From Assay to Answer

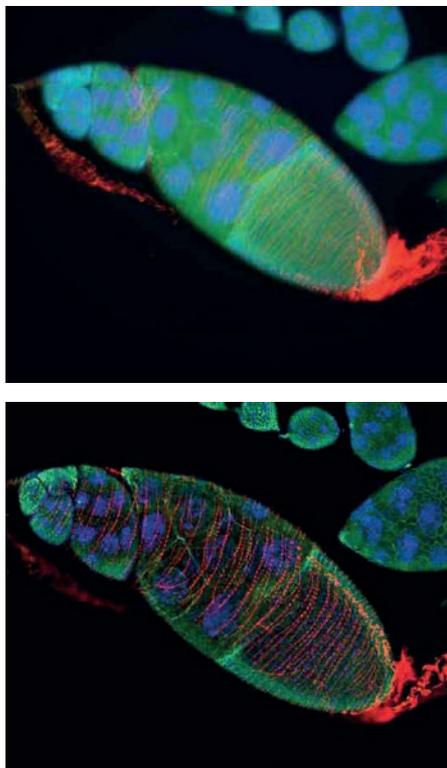## Automated Workflows in High Content Analysis

Fig.1: A single z-slice image of a *Drosophila* ovary acquired in (top) widefield, and (bottom) the same image after 3D deconvolution processing has been applied.

IN Cell Analyzer 2500*HS* is an automated widefield imaging system for HCA.

High throughput technologies for relatively simple liquid handling, environmental control, and other sample treatment procedures have been available for decades. However, when it comes to complex assays, for example the imaging of live cells, flexible and complex procedures are still needed since such workflows are often conducted manually. As a result, errors, inconsistencies, and laborious and expensive workloads result in a limited number and quality of experiments. Therefore, highly automated workflows with extremely high repeatability and reproducibility are needed.

IN Cell Analyzer 2500*HS*

The IN Cell Analyzer 2500*HS* is a widefield cell imaging system, providing fast acquisition times with a bright seven–channel light source, advanced scientific CMOS camera, and precise motorized stage. It enables the acquisition of quantifiable data using advanced flat field tools, image deconvolution, and stable solid-state illumination.
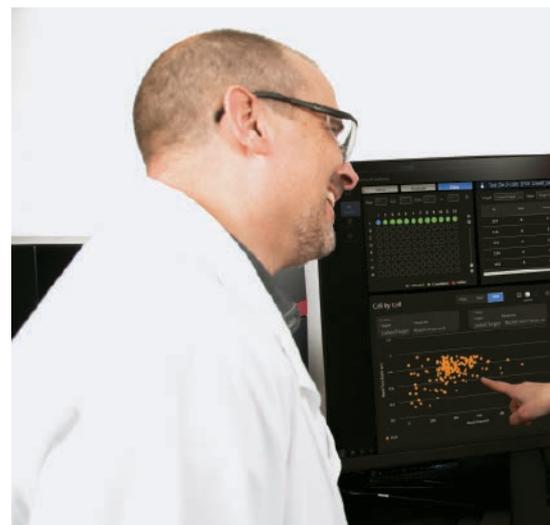
Multiple imaging modes give the flexibility to image samples using a broad range of techniques. The system uses fluorescent illumination in widefield mode and is equipped with transmitted light imaging. Images can be acquired in 2D with fast scan times or when using an objective with a large depth of field. The unique 2.5D mode captures 3D information in a 2D format for use in assays where 3D information is required but maximum speed or minimizing data volume is important. Three-dimensional imaging may also be used by collecting a series of 2D images through the z-axis, enabling visualization of sample volume. Additional options allow for performing time–lapse studies, deconvolution, and maximum intensity projection. Integrated deconvolution tools improve image resolution, contrast, and segmentation of fluorescent images. The standard software includes 2D, advanced 2D, and 2.5D deconvolution modes. An optional 3D deconvolution module is available to maximize resolution and contrast.

IN Cell Analyzer 6500*HS*

IN Cell Analyzer 6500*HS* is a confocal cell imaging system featuring IRIS confocal technology to optimize cellular imaging for all sample types and experimental goals. Fast acquisition times are realized using a four color laser illumination, advanced scientific CMOS camera, and precise motorized stage. The system utilizes laser illumination for fluorescence imaging in either IRIS confocal, widefield (open aperture confocal mode), or EDGE confocal mode and is equipped with transmitted light imaging. Images can be acquired in a single plane (2D), in multiple stacked planes (3D), or as a maximum intensity projection. Time series acquisition in 2D and 3D is also enabled.

