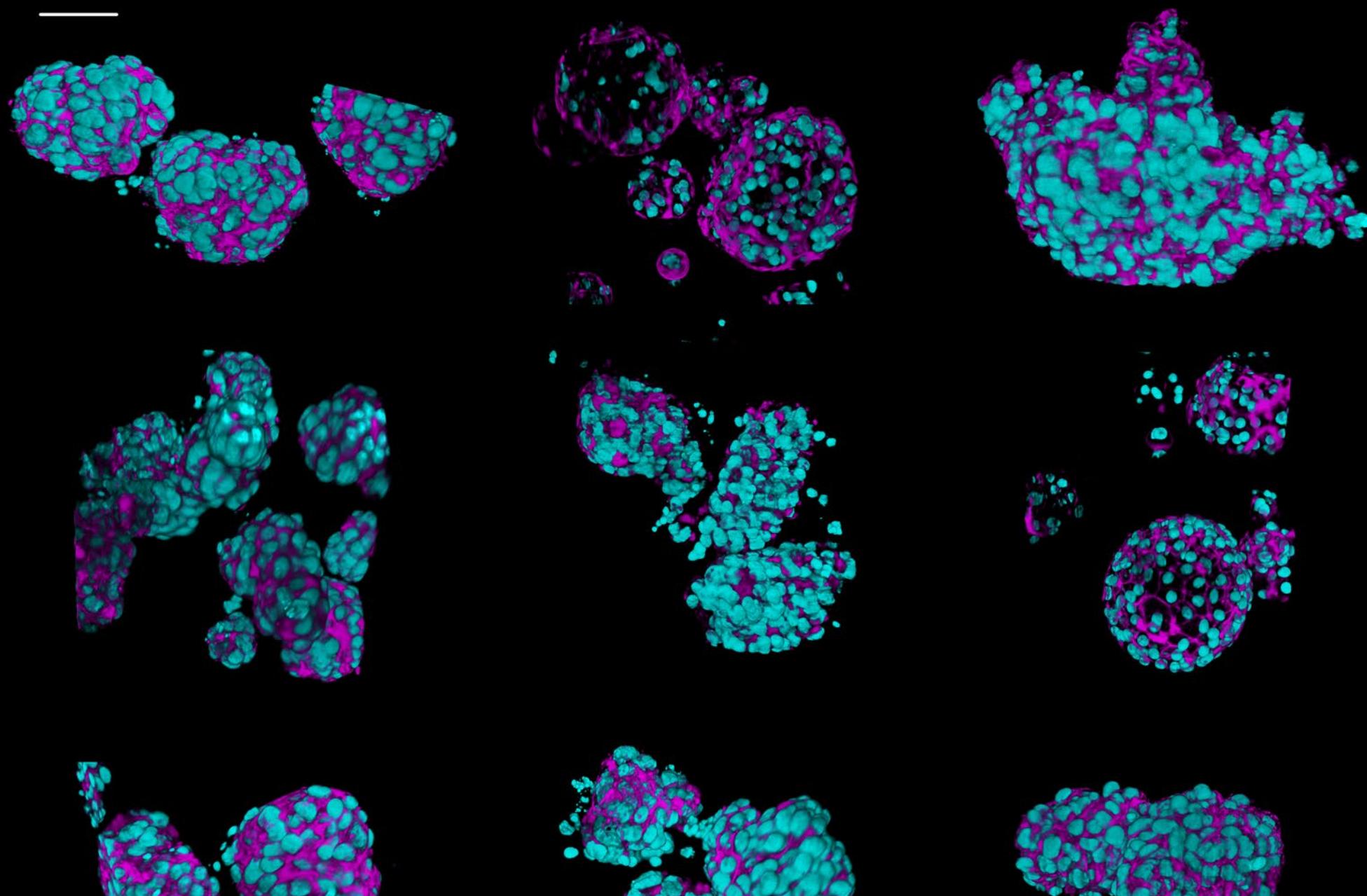


TECHNOLOGY SHOWCASE · AUGUST 2026

Human-relevant models, brought into focus

How patient-derived organoids and advanced imaging are
reshaping the earliest stages of drug discovery.



