

ANDERS SEJR HANSEN

Underwood-Prescott Career Development Professor of Biological Engineering, MIT

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EDUCATION

PhD , Chemistry and Chemical Biology, Harvard University	2010-2015
AM , Chemistry and Chemical Biology, Harvard University	2010-2012
MChem , Chemistry, University of Oxford	2006-2010

RESEARCH AND POSITIONS

Underwood-Prescott Career Development Professor , Dept. of Biological Engineering, MIT	2020-present
Associate Member , Broad Institute of MIT and Harvard	2020-present
Member , Gene Regulation Observatory, Broad Institute	2020-present
Extramural Member , Koch Institute for Integrative Cancer Research, MIT	2021-present

Post-doctoral research , Biophysics, University of California, Berkeley	2015-2020
Regulation of 3D genome structure by CTCF and cohesin. Advisors: Robert Tjian and Xavier Darzacq	
Graduate research , Chemistry and Systems Biology, Harvard University	2010-2015
Information transduction through regulation of transcription factor dynamics. Advisor: Erin O'Shea	
Masters and prior research , Synthetic Organic Chemistry, Oxford and Harvard	2007-2010
Synthetic organic chemistry with Steve Davies (Oxford), Chris Schofield (Oxford), Stuart Schreiber (Harvard)	

HONORS

Pew-Stewart Scholar for Cancer Research	2021-2025
NIH New Innovator Award (DP2 GM140938)	2020-2025
K99/R00 Pathway to Independence (NIGMS K99GM130896)	2019-2023
Siebel Post-doctoral Fellowship, Siebel Foundation	2016-18
Best talk award (MCB/GGD Retreat) UC Berkeley	2018
Derek Bok Certificate of Distinction in Teaching, Harvard University (Q-score: 4.8/5.0)	2012
Top of class (highest ranked student out of 152 students), Oxford University	2010
Gibbs Prize (best performance in Part 1B exams out of 154 students), Oxford University	2009
Evonik Degussa Prize (best performance in Part 1A exams out of 156 students), Oxford University	2008
Casberd Scholarship, St John's College, Oxford University	2007
Distinctions, Preliminary Exams, Quantum Chemistry, Aromatic and Heterocyclic Chemistry	2007-09
Glaxo-Smith-Kline Organic Chemistry Bursary	2006-10
Prince Joachim's and Princess Alexandra's Foundation Award, Royal Danish Monarchy	2006

PUBLICATIONS

+ indicates corresponding author and * indicates co-first author. See also [Google Scholar](#).

39. Cerda-Smith C*, Hutchinson HM*, Liu A, Goel VY, Sept C, Kim H, Casaní-Galdón S, Burkman KG, Bassil CF, **Hansen AS**, Aryee MJ, Johnstone SE, Eyler CE+, Wood KC+. [Integrative PTEN Enhancer Discovery Reveals a New Model of Enhancer Organization](#). 2023. [BioRxiv 2023](#)
38. Dekker J+ *et al.*. [Spatial and temporal organization of the genome: Current state and future aims of the 4D nucleome project](#). *Molecular Cell*. 2023.
37. Drayton JA, **Hansen AS**+. [Right on target: Chromatin jets arise from targeted cohesin loading in wild-type cells](#). *Molecular Cell*. 2022.
36. Goel VY, Huseyin MK, **Hansen AS**+. [Region Capture Micro-C reveals coalescence of enhancers and promoters into nested microcompartments](#). *Nature Genetics*. 2023. [BioRxiv 2022](#)

Video overview on [YouTube](#),

Highlighted in [MIT News](#), [YouTube](#), [Science Daily](#), [Technology Networks](#), [The Medical News](#), [EurekAlert](#), [Newsbeezzer](#), [Interesting Engineering](#), [Revyuh](#), [Mirage News](#), [MedicalXpress](#), [Focus.pl](#).