IN Cell Analyzers are fully automated laser-based and LED-based high-content imaging systems. Building on the capabilities of earlier systems, they provide a platform to deliver advances in speed, image quality, and throughput. When combined with intuitive workflows provided by new IN Carta analysis software, these systems allow users with all levels of ex-

IN Cell Analyzer 6500*HS* system is an automated confocal imaging system for HCA.
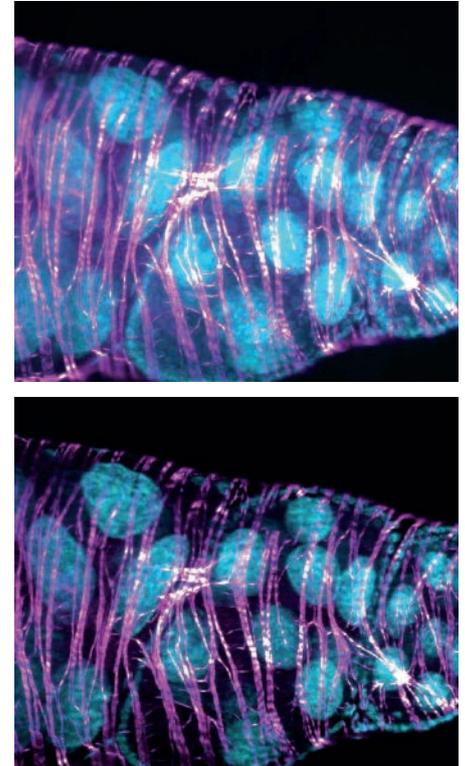

Fig.2: A single z-slice of a *Drosophila* oocyte acquired with (top) IRIS confocal illumination and with (bottom) EDGE confocal enhancement applied. The improvement in image contrast and resolution in the z-dimension (axially) is clearly visible in image B with EDGE enhancement.

perience to perform powerful analysis as part of a complete high content analysis (HCA) solution from assay to answer.

Data can be collected with ease and confidence through flexible protocol design in an intuitive user interface. The system can be individually configured using a range of optional modules to perform fixed or live-cell assays using multi-well plates, culture dishes, glass slides, or chambered cover glass.

Even the most delicate live-cell assays are imaged without sacrificing physiological relevance or image quality. Details in cellular and subcellular structures down to 300 nm for high quality images can be resolved. High throughput assays can be designed utilizing the large field–of–view sCMOS camera and numerous automation options to image hundreds of plates per day.

3D Imaging

Three-dimensional models, such as spheroids, organoids, and 3D cell cultures are becoming essential due to the biologically relevant data and context they provide. The IN Cell analyzers offer several tools to make volumetric data acquisition easy. Z-stack parameters can be defined graphically using 3D frames to ensure all relevant volumetric data is captured. The SmartScan toolkit including Spheroid Finder, an automated target finding workflow, can be utilized to optimize data collection and minimize data volume. When 3D information is required, but localization is not, the Maximum Intensity Projection imaging modes to collect 3D information in a single 2D image can be used. The highly optimized optical system reduces exposure times and maximizes speed while delivering publication quality images from a wide range of sample types.

IN Carta Image Analysis Software

The intuitive design makes complex analysis accessible with minimal training. The software enables shorter analysis times with multi-well parallel processing. Using interactive data visualization and classification tools, results — from populations to single cells — can be seen quickly. Traditional High Content Analysis relies heavily on the user to devise an analysis

strategy for identifying phenotypic subpopulations. Manually choosing measurements and setting thresholds that are phenotypically selective is tedious, sensitive to user bias, and is often poor at differentiating subtle phenotypic differences. The Phenoglyphs software module automates and simplifies this complex process with the use of machine learning.

If you are interested in a demonstration of the Phenoglyphs software module, e-mail to:contact.cells@ge.com

IN Carta with Phenoglyphs-Module
Demo: contact.cells@ge.com
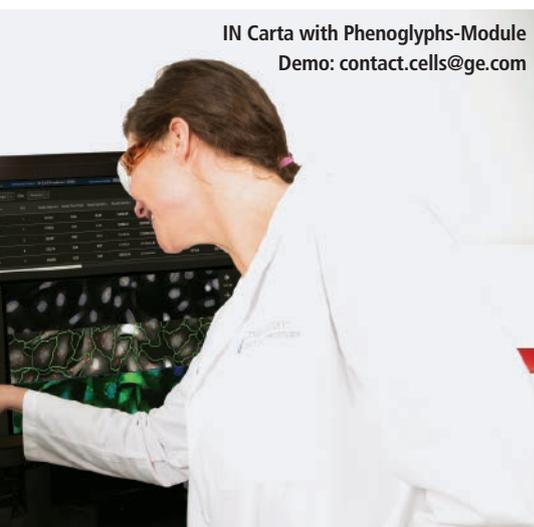
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