

EVENTO DE NETWORKING

HEALTHCARE & PHOTONICS

TECNOLOGIAS FOTÓNICAS APLICADAS AL SECTOR HEALTHCARE

26 MARZO/14

09.45h-17.00h
**Parc Audiovisual
de Catalunya**
Carretera BV-1274,
Km.1, 08225 Terrassa
(Barcelona)



Dispositivos avanzados point-of-care para el diagnóstico descentralizado y precoz de enfermedades

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Nanobiosensors & Bioanalytical Applications Group
ICN2. CSIC & CIBER-BBN

DIAGNOSTICS: today and tomorrow

Clinical laboratory



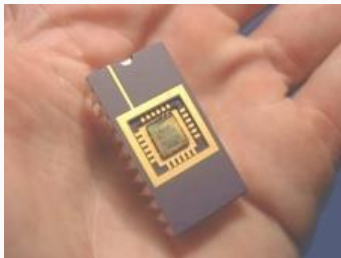
- Limited to centralised laboratories
- Required trained personnel
- Time-consuming
- Expensive instrumentation
- Not available to everyone (*resource-constrained settings*)



HIGH COSTS

LOW SPEED OF ANALYSIS

Biosensor/POC devices



- Suitable for diagnostics in the field and in-situ
- Fast, label-free, high sensitivity
- Enable permanent deployment and unattended operation

POC Biosensor technologies present attractive alternative to traditional laboratory diagnostics

Final Goal in Diagnostics

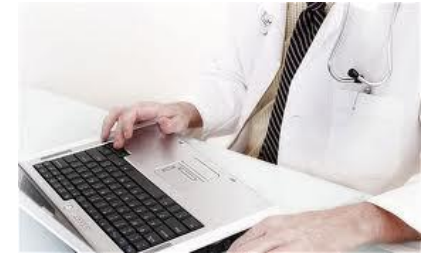
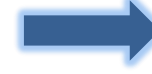


sample



Sanofi BGStar[®]

biosensing evaluation



treatment

Angewandte Chemie, 124,11753, 2012
Sensor Actuat. B., 176, 225, 2013



Science ~~fiction~~ reality in the palm of your hand

X PRIZE Foundation and Qualcomm
Foundation Set to Revolutionize
Healthcare with Launch of **\$10 Million**
Qualcomm Tricorder X PRIZE

The device will be a tool capable of diagnosing a set of 15
diseases, with a total weight not more than 2 Kg

Final goal: lab-on-chip biosensor devices

Technological platforms

We develop our own technological platforms (IP & know-how): (nano)plasmonics, integrated optics and nanomechanical based microchips. Microfluidics & electronics.

Biofunctionalization protocols

Specific and custom-design of bioreceptor immobilisation for each application

Real Sample Evaluation

Blood/Serum



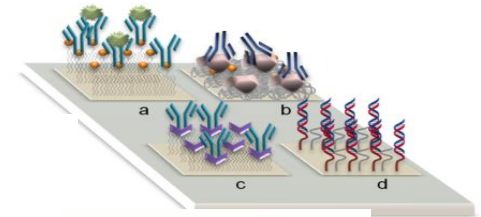
Real samples



Urine

Tears

Environmental samples

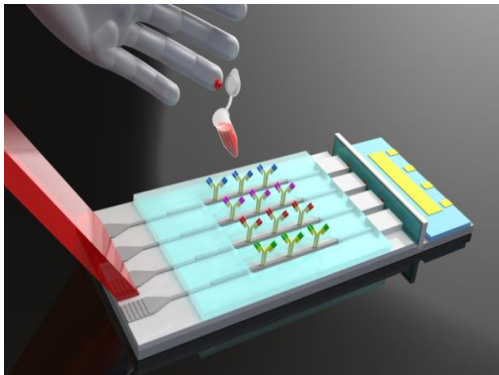
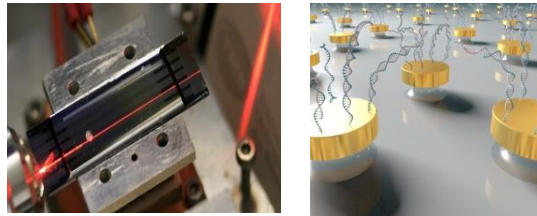