35. Narducci D, **Hansen, AS+**. [Reeling it in: how DNA topology drives loop extrusion by condensin](#). *Nature Structural and Molecular Biology*. 2022.
34. Mahadevan J, Jha A, Rudolph J, Bowerman S, Narducci D, **Hansen AS**, Luger K+. [Dynamics of endogenous PARP1 and PARP2 during DNA damage revealed by live-cell single-molecule imaging](#). *iScience*. 2023. [BioRxiv 2022](#).
33. Jha A, **Hansen AS+**. [A Protocol for Studying Transcription Factor Dynamics Using Fast Single-Particle Tracking and Spot-On Model-Based Analysis](#). *Chromatin: Methods in Molecular Biology*. 2022.
32. Gabriele M*, Brandão HB*, Grosse-Holz S*, Jha A, Dailey GM, Cattoglio C, Hsieh THS, Mirny L+, Zechner C+, **Hansen AS+**. [Dynamics of CTCF- and cohesin-mediated chromatin looping revealed by live-cell imaging](#). *Science*. 2022. [BioRxiv 2021](#)

Highlighted in [MIT News](#), [Zeiss Microscopy News](#), [Wikipedia](#), [Faculty Opinion](#), [Genetics Engineering and Biotechnology News](#), [Sci Tech Daily](#), [Phys.org](#), [Bioengineer.org](#), [Mirage News](#), [Scien Mag](#), [EurekAlert](#), [Science Daily](#), [Business Mayor](#), [Business Fast](#), [Informationsdienst Wissenschaft](#), [Press Release Point](#), [Technology.org](#), [Mosaic](#), [Thinking Port](#), [Bionity](#), [Tech Register](#), [VBio](#).
31. Yang HY, Brandão HB+, **Hansen AS+**. [DNA double-strand break end synapsis by DNA loop extrusion](#). *Nature Communications*. 2023. [BioRxiv 2021](#)
30. Hsieh TSH, Cattoglio C*, Slobodyanyuk E*, **Hansen AS**, Darzacq X+, Tjian R+. [Enhancer-promoter interactions and transcription are maintained upon acute loss of CTCF, Cohesin, WAPL, and YY1](#). *Nature Genetics*. 2022. [BioRxiv 2021](#)
29. Brandão HB*, Gabriele M*, **Hansen AS+**. [Tracking and interpreting long-range chromatin interactions with super-resolution live-cell imaging](#). *Current Opinion in Cell Biology*. 2021.
28. Goel VY, **Hansen AS+**. [The macro and micro of chromosome conformation capture](#). *WIREs Developmental Biology*. 2020.
27. Agbleke AA, Amitai A, Buenrostro JD, Chakrabarti A, Chu L, **Hansen AS**, Koenig KM, Labade AS, Liu S, Nozaki T, Ovchinnikov S. [Advances in Chromatin and Chromosome Research: Perspectives from Multiple Fields](#). *Molecular Cell*. 2020.
26. **Hansen AS+**. [CTCF as a boundary factor for cohesin-mediated loop extrusion: evidence for a multi-step mechanism](#). *Nucleus*. 2020.
25. Xie L*, Dong P*, Qi Y, Hsieh THS, De Marzio M, Chen X, Banala S, Legant WR, English BP, **Hansen AS**, Schulmann A, Lavis LD, Betzig E, Casellas R, Chang HY, Zhang B+, Tjian R+, Liu Z+. [3D ATAC-PALM: super-resolution imaging of the accessible genome](#). *Nature Methods*. 2020.
24. **Hansen AS+**, Zechner C+. [Promoters adopt distinct dynamic manifestations depending on transcription factor context](#). *Molecular Systems Biology*. 2021. [BioRxiv 2019](#)
23. Hsieh THS, Cattoglio C, Slobodyanyuk E, **Hansen AS**, Rando OL, Tjian R+, Darzacq X+. [Resolving the 3D landscape of transcription-linked mammalian chromatin folding](#). *Molecular Cell*. 2020. [BioRxiv 2019](#)
22. **Hansen AS***, Hsieh THS*, Cattoglio C*, Pustova I, Saldana-Meyer R, Reinberg D, Darzacq X+, Tjian R+. [Distinct Classes of Chromatin Loops Revealed by Deletion of an RNA-Binding Region in CTCF](#). *Molecular Cell*. 2019. [BioRxiv 2018](#)
21. **Hansen AS***, Amitai A*, Cattoglio C, Tjian R+, Darzacq X+. [Guided nuclear exploration increases CTCF target search efficiency](#). *Nature Chemical Biology*. 2019. [BioRxiv 2018](#)

