PLEXERA

Multiplexed

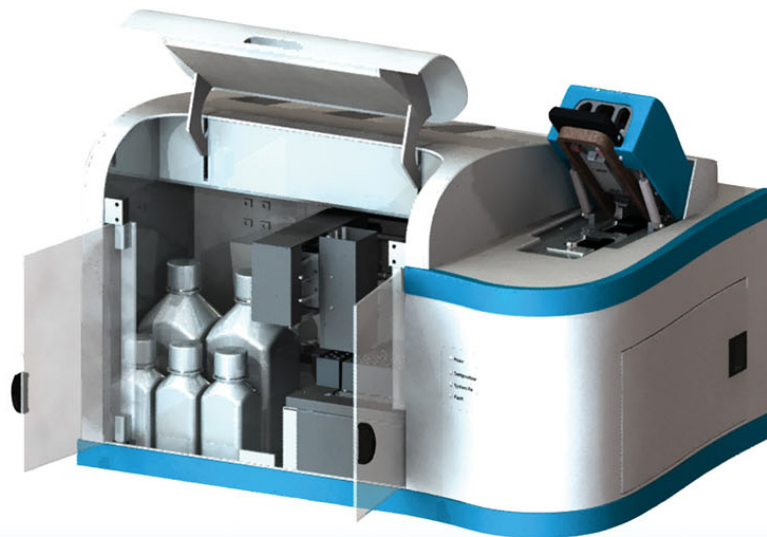**Label-free**

Kinetic Analysis

Introducing the *PlexArray*™ System

— *Solutions for Functional Proteomics*

A label-free, high-density and high-throughput Surface Plasmon Resonance (SPR) system

Providing information on kinetic characterization, multiplexed quantitative analysis of affinities, concentrations and specificities

Plexera LLC is a world-wide provider of label-free, high-content and high-throughput biosensing and bio-chip technologies. We focus on providing cutting-edge technologies, equipment and services that simplify and accelerate proteomic applications such as antibody library screening, drug discovery, and biomarker panel profiling to global life science customers. Our main products include *PlexArray*™ Analyzer and *PlexArray*™ Sensor Chips, and their combination offers an optimized solution for functional proteomics.

The *PlexArray*™ Analyzer uses surface plasmon resonance (SPR) technology to analyze biomolecular interactions in order to provide researchers with high-quality information on the kinetics, affinities and specificities in a label-free, high-content and high-throughput format. Early-access *PlexArray*™ systems have been installed and are being used at highly respected institutions, including the Institute of Systems Biology, Arizona State University, the Medical University of South Carolina and the Baylor Institute for Immunology Research. Plexera is also engaged in research and development projects with synergistic technology companies. The outstanding performance of the *PlexArray*™ Analyzer has been well received by the research and industrial communities alike.

Surface Plasmon Resonance Imaging

The *PlexArray*™ Analyzer utilizes the surface plasmon resonance (SPR) technology, an advanced optical technology, to measure refractive index changes near or on a sensor surface.SPR is a well-established leading method to detect molecular interactions. A surface plasmon wave is an electromagnetic oscillation propagating along the interface between a thin metal layer and a dielectric sample material. Polarized light is directed at this material matrix under the correct conditions and at the correct plasmon

resonance angle. The microarray surface is populated or printed with binding molecules or ligands. In this process the incident light is substantially absorbed, and the intensity of reflected light is significantly reduced. SPR is very sensitive to the refractive index of the dielectric materials on the microarray metal surface. Small changes in the dielectric properties cause variation in the SPR light angle. Based on this principle, the binding process on the metal surface of the capture slide between ligands and flowing analytes can be detected, measured and monitored through a continuous experiment.

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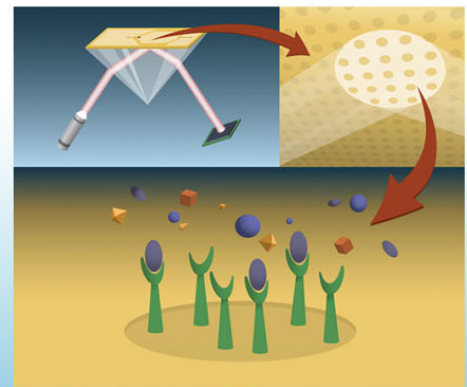
PlexArray™ System

Label-free, high-density and high-throughput

PlexArray™ Analyzer

Label-free, high-throughput and kinetic data -- all in one package

– Multiplexed label-free, kinetic analysis

– High-density microarray, up to thousands of unique ligands

– Fast detection, analyzing the interaction of thousands of antibodies or proteins in as little as 30 minutes

