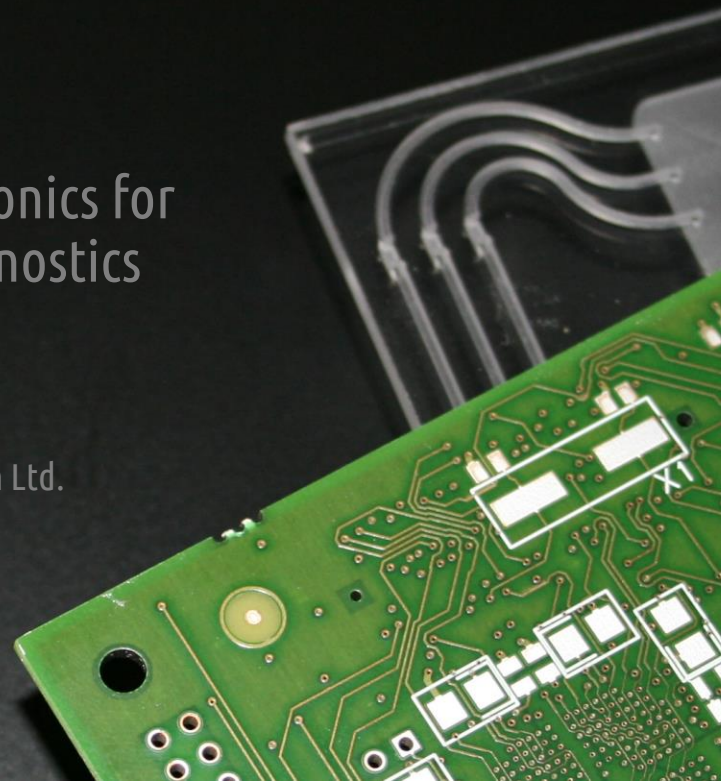


A Lab in the palm of your hand...

Microsystems and microelectronics for
point-of-care molecular diagnostics

Dr. Thanos M. Demiris
R&D Director and co-founder micro²gen Ltd.

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Back in the future...



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Star Trek Original Series – Created by Gene Roddenberry – Produced by Desilu Productions, Paramount TV, Norway Corp. and distributed by CBS TV Distr.

In other words...



- A diagnostic device
 - hand-held
 - portable
 - contactless
- Easily operated by a medical expert (or not even that...)
- Delivering comprehensive diagnostic information
- Almost instantly

Can we do that?



- We can build a diagnostic device that is
 - compact
 - portable
 - Easily operated by a medical expert (and later perhaps also patients)
 - Delivering comprehensive diagnostic information
 - In a significantly reduced time
- And requires a minimal amount of sample...

Multidisciplinary

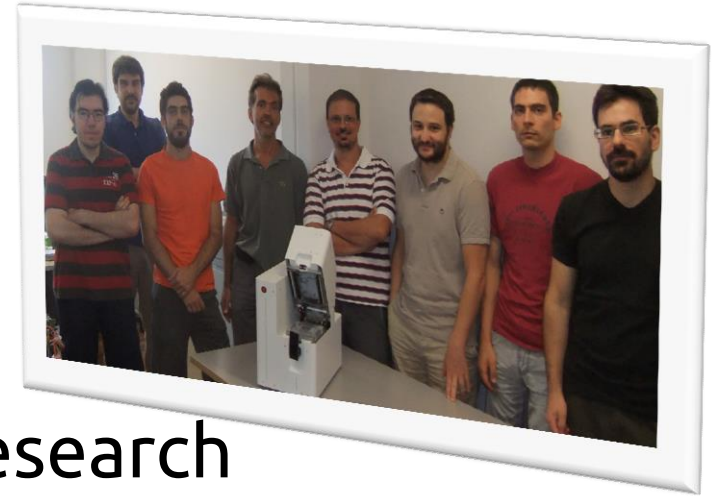


- Combine
 - Molecular Diagnostics
 - Microsystems and particularly microfluidics
 - Biosensors and surface chemistry
 - Microelectronics
 - Software engineering and data/knowledge processing algorithms

History...



- Established 2007
- Based in Athens in the “Lefkippos” Technology Park of NCSR Demokritos
- Close collaboration with research labs of NCSR, although not a spin-off
- Still strong “start-up” character and spirit...



Mission



To design and produce **innovative molecular diagnostics solutions** supporting **researchers and clinicians** in diagnosing and/or analyzing physiological and pathological conditions for individuals or across populations.

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Vision



- Become a leading group in the **design of innovative, specialized components** for microfluidics control and instrumentation
- Further expand strategic partnerships or in-house knowledge for the **design of microfluidic MEMS**
- Become a **reference center for the downscaling of molecular diagnostics assays** for microfluidic microsystems
- Use these components and expertise to develop an **All-in-One™ solution for molecular diagnostics**

Realism...



