

# Agilent BioTek Cytation 1 Cell Imaging Multimode Reader

The affordable imaging reader that delivers uncompromising performance



10  
Years

**Agilent BioTek**  
Celebrating a decade of  
Imaging & Microscopy

# Agilent BioTek Cytation 1 Cell Imaging Multimode Reader

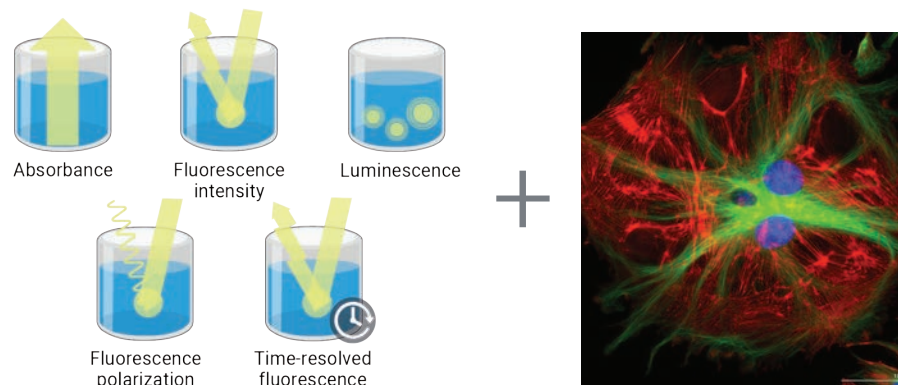


The Agilent BioTek Cytation 1 cell imaging multimode reader combines automated digital microscopy and conventional microplate detection in a configurable, upgradable platform. This proprietary design, along with Agilent BioTek Gen5 microplate reader and imager software, enables automated workflows across a vast range of biochemical and imaging applications.



Cytation 1 shown with CO<sub>2</sub>/O<sub>2</sub> gas controller and dual-reagent injector.

## Multimode plate reader with sophisticated imaging



Cytation 1 extends the legacy of the BioTek multimode plate readers with a modular and upgradable imaging mode. Imaging opens up a range of applications for cell-based assays that cannot be performed on a standard plate reader. Information on cell morphology, localization of signal, cell count, and more is obtained using the Cytation 1 imaging mode.

**Plate reading:** absorbance, fluorescence; luminescence; advanced read modes.

**Imaging:** fluorescence; high-contrast brightfield.

*"The Cytation has been a wonderful addition to our lab. It allows us to generate a lot of data in a short amount of time. We are constantly adding new assays based on the Cytation's capabilities."*

– **Jill Schriever,**  
MilliporeSigma

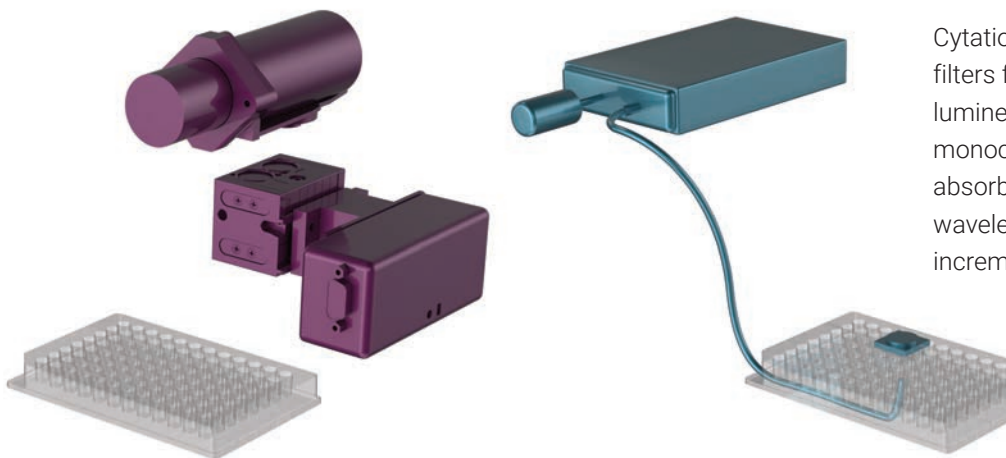
- 3D cell culture
- Nucleic acid quantification
- Live cell imaging
- Biochemical assays
- Label-free cell counting
- Histology
- Calcium flux
- Apoptosis and necrosis
- Cell migration and invasion
- Cell proliferation
- Cell viability and toxicity
- Confluence
- Phenotypic assays
- Stem cell differentiation
- Transfection efficiency
- Whole-organism imaging
- Normalization
- Phagocytosis
- Signal transduction
- Translocation
- Fast kinetics
- Genotoxicity
- Immunofluorescence
- Microbiology