20. Cattoglio C, Pustova I, Walther N, Ho JJ, Hantsche-Grininger M, Inouye CJ, Hossain MJ, Dailey GM, Ellenberg J, Darzacq X, Tjian R, **Hansen AS**+. [Determining cellular CTCF and cohesin abundances to constrain 3D genome models.](#) *eLife*. 2019. [BioRxiv 2018](#)
19. McSwiggen DT, **Hansen AS**, Marie-Nelly H, Teves SS, Heckert A, Hao Y, Umemoto K, Dugast-Darzacq C, Tjian R+, Darzacq X+. [Evidence for DNA-mediated nuclear compartmentalization distinct from phase separation.](#) *eLife* 2019. [BioRxiv 2018](#)
18. Oomen ME, **Hansen AS**, Liu Y, Darzacq X, Dekker J+. [CTCF sites display cell cycle dependent dynamics in factor binding and nucleosome positioning.](#) *Genome Research*. 2019. [BioRxiv 2018](#)
17. Boehning M, Dugast-Darzacq C, Rankovic M, **Hansen AS**, Yu TK, Marie-Nelly H, Kokic G, Dailey GM, Cramer P+, Darzacq X+; Zweckstetter M+. [RNA polymerase II clustering through carboxy-terminal domain phase separation.](#) *Nature Structural and Molecular Biology* 2018. [BioRxiv 2018](#)
16. Lu H, Yu D, **Hansen AS**, Ganguly S, Liu R, Heckert A, Darzacq X, Zhou Q+. [Phase-separation mechanism for C-terminal hyperphosphorylation of RNA polymerase II.](#) *Nature* 2018.
15. Mir M, Reimer A, Stadler M, Tangara A, **Hansen AS**, Hockemeyer D, Eisen MB, Garcia H, Darzacq X+. [Single molecule imaging in live embryos using lattice light-sheet microscopy.](#) *Methods in Molecular Biology. Nanoscale Imaging*. 2018
14. **Hansen AS***+, Woringer M*, Grimm J, Lavis LD, Tjian R+, Darzacq X+. [Robust model-based analysis of single-particle tracking experiments with Spot-On.](#) *eLife*. 2018. [BioRxiv 2017](#)
13. **Hansen AS**+, Cattoglio C, Darzacq X, Tjian R. [Recent evidence that TADs and chromatin loops are dynamic structures.](#) *Nucleus* 2018.
12. Dekker J+ *et al.*. [The 4D Nucleome Project.](#) *Nature*. 2017.
11. **Hansen AS**, Pustova I, Cattoglio C, Tjian R+, Darzacq X+. [CTCF and Cohesin Regulate Chromatin Loop Stability with Distinct Dynamics.](#) *eLife*. 2017. [BioRxiv 2016](#)
10. Teves SS, An L, **Hansen AS**, Xie L, Darzacq X+, Tjian R+. [A dynamic mode of mitotic bookmarking by transcription factors.](#) *eLife*. 2016. [BioRxiv 2016](#)
9. Huang L, Pauleve L, Zechner C, Unger M, **Hansen AS**, Koepl H+. [Reconstructing dynamic molecular states from single-cell time series.](#) *Journal of The Royal Society Interface* 2016.
8. **Hansen AS**, O'Shea EK+. [Encoding four gene expression programs in the activation dynamics of a single transcription factor.](#) *Current Biology*. 2016.
7. **Hansen AS**, O'Shea EK+. [Cis-determinants of promoter threshold and activation timescale.](#) *Cell Reports*. 2015,
6. **Hansen AS**, Hao N, O'Shea EK+. [High-throughput microfluidics to control and measure signaling dynamics in single yeast cells.](#) *Nature Protocols*. 2015.
5. **Hansen AS**, O'Shea EK+. [Limits on information transduction through amplitude and frequency regulation of transcription factor activity.](#) *eLife*. 2015.
4. **Hansen AS**, O'Shea EK+. [Promoter decoding of transcription factor dynamics involves a trade-off between noise and control of gene expression.](#) *Molecular Systems Biology*. 2013.
Highlighted in News and Views, Moody A, Batchelor A, [Promoter decoding of transcription factor dynamics.](#) *Molecular Systems Biology*. 2013.
3. Wang Y, Jimenez M, **Hansen AS**, Raiber EA, Schreiber SL, Young DW+. [Control of olefin geometry in macrocyclic ring-closing metathesis using a removable silyl group.](#) *Journal of the American Chemical Society*. 2011.
2. Thallhammer A, **Hansen AS**, El-Sagheer AH, Brown T, Schofield CJ+. [Hydroxylation of methylated CpG dinucleotides reverses stabilisation of DNA duplexes by cytosine 5-methylation.](#) *Chemical Communications*.