- But start small...
- Firstly narrow down your application area
- Joined a European Collaborative Effort in the realm that targeted coeliac disease
 - an autoimmune disorder of the small intestine
 - that occurs in genetically predisposed people of all ages
 - Reaction to gliadin (a gluten protein)
 - Found in wheat, barley and rye (other proteins)

Target



- Perform all necessary tests using disposable microsystems
 - Genetic tests to determine predisposition
 - Serology tests to quantify levels

Lab-on-a-Chip



1

Sample Preparation:
DNA Extraction



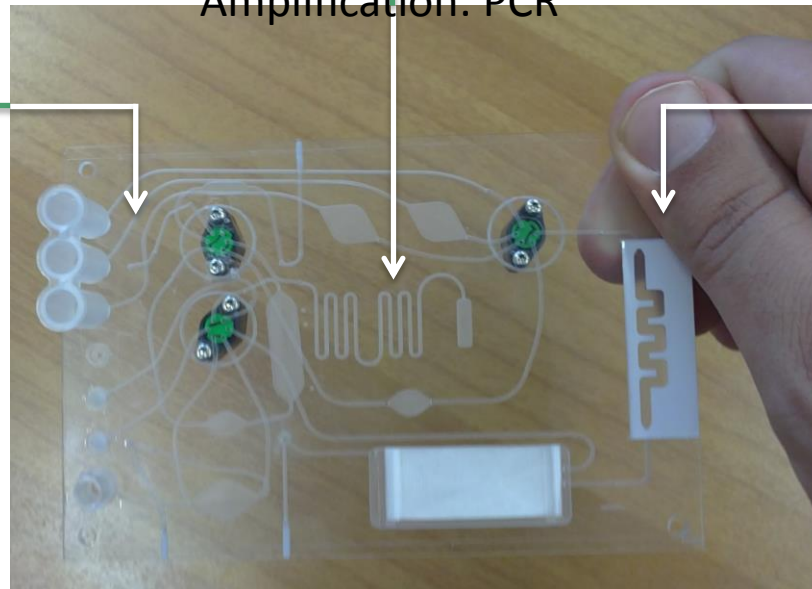
2

Amplification: PCR



3

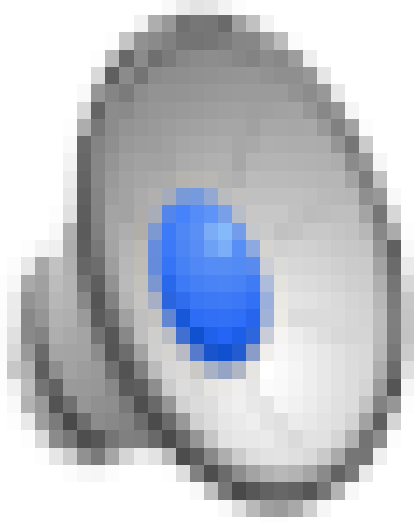
Hybridization
Detection



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A complete use case: Coeliac Disease



Intermediate steps...