– Capable of detecting low-affinity interactions

– Parallel analysis of multiplex detections

– Automated system, unattended overnight operation

– Flexible platform, compatible with most industry available printers or arrayers
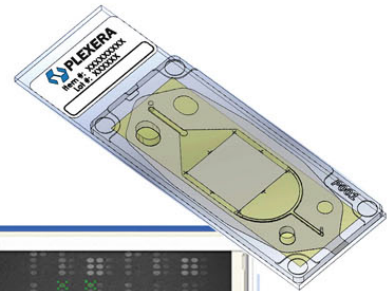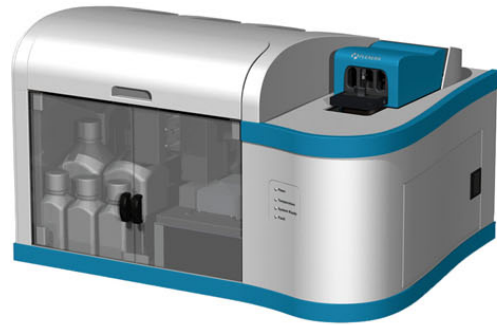
PlexArray™ Analysis Software Package

Powerful control interface, quickly analyzing and processing massive data sets

– User-friendly and flexible graphical interfaces

– Real time and end-to-end process control

– High-quality and high-content information including kinetics, affinities and specificities

– Advanced data analysis algorithms and automated database, tailored for large-scale measurements

PlexArray™ Sensor Chips

High-density microarray biosensor chips

– Flexible array density (1 to 5000 maximum spots) and array spot size (60 to 300 μm, depending on printer specifications)

– Diverse surface chemistries for protein, nucleic acid, small molecule and live cell immobilization

– Antibody chips can be regenerated for multiple experiments

– Custom array development and analysis service based on our customers' specific needs
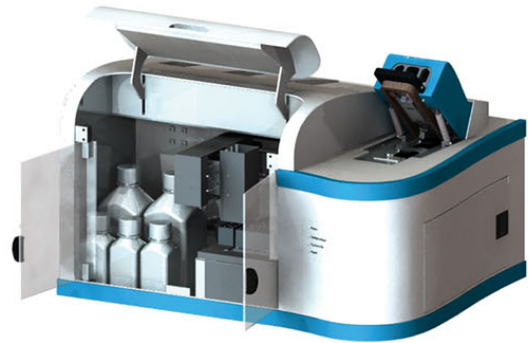
PlexArray™ Analyzer

Fully accelerating your research and development

Label-free

Label-free detection makes sample preparation faster,less expensive and the analytical process easier. This avoids the unnecessary chemical treatment of sample with fluorescent or luminescent tags that are likely to interfere with the biomolecular interactions and affect the reaction kinetics.

High-density Microarray

The *PlexArray*™ analysis system has the industry's highest density format capability, thus the greatest throughput capacity, in the field of label-free, SPR based detection of biological molecules. Users can print 5000 features in a single 1.4cm x 1.4cm array region.The array is analyzed as a movie rather than a one at a time snap shot, thus providing real time interaction data sets.

Flexible Open Platform

The *PlexArray*™ analysis system is designed to meet the varying needs of researchers and product developers. For example, by changing the micro-fluidic, chips can be defined as dozens or even hundreds of sub-array, or as many analysis channels, to meet the demand for simultaneous analysis of multiple samples.

Fast Detection

The *PlexArray*™ Analyzer measures a serum sample in 15 minutes, and analyzes the interaction of thousands of antibodies or proteins in as little as 30 minutes.

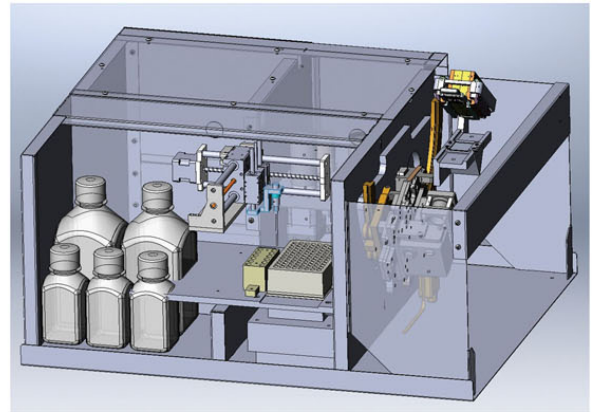# Mechanical Improvements: New Chassis Design

Separate Compartments

-- Optics

-- Fluidics

-- Electronics

-- Sample

Flow Cell Mounting Station

-- Easy to use

-- Solid-state temparature control

-- Flow cell carrier protects the array

Vibration Damping Mounts

Integrated Temperature Control System

Sample stability and quality results require an eff-ective temperature control system. The *PlexArray*™ Analyzer has multiple controlled zones, including the thermal-insulated design of the optical comp-artment for better system stability, the precise co-ntrol over the auto-sampler temperature, and the loaded samples and the sensor chip using Peltier cooling devices.