In Partnership with



Featuring
presentations from



Cover Image: Fixed patient-derived
neuroendocrine tumor organoids labelled
with DAPI (cyan) and phalloidin (magenta),
imaged using Viventis SCAPE; scale bar 50 μ m.
Courtesy of Marina Cuenca and Heleen
Jungen (Dayton lab), EMBL Barcelona.



INTRODUCTION

Bringing a new drug to patients can take a decade — and roughly three in four discovery programmes still fail, most often because the biological target was never the right one.

That translation gap, from what works in a dish to what works in a patient, is pushing drug discovery toward more human-relevant models. Patient-derived organoids sit at the centre of that shift: three-dimensional mini-tissues grown directly from a patient's own cells that hold on to much of the genetics, architecture and behaviour of the tissue they came from.

But models are only as useful as our ability to read them. Organoids are fragile, highly variable, difficult to image and slow to grow — and studying them at the scale drug discovery demands has, until recently, been the bottleneck.

MEET THE SPEAKERS

This Technology Showcase brought together three perspectives on closing that gap: a drug-discovery scientist putting organoids to work against real targets, a cell-modelling specialist scaling the hardest models to production, and an imaging specialist mapping the technology that makes organoids visible.



LUIGI ALOIA

Associate Director, Functional Genomics & Discovery Sciences, AstraZeneca



MARYNA PANAMAROVA

Cellular Modelling Specialist, Cellular Operations, Wellcome Sanger Institute



ANDREA BONI

Market Segment Director, Human-Relevant Models, Leica Microsystems

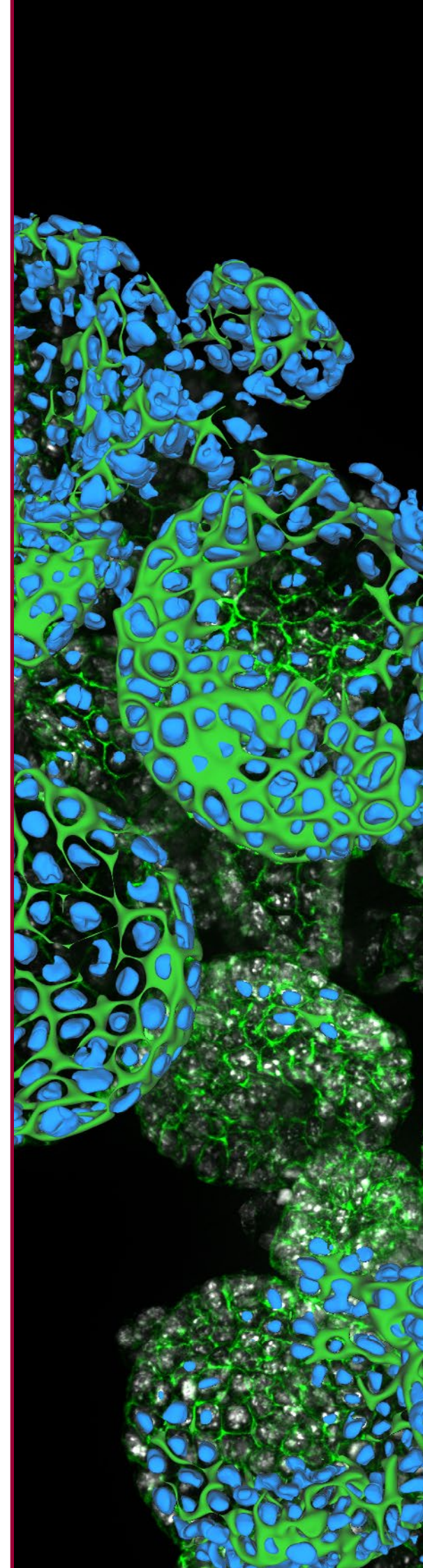
PRESENTED BY



PAUL MCCORMICK

Advanced Workflow Manager, Leica Microsystems

Organoid cluster labelled for nuclei (DAPI, blue) and plasma membrane (GFP, green). Thickness 100 μm . 469 Z planes were acquired using THUNDER Imager Cell.
Courtesy of M.Sc. Dana Krauß, Medical University of Vienna, Austria.



