Microscope camera to shed light how living cells behave

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A powerful camera is being developed that will enable scientists to examine living cells in unprecedented detail.

The fingernail-sized device, mounted within a microscope, will enable close-ups of the movement of molecules within cells. It should give scientists fresh understanding of how healthy – and diseased – cells behave.

Photons of light

Engineers are designing the camera to be sensitive enough to capture single photons of light – the smallest unit in which light can exist. Conventional cameras typically capture thousands of photons at once on each of their pixels.

The camera will combine thousands of light detectors that are fast and sensitive enough to capture short-lived photons. These detectors, housed on a microchip, should enable a detailed study of many molecules in a single frame.

Cells can be studied by marking them with fluorescent dye, and capturing microscopic emissions of the light as small changes occur in the cells – typically at a rate of billions of photons per second.

Digital imaging technology

Researchers at the University of Edinburgh and Heriot-Watt University are working together on the five-year, €2.3 m project.

Dr Robert Henderson, of the University of Edinburgh's School of Engineering, who is leading the project, said: "This camera will take digital imaging technology to the next level.

"It will allow us to look at what goes on in living cells, which until now has eluded scientists. This device could be the key to understanding on a molecular level exactly how our cells function, and what happens when this goes wrong."

Once the first generation of the camera is developed, Dr Colin Rickman at Heriot-Watt University will use the camera to study insulin secretion and how this can change in diabetes. This will test the camera and its capabilities to provide feedback for the next phase of camera development.

Dr Colin Rickman commented: "For the first time, this unique camera will allow us to examine in real time, protein interactions in live cells. Initially, we'll use the camera to study the release of insulin in diabetes, however ultimately it will be used in diverse areas of biomedical research to help scientists gain a deeper understanding of how diseased cells behave in patients living with other long term conditions such as cancer."

Provided by Heriot-Watt University

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