### Ready for any assay

With its combination of plate reader and advanced microscopy modes, Cytation 1 is truly ready for any assay. Contact us to learn how Cytation 1 can transform your lab and greatly increase your productivity.

### High-performance multimode detection

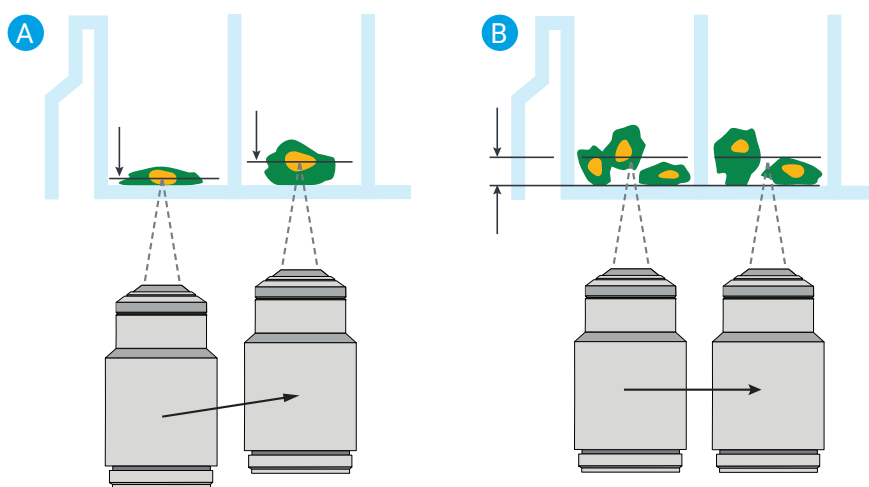
Cytation 1 contains high-performance filters for fluorescence and luminescence detection (left), and monochromator-based UV-Vis absorbance (right) for convenient wavelength selection in 1 nm increments.





### Microvolume analysis with the Take3 microvolume plate

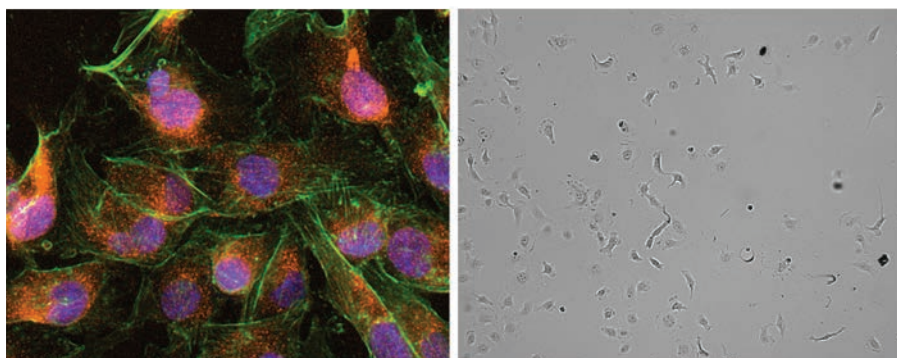
Enable microvolume analysis with the Cytation 1, using the Agilent BioTek Take3 microvolume plate. Measure up to 16 or 48 samples in one run and save time compared to single-sample devices. Gen5 microplate reader and imager software has customizable protocols for ssDNA, dsDNA, RNA, and protein quantification in 2  $\mu$ L.



