Tested Studies for Laboratory Teaching
Proceedings of the Association for Biology Laboratory Education
Vol. 35, 451-452, 2014

Evolution in Instrument Design of Inexpensive but Highly Sensitive Devices for the Life Sciences

Patrick Lai, Matthew Patterson, Kim Willoughby, Neil Berezowski, Mark Mahadeo, Mohamed Hassanin, and Elmar J. Prenner

University of Calgary, Department of Biological Sciences, Calgary AB T2N 1N4 CAN
(**palai@ucalgary.ca; mjpatter@ucalgary.ca; k.willoughby@ucalgary.ca; nsberezo@ucalgary.ca; mnmahade@ucalgary.ca; mhassani@ucalgary.ca; eprenner@ucalgary.ca**)

Absorbance and fluorescence spectroscopy are very common tools in undergraduate teaching within the life sciences. However, instrument costs are always a limiting factor for the number of devices available in a student laboratory. Earlier generations of instruments used simple unstabilized LED excitation and LCD displays for data output but already showed the remarkable sensitivity of ng/mL detection of DNA. In addition, their modular design allowed combining a multitude of excitation windows and emission ranges for any dye of choice. Later generation instruments added enhanced electronic control, stirring and temperature control capabilities, and especially USB connectivity, which allowed for software controlled measurements and data storage on a PC. The latest generation instruments, now in the Beta stage, have stabilized LED output and even more sensitive detectors, enabling DNA detection in the pg/mL range. As well, very low standard deviations allow quantitative fluorescence based detection of analytes, such as DNA, protein, or ions.

The second limiting factor in many laboratory budgets are reagent costs, which limits the use of expensive fluorophores or kits in at least the larger classes. Thus, the combination of a custom-made device for a dye of choice that also fits a teaching lab budget is the ultimate goal. A range of novel and very sensitive dyes, developed by SETA BioMedicals, were selected to design a teaching instrument capable of detecting DNA (pg/mL) and protein (µg/mL) that uses bulk detection kits and is optimized to allow larger class access to state-of-the-art spectroscopic experiments.

Mission, Review Process & Disclaimer

The Association for Biology Laboratory Education (ABLE) was founded in 1979 to promote information exchange among university and college educators actively concerned with teaching biology in a laboratory setting. The focus of ABLE is to improve the undergraduate biology laboratory experience by promoting the development and dissemination of interesting, innovative, and reliable laboratory exercises. For more information about ABLE, please visit **http://www.ableweb.org/.**

Papers published in *Tested Studies for Laboratory Teaching: Peer-Reviewed Proceedings of the Conference of the Association for Biology Laboratory Education* are evaluated and selected by a committee prior to presentation at the conference, peer-reviewed by participants at the conference, and edited by members of the ABLE Editorial Board.

Citing This Article

Lai, P., M. Patterson, K. Willoughby, N. Berezowski, M. Mahadeo, M. Hassanin and E.J. Prenner. 2014. Evolution in Instrument Design of Inexpensive but Highly Sensitive Devices for the Life Sciences. Pages 451-452 in *Tested Studies for Laboratory Teaching,* Volume 35 (K. McMahon, Editor). Proceedings of the 35th Conference of the Association for Biology Labora-tory Education (ABLE), 477 pages. http://www.ableweb.org/volumes/vol-35/?art=55