WHAT'S INSIDE?

01.	Presentation: From biopsy to target	AstraZeneca
02.	Presentation: Scaling the unscalable	Sanger Institute
03.	Presentation: One workflow, every scale	Leica Microsystems
04.	Panel Discussion: Adoption, imaging & AI	All speakers

THE TECHNOLOGY SHOWCASE IN NUMBERS

~10yrs

from target discovery to a drug on the shelf

3 out of 4

discovery campaigns fail — lack of efficacy leads

50–70

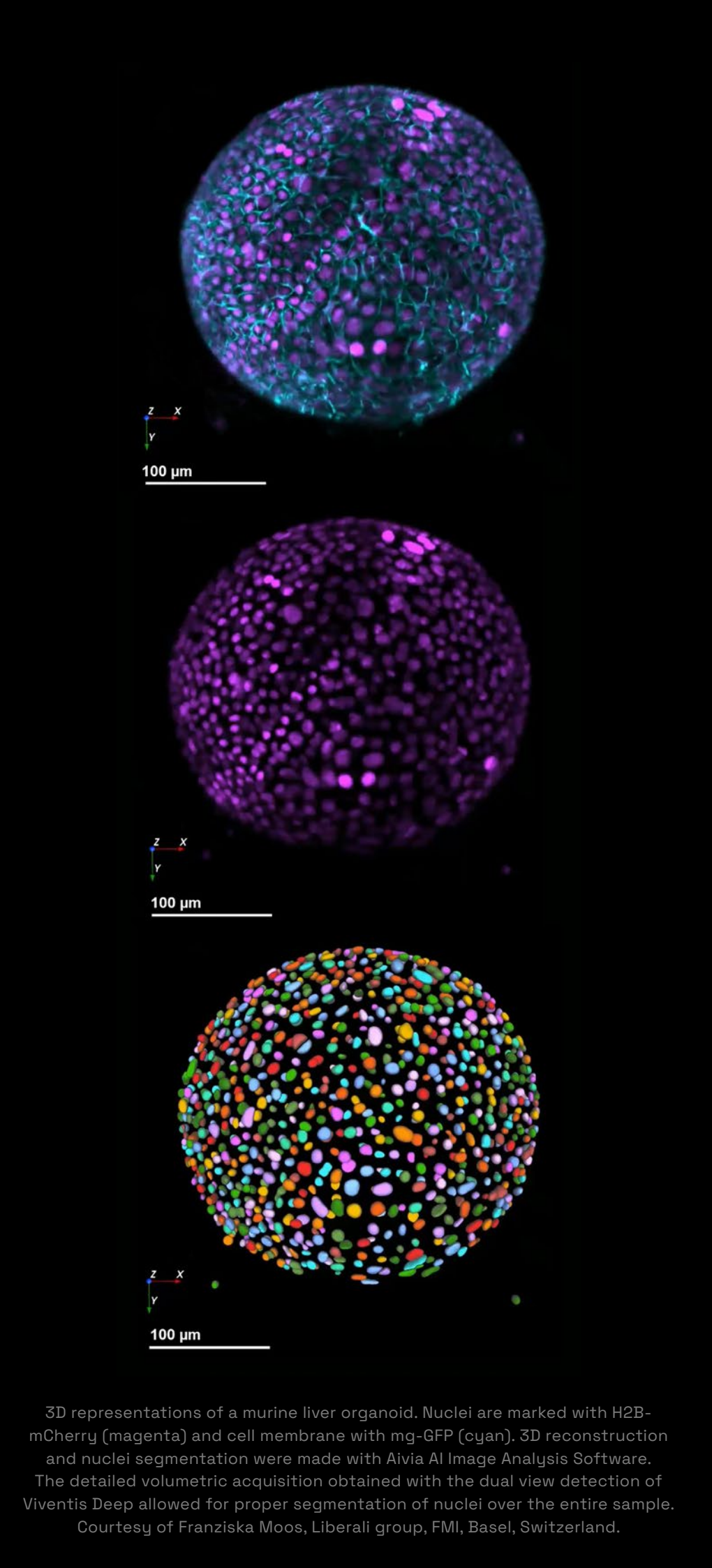
organoids imaged per well in a single microcavity plate

