

# CRT Licensing Opportunity



## CyMap: A Novel Miniature Imaging Device

- Novel, patented, diffraction-based, lens-free imaging system
- Easily miniaturised and low component cost
- Validated for monitoring cell number, cell division, tracking cell movement, particle detection
- Suitable for multiple biolocial and industrial applications

ENABLING TECHNOLOGY

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## Introduction

'CyMap' is a novel CCD-based imaging system with potential applications in automating a wide range of cell-based assays as well as other industrial processes. The simple system utilises only low-cost components, is readily miniaturised and can be used inside a standard tissue culture incubator. Furthermore, the imaging modality has great potential for incorporation into lab-on-a-chip devices and integration with microfluidic platforms or QC instrumentation.

## Background

There is growing demand for miniaturised systems suitable for automating and quantitating cellular assays and reducing user input. At present, the majority of optical imaging of cells is carried out using large, low-throughput microscope systems or costly 'high-content' automated imaging systems. Though a number of novel miniaturised lab-on-a-chip devices for cell imaging have been described in the literature, the range of applications of each is generally limited to monitoring only a few parameters. As such, novel, cost-effective, and flexible imaging devices may find a wide application as components of cell analysis systems or as independent tools.

## The Technology

The 'CyMap' concept is based on the observation that cells grown in normal medium or other particles create light diffraction and interference patterns that can be directly recorded by a CCD camera, and analysed using simple computer algorithms. This means that cell number, locations,

movements and divisions can be recorded using only an LED light source, cells grown on a standard optically-clear substrate, and a low-cost CCD camera. A prototype device is illustrated in Figure 1.

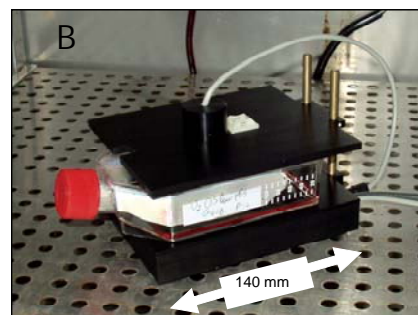
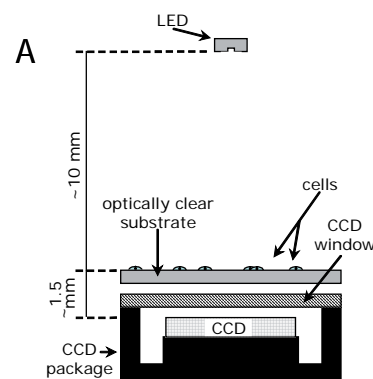


Figure 1: A. Schematic representation of the CyMap device; B. the CyMap used inside an incubator

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The CyMap device has been utilised to automate a number of live-cell assays. Figure 2 shows selected images captured using the system in time-lapse mode over a 62 hour period. Individual cells are clearly identifiable, and software algorithms can be utilised to assess cell number or colony formation. Analysis of time-lapse CyMap images can also be used to monitor wound healing assays or to track individual cell movements. In addition, cells undergoing mitosis demonstrate detectable changes in their diffraction patterns, and this can be used to monitor cell division on a single cell basis (Figure 3).

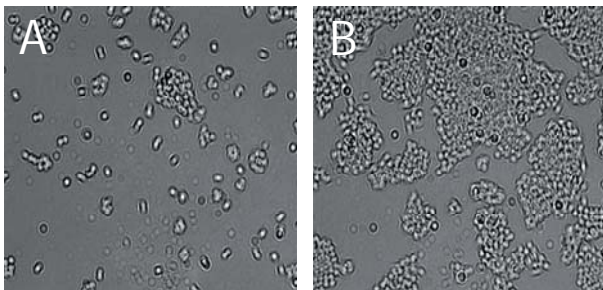


Figure 2: Two frames from a time-lapse recording of colony formation by U-2OS osteosarcoma cells at 0 hours (A), and 62 hours later (B)

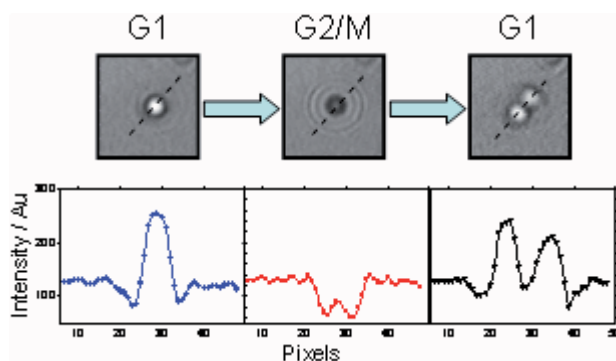


Figure 3: Images showing changes in the diffraction pattern of a single U-2OS cell undergoing mitosis [captured by the CyMap], and line profiles showing quantitation of the diffraction patterns.

The potential for CyMap to be used in combination with a microfluidic system has also been demonstrated by successfully imaging cell movements through 500µm polydimethylsiloxane (PDMS) channels. Combination of CyMap with microfluidic platforms would allow automated perfusion, introduction or removal of cells, and concurrent analysis of multiple cell chambers and demonstrates that CyMap could form a valuable addition to a variety of lab-on-a-chip systems.

## Commercial Opportunity

An exclusive multi-territory license is available to further develop and commercialise the CyMap technology for use in cell imaging or other applications.

## Intellectual Property

CRT hold the rights to a patent family covering the CyMap technology(WO 2008/090330). The patent is available for exclusive licensing together with associated confidential validation data.

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