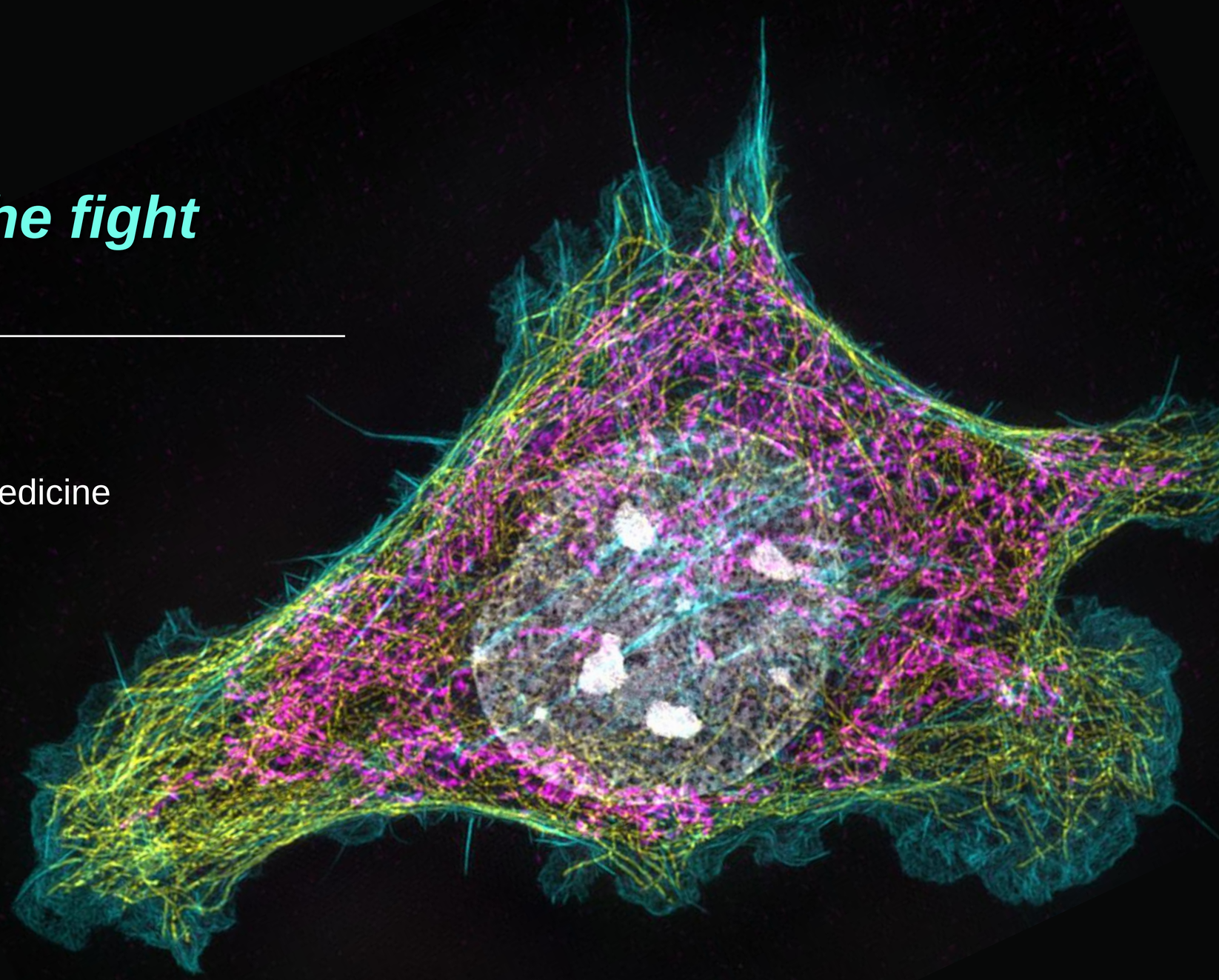
New technologies in the fight against cancer