Temperature Control

Auto-sampler: 4°C - 40°C

Flow Cell: 10°C - 40°C

Automatic Processing System

The *PlexArray*™ Analyzer has an automatic pro-cess control system, which allows for automated system operations once a chip is loaded and the system parameters are set up. The system com-es with an integrated custom-made 96-well auto-sampler that can accommodate vials,tubes and bottles, which allows unattended overnight operations.

Novel Fluidics System

The *PlexArray*™ Analyzer's fluidics system uses multiple program-controlled micro-flow pumps and valves that offer pulse-free operation and flow rate control to achieve a continuous, low-dispersion injection between the sample and the running buffer. Degassing capability coupled with a novel flow cell design reduces the occurrence of bubbles in the analytical process.

Powerful Control Software

Quickly analyzing and processing massive data sets

Graphical Interfaces

optimized user-friendly platform

– Develop based on National Instruments Lab-view™ software.

– Control multiple devices and keep the integrity of timing between data aquisition and process control using state of the art machine control programming

– Create databases to provide relevant information according to the experimental results and application requirements
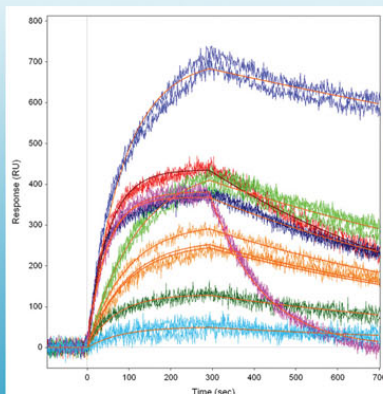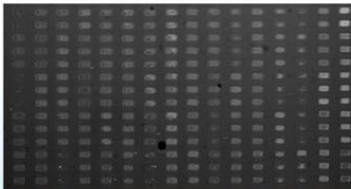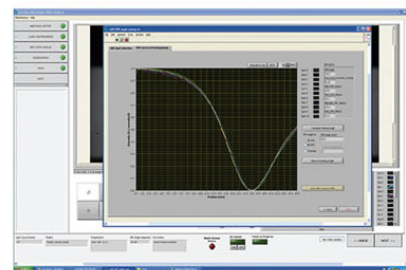
Real-time and End-to-end Process Control

– Seamless monitoring of the whole analytical process

– Various tools to visualize the analysis results in different formats

Efficient Data Processing and Storage Capacity

tailored for large-scale measurements

– Automatic QC tools to identify high value results in a large-scale data set

– Provides a cutting-edge verification algorithm for kinetic analysis

– Database storage

PlexArray™ Sensor Chips

Meeting your various application needs

Bare Gold Surface Chips

Customers can self print proprietary biological content on the sensor chips.