3x

efficacy signal surfaced in the KRAS combination case

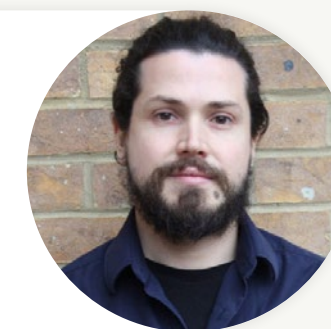
5 months

for skin-organoid production, now streamlined by automation



From the right target to therapeutic impact

LUIGI ALOIA, Associate Director, Functional Genomics & Discovery Sciences, AstraZeneca



Target discovery is the moment everything downstream depends on: pick the wrong target, and years of work follow it off a cliff.

The leading reason programmes fail isn't hitting the wrong molecule — teams are good at engaging their intended gene or protein — it's that the target turns out not to matter for the disease. What holds up in a conventional preclinical model too often fails to translate into patients.

Patient-derived organoids narrow that gap. Grown straight from a biopsy without immortalisation or reprogramming, they retain much of a patient's genetic and epigenetic profile and their tissue's 3D architecture — while remaining, deliberately, a simplified model of the epithelium rather than a whole organ. Two problems have historically made them hard to use at scale: they're scattered through

matrix domes that are slow to image, and they vary widely between and within donors.

The answer of the organoid platform led by Luigi was to move organoids into **microcavity multi-well plates** — 50 to 70 tiny cavities per well, each holding a single organoid on roughly the same focal plane. Imaging becomes fast, and a triplicate yields 150+ individual data points instead of three, turning donor variability from a liability into statistical power. Layered on top: CRISPR knockouts combined with drugs to probe what drives sensitivity or resistance, and **AI-analysed live imaging** that classifies each organoid as alive or dead and builds heat maps to focus deeper analysis only where it counts.

The payoff showed up in a **KRAS** case. KRAS-mutant cancers now have targeted inhibitors in

“The molecules we advance usually hit the right protein. Too often it just isn't the right protein for the disease.”

- Luigi Aloia

the clinic, but resistance emerges fast — so the team ran CRISPR screens to find combination partners, validated a candidate in organoids, and tracked the response over an extended assay only organoids make possible. AI imaging revealed that under standard-of-care combinations 60% of the organoids were still alive, versus roughly 20% under the new combination — a threefold efficacy signal, and the confidence to progress the molecule.

KEY TAKEAWAYS

1

Most discovery failures trace back to the target, not the molecule — which is why disease-relevant models matter so early.

2

Microcavity plates convert organoid variability into statistical power: dozens of data points per well, all on one focal plane.

3

Pairing CRISPR knockouts with drugs turns organoids into a system for finding combination partners, not just testing single agents.

4

AI-driven analysis of live imaging enables the use of translatable models at scale to reveal efficacy difference.

Scaling the unscalable

MARYNA PANAMAROVA, Cellular Modelling Specialist, Cellular Operations, Wellcome Sanger Institute



The last fifteen years have produced an explosion of complex cell models — patient- and iPSC-derived organoids, co-cultures with immune cells, assembloids, organ-on-chip, 3D bioprinting.

