PHOTOMETRICS®

HIGH PERFORMANCE EMCCD & CCD CAMERAS FOR LIFE SCIENCES

CUSTOMER REFERENCE

Evolve™ 128 EMCCD Camera

# Voltage and Calcium Imaging


## Gil Bub, PhD, University Research Lecturer

**University of Oxford, Department of Physiology, Anatomy and Genetics**


> "The Evolve 128 is very reliable and a joy to use. It has proven to be an ideal camera for our demanding temporal requirements."

## BACKGROUND

Home to a large number of internationally-renowned scientists, the research teams at Oxford are addressing major questions in biomedicine. Their research spans across six broad areas of study, including Cardiac Science, Development and Reproduction, Functional Genomics, Ion Channels, Transporters and Signaling, Metabolism and Endocrinology and Neuroscience.

Dr. Bub, university research lecturer at Oxford, provides equipment and expertise to researchers who are mapping activity in the heart at the British Heart Foundation's Centre (BHF). He is also developing a new technology, temporal pixel multiplexing (TPM), for fast cardiac imaging. TPM enables slow-scan, high-resolution cameras to be used for fast imaging tasks.

## CHALLENGE

The research involves mapping activation patterns in heart preparations that are used to determine how arrhythmias start and stop. Specifically, it involves looking at spiral wave formation in isolated heart preparations and cultured cardiac monolayers using voltage and calcium sensitive dyes and fast, sensitive detectors.

To meet the imaging requirements, a high speed (1 KHz), high dynamic range camera was needed to enable the ability to measure fluorescence signals with large offsets. The team found that conventional cameras lacked both the speed and dynamic range needed to meet their challenge.

**Dr. Bub has been using Photometrics cameras for 20 years and is very familiar with the Software Development Kit (SDK), which allows him to easily control the camera with his own software.**

**Additional information about the Department of Physiology, Anatomy and Genetics at Oxford University is available at www.dpag.ox.ac.uk/**

**SOLUTION**

"The Evolve 128 is very reliable and a joy to use!" exclaims Dr. Bub. "It has proven to be an ideal camera for our demanding temporal requirements with its high speed and low light capabilities." The camera's easy triggering, high sensitivity and high dynamic range provided many benefits and the research was improved with the team's ability to acquire high quality datasets. The firewire interface made for simple and easy setup, and Micro-Manager support enabled the team to quickly acquire high quality data with minimal effort.

**Read the team's recently published paper, "Mechanism of reentry induction by a 9-V battery in rabbit ventricles" online at: http://ajpheart.physiology.org/content/306/7/H1041.short**

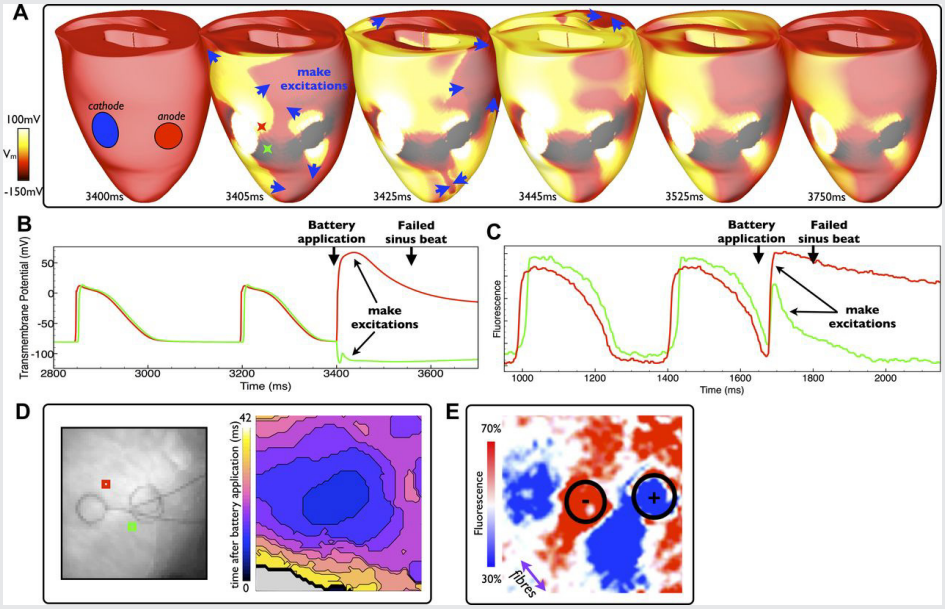


**Figure 1:** Battery application during diastole. *A*: epicardial distribution of $V_m$ in the model at different times after battery application (at 3,400 ms) with make excitation wavefront propagation indicated by blue arrows. *D*: the experimental activation map *(right)* along with electrode locations *(left)* of excitation patterns after a similar battery application episode (at 1,680 ms). Stimulus durations were both of relatively long duration: 700 and 500 ms in the model and experiment, respectively. *B* and *C*: individual temporal model epicardial $V_m$ (*B*) and fluorescent signal traces (*C*) from locations shown by the colored Xs in *B* (3,405 ms) and squares in *D*. Make excitation induction is seen immediately after battery application in both the model and experiment, which subsequently excites the rest of the ventricles and causes the next sinus beat to be blocked. After recovery of the tissue from this initation excitation, a static virtual electrode pattern is seen around the ventricles in the model (*A*, 3,750 ms) and experiment (*E*). The color bar scale in *E* is relative to fluorescent intensity of the action potential amplitude recorded during sinus pacing. The approximate fiber orientation is shown by the purple arrow.

www.photometrics.com
info@photometrics.com
tel: +1 520.889.9933