Associate Professor Dr Fena Ochs

Department of Cellular and Molecular Medicine
University of Copenhagen



KØBENHAVNS UNIVERSITET

ochs laboratory
SEEING IS BELIEVING

My background: cancer biology & technology development

2013-2014

Master Student
Rockefeller University
Professor Titia de Lange

2014-2019

PhD Fellow
University of Copenhagen
Professor Jiri Lukas

2019-2023

Postdoctoral Fellow
University of Oxford
Professor Kim Nasmyth

2023 August

Associate Professor
Principal Investigator
University of Copenhagen

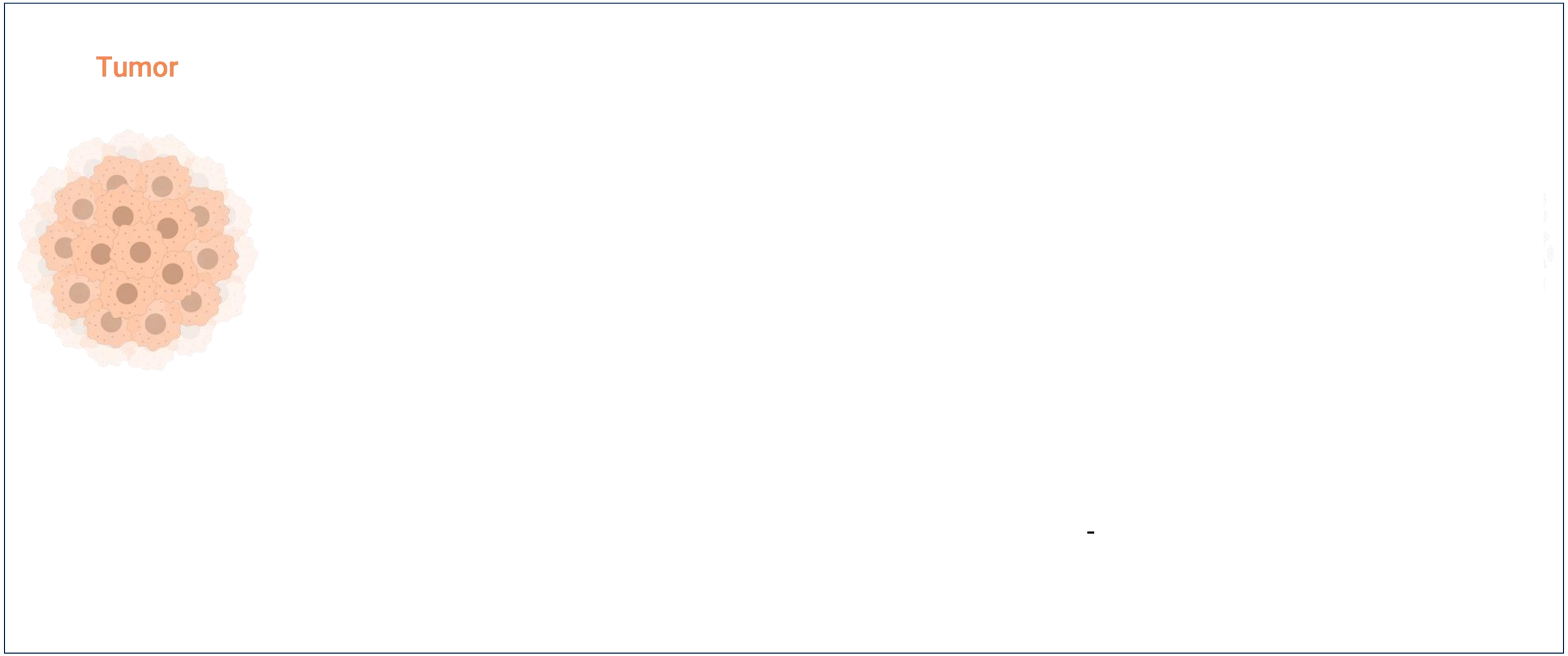
Our vision: technology-driven cancer research towards new treatments

The problem: resistance to cancer treatment

A person goes ice bathing: at first a shock, but the body adapts.

