIENCE

Postdoctoral Associate — National Taiwan University (NTU), Taipei, Taiwan

Dec 2021 – Jul 2025

Supervisors: Prof. Hung-Wen Li (Chemistry, NTU) & Prof. Hung-Yuan Chi (IBS, Taipei)

- Established quantitative CoSMoS and smFRET assays to dissect multi-step kinetics of RecA mediated homologous recombination (HR) on single-DNA substrates.
- Discovered the RNA-involvement mechanism in RecA-mediated HR: revealed distinct kinetic intermediates by temporal analysis of fluorescent trajectories (manuscript in preparation).
- Identified Hop2-Mnd1 as a DNA sequence fidelity switch in Dmc1-mediated strand invasion, resolving a long-standing mechanistic question in meiotic recombination (Nat. Commun. 2024).
- Supervised 2 undergraduate research projects; maintained multi-user TIRF and CoSMoS instruments.

Postdoctoral Associate — Singapore-MIT Alliance for Research & Technology, Singapore

May 2011 – Dec 2012

Supervisors: Prof. Patrick Doyle (MIT) & Prof. Jie Yan (NUS)

- Studied single DNA polymer dynamics under spatial confinement and controlled flow.
- Developed quantitative frameworks for polymer extension statistics in microconfinement, establishing direct connections between physical confinement parameters and biopolymer behaviour.

PhD Researcher — Institut Charles Sadron (ICS-CNRS), University of Strasbourg, France

Jan 2008 – Dec 2010

Supervisors: Prof. Carlos Marques & Dr. André Schröder (ICS)

- Single-molecule fluorescence and RICM study of giant unilamellar vesicle (GUV) adhesion on end-grafted DNA carpets — a biophysical model for cell-surface molecular recognition.
- Demonstrated photocontrol of λ -phage DNA conformation via azobenzene end-grafting (Soft Matter 2011, Inside Front Cover).
- Received IRTG Soft Matter Science Scholarship (2008–2010); delivered invited talk at Jülich Soft Matter Days 2009.

Master's Researcher — Max Planck Institute for Polymer Research (MPIP), Mainz, Germany

Nov 2006 – Dec 2007

Supervisor: Prof. Hans-Jürgen Butt & Dr. Elmar Bonaccorso (MPIP)

- AFM characterisation of liquid crystal layering on surfaces; developed nanolithography technique on polystyrene via AFM-based local anodic oxidation.

TEACHING EXPERIENCE

Chemistry & Mathematics Teacher — Beijing Huijia Private School, Beijing, China

Dec 2013 – Aug 2015

Taught IB Diploma Programme Chemistry & Mathematics (Grades 10–11); supervised student scientific research projects.

Career break (Sep 2015 – Nov 2021): Relocated to Taiwan following marriage; primary caregiver for family. Returned to full-time research in Dec 2021.

EDUCATION

- Ph.D. Biophysics** — University of Strasbourg / ICS-CNRS, France 2008 – 2010
Dissertation: Kinetics of cell adhesion in biomimetic systems · IRTG Soft Matter Science Scholar
- M.Sc. Chemistry** — University of Siegen, Germany 2005 – 2007
Thesis: Liquid crystal layering on surfaces by AFM (MPIP Mainz)
- B.Eng. Chemical Engineering** — China University of Petroleum (Beijing), China 2001 – 2005
Award: Contemporary Undergraduate Mathematical Contest in Modelling (2003) · Outstanding Students' Leader Award & Scholarship (×2)

PUBLICATIONS

- Y.L. Sun**[†], X.-Y. Li[†], C.-H. Tsai, H.-Y. Yeh, C.-R. Neoh, N.-L. Chan, P. Chi, H.-W. Li. "Mechanism of RNA-Involved Homologous Recombination Mediated by E. coli RecA." Manuscript in preparation. (†Equal contribution)
 - J.-C. Peng, H.-Y. Chang, **Y.L. Sun**, M. Prentiss, H.-W. Li, P. Chi. "Hop2-Mnd1 functions as a DNA sequence fidelity switch in Dmc1-mediated DNA recombination." *Nature Communications* 15, 9266 (2024).
 - Y. Sun**, C. M. Marques, A. P. Schröder. "Adhesion of giant unilamellar vesicles on double-end grafted DNA carpets." *Eur. Phys. J. Spec. Top.* 223, 1755–1769 (2014).
 - Y.L. Sun**, N. K. Mani, D. Baigl, T. Gisler, A. P. Schröder, C. M. Marques. "Photocontrol of End-Grafted λ -phage DNA." *Soft Matter* 7, 5578–5584 (2011). [Inside Front Cover]
 - G. Nam, M. L. Hisette, **Y.L. Sun**, T. Gisler, A. Johner, F. Thalmann, A. P. Schröder, C. M. Marques, N.-K. Lee. "Scraping and stapling of end-grafted DNA chains by a bio-adhesive spreading vesicle reveal chain internal friction and topological complexity." *Physical Review Letters* 105, 088101 (2010). [Cover Story]
- * All publications listed under Y.L. Sun or Y. Sun are by the same author (Yu-Ting Sun).

SELECTED PRESENTATIONS

- Invited Talk** Jülich Soft Matter Days, Bonn, Germany (2009)
- Contributed Talk** *Soft Condensed Matter Physics of Model Systems, Grenoble, France (2009)*
- Contributed Talk** *Journées Scientifiques ICS-LIPHT, Albé, France (2009)*
- Poster** *Biophysical Society 54th Annual Meeting, San Francisco, USA (2010)*
- Poster** *29th Biophysics Conference Taiwan (2025)*
- Seminar** *Department of Chemical Engineering & Materials Science, UC Davis, USA (2010)*

TECHNICAL SKILLS

- Microscopy & single-molecule:** TIRF, smFRET, CoSMoS, RICM, AFM
- Biochemistry:** DNA–protein interaction assays; recombinase systems (RecA, Rad51, Dmc1, Hop2-Mnd1)
- Data analysis:** Python (single-molecule trajectory analysis, kinetic modelling, statistical frameworks)
- Languages:** Mandarin (native), English (fluent), German (basic), French (basic)

OPEN-SOURCE SOFTWARE

LitGap — Zotero plugin for AI-assisted literature gap analysis. Identifies unread but relevant papers and maps conceptual gaps in a researcher's reading history. github.com/Yu-TingSun/LitGap

OGM / KGM — Web tools for systematic opportunity and knowledge gap mapping in research and career trajectories. ogmapping.netlify.app · kgmapping.netlify.app