2011.

1. **Hansen AS**, Thallhammer A, El-Sagheer AH, Brown T, Schofield CJ+. [Improved synthesis of 5-hydroxymethyl-2'-deoxycytidine phosphoramidite using a 2'-deoxyuridine to 2'-deoxycytidine conversion without temporary protecting groups.](#) *Bioorganic and Medicinal Chemistry Letters*. 2011.

INVITED TALKS AND SEMINARS

National University of Singapore, invited seminar	2023-08-07
Genome Architecture in Cell Fate and Disease Gordon Research Conference, invited talk	2023-06-14
Columbia University Precision Medicine Initiative Conference, invited seminar	2023-05-19
University of Pennsylvania and Childrens Hospital of Pennsylvania, CCGM, invited seminar	2023-05-09
Westlake-Science/AAAS Dynamic Molecular Systems Webinar, invited seminar	2023-03-30
Pew and Pew-Stewart Scholars Annual Meeting, awardee talk	2023-03-25
Telluride Science Meeting on Physical Genomics, invited talk	2023-02-27
Weill Cornell NYC Physiology, Biophysics, and Systems Biology (PBSB) Series, invited seminar	2023-01-25
Broad Institute Retreat, invited talk	2022-12-12
NIH Transcription Interest Group, invited talk	2022-12-07
Uni Nebraska Medical Center, invited seminar	2022-11-16
Princeton Biophysics Seminar, invited seminar	2022-11-14
Boston University, Department of Biology, invited seminar	2022-11-07
6th International Conference on Epigenetics and Bioengineering (EpiBio 2022), invited talk	2022-10-27
EMBO Nucleus conference, Montpellier, France, invited talk	2022-10-11
NIH High Risk High Reward, awardee seminar	2022-09-15
Keystone Gene Regulation Symposium in Santa Fe, invited talk	2022-06-23
NICHD DIR TTI Symposium, invited seminar	2022-06-09
Brandeis CMCB Workshop, invited keynote	2022-06-01
Genome Organization Australia, invited seminar	2022-05-26
EMBL Nuclear Architecture, invited seminar	2022-05-25
4D Nucleome, invited seminar	2022-04-21
Broad Institute, Cell Circuits and Epigenomics, invited seminar	2022-02-07
University of Liverpool, BSB and MPCS, invited seminar	2022-01-25
Dana-Farber Center for Functional Cancer Epigenetics, invited seminar	2021-12-17
Broad Institute Gene Regulation Observatory-Schmidt Center Workshop, invited talk	2021-12-09
Northeastern University, Department of Bioengineering, invited seminar	2021-12-01
UC Irvine, Departmental Seminar in Biological Chemistry, invited seminar	2021-11-29
University of Ulm, Germany, Physics Colloquium, invited seminar	2021-11-22
Keystone Symposium, Higher-Order Chromatin Architecture in Time and Space, invited talk	2021-11-15
Salk Institute - UC San Diego Chromatin Club Seminar	2021-11-12
NIH/NIEHS, invited branch seminar	2021-10-28
Broad Institute, Variants2Function, invited talk	2021-08-17
American Society for Biochemistry and Molecular Biology, Signaling Interest Session, invited talk	2021-04-26
Broad Institute, Cell Circuits and Epigenomics, invited seminar	2021-02-08
American Society for Cell Biology, December meeting, invited talk	2020-12-07
UMass Medical Science on Tap, invited seminar	2020-09-25
Cold Spring Harbor Epigenetics and Chromatin Meeting, invited talk	2020-09-15
Broad Institute Symposium on Nuclear Architecture, invited talk	2019-11-21