Our vision: technology-driven cancer research towards new treatments

The problem: resistance to cancer treatment

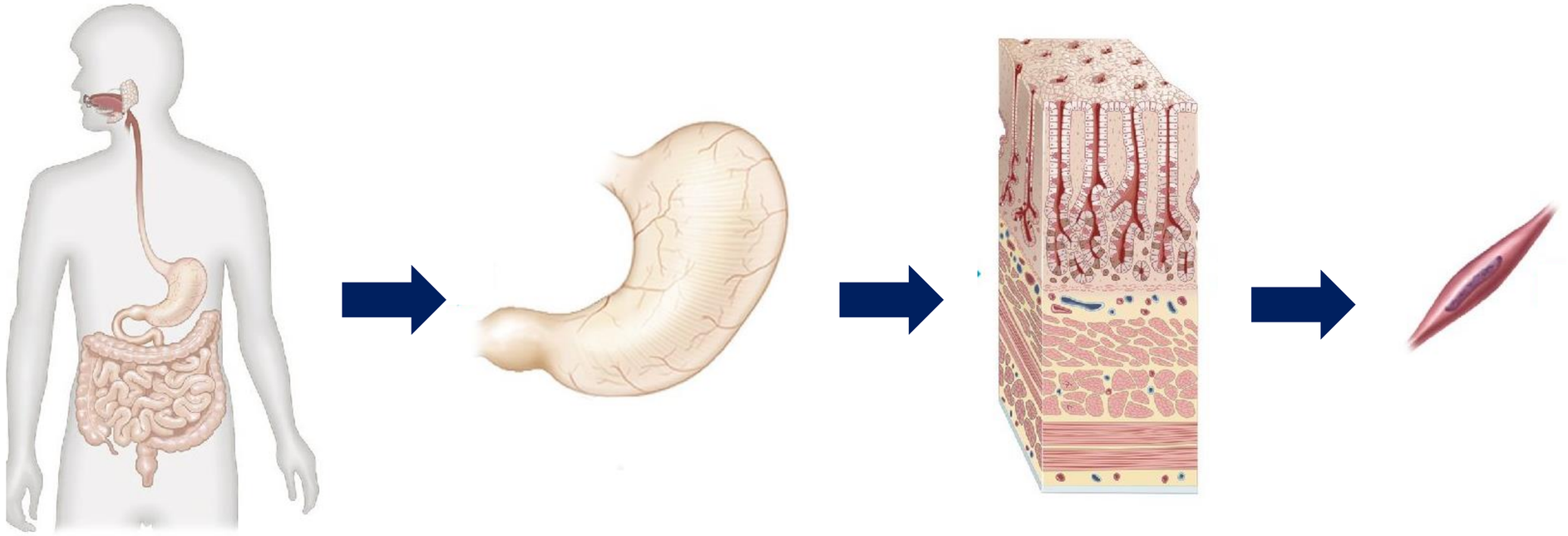


The solution: Super-resolution microscopy to investigate why drug resistance develops.

