Image supplied by Q Chip

# Fluid Movement

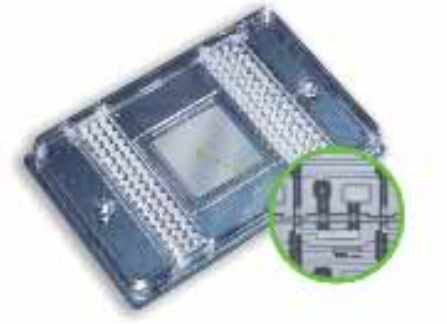
## Miniature-scale fluid technology is gaining momentum

A potent technology is beginning to spread in the field of molecular biology that can take PCR and other applications to the next level. Explore the tools of microfluidics below and do more in less time.

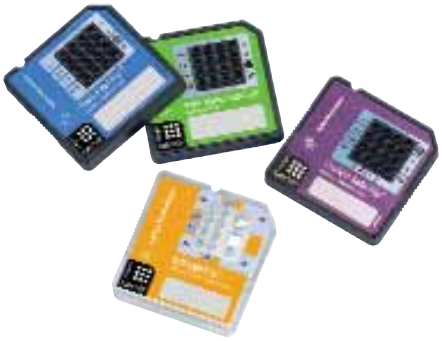
**LC Sciences** has developed its second generation of **µParaFlo biochips**. µParaFlo is an innovative microfluidic platform for synthesis of custom biomolecules (DNA oligos, RNA oligos, peptides or peptido-mimetics) on microarray biochips. Fabricated using MEMS (Micro Electro-Mechanical System) process, the functionalized microchips are particularly suited for applications where small sample consumption, contamination-free, high density of probes, high sensitivity, stringent specificity, and performance-reproducibility are primary concerns. The technology has been applied to miRNA profiling, aptamer screening, epitope mapping, kinase profiling, and molecular library production. With this new design, LC Sciences has significantly increased the number of features on the µParaFlo chips from 4K up to 24K. The new biochip design offers the option of running multiple (up to 6) samples per chip, further increasing its flexibility, throughput and assay consistency. Together with a fully automated fluidics station capable of handling up to 6 chips simultaneously, they comprise an efficient and robust system for biomolecular analysis.

**Q Chip** has developed the **MicroPlant**, a microfluidics-based device which enables the precise encapsulation of aqueous molecular biology reagents within re-dissolvable polymer microspheres. MicroPlant's hydrogel encapsulation technology offers significant benefits compared to conventional reagent lyophilization, such as ultra-low wastage, uniform dosing and morphology and low process costs. MicroPlant has a variety of applications in molecular biology processes, ranging from food pathogen detection to real time PCR and viral-load quantification. These molecular assays often involve expensive biological reagents and complex mixtures, which in turn calls for skilled technicians as extraordinary experimental precision is required to achieve reliable, reproducible results. MicroPlant allows both large and small volumes of solutions to be accurately aliquoted into sub-nanoliter droplets, which are converted to polymer beads. Crucially, the bead size variation is frequently less than 1%, which means extremely low assay variability. The MicroPlant platform is fully scalable; able to produce batches as small as 1,000 beads but also up to 15 million x 96 well plates annually.

**Fluidigm** has introduced a new high-density chip for multiplexing 48 TaqMan assays against 48 samples, generating 2,304 reactions. The **BioMark 48.48 Dynamic Array** assembles assays within an integrated fluidic circuit (IFC). After thermal cycling and end point detection, Genotyping Analysis Software is used to process the raw data. Analyzed data is displayed as an allele map and as corresponding scatter plots for each run. Dynamic arrays address the expanding niche for mid-multiplex



The BioMark 48.48 Dynamic Array from Fluidigm



Bioanalyzer Series II kits from Agilent

**"Microfluidic biochips closely mimic the *in vivo* conditions of blood capillaries."**

- Dmitry Kashanin, Chief Technology Officer, Co-founder of Cellix

genotyping (30-300 SNPs) while delivering high throughput, excellent call rates, and ease of use. Fluidigm also offers microfluidic chips, as well as detection and data analysis software, for gene expression analysis and for digital PCR.

**Guava ExpressPro software** has been designed to simplify the traditional complexity of multi-color detection. Designed for both data acquisition and analysis, the intuitive software interface allows you to visualize up to 8 plots simultaneously, while still accessing operation or data analysis functions, all from the same screen. With just a right click of the mouse, features including the plot type, marker selection, statistics, gates, and other functions, are easily selected and customized to your experimental design. Color coded dots allow you to simply follow your gating strategies across multiple plots and histograms. Special batch file printing of 96-well data and downloading of screen shots to a clipboard provide easy incorporation into presentation or report writing formats. Novice and experts alike will appreciate the Guava **EasyCyte Plus**. The compact system combines ease of use, affordability and 96 well high throughput screening with the expanded capabilities of a fourth color option. The unique, built-in 96 well sample tray feature also accommodates an additional 10 sample tubes, providing added flexibility for varying throughput needs. Simultaneous four-color fluorescence detection greatly expands the results obtainable from any one well, simplifying simultaneous monitoring of more complex biological studies such as white blood cell phenotyping, cell signaling, cytokine production, activation marker analysis, and multiplex compound screening. Monitoring the interplay of up to four different biological mechanisms simultaneously improves the efficiency of experimental outputs. Not only does this shorten the number of iterations for any one experiment, it also comes that much closer to mimicking the complex biological responses within the body. Easy integration with third party plate handlers makes high throughput flow cytometry a reality.

The **2100 Bioanalyzer Series II kits**, from **Agilent**, offer improvements to the previous version in all specifications including sensitivity, sizing range, robustness and sample matrix tolerance for RNA, DNA and protein. In addition to improved specifications, the new kits offer an extended shelf life of a minimum of four months, which is expected to grow with further testing. There is no price increase over existing 2100 Lab-on-a-Chip assay kits, and users will no longer need to purchase separate RNA ladders for the RNA assay. The new assay kits are reverse-compatible with all Agilent 2100 bioanalyzer instruments. A free software upgrade is required to run the new assays. The improved Series II protein assays facilitate the replacement of time and labor-intensive SDS-PAGE and capillary gel electrophoresis (CGE) measurements in research and regulated laboratories, with much faster microfluidic analyses. While the new Protein 230 kit features an increased sizing range, higher sensitivity and salt tolerance, the new Protein 80 kit provides optimal performance for the analysis of proteins from 5 to 80kDa, which is ideal for analyzing reduced antibodies.

**Micronit** offers glass **microreactor chips** which normally consist of one or more mixing areas and reaction chambers. Standard microreactors are made from two layers of borosilicate glass. The channels in the 'R50' chips are 100% optically clear; the channels in the 'R150' chips are semi-transparent. Some of the chips have an extra thin bottom (for confocal microscopy purposes). Micronit develops and supplies customized microreactor chips with, for instance, other channel designs, integrated metal layers, etc. The standard material for glass microreactor chips is borosilicate glass, but fused silica can be used as well (for UV applications). Different glass thicknesses can be used. Micronit's design engineers can calculate the necessary depth, width and length of the channels with the information you supply and make an appropriate design for your application. They can also prototype a microfluidic reactor chip with integrated possibilities, like electrodes.

**Companies mentioned in this Product Focus:**

**Agilent** – www.agilent.com
**Fluidigm** – www.fluidigm.com
**Guava** – www.guavatechnologies.com
**LC Sciences** – www.lcsciences.com
**Micronit** – www.micronit.com
**Q Chip** – www.q-chip.com