Print
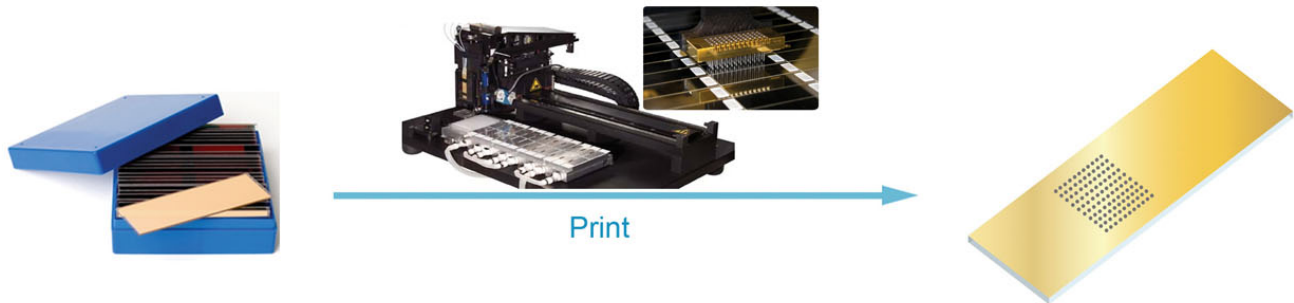
Microfluidic Flow Cell

A newly developed microfluidic flow cell is composed of a semi-circular pattern on the surface of the sample chip in order to maintain the flow of the analyte fluid uniform front forms on the surface of the sample chip at the inlet end and moves along the surface of the sample chip. Proprietary treatment of the fluidic components help to reduce the internal pressure and the dispersion of the sample solution during the sample injection process. The sample handling fluidic system shows significant improvement in reducing sample volumes and consistent sample delivery.
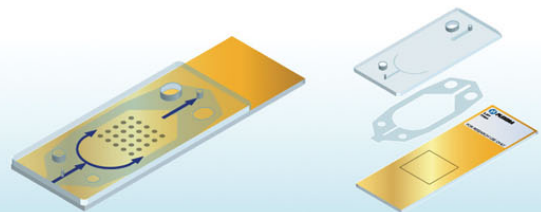
Uniform Analyte Fluid Delivery

-- More laminar flow

-- Less mixing

-- Less sample needed

-- Better kinetics

Products Timeline

ProteomicProcessor™
Prototype Placements

Kx5 System
Beta Sites

PlexeArray™ System

| 2006 | 2007 | 2008 | 2009 |

"We believe that SPR-based antibody arrays combined with reagents for detection of post-translational modifications is the future of proteomics and that the Plexera SPR analyzer is poised to capture that market."

"I also see this instrument as being the future for proteomics."

Craig Beeson, Ph.D
Associate Professor
Medical University of South Carolina

"The Plexera ProteomicProcessor™ holds great promise as a disruptive technology in the field of vaccine immunomonitoring."

John E. Connolly Ph.D.
Director
Baylor Institute for Immunology Research

"In my view, this technology offers us the ability to significantly accelerate our workflow to a level that can not be obtained using existing alternative technologies. Successful integration of this technology into our workflow would provide us and our collaborators with a significant advantage that would likely be subsequently replicated in other antibody discovery facilities."

Daniel J. Sexton, Ph. D
Director, Head of Lead Discovery
Dyax Corp.

"The new field of Systems Biology requires high-throughput data sets taken by analyzing thousands of interactions in parallel. This need for a high throughput platform is shared by the pharmaceutical industry (screening compound libraries and conducting immunogenicity testing) and the antibody industry (screening and characterizing new antibodies). The *Kx5* is suited well to all of these applications."
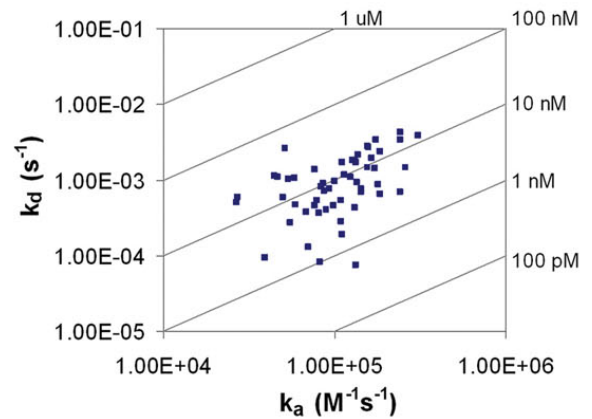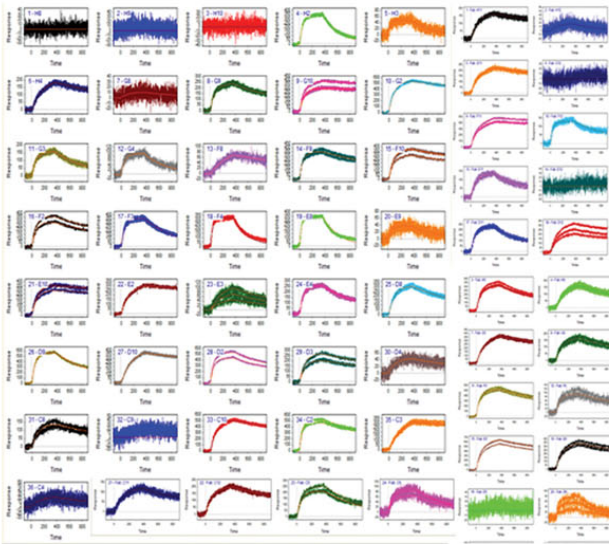
Christopher Lausted
Senior Research Engineer
Institute for Systems Biology

![Plexera logo]