Our vision: technology-driven cancer research towards new treatments

The technology: Super-resolution microscopy

Cancer resistance starts in a single human cell



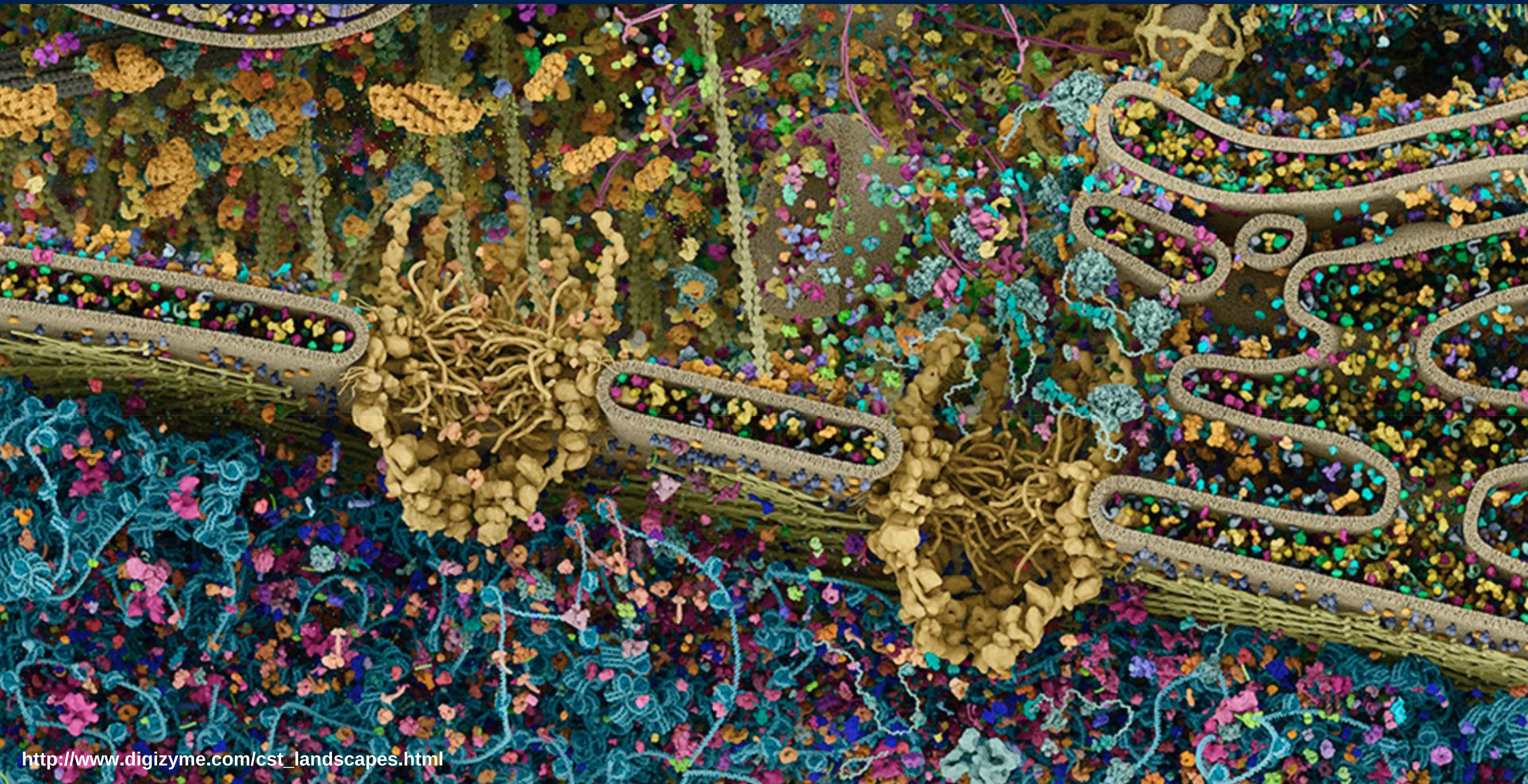
Human Organ Tissue Cell

Drug resistance: A cancer cell survives drug treatment.

The reason: Changes inside the cell.

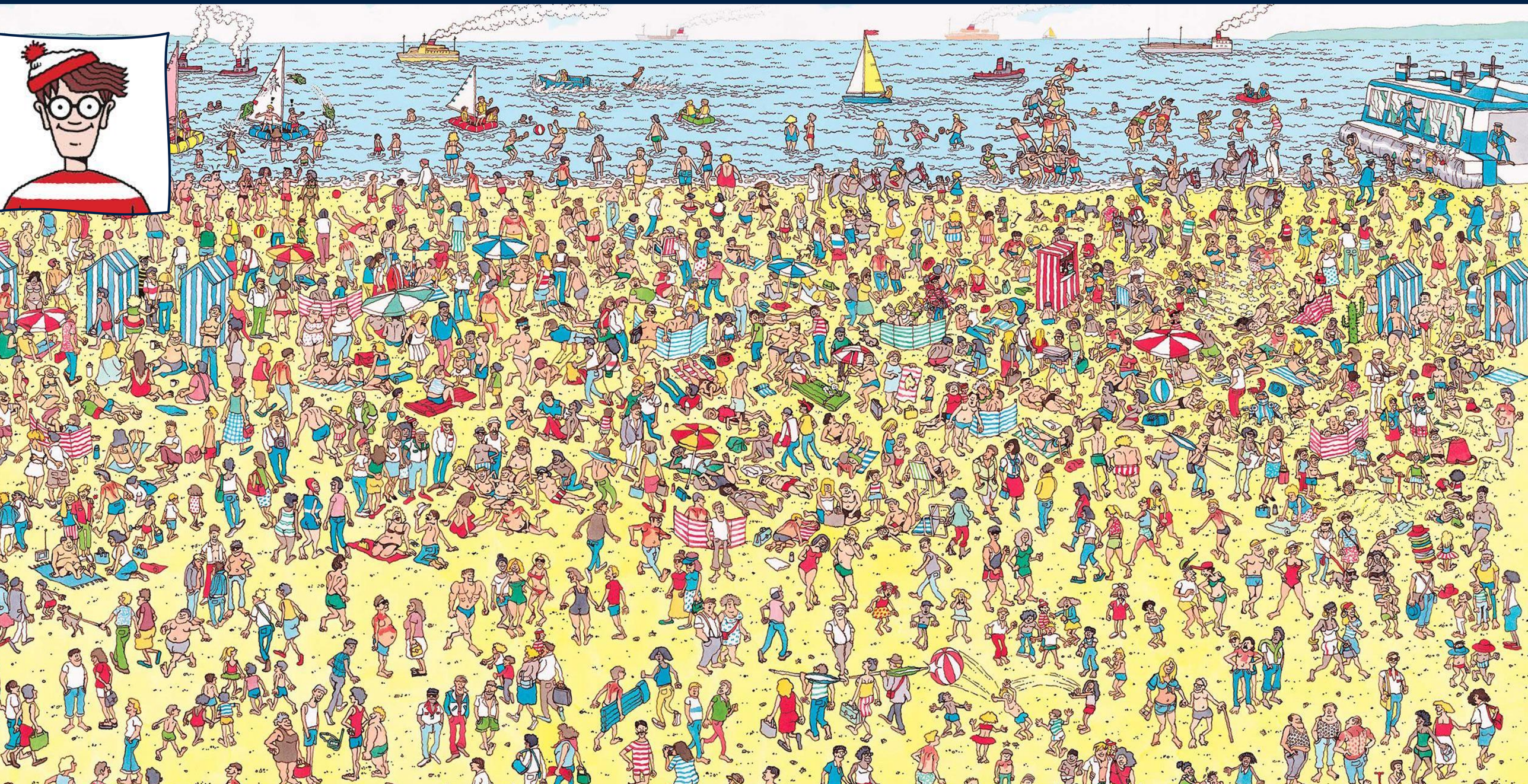
Challenge: Visualise the small changes that make a cancer cell unresponsive to treatment.