### Laser and image autofocus

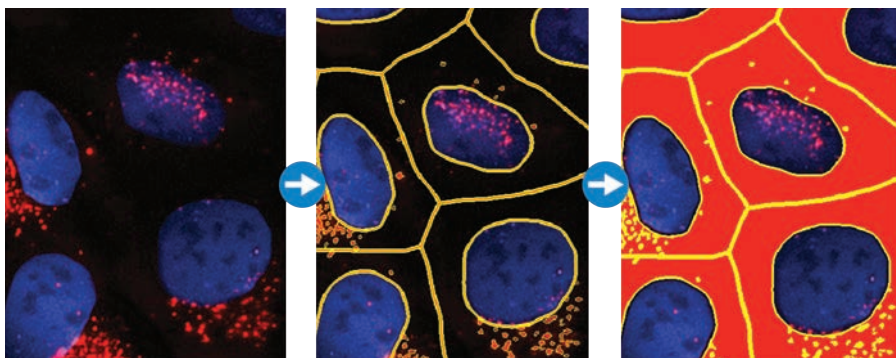
**A.** Image-based autofocus is available on all Agilent BioTek imaging systems. It focuses on the plane of highest contrast in the sample, including “shifting” biology within the well.

**B.** The Agilent BioTek proprietary autofocus method uses the same focal offset from a laser identified interface unique to each well or area to be imaged. It is typically faster, works with dim fluorophores, and helps prevent phototoxicity and photobleaching. Laser autofocus also offers better reproducibility and higher accuracy during long-term kinetic imaging.



### Fluorescence and high-contrast brightfield imaging

The powerful imaging module in Cytation 1 offers more than 20 fluorescence imaging filter/LED combinations, in addition to high-contrast brightfield. Objectives range from 1.25x to 60x to capture large regions of interest or intracellular details.

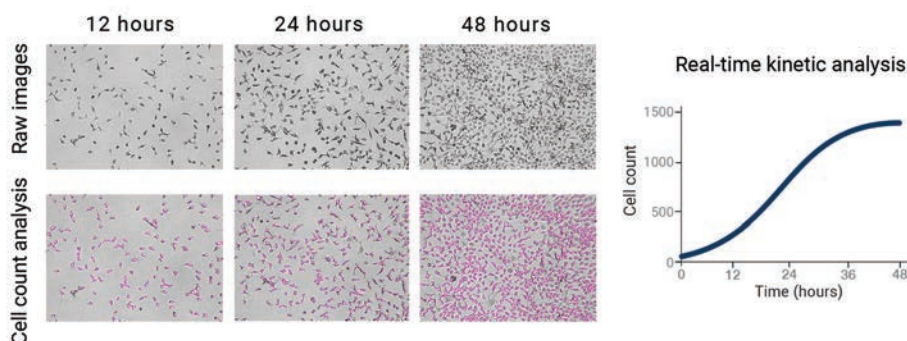


## Powerful image processing

No need to process and analyze images one by one on a dedicated computer. In Gen5, preprogram your analysis tasks and walk away.

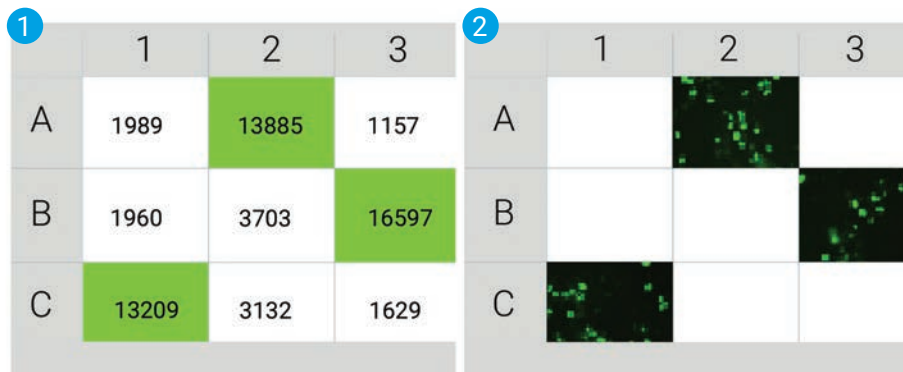
**Image processing:** stitching, Z-projection, deconvolution, digital phase contrast.