Applications

Antibody Screening

-- 60 antibodies, printed in triplicate

-- Measured binding to 100nM of antigen

-- Globally fit replicate curves to get ka, kd, KD

Small Molecule Detection

-- Coat gold surface with biotinylated BSA follo-
   wed by streptavidin

-- Measure binding of various biotin conjugate

| Name	MW (Dal.)	CO (ng/ml)
Biotin	244	0.37
BioGEE	562	0.84
Biotin-4-fluorescein	645	0.97
Alexa Fluor 546 Biocytin	1210	1.80
Biotin-insulin	6000	9.00
Biotin-BSA	66000	99.00
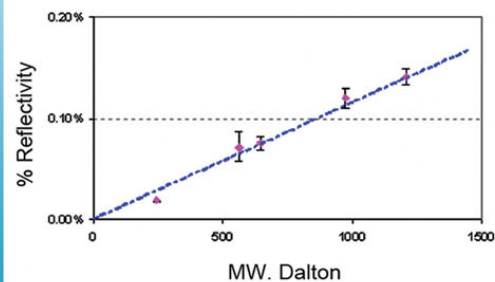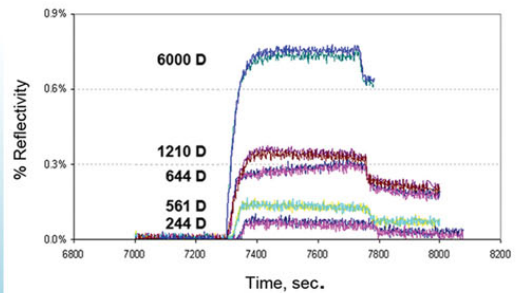
Biomarker Discovery *

Print 800 spot arrays with antibodies against liver related proteins, and compare the binding profiles of human serum samples.

-- 3 liver cancer serum samples

-- 3 other cancer serum samples

-- 1 control serum sample

Hierarchical clustering of the data distinguishes the liver cancer from the other cancer types.

-- 38 significant protein changes were detected

-- 7 previously reported in the literature

-- alpha fetoprotein, a known marker of liver cancer, was found to increase

Hierarchical clustering of human liver cancer serum samples. Sera from liver cancer (H1, H2, H3) and non-liver cancer (C1, C2, C3) subjects were analyzed with PlexArray™ Analyzer. The protein binding patterns from the six subjects cluster into two distinct groups. Red color represents increased protein relative to normal healthy serum, while green color represents decreased measurement.
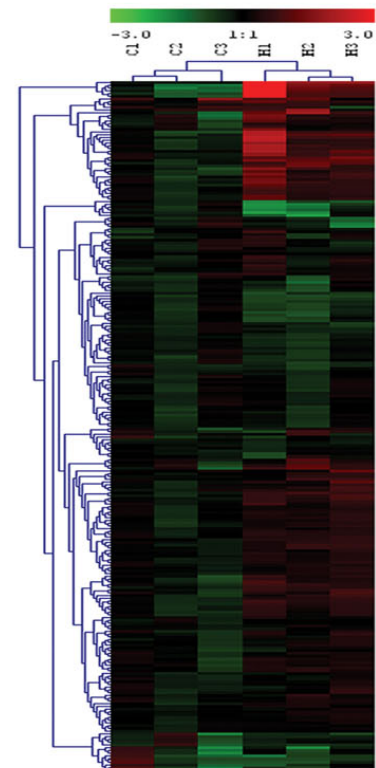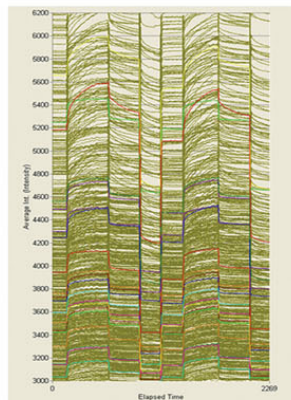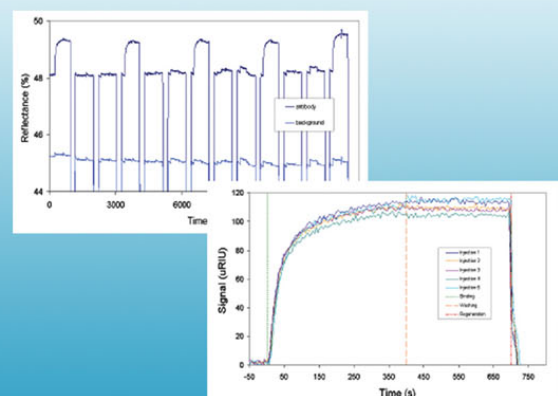
Advantages in biomarker discovery

Label-free -- **Simple**

800 spots -- **High Throughput**

15 minutes for each serum sample -- **Fast**

30 samples by same chip -- **Low Variation**

Antibody chip can be regenerated using a mild acid solution and reused up to 25 times -- **Low Cost**

* Lausted C, Hu Z, Hood L. Mol Cell Proteomics. 2008 Dec, 7(12): 2464-74