Our cells are crowded environments limiting detailed studies



http://www.digizyme.com/cst_landscapes.html

How can super-resolution microscopy benefit cancer research?



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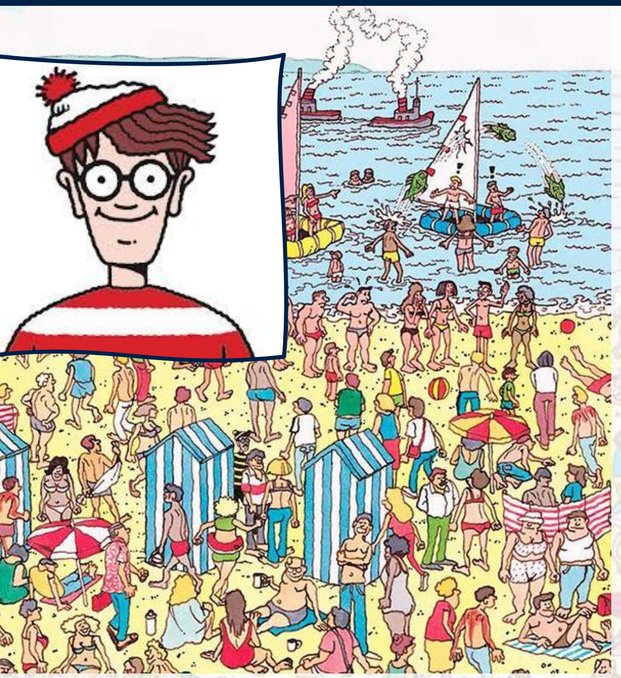

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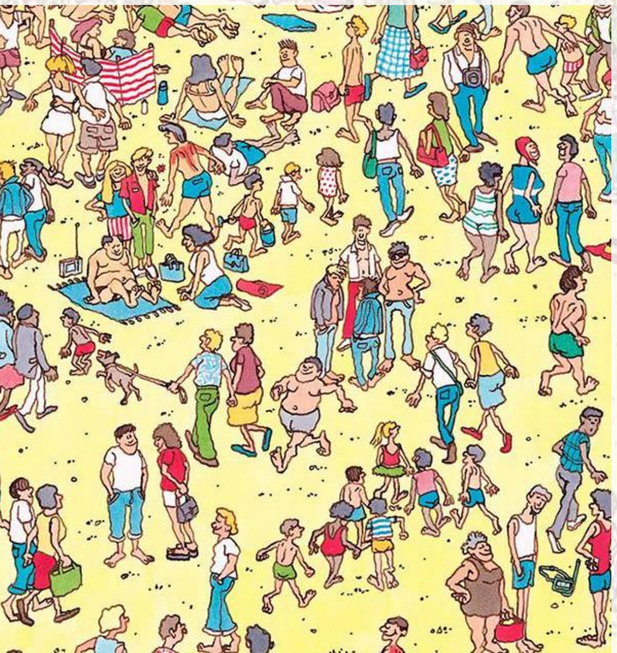

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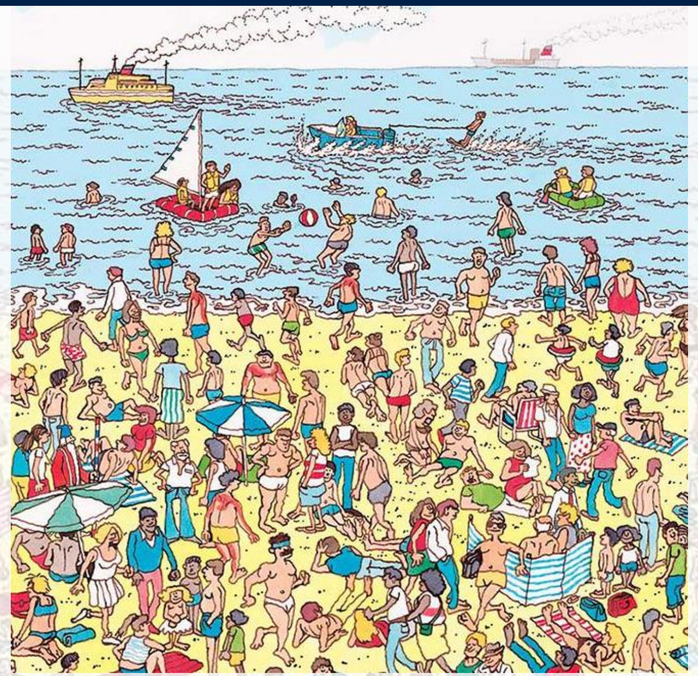