**Image analysis:** cell count, confluence, cytoplasm analysis, intracellular analysis, subpopulation analysis, signal translocation, and much more.



## Environmental control for live cell imaging

Live cell assays require an optimal environment. Cytation 1 has temperature control and shaking, plus CO<sub>2</sub>/O<sub>2</sub> control, to facilitate longer-term kinetic studies. Powerful movie maker and kinetic image analysis software tools allow visualization and analysis of time-lapse experiments.



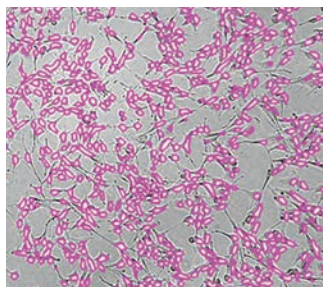
## Hit picking—multimode detection and imaging saves time and data storage

**(1)** Plate reader quickly identifies GFP-positive wells.

**(2)** Only GFP-positive wells are imaged, saving both time and computer memory.

# Applications—imaging

## Label-free cell counting



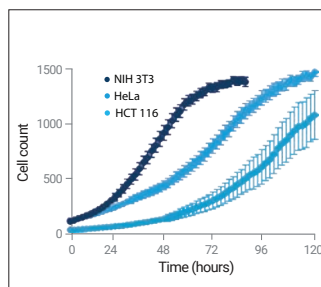
Use high-contrast brightfield imaging for accurate, label-free cell counting without the need for cell-labeling dyes.

## Calcium kinetics



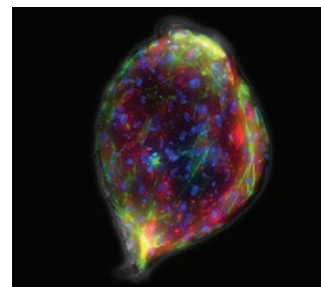
The Cytation 1 dual-reagent injectors enable capture and analysis of fast inject/image assays like calcium kinetics.

## Time-lapse live cell imaging



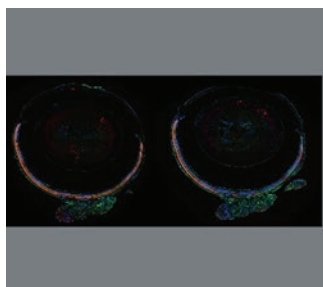
Cell proliferation studies require controlled environments. Cytation 1 automates image capture through analysis.

## 3D cell culture



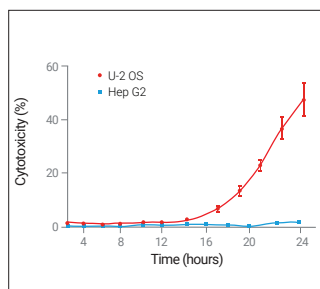
Automate 3D spheroid and tumoroid assays using environmental control and Agilent BioTek Automated Media Exchange with an Agilent BioTek liquid handler. Z-stack, Z-project, and analyze with Gen5 software.

## Fluorescent slide scanning



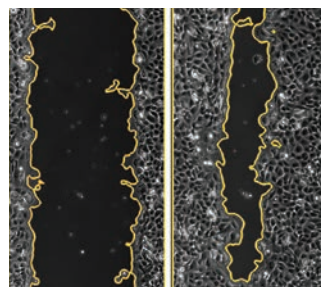
Fluorescent staining and imaging allow easy, rapid image capture and analysis. Automate and increase throughput by integrating Cytation 1 to BioStack microplate stacker.