The promise is higher translational value; the persistent limits are scalability and reproducibility. Several practical levers help: shared open resources that let teams benchmark fidelity against reference atlases; a move away from animal-derived reagents toward animal-free matrices and recombinant growth factors; automation across generation, maintenance and downstream steps; and AI to handle the data volumes that organoid studies generate.

The talk's centrepiece was a genuinely hard model: **hair-bearing skin organoids**. Skin is a dozen-plus

cell types across three layers, and iPSC-derived skin organoids can now grow with hair follicles, a fat layer and rudimentary innervation. Single-cell work showed their cell populations are remarkably well conserved against prenatal skin — with two exceptions: endothelial and immune cells, particularly macrophages, are sharply reduced. Reintroducing macrophages early in differentiation produced markedly more organised vasculature — a finding worth studying properly, which meant scaling production dramatically.

Scaling ran into physical problems. These organoids grow one-per-well in suspension in 24-well plates, sitting unpredictably within each well — easy to damage or aspirate, and awkward for standard automation. The team's fix was elegantly simple: a bespoke 3D-printed holder that **tilts the plate** so organoids settle in one spot, paired with an

“The model takes up to five months and constant media changes. Nothing about that says “scale” — until you engineer it to.”

– Maryna Panamarova

adjustable-spacing pipette, enabling automated row-by-row media changes across up to 40 plates an hour. They added an **early go/no-go checkpoint** — imaging embryoid-body size the day after seeding, since it predicts successful differentiation — and an automated imaging system doing full-vessel scans with stitching, robotic plate handling and automated analytics, generating the clean, high-volume data needed to train QC and prediction models.

KEY TAKEAWAYS

1

Reproducibility starts upstream: open reference atlases and animal-free reagents remove hidden sources of variability.

2

The hardest scaling problems are often physical — a tilted, 3D-printed plate holder unlocked automation others couldn't.

3

An early, imaging-based go/no-go checkpoint saves months of investment in batches that won't differentiate.

4

Automated, consistent imaging isn't just monitoring — it's what makes machine-learning QC possible at all.

One workflow, every scale

ANDREA BONI, Market Segment Director, Human-Relevant Models,
Leica Microsystems



As biological relevance climbs — from spheroids to organoids to assembloids and co-cultures — imaging complexity climbs with it.

The recurring challenges are consistent: light-scattering and limited penetration in samples hundreds of microns deep; phototoxicity over long developmental windows; the imaging speed fast dynamics demand; the multiplexing needed for cellular heterogeneity; throughput to capture variability meaningfully; and the sheer data volume 3D imaging generates. The premise of the talk was that no single instrument can address all of these — what **matters is designing a workflow with the right imaging system at each stage, that scales from simple readouts to deeper characterization** as the question demands.

The example workflow shown goes from initial cell culture checks, transitioning to more detailed

3D organoid live imaging and end-point assays, and then finally 2D/3D image analysis to generate quantitative results – all on connected tools. When it comes to detailed 3D organoid imaging, three pillars were discussed. **Throughput imaging** – to work across many organoids at once, using high-speed widefield, spinning disk and lightsheet approaches.

Long-term live and cleared 3D imaging – using next-generation light sheet technologies. And **high-resolution, multimodal imaging** — using confocal, spectral multiplexing, and label-free chemical imaging (CRS) for more depth and detail.

Two use cases stood out: (1) **Single-objective light-sheet imaging with Viventis SCAPE** scans the sheet across samples in standard multi-well plates, making gentle, volumetric imaging suitable for biobank-scale work — a study at EMBL Barcelona

“Don’t over-complicate the assay – but be ready to reach for more information the moment the biology asks for it.”