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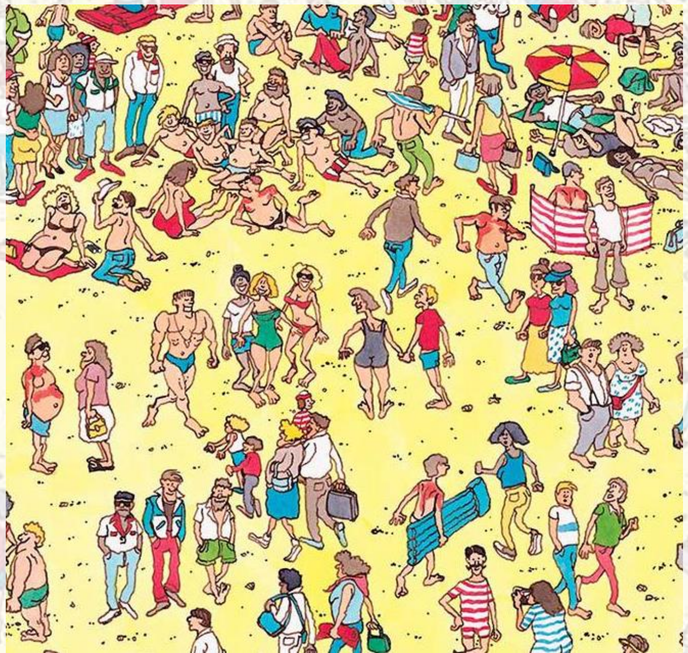

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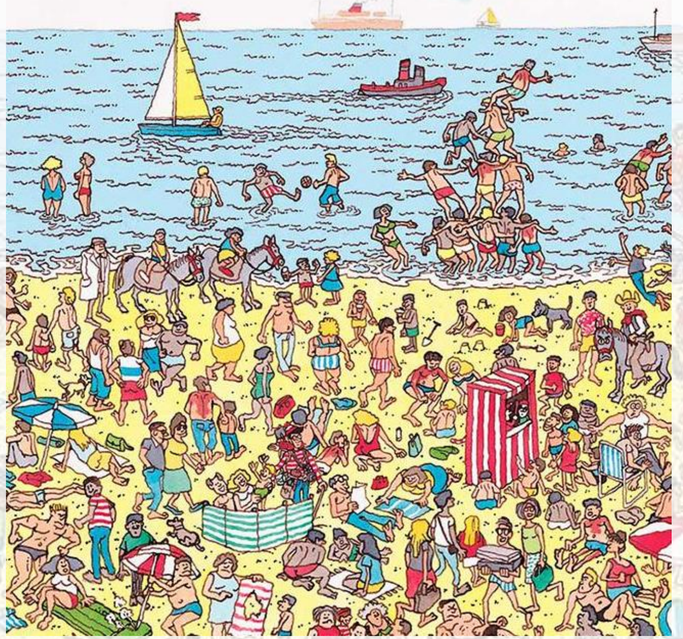
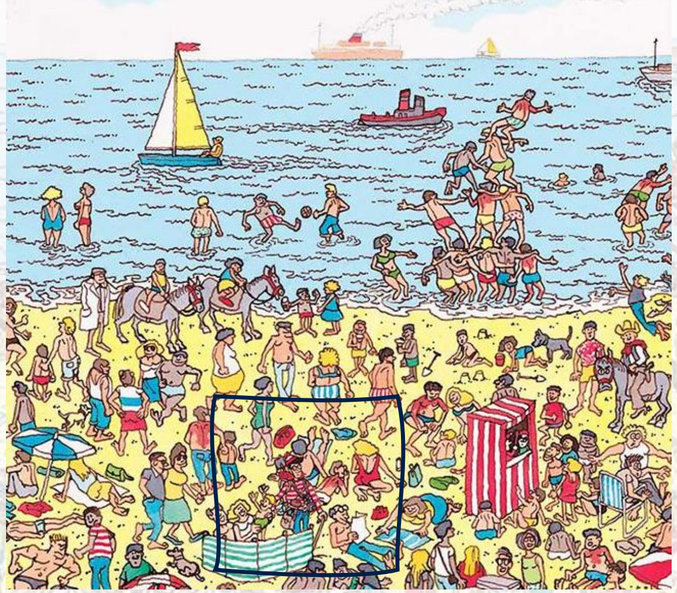
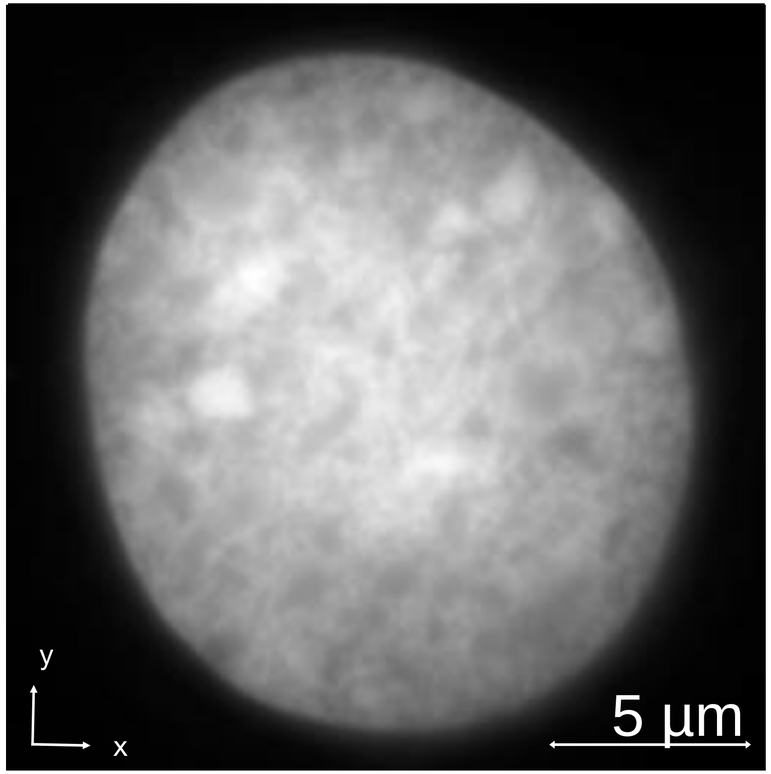


