

# TOP Trends IN Life Science RESEARCH

## STANDARDIZING THE UNIT OF MEASUREMENT FOR IMAGING DATA

### Photometrics

"People in my lab produce different answers from the same fluorescence experiments, over and over again," says Alex Rodriguez, assistant professor of cell biology at Rutgers University.

Identifying why results differ is problematic for Rodriguez and other researchers because current microscope cameras report data in arbitrary units. These units—known variably as fluorescence units, grey scale units, analog-to-digital units, etc.—are merely electronic representations of incident photons. Individual cameras, even of the same make and model, produce these representations differently. User-changeable settings, such as gain, and sensor aging also variably affect the representations.

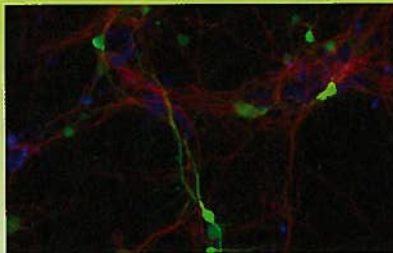
Standard units of measurement that directly correlate with incident light are needed so that data can be directly compared within and between labs.

Photometrics has engineered the Evolve EMCCD Camera, which reports live data in standardized units: photoelectrons. Produced directly by incident photons, photoelectrons are independent of user-changeable settings, camera make or model, and sensor aging.

"Photometrics' Evolve camera finally gets rid of arbitrary gray levels in favor of photoelectron counts, a meaningful standard that scientists can use for comparing their imaging systems and their image-based data," explained Sidney L. Shaw, assistant professor in the Department of Physics at Indiana University.

## NEURON TRANSFECTION Lonza Cologne AG

Neurobiology research often involves transfection of primary neural cells, which can be a challenge. Lipid-mediated methods usually do not achieve high efficiencies, while viral transduction can be efficient but requires experience and effort in generating the viruses and holds safety concerns.



Since 2003 Lonza's non-viral Amaxa nucleofector technology has aided neurobiology research by allowing highly efficient transfection of primary neurons, glial cells, and neural stem cells. However, as an electroporation-based method, it has thus far required cells to be transfected in suspension and as a consequence could only transfect neurons straight after isolation. Neurons at later developmental stages could not be transfected as they cannot be brought back into suspension once they adhered.

After extensive R&D Lonza has now introduced the first of a series of Nucleofector AD Kits that enable Nucleofection of cells in adherence. With the Basic Neuron Nucleofector AD Kit primary neural cells can be cultured prior and post Nucleofection for up to 14 days in special Nucleocuvette AD Plates and transfected at any time, i.e. also at later developmental stages. The plates are suited for analysis of cells by transmission light or fluorescence microscopy as well as absorption, luminescence or fluorescence assays.



## PRODUCTIVITY - MORE SAMPLES IN LESS TIME IDEX Corp.

The trend for improved productivity has been developing for some time. Initially with the use of autosamplers and computerized data analysis, but more recently, incorporating robotics, liquid handling devices, and optimized sample and reagent movement and delivery. The trend to increased productivity is accelerating with the technology and computing power available to deliver results. Current examples of this are robotic liquid handling for genomic, proteomic, and PCR analysis and Ultra High Performance Liquid Chromatography (UHPLC) for chromatographic and mass spec analysis.

In the area of robotic liquid handling sample dispensing has quickly evolved from the use of 96 well plates five years ago to 384/1536 well plates today with the need for even greater assay densities with or without well plates in the near future. This trend is not without its own pain points.

In the area of UHPLC, the chromatographic system pressure and temperature have been modulated to increase sample throughput. Pressures of 15,000 psi are common today with the trend to 25,000 to 30,000 psi in the near future. The challenge of providing system components at these pressures is affected by both system and component design and the materials chosen for the job.

## SHIFTING FROM QUALITATIVE TO QUANTITATIVE ANALYSIS LI-COR Biosciences

The shift from qualitative to quantitative analysis is a significant trend in protein detection methods such as Western blotting. Researchers have recognized that quantitative measurements provide a more accurate view of cellular events.

"Target identification and measuring efficacy against a target are significant for drug discovery research," says Mike Olive, vice president, translational research, LI-COR Biosciences. "To accurately monitor protein expression and cell signaling, you need quantitative data."

Two-color, near-infrared (NIR) fluorescent detection of Western blots eliminates many of the variables of chemiluminescent detection and enhances accuracy.

"With NIR fluorescence, a researcher can use multiplex detection to simultaneously measure the total amount of target present and the level of phosphorylation of that same target," adds Olive. Accurate, quantitative measurements facilitate many types of research, including cell signaling studies, systems biology, and stoichiometric analysis of protein interactions.

LI-COR developed the Odyssey Infrared Imaging system and family of IRDye infrared dyes and reagents to facilitate simultaneous analysis of multiple protein targets from a single sample. Multiplex detection increases efficiency and accuracy and is ideal for rare or limited samples. The systems are used for a variety of applications, including cell-based assays, array-based approaches, and *in vivo* molecular imaging.