LAB MEMBERS AND ADVISING

Years	Name	Lab Position	Current Position
2023-present	Sumin Kim	Post-doc (SoE Engineering Excellence fellowship)	
2023	Angelina Schorr	MIT MSRP Summer student	Brown University

2023-present	Matteo Mazzocca	Post-doc	
2023-present	Clarice Hong	Post-doc	
2022-present	James Jusuf	BE graduate student	
2022-present	Christos Kafsifis	Tech Associate	
2022-present	Andrea Perry	MIT Physics graduate student	
2022-2023	Luoyu Zhang	Tech Associate	Graduate student, Harvard University
2022-present	Jamie Drayton	BE graduate student	
2021	Isadora De Abreu	MIT MSRP Summer student	Research Assistant, NIH
2021-2022	Emma Magee	Tech Associate	Graduate student, Stanford University
2021-present	Domenic Narducci	BE graduate student	
2021-present	Sarah Nemsick	BE graduate student (NSF fellowship)	
2020-present	Shdema Filler-Hayut	Post-doc (Zuckerman STEM Fellowship)	
2020-present	Miles Huseyin	Post-doc (F32 and EMBO fellowships)	
2020-2022	Hugo Brandão	Harvard Biophysics graduate student (w. Leonid Mirny) and brief post-doc	Senior Scientist, Illumina
2020-2022	Asmita Jha	Tech Associate	Graduate student, Yale University
2020-present	Jin Harvey Yang	BE graduate student (Mathworks and KI fellowships)	
2020-present	Viraat Goel	BE graduate student (KI fellowship)	
2020-present	Michele Gabriele	Post-doc (AICF and K99 fellowships)	

Coursework advising: MIT Biological Engineering undergraduate course advising (2022-present): Xinyan Pan, Amina Abdella, Cassandra Lawson, Naomi Zecharias. MIT Computational and Systems Biology graduate course advising (2020-present): Advait Athreya, Peter DeWeirdt, Matteo Di Bernado, Helen Kang.

MIT TEACHING

20.430 Fields, Forces, and Flows in Biological Systems (graduate class)	Fall 2023
20.309 Instrumentation and Measurement for Biological Systems (undergraduate class)	Spring 2023
20.430 Fields, Forces, and Flows in Biological Systems (graduate class)	Fall 2022
20.309 Instrumentation and Measurement for Biological Systems (undergraduate class)	Spring 2022
20.430 Fields, Forces, and Flows in Biological Systems (graduate class)	Fall 2021
20.309 Instrumentation and Measurement for Biological Systems (undergraduate class)	Spring 2021

MIT COMMITTEE SERVICE

Search Committee for new Head of Department of Biological Engineering	2023
MIT MSRP Program Admissions Committee	2023
MIT Computational and Systems Biology Graduate Admissions Committee	2023
MIT Biological Engineering Graduate Program Admissions Committee	2023
Department of Biological Engineering Retreat Organization Committee, Chair	2022
MIT MSRP Program Admissions Committee	2022
MIT Computational and Systems Biology Graduate Admissions Committee	2022
MIT Biological Engineering Graduate Program Admissions Committee	2022
MIT Computational and Systems Biology Graduate Admissions Committee	2021
MIT Biological Engineering Graduate Program Admissions Committee	2021
MIT Computational and Systems Biology Graduate Admissions Committee	2020
MIT Biological Engineering Graduate Program Admissions Committee	2020