How can super-resolution microscopy benefit cancer research?

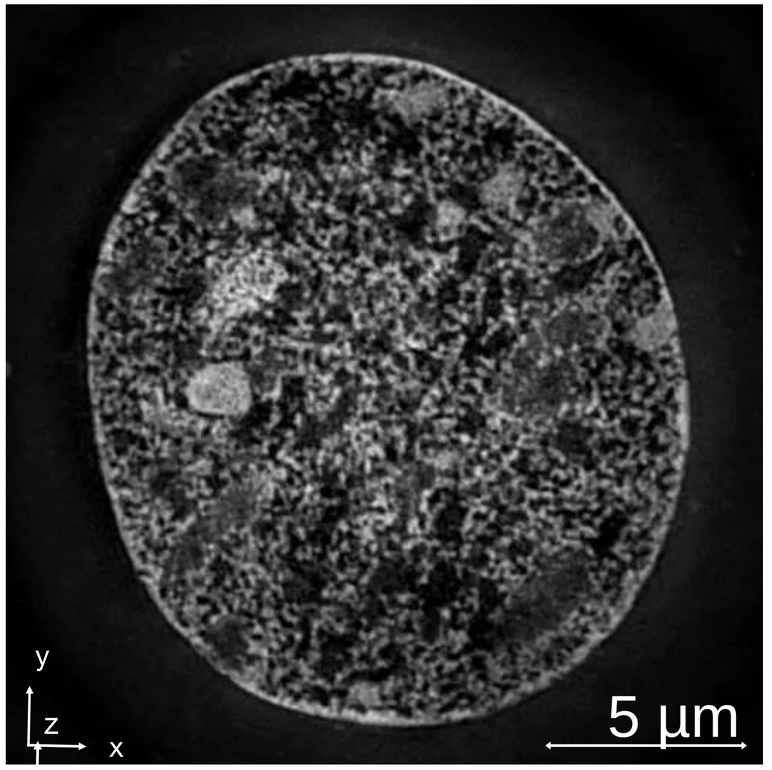


Live-3D-SIM: cutting-edge microscopy technology enables unprecedented research

Conventional microscopy



3D-SIM



Super-resolution microscopy allows detailed insights into resistance mechanisms.

Live-3D-SIM: cutting-edge microscopy technology enables unprecedented research

X-INACTIVATION

Time-resolved structured illumination microscopy reveals key principles of Xist RNA spreading

Lisa Rodermund, Heather Coker, Roel Oldenkamp†, Guifeng Wei, Joseph Bowness, Bramman Rajkumar, Tatyar

JCB: Article

Dynein light chain 1 and a spindle-associated adaptor promote dynein asymmetry and spindle orientation

ija K. Dunsch [1] Dean Hammond [2] Jennifer Lloyd [2] Lothar Schermelleh [1] Ulrike Gruneberg [1] and Francis A. Barr[1]

LETTER

RecA bundles mediate distant sisters during I

Christian Lesterlin[1], Graeme Ball[1], Lothar Schermelleh[1] & David J. Sherratt

Science

Sister chromatid cohesion is mediated by individual cohesin complexes

FENA OCHS, CHARLOTTE GREEN, ALEKSANDER TOMASZ SZCZUREK, LIOR PYTOWSKI, SOFIA KOLESNIKOVA, JILL BROWN, DANIEL WOLFRAM GERLICH, VERONICA BUCKLE, LOTHAR SCHERMELLEH, AND KIM ASHLEY NASMYTH Authors Info & Affiliations

nature

Stabilization of chromatin topology safeguards genome integrity

Fena Ochs, Gopal Karemore, Ezequiel Miron, Jill Brown, Hana Sedlackova, Maj-Britt Rask, Marko Lampe, Veronica Buckle, Lothar Schermelleh, Jiri Lukas & Claudia Lukas