Operational prototypes

Full integration in portable "lab-on-chip" platforms

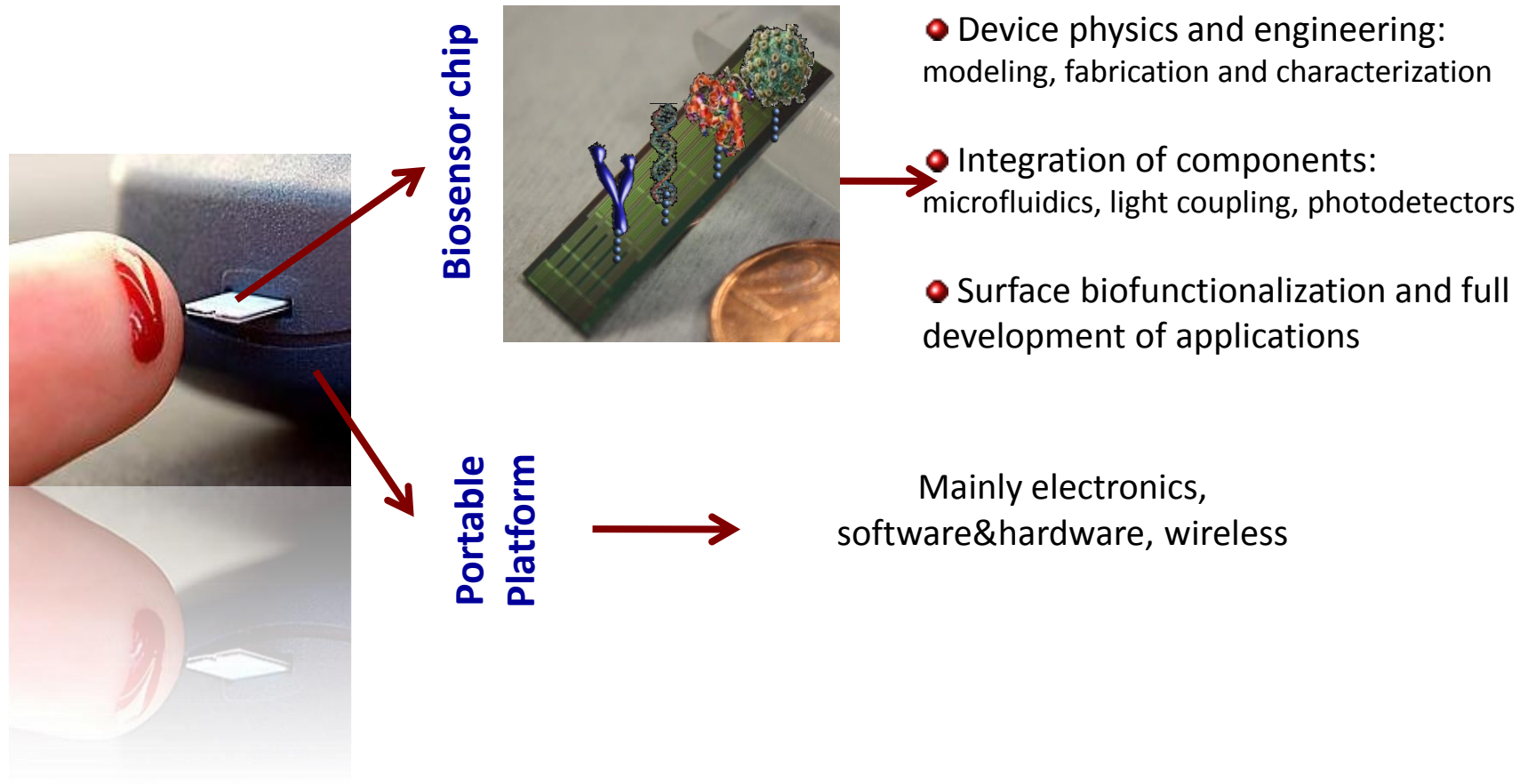
- SENSIA, SL (2004) (Sold in 2012)
- BiMW tech transfer (2014)

