TIRF Labs

i-Diagnostics and TIRF Analytix
## non-profit project

Goal: **Prevent Future Pandemics and Minimize Damage from Existing Diseases**

TIRF Analytix and *i*-Diagnostics technologies will enable global infrastructure of precision medicine, minimize risks of infection emergence, localize outbreaks, facilitate cures development and provide precision diagnosing for home-use

TIRF Analytix cluster of technologies includes instruments and techniques for single molecule biology, elucidating mechanisms, studies on infection emergence, pandemic prevention, devices for real-time TIRF microarrays for drug screening and development of countermeasures, laboratory-based mega-diagnostics, and more >>>
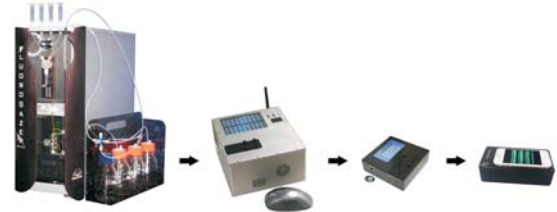
Downsizing TIRF Microarray Biosensors

i-**Diagnostics** cluster comprises diagnostic gadgets that facilitate localization of outbreaks and prevention of their spread. They are designed for home-use, as well as for first-responders, medical doctors, and other users. Built on the most sensitive biodetection platform TIRF microarrays, capable of single molecule detecting. This handheld device brings enabling technology to new dimensions in diagnosing.

3D - fibroin-enhanced 3D TIRF real-time microarrays minimize false-negative and false-positive results. Confidence is the key to diagnosing.

4D - detecting 4 classes of biomarkers: DNA, RNA, proteins, and metabolites enables accurate diagnosing necessary for precision medicine.

Detects Covid, Flu, Ebola, MERS, Zika, HIV, STD, cardio-, neuro-diseases, cancer, etc. Provides results in 5-10 min.

cartridges $1-10   i-Diagnostics Reader ~$100

## i-Diagnostics and TIRF Analytix Technologies (patent pending)

The underlying technologies use the phenomenon of Total Internal Reflection Fluorescence (TIRF), which provides an extremely thin layer of excitation light ~100 nm, thus removing the background interference, maximizing the sensitivity, and minimizing rate of false-positive and false-negative responses. Combined with microfluidics and nanotechnology, this ultrasensitive handheld device can detect and analyze over 100 different biomarkers simultaneously, on par with benchtop devices.

3D - Real-time TIRF Microarray

Classical TIRF microarrays are 2D. In i-Diagnostics we extended TIRF into the 3rd dimension using spider silk protein, which acts both as a light-guide and an assay chamber. The 3D TIRF allows encapsulation of bioassays into a biologically friendly environment, where molecular beacons not only exhibit major gain in sensitivity, but also results in the speed of the response and minimal requirements to sample preparation.

4D - Mega-diagnostics Detects 4 Classes of Biomarkers

Typical diagnostic technologies detect only one class of biomarkers. i-Diagnostics can detect all 4 major classes of biomarkers simultaneously: DNA, RNA, proteins, and metabolites, allowing for designing of complex diagnostic panels necessary for precision personalized medicine. Scalability of i-Diagnostics technology can go from 10 to 100 and 1,000 biomarkers on a single microarray, making i-Diagnostics a genuine Mega-diagnostics platform.
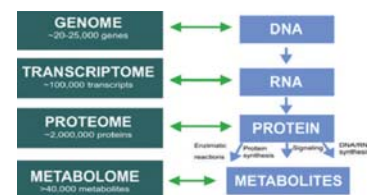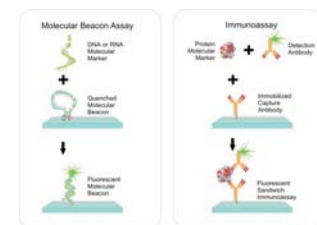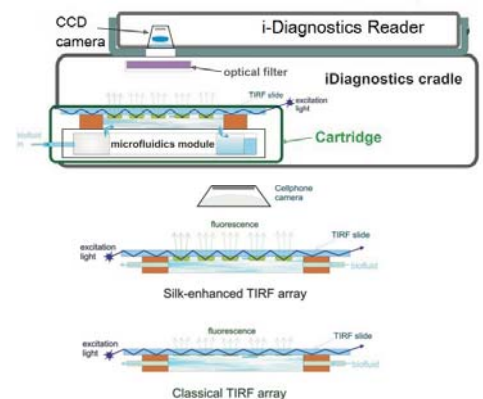
Early Diagnosing = a Step Ahead of Any Disease