II during ts SMC2-

mim[3,4,5], Jonathan Godwin[1], nan Aiden[3,5], asmyth[1]*

The SET1 Complex Selects Actively Transcribed Target Genes via Multivalent Interaction with CpG Island Chromatin

David A. Brown,[1,5] Vincenzo Di Cerbo,[1,5] Angelika Feldmann,[1] Jaewoo Ahn,[3] Shinsuke Ito,[2] Neil P. Bla
Manabu Nakayama,[2] Michael McClellan,[4] Emilia Dimitrova,[1] Anne H. Turberfield,[1] Hannah K. Long,[1] H
Skirmantas Kriaucionis,[4] Lothar Schermelleh,[1] Tatiana G. Kutateladze,[3] Haruhiko Koseki,[2] and Robert

Spatial separation of Xist RNA and polycomb proteins revealed by superresolution microscopy

Andrea Cerase[a], Daniel Smeets[a,1], Y. Amy Tang[b,2], Michal Gdula[c], Felix Kraus[d], Mikhail Spivakov[b,3], Benoit Moindrot[a], Marion Leleu[b,4], Anna Tattermusch[a], Justin Demmerle[a], Tatyana B. Nesterova[a], Catherine Green[c], Arie P. Otte[e], Lothar Schermelleh[a], and Neil Brockdorff[a,5]

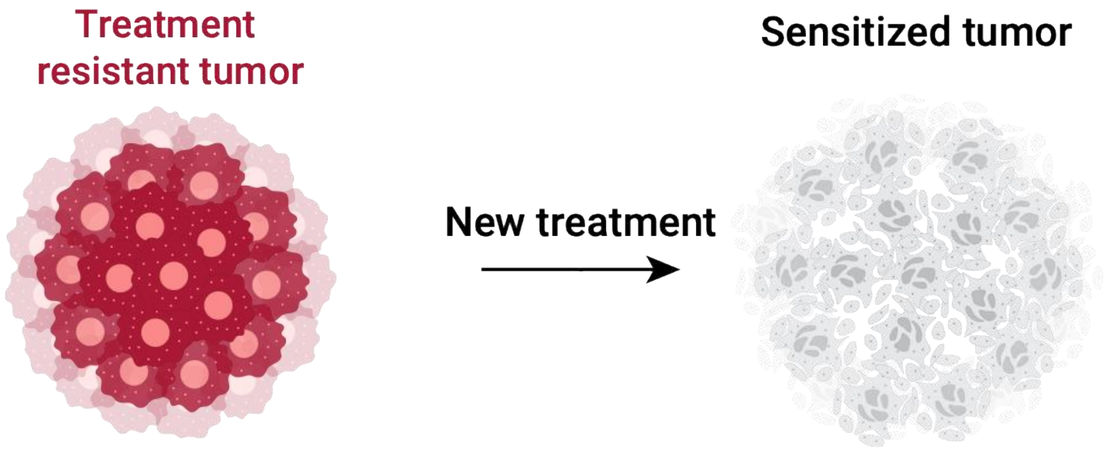
New hope: overcoming treatment resistance through technological advancement

Targeting DNA repair pathways

Restored DNA repair causes drug resistance.

→ Discover the mechanism of restored DNA repair.

→ Identify new drug targets → Resensitise and kill cancer cells.



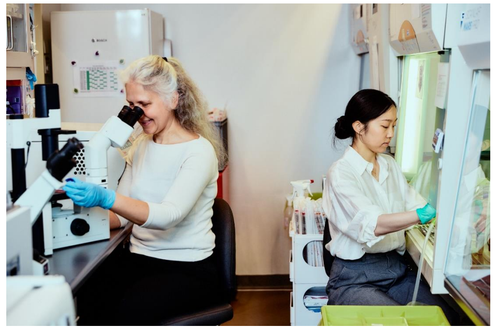
From insight to impact

Our academic discoveries will pave the way for new therapies that can improve survival and quality of life.

→ Applicable for many cancer types
→ Expanded to scientists and clinicians around Denmark.

Hope through innovation: every breakthrough brings us closer to curing cancer.

Thank you!



UNIVERSITY OF COPENHAGEN

DANMARKS FRIE FORSKNINGSFOND
INDEPENDENT RESEARCH FUND DENMARK

Danish Cancer Society

novo nordisk foundation

Thank you to all mentors, colleagues, funders, family and friends for their support. Thank you for the nomination and for your attention.