DISSERTATION THESIS COMMITTEES

Start	Name	Graduate Program	Thesis advisor
2023	Paola C. Gonzalez	Northwestern Biomedical Engineering	V Backman, I Szleifer
2023	Hannah Ramcharan	MIT Computational and Systems Biology (CSB)	Olivia Corradin
2023	Emily Navarrete	MIT Biology	Leonid Mirny
2023	Kasey Love	MIT Biological Engineering (BE)	Katie Galloway
2023	Edwin Neumann	MIT Biological Engineering (BE)	Jonathan Weissman
2022	Paritosh Gangaramani	MIT Biology	Stephen Bell
2022	Corriene Sept	Harvard Biostatistics	Martin Aryee
2022	Caroline Comenho	Harvard Systems, Synthetic, and Quantitative Biology	Jason Buenrostro
2021	Amalia Colangelo	Driller-Harvard Biological and Biomedical Sciences (BBS)	Jason Buenrostro
2021	Rachel Savage	Harvard Molecules, Cells, and Organisms (MCO)	Jason Buenrostro
2021	John Day	MIT Biological Engineering (BE)	Laurie Boyer
2021	Advait Athreya	MIT Computational and Systems Biology (CSB)	Bin Zhang

PROFESSIONAL ACTIVITIES

Peer Review: *Science, eLife, Nature, Cell, Nature Genetics, Science Advances, Molecular Cell, PNAS, Nature Methods, Nature Cell Biology, Nature Structural and Molecular Biology, Nature Chemical Biology, PLOS Genetics, PLOS Computational Biology, Nucleus, Trends in Cell Biology, Cell Cycle, Nature Communications, Biophysical Journal, Annals of Applied Statistics, Nature Reviews Genetics, Genome Biology, Nucleic Acids Research, Journal of Molecular Biology, Biochemical Society Transactions, Gene, EMBO Reports, BMC Genomics, Current Opinion in Systems Biology, Cell Reports, Epigenetics and Chromatin, Current Opinion in Genetics and Development, Genome Research, DNA Repair.*

Grant Review: National Science Foundation (NSF), Mathers Foundation, Vienna BioCenter Fellowships, Vidi-NWO Dutch Research Council, Wellcome Trust UK, Koch Institute at MIT.

GRANTS AND FUNDING

U.S. Army Research Office, Institute for Collaborative Biotechnologies, PI, W911NF-19-2-0026	2023-2025
MIT Research Support Committee, Westaway Research Fund, PI	2023-2024
Koch Institute for Integrative Cancer Research, Frontier Award, PI	2023-2024
Broad Institute Gene Regulation Observatory, co-PI (w. Melina Claussnitzer)	2022-2023
Broad Institute Gene Regulation Observatory, co-PI (w. Vijay Sankaran)	2022-2023
Koch Institute for Integrative Cancer Research, Frontier Award, PI	2021-2022
Mathers Foundation, PI	2021-2024
Pew-Stewart Scholars for Cancer Research, PI	2021-2025
NSF MCB/BIO Genetic Mechanisms research grant, PI, MCB-2036037	2021-2024
NIH/NCI Innovate Molecular Analysis Technologies (IMAT), PI, R33CA257878	2021-2024
Broad Institute Gene Regulation Observatory, co-PI (w. Abudayyeh-Gootenberg)	2020-2021
Broad Institute Gene Regulation Observatory, co-PI (w. Fei Chen)	2020-2021
Broad Institute Gene Regulation Observatory, co-PI (w. Fei Chen)	2020-2021
Broad Institute Gene Regulation Observatory, co-PI (w. Brad Bernstein)	2020-2021
NIH 4DN Nucleome Center for 3D Structure and Physics of the Genome, sub-PI, UM1HG011536	2020-2025
MIT Research Support Committee, Solomon Buchsbaum Research Fund, PI	2020-2021
NIH/OD NIH Director's New Innovator Award, PI, DP2GM140938	2020-2025
NIH/NIGMS K99/R00 Pathway to Independence, PI, R00GM130896	2019-2023