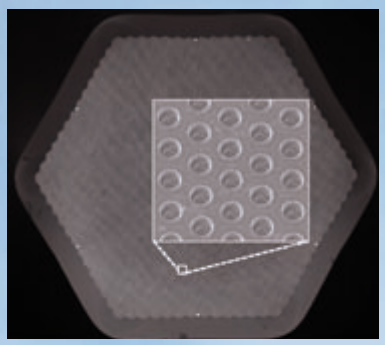
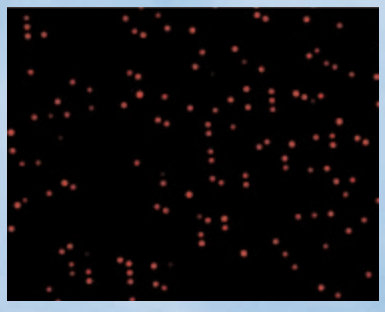
Accuracy to the nth degree

Researchers at Quanterix in Cambridge, Massachusetts, USA, are relying on a Freedom EVO® 150 liquid handling workstation to provide reliable and consistent pipetting in the development of a revolutionary new technology for single molecule detection.

An optical fiber bundle. The higher magnification view (inset) shows the uniform individual reaction vessels





Fluorescent image of the optical fiber bundle. Illuminated spots represent single protein molecules

Quanterix Corporation in Cambridge, Massachusetts, USA, was founded in 2007 to develop a novel platform for single molecule detection. The revolutionary SiMoA™ (Single Molecule Array) technology was originally developed at Tufts University, Massachusetts, by Quanterix scientific founder Dr David Walt, and is based on arrays of femtoliter-sized reaction vessels arranged uniformly on the tip of an optical fiber bundle. Each reaction vessel is isolated from neighboring vessels, and when incubated with dilute solutions, can be used to trap single molecules according to Poisson statistics. Fluorescent signals are detected via a custom instrument using automated image analysis software.

Initial applications for this innovative technology are focused on the detection of protein biomarkers. Quanterix has combined single molecule detection with the reagents used in immunoassays to achieve a 1,000-fold increase in sensitivity over standard ELISA. The company hopes that enhanced sensitivity will lead to real clinical benefits for patients. David Hanlon, Director of Strategic Marketing and Collaborations at Quanterix, explained: "This technology employs very similar principles to traditional ELISA methods, but instead of detecting many molecules per well as with traditional analog systems, our technology isolates individual molecules in femtoliter volume reactions for a digital output. This approach offers a significant increase in sensitivity relative to standard assays, so we are looking into applications where the improved detection limits will provide real value to clinical diagnostics. There are many clinical opportunities for improved biomarker detection, including the detection of proteins implicated in oncology and cardiovascular disease, as well as markers useful for monitoring infectious agents and inflammatory response. One exciting prospect is the possibility of switching from detection of biomarkers in blood to less invasive body fluids, where the same marker proteins may be present at much lower concentrations. Using the sensitivity of the SiMoA platform, we are hoping to characterize the expression of many of these biomarkers in saliva or urine. We expect that our technology could be of particular value for screening programs, where earlier diagnosis of a condition could potentially have a much more favorable outcome for the patient."

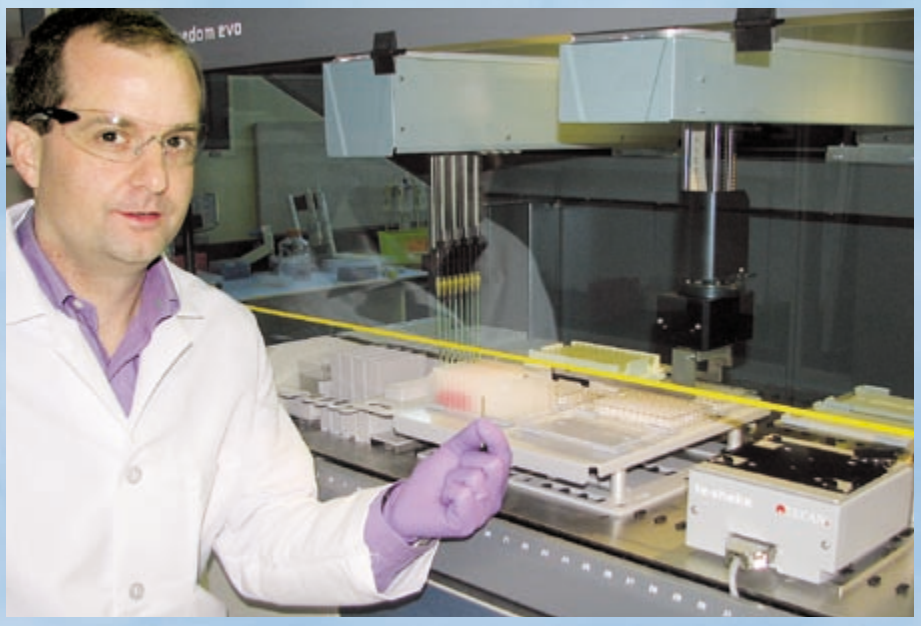
(l to r) David Rissin, Senior Scientist, Jeffrey Randall, Principal Scientist, and Todd Campbell, Senior Automation Engineer, with the Freedom EVO

SiMoA is a trademark of Quanterix Corporation.

Todd Campbell, Senior Automation Engineer, continued: "We currently use the Freedom EVO platform as a research and development tool to optimize our assays, ensuring consistency throughout every assay we run from day to day. We use the automated system for both liquid handling as well as the manipulation of our consumable test strips. With the assay protocols under continuous evolution, this makes it much easier to make small adjustments to the system. The Freedom EVO offers the flexibility we need to make these changes as necessary, and the software is easy to use. This has enabled us to develop our assay platform more quickly, and begin testing samples with our instrument."

Jeffrey Randall, Principal Scientist, explained why Quanterix opted for Tecan systems: "Our proprietary assay and detection system is at least 1,000 times more sensitive and much more accurate than the traditional bulk ELISA assays, so careful control of pipetting volumes is important to us. The Freedom EVO platform offers very repeatable pipetting, and this has allowed us to ramp up our throughput without sacrificing the consistency of our results. We looked at other automated liquid handling systems on the market, but they did not meet our requirements."

In his role as senior automation engineer, Todd has worked closely with Tecan to optimize the Freedom EVO platform for Quanterix's needs. "I have been very impressed with Tecan's support. When we were first setting up the system, our sales engineer was very helpful and extremely knowledgeable about the system. In the past, I have often found that equipment manufacturer's sales personnel are not necessarily system specialists, but that is certainly not the case with Tecan. With our Freedom EVO systems in heavy use every day, it is especially important that any issues we have are resolved quickly. Whenever we have needed support, they have been here within 24 hours, which is very impressive."



Todd Campbell holding an optical fiber bundle