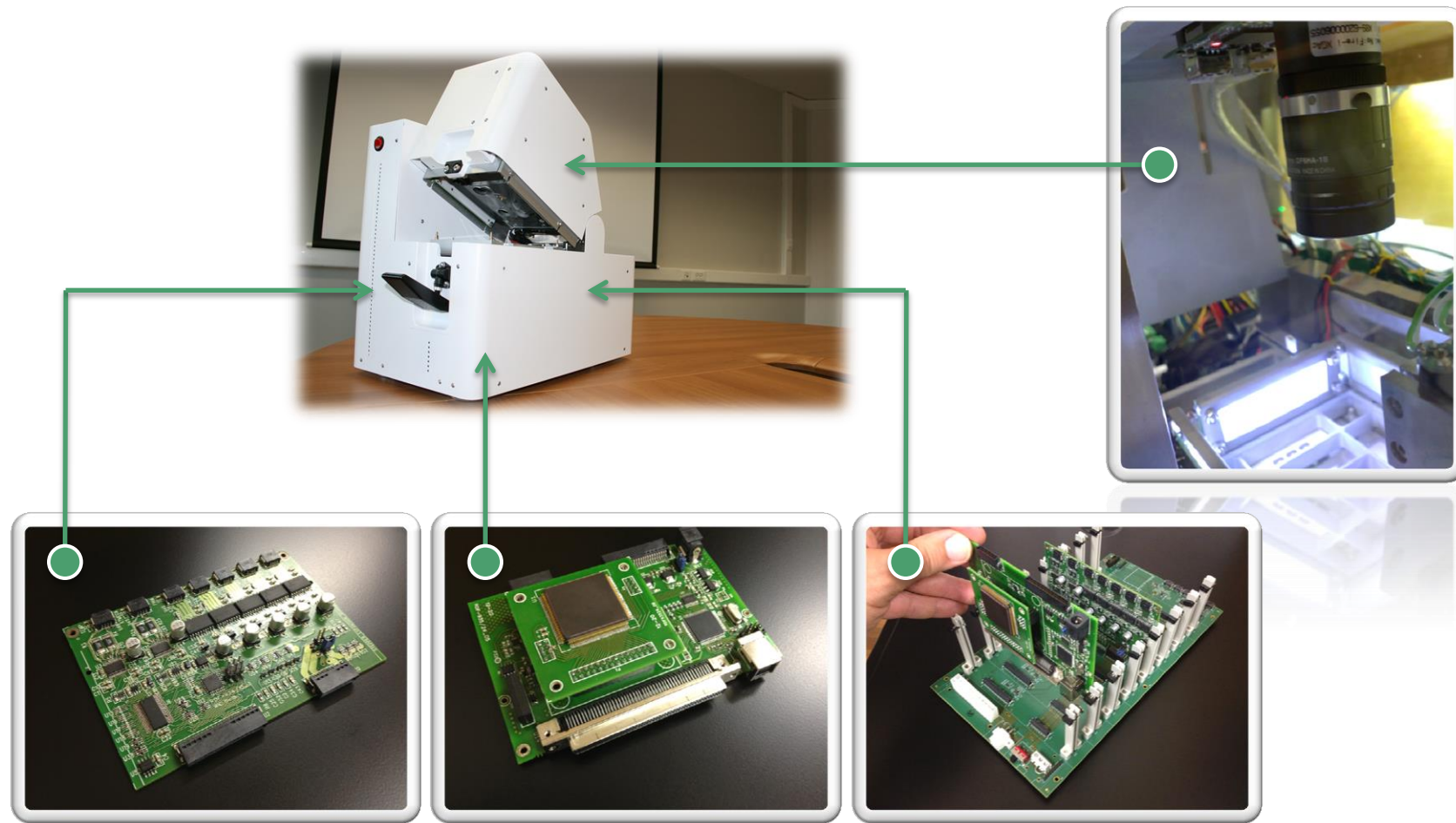
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- The envisaged All-in-One Solution is feasible
 - But needs some more time
- Try to start commercial operations asap
 - Introduce an intermediate market strategy

Current developments: OEM Components



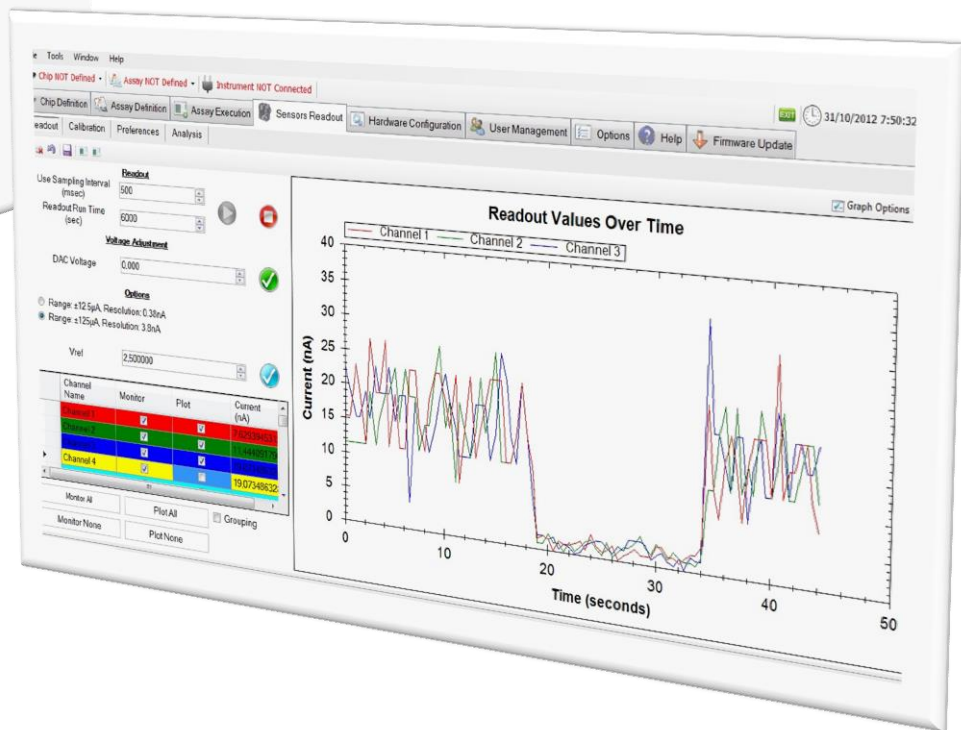
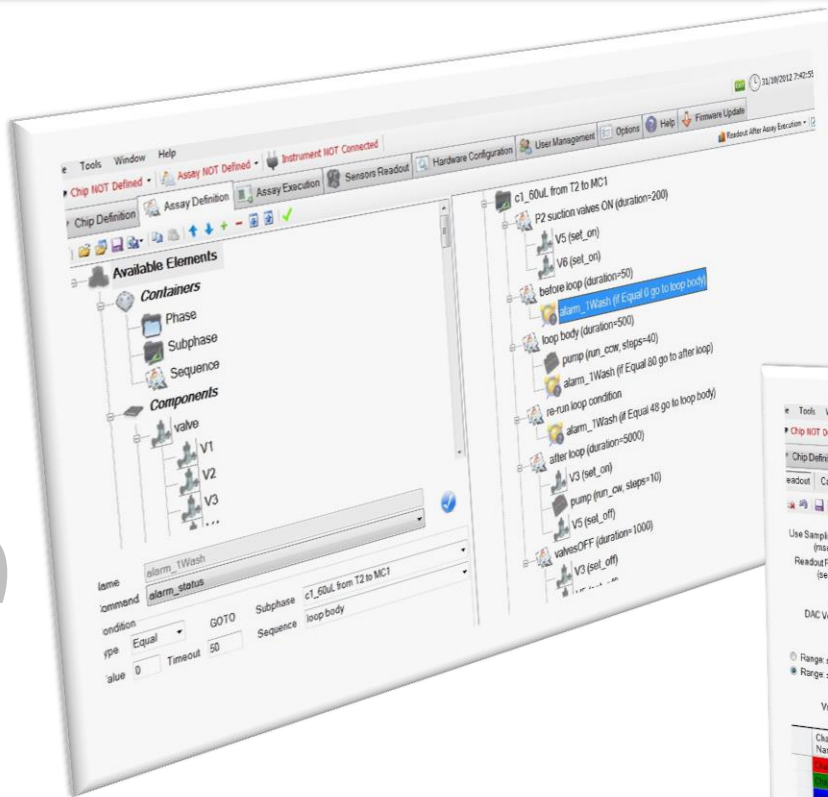
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Adaptable SW for control and analysis



