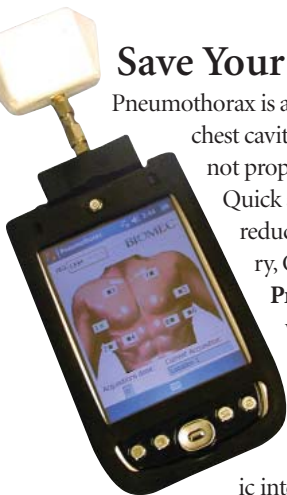


Save Your Breath



Pneumothorax is a medical condition caused by air trapped in the space between the wall of the chest cavity and the lung. It often results in reduced lung capacity or a collapsed lung, and if not properly diagnosed and quickly treated, pneumothorax can cause death in minutes.

Quick and accurate diagnosis and monitoring of a pneumothorax can save lives and reduce morbidity. To that end, researchers at Lawrence Livermore National Laboratory, Calif., and BIOMEC, Inc., Cleveland Ohio, have developed the **Noninvasive Pneumothorax Detector**, a handheld medical diagnostic device based on ultra wideband (UWB) technology for the detection of pneumothorax in real time.

The Noninvasive Pneumothorax Detector can operate anywhere. It provides quick and accurate detection and continuous monitoring of a patient's pneumothorax with a graphical user interface. Its portable, flexible design, based on UWB technology, is immune to acoustic background noise and electromagnetic interference. It is noninvasive and can be used without attaching sensors to the patient. Its spatial accuracy ensures no interference with other devices. Its medically safe, compact, lightweight assembly is low-cost and consumes low amounts of electrical power. The Noninvasive Pneumothorax Detector is suitable for use in a hospital or in the field, for civilian or military use.

► **Lawrence Livermore National Laboratory**, www.llnl.gov

Quickly Quantifying Molecules

DNA, RNA, and protein are the key molecules used in biomedical research. Despite their importance, it has been difficult to measure the exact amounts in an experimental sample. To overcome this difficulty, Matt Beaudet, Jill Hendrickson, and Kurt Roeder at Invitrogen, Eugene, Ore., developed the **Qubit Quantitation Platform**, a specialized detection system for minute quantities of DNA, RNA, and protein.

The Qubit Quantitation Platform provides a new level of accuracy, speed, and sensitivity for the detection of these biologically important molecules. It provides an order of magnitude improvement in quantitation over conventional

technologies, leading to fewer experiment failures, more efficient research programs, and more streamlined product development.

To achieve this improvement, the Qubit Quantitation Platform integrates two technologies: specialized fluorogenic chemicals that bind to the target molecule and transform into fluorescent dyes with specific spectral signatures, and a specially-designed fluorometer that excites these dyes and measures the emitted fluorescent light. Together, they create an integrated platform that provides results in less than 5 min out of the box.

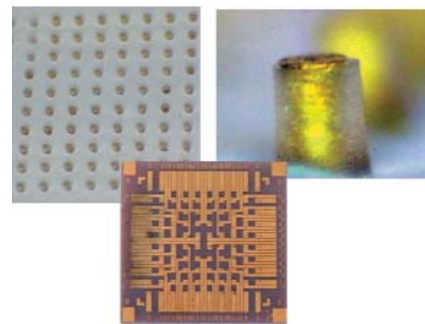
► **Invitrogen**, www.invitrogen.com

Peering Deeper into the Eye

Through a joint effort between Lawrence Livermore National Laboratory, Calif., the Univ. of Southern California Doheny Eye Inst., Los Angeles, the Univ. of California, Berkeley, School of Optometry, the Univ. of Rochester Center for Visual Science, N.Y., the Indiana Univ. School of Optometry, Bloomington, and Boston Micromachines Corp., Watertown, Mass., the **MEMS-based Adaptive Optics Scanning Laser Ophthalmoscope (MAOSLO)** has

been developed to measure and automatically correct aberrations in the eye in real time; provide non-invasive, *in vivo* images of the retina at the cellular level; enable optical sectioning of different cellular layers in the retina; and produce a permanent, digitized record of clinical observations to facilitate monitoring of disease progression and the effects of therapeutic treatments. The MAOSLO's resolution and 3-D sectioning capability represent a breakthrough in the visualization of the retina.

► **Lawrence Livermore National Laboratory**, www.llnl.gov



Diagnostic Medical Lab on a Patch

A critical need exists for techniques that can measure a wide range of biomedical analytes at the point of care, generating an instant, comprehensive picture of a patient's health for a rapid, accurate diagnosis.

Researchers at Sandia National Laboratories, Albuquerque, N.M., have addressed this need with the development of the **ElectroNeedle Biomedical Sensor Array**, a device that, when pressed against the skin, can make rapid, multiplexed diagnostic measurements in a point-of-care setting.

The ElectroNeedle contains arrays of microfabricated electrochemical probes, functionalized with antibodies, enzymes, and other biological receptors immobilized on the probe tip, for use as minimally invasive diagnostic sensors. By combining electrochemical techniques with well-defined recognition chemistries and an easy-to-use sensor, a range of biologically important species, including carbohydrates, electrolytes, lipids, enzymes, toxins, proteins, viruses, and bacteria can be detected in a patient's blood or interstitial cellular fluid. This provides a painless and rapid measurement of biologically relevant molecules without having to extract fluids for later analysis.

When pressed against a patient's skin, an ElectroNeedle patch can detect and identify biological markers just beneath the skin's surface. Because the electrochemical analysis is accomplished *in situ*, the need to withdraw body fluid is eliminated. The height of the needles, adjustable during microfabrication, allows the biological recognition layer to be placed in intimate contact with the appropriate tissue beneath the skin's surface.

► **Sandia National Laboratories**, www.sandia.gov