– Andrea Boni

imaged hundreds of organoids per experiment to separate healthy vs. tumour organoids by morphology (e.g. organised single lumens versus compact, rosette-like structures). And (2) **label-free chemical imaging** via Coherent Raman Scattering (CRS) examines a sample’s protein and lipid composition with no stain at all — resolving, for instance, lipid-rich subpopulations in a pancreatic organoid. For primary organoids that are not suitable for fluorescent labelling, that’s a genuinely different way in.

KEY TAKEAWAYS

1

No single imaging approach answers every need – the goal is a connected workflow that matches resolution and throughput to the question.

2

Single-objective light-sheet bring fast and gentle volumetric imaging to standard plates, making biobank-scale organoid studies practical.

3

Label-free chemical imaging reads protein and lipid composition — without any stain.

4

Metabolic and biosensor readouts could be the next frontier for understanding what’s happening inside a living organoid.

PANEL DISCUSSION

Where the field is heading

Three questions to the full panel:

Adoption | Imaging strategy | The real role of AI

ADOPTION & REGULATION

Uptake of new approach methodologies (NAMs) is clearly rising — driven by the efficacy gap in conventional models, and encouraged by regulators increasingly open to human disease-relevant systems, even where animal data is limited. What the field still needs is **clarity: guidelines, defined contexts of use, and agreed minimum cellular components**. The fastest adoption, the panel noted, has come where three things converged — animal models with poor predictive power, a technology mature enough to make the model tractable, and a societal shift on animal use. Neuroscience and oncology led precisely because iPSC and stem-cell protocols were ready.

DESIGNING AN IMAGING STRATEGY

Resolution and throughput are key factors to balance — more resolution means bigger data, slower acquisition and lower capacity. The discipline is to **start from the scientific question and work backwards** to the resolution and throughput you actually need, rather than defaulting to the most powerful mode available. Favour platforms that move from simple readouts into deeper ones without switching systems — and watch the emerging space of metabolic imaging and biosensors for understanding a living organoid's internal state.

ARTIFICIAL INTELLIGENCE: POWER & CAUTION

AI is already essential simply to analyse the millions of images these studies produce, and it outperforms bulk enzymatic assays at predicting organoid fate. But the panel was pointedly measured: **AI models are only as good as their data and assumptions; they should guide experiments, not replace them**. Generalisation is the trap — an algorithm tuned to one organoid line may fail on another — so human supervision, internal controls and QC of AI outputs are non-negotiable. In silico organoid models may eventually let teams screen less but learn more.



FIVE THINGS TO TAKE AWAY

1

The translation gap is a target problem. Human-relevant models earn their place by getting the biology right before the expensive work begins.

2

Variability is manageable. Confining organoids and imaging them in parallel turns noise into statistical power.

3

Scaling is often an engineering problem, not a biology one — and small, clever fixes unlock automation.

4

Imaging is the connective tissue. From live monitoring to label-free imaging, it's what makes these models legible.

5

AI is indispensable and fallible at once. It scales analysis, but it needs controls, supervision and a healthy scepticism.

CONTINUE THE CONVERSATION

See what advanced imaging can do for your organoid workflow

This session was brought to you in partnership with **Leica Microsystems**, whose imaging ecosystem spans live monitoring, high-throughput light-sheet and label-free chemical imaging for complex 3D models.

If any of the challenges here sound familiar, the team is happy to talk through your workflow.

Explore organoid imaging solutions

Request a conversation

ABOUT THIS SESSION

Oxford Global's R&D Spotlights

R&D Spotlights are digital sessions created to spark thought leadership and connection across the research community — part of Oxford Global's year-round programme.

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View upcoming R&D Spotlights

Watch this session's recording



Leica Microsystems, a Danaher company, has a broad portfolio covering compound microscopy, digital microscopy, confocal laser scanning, super-resolution microscopy, light-sheet imaging and more. Their microscopy-based imaging systems are helping scientists to unlock the full potential of complex human-relevant models such as organoids. They enable high-resolution visualization of cellular organization, dynamic processes, and disease phenotypes in a 3D context – and across multiple scales.

www.leica-microsystems.com

