CRT Licensing Opportunity

CyMap: A Novel Miniature Imaging Device

- Novel, patented, diffraction-based, lens-free imaging system
- Easily miniaturised and low component cost
- Many applications incl. cell imaging systems, blood cell counting, fertility testing and biosystem QC
- No focussing required, superior depth of field versus traditional imaging approaches

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Introduction

'CyMap' is a novel, proprietary, CCD-based imaging system with potential applications in automating a wide range of research, clinical and industrial processes. The simple system utilises only low-cost components and is readily miniaturised. CyMap is protected by a patent application and CRT is seeking licensees or co-development partners to exploit the CyMap technology in multiple fields.

Potential Applications

There is growing demand for miniaturised systems suitable for automating and quantitating processes and assays, both for research, medical and environmental purposes. As such, novel, cost-effective, and flexible imaging devices may find a wide application. Due to it's small size and low component cost, CyMap technology is applicable to a range of applications that require monitoring of the number, size or movement of cells or other particles. It would be readily incorporated into lab-on-chip devices, point-of-care diagnostic devices or telemedicine platforms.

Examples include:

- Imaging cells in culture – counting cell number, monitoring cell division and migration, wound healing assays
- Blood cell counting – red and white blood cells give different image signatures
- Male fertility testing – sperm counting and monitoring of movement in live samples
- Pathogen / parasite detection – in water or biological samples
- Bioreactor QC testing

The Technology

In December 2009, CyMap was awarded first prize in the Medical and Healthcare category, as well as the overall Grand Prix prize of the prestigious The Engineer's Technology and Innovation Awards, which recognise and honour innovation in the UK. The 'CyMap' concept is based on the observation that cells or other particles create light diffraction and interference patterns that can be directly recorded by a CCD camera, and analysed using simple computer algorithms. A prototype device is illustrated in Figure 1.

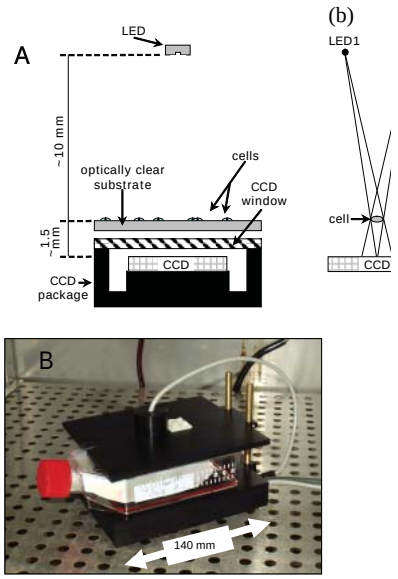

Figure 1: A. Schematic representation of the CyMap device; B. the CyMap used inside an incubator.

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The technology allows cell/particle number, locations, movements and divisions to be recorded using only an LED light source, cells/particles on a standard optically-clear substrate, a low-cost CCD camera and customised analysis algorithms. Since there is no lens-based magnification, the resolution of the recorded images is relatively low. However this is not a limitation to CyMap's applications since different cells/particles produce unique 'image signatures' meaning they can be easily counted and differentiated e.g. red blood cells vs white blood cells.

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).

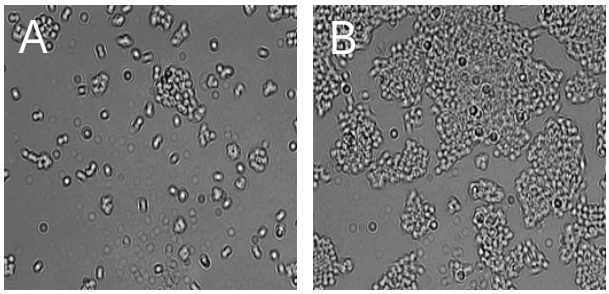

Figure 2: Two frames from a time-lapse recording of colony formation by U-2OS osteosarcoma cells at 0 hours (A), and 62 hours later (B).

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 demonstrates that CyMap could form a valuable addition to a variety of lab-on-a-chip systems.

CyMap technology would be equally applicable to a range of other monitoring systems, including blood cell counting, which would allow point-of-care monitoring of conditions including leukaemias, anaemia and HIV.

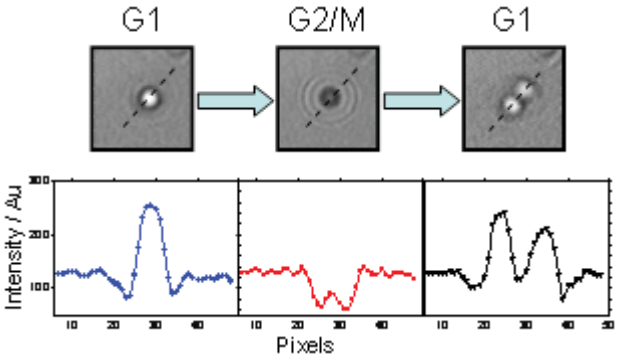

Figure 3: Images showing changes in the diffraction pattern of a single U-2OS cell undergoing mitosis [captured by the CyMap], and line profiles showing quantitation of the diffraction patterns.

Commercial Opportunity

An exclusive multi-territory license is available to further develop and commercialise the CyMap technology for use in cell imaging and/or other applications. CRT are also working with The Technology Partnership to identify commercial licensees for collaborative development programmes for selected 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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