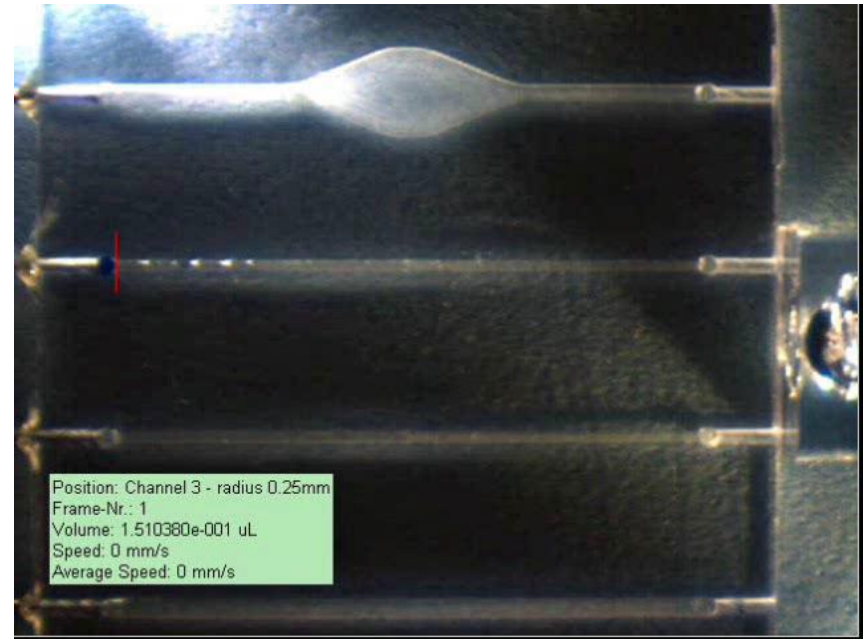
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Adaptable SW for control and analysis



- A patent for optical detection and analysis of microfluidic plug or laminar flow
- Also applicable to droplet microfluidics
- Machine vision determination of:
 - Wavefront position
 - Speed
 - Volume (in characterized microsystems)
 - Bubble formation



Synergies



- Look for synergies in a multidisciplinary field
 - Being in the NCSR Demokritos Technology Park is vital
 - Strategic collaborations and use of infrastructure
 - Institute of Microelectronics
 - Institute of Radioisotopes & Radiodiagnostic Products -
Immunochemistry & Immunodiagnostics Lab + Molecular Diagnostics
Lab
- International strategic partnerships play vital role
 - Spanish Biosensors company and institute
 - German Microsystems Institute

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