## Cell viability/toxicity



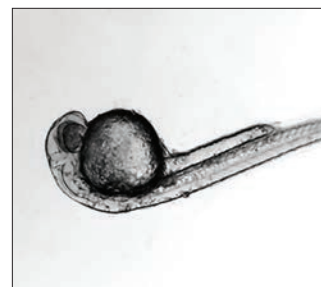
Classic live/dead assays use fluorescent probes or membrane-impermeable dyes; viability or toxicity is measured in real time.

## Cell migration



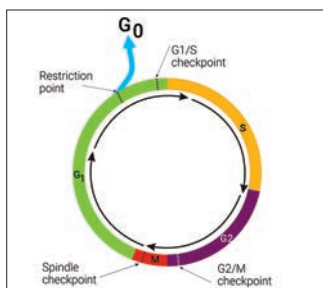
High-throughput cell migration assays are enabled with the Agilent BioTek AutoScratch wound making tool, with time-lapse imaging under environmental controls in Cytation 1.

## Whole-organism imaging



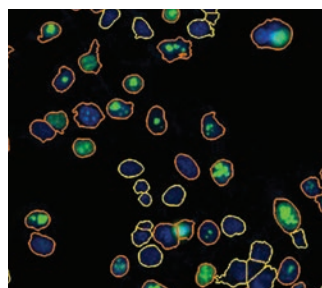
Essential to current drug screening methods, whole organisms like zebrafish and nematodes are effectively imaged and analyzed with the Cytation 1 and Gen5 software.

## Cell cycle analysis



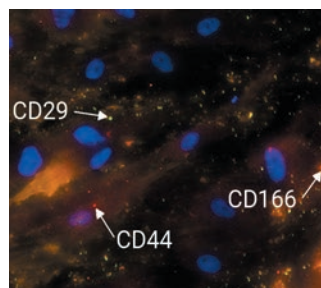
The progression of cell growth through the cell cycle is a highly regulated process. Automated histogram analysis of objects facilitates threshold definition.

## Transfection efficiency



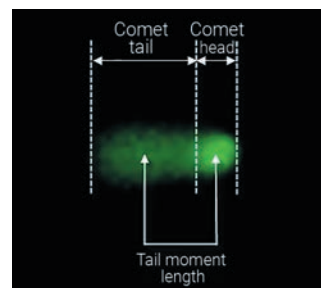
Cytation 1 provides intuitive image analysis for automating the assessment of transfection efficiency.

## Stem cell differentiation



Cytation 1 integrated with the Agilent BioTek BioSpa 8 automated incubator and MultiFlow FX multimode dispenser can automate the lengthy analysis of stem cell differentiation to find highly physiologically relevant cells for drug discovery.

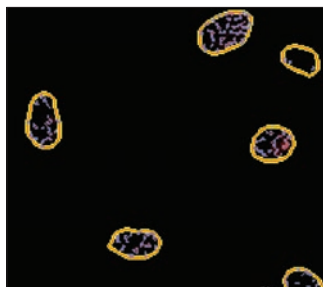
## Genotoxicity



The destructive effects of mutagens, such as high-energy radiation and chemicals on nuclear DNA, are measured with the comet assay and H2AX immunofluorescence assays. Cytation 1 is an ideal imaging platform for these assays.

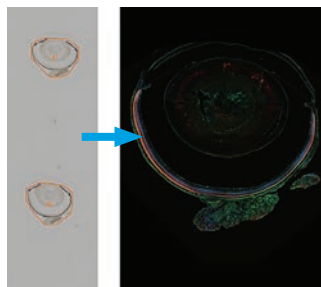
# Applications—advanced imaging modules and overlays

## Spot counting



The Agilent BioTek spot counting module allows users to gain information about a second set of objects within primary and/or secondary mask compartments, which are tied to the original primary mask data.