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i-Diagnostics and TIRF Analytix - Open Source Platforms for Creating Global Biological Safety Infrastructure

Intelligence - a Dimension Driven by Open Source Biodetection Platforms TIRF Analytix and i-Diagnostics

Complex diagnostics is powerful to use, but hard to develop. We pledge to make i-Diagnostics and TIRF Analytix THE OPEN SOURCE PLATFORMS - so that thousands research groups worldwide can develop their own applications using their areas of expertise. The envisioned global network will create the infrastructure preventing outbreaks and emergence of infections. Diagnostic panels will be designed by researchers, but inspired by doctors and other users to sync their needs with technological potential of i-Diagnostics. Making the technology affordable is essential to spearhead joined effort in assay development, to global acceptance, and to expeditious regulatory process
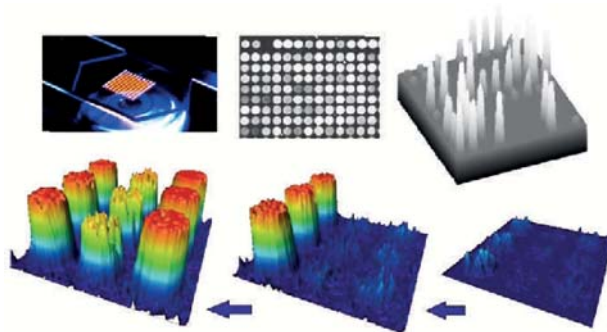
Real Time DNA/Protein detection by TIRF microarray

i-Diagnostics and TIRF Analytix Applications

- Detection and diagnosing of infection diseases: COVID-19, influenza, Ebola, HIV, Zika, STDs, etc.
- Diagnosis and prognosis of cancer
- Diagnosis and prognosis of cardiovascular diseases
- Diagnosis and prognosis of Alzheimer's, Parkinson's and other neurological disorders
- Drug screening and cure development studies

- Longevity, rejuvenation studies and popular efforts
- Food and water safety applications
- Civil and military biodefense applications
- Forensic applications
- Environmental applications
- Agricultural analyses

Mega-Diagnostics in the Palm of Your Hand

- Ultimate sensitivity - the ability to detect diseases at early stages
- Superior confidence - minimal rate of false-positive and false-negative responses
- Fast results - providing test results within 5 minutes - easy logistics
- Minimal requirement to sample preparation allows for home use
- Single TIRF microchip can analyze over 1000 different biomarkers at once
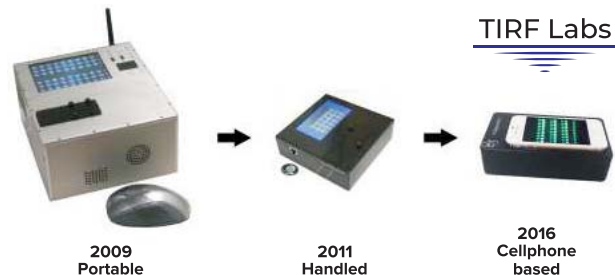- Simultaneous detection of DNA, RNA, proteins, and metabolites

Reader ~$100, Cartridges ~$1-10

TIRF Analytix Technology is Mature

Numerous research groups are using our analytical-grade TIRF Analytix instruments that are capable of detecting single molecules. As Open Source platform, TIRF Labs will share with our partners the complete set of TIRF application development tools, methods and consumables, and provide technical support, including on-site training.

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Downsizing TIRF Microarray

2009 Portable → **2011 Handled** → **2016 Cellphone based**

2015 - 2D TIRF microarray instruments were favorably evaluated against alternative detection systems by the US Department of Defense and Department of Homeland Security.
2016 - We extended 2D TIRF microarrays into the 3rd dimension using silk protein as lightguide and assay chamber.
2019 - We optimized the system to allow detection by smartphone camera and reduced the cost below $100 for the reader and $1-10 for the cartridge.

Let's Change the Future of Healthcare Together to Be a Step Ahead of Any Disease