## Automatic region of interest



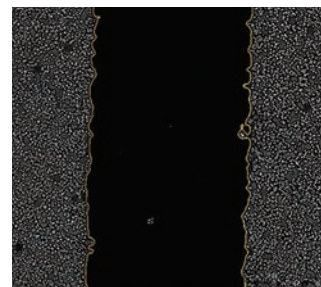
The automatic region-of-interest (AutoROI) module is a three-step process to eliminate superfluous image capture. A low-magnification step quickly images the entire area. The regions of interest are automatically identified, and high-magnification imaging of the areas then occurs.

## Single-cell object tracking



The Agilent BioTek Gen5 object tracking module provides the ability to track single objects over time. Relative motility can be visualized by selecting single cells or entire populations within an image. Calculated metrics include total distance, Euclidean distance, and mean, median, and maximum object velocity.

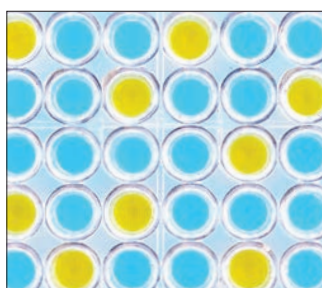
## Scratch Assay application



The Agilent BioTek Scratch Assay app provides an integrated workflow to capture images of, and analyze, 2D scratch-wound healing assays. Predefined protocols for 24- and 96-well plates include auto-exposure, built-in image processing and analysis to calculate average wound width, percent wound confluence, and maximum wound healing rates.

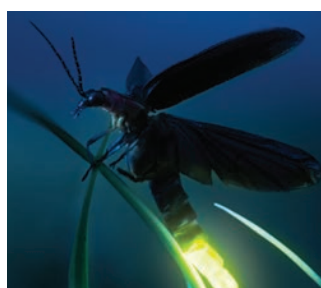
# Applications—multimode detection

## ELISA



ELISA methods with colorimetric, fluorescent, and luminescent substrates are easily detected with Cytation 1.

## Luciferase reporter assays



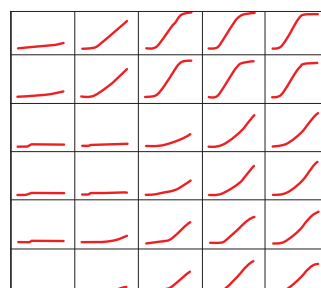
Luciferase-based reporter assays measure luminescent signal. This enables users to quantify the activity of factors that affect particular signaling pathways.

## Nucleic acid and protein quantification



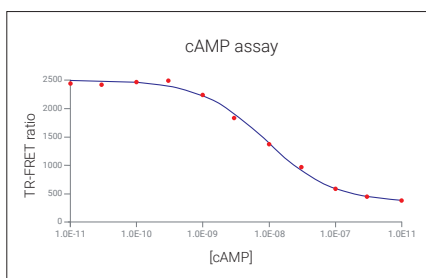
Nucleic acid and protein quantification assays can be executed by spectrophotometric or fluorescent determination with Cytation 1, in microplates or in microvolumes with the Take3 microvolume plate.

## Cell growth



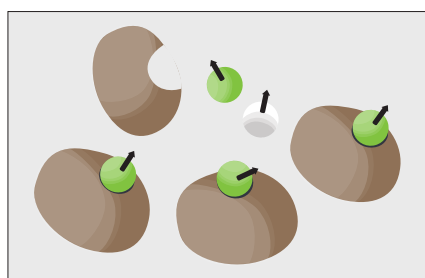
Microbial growth assays with yeast and bacteria, for example, can be measured by several methods, including turbidimetric measurements with Cytation 1.

## Time-resolved fluorescence energy transfer



Time-resolved fluorescence energy transfer (TR-FRET) and homogeneous time-resolved fluorescence (HTRF) are sensitive, robust methods. The Cytation 1 and Gen5 software provide excellent sensitivity for optimal Z-factors.

## Fluorescence polarization



Fluorescence polarization is widely used in research labs to study molecular binding or dissociation events, and in screening labs to screen for drug candidates.

# Peripherals



## BioSpa 8 automated incubator

The BioSpa 8 environmental controls and labware handling capabilities, integrated with Cytation 1, facilitate long-term live cell kinetic imaging processes for up to eight microplates and other labware.



## BioStack microplate stacker

The BioStack microplate stacker manages up to 50 microplates for automated imaging or multimode operations, including de- and relidding of microplates used with cell-based assays.



## CO<sub>2</sub>/O<sub>2</sub> controller

The compact gas controller maintains control of CO<sub>2</sub> and O<sub>2</sub> levels in the Cytation 1 to support live cell assays.

## Dual-reagent injector

The dual-reagent injector module enables fast inject/read processes. Angled injector tips protect cell monolayers from shear stress during injection.



### AutoScratch wound making tool

The AutoScratch wound making tool automatically creates reproducible scratch wounds in cell monolayers grown in 24- or 96-well microplates, for cell migration and invasion studies.



### Peltier cooling module

The Peltier cooling module cools the Cytation 1 interior after incubations, enabling efficient switching between multiple applications without unwanted temperature influences. The cooling module maintains environmental stability within Cytation 1, maintaining a less than 1 °C rise in ambient temperature, regardless of external and internal temperature fluctuations.



### Take3 microvolume plate

Measure multiple 2 µL samples at a time with the Take3 microvolume plate, used with Cytation 1. Microvolume nucleic acid and protein quantification are fast and easy.



Agilent BioTek Cytation 1  
cell imaging multimode reader

# Technical Details



| General                        |                                                                                                                                                           |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microplate Types               | Monochromator: 6- to 384-well plates<br>Filters: 6- to 1536-well plates<br>Imaging: 6- to 1536-well plates                                                |
| Other Labware Supported        | Microscope slides, Petri and cell culture dishes, cell culture flasks (T25), counting chambers (hemocytometer)<br>Agilent BioTek Take3 microvolume plates |
| Environmental Controls         | Temperature control to 45 °C<br>CO <sub>2</sub> /O <sub>2</sub> controller<br>Peltier cooling module                                                      |
| Shaking                        | Linear, orbital, double orbital                                                                                                                           |
| Automation                     | Agilent BioTek BioSpa 8 automated incubator compatible<br>Agilent BioTek BioStack microplate stacker and third-party automation compatible                |
| Modularity and Configurability | Cytation 1 has many available configurations, including imaging only, multimode only, and combinations; modules can be added as laboratory needs change   |
| Imaging                        |                                                                                                                                                           |
| Imaging Modes                  | Fluorescence, high-contrast brightfield                                                                                                                   |
| Imaging Methods                | Single color, multicolor, montage, time lapse, Z-stacking                                                                                                 |
| Light Source                   | Long-life LEDs                                                                                                                                            |
| Camera                         | Sony CMOS, 16-bit grayscale                                                                                                                               |
| Imaging Objectives Capacity    | 1.25x to 60x magnification/two-position automated turret                                                                                                  |
| Imaging Filter Cubes           | More than 20 filter/LED cubes available                                                                                                                   |
| Imaging Filter Cube Capacity   | Four color channels plus brightfield                                                                                                                      |
| Autofocus Methods              | Image-based and laser autofocus                                                                                                                           |
| Multimode Detection            |                                                                                                                                                           |
| Detection Modes                | UV-Vis absorbance<br>Fluorescence intensity<br>Luminescence<br>Fluorescence polarization<br>Time-resolved fluorescence                                    |
| Reading Methods                | End point, kinetic, spectral scanning, well-area scanning                                                                                                 |

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