Technology transfer

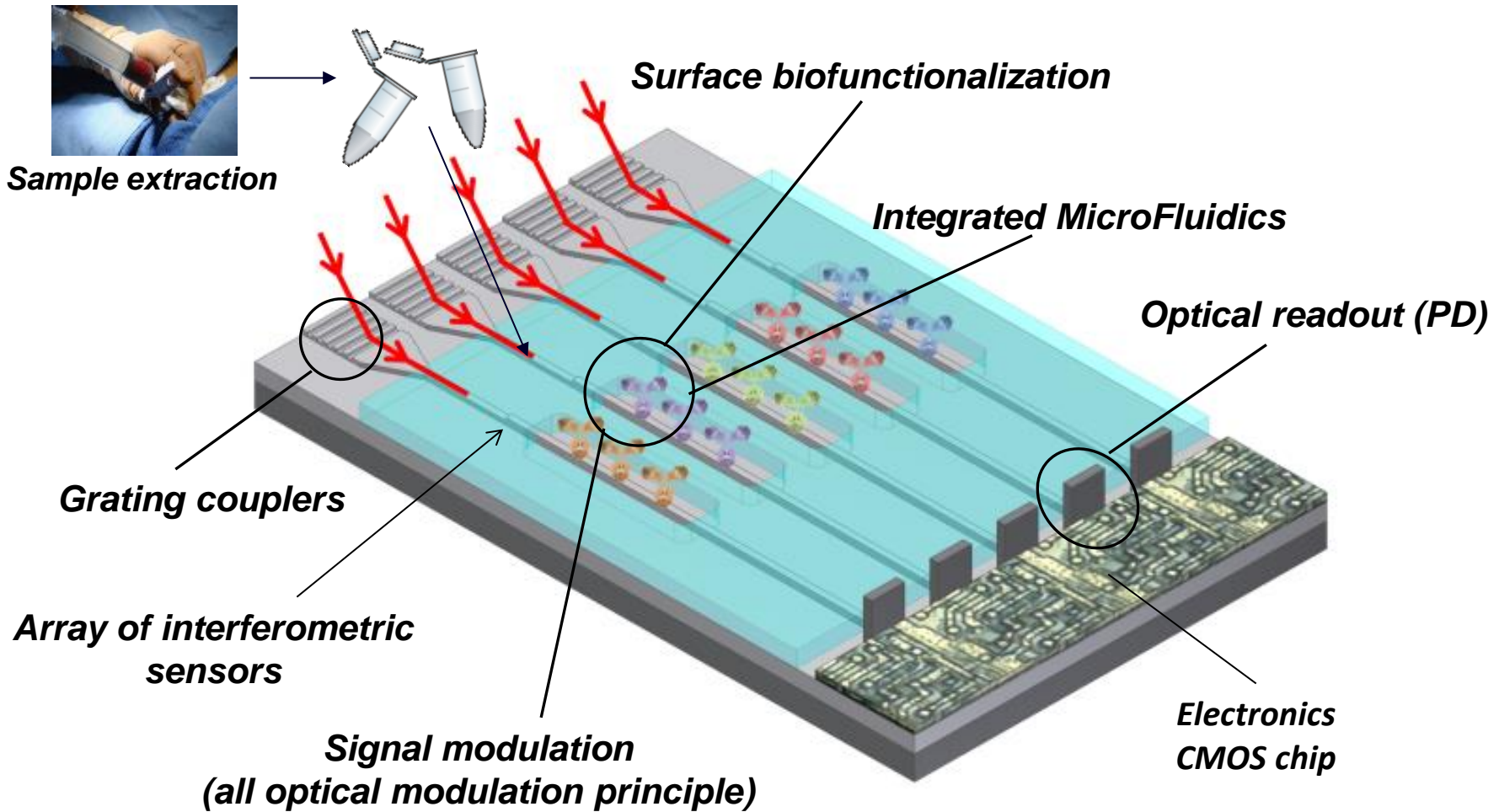


POINT OF CARE WITH OPTICAL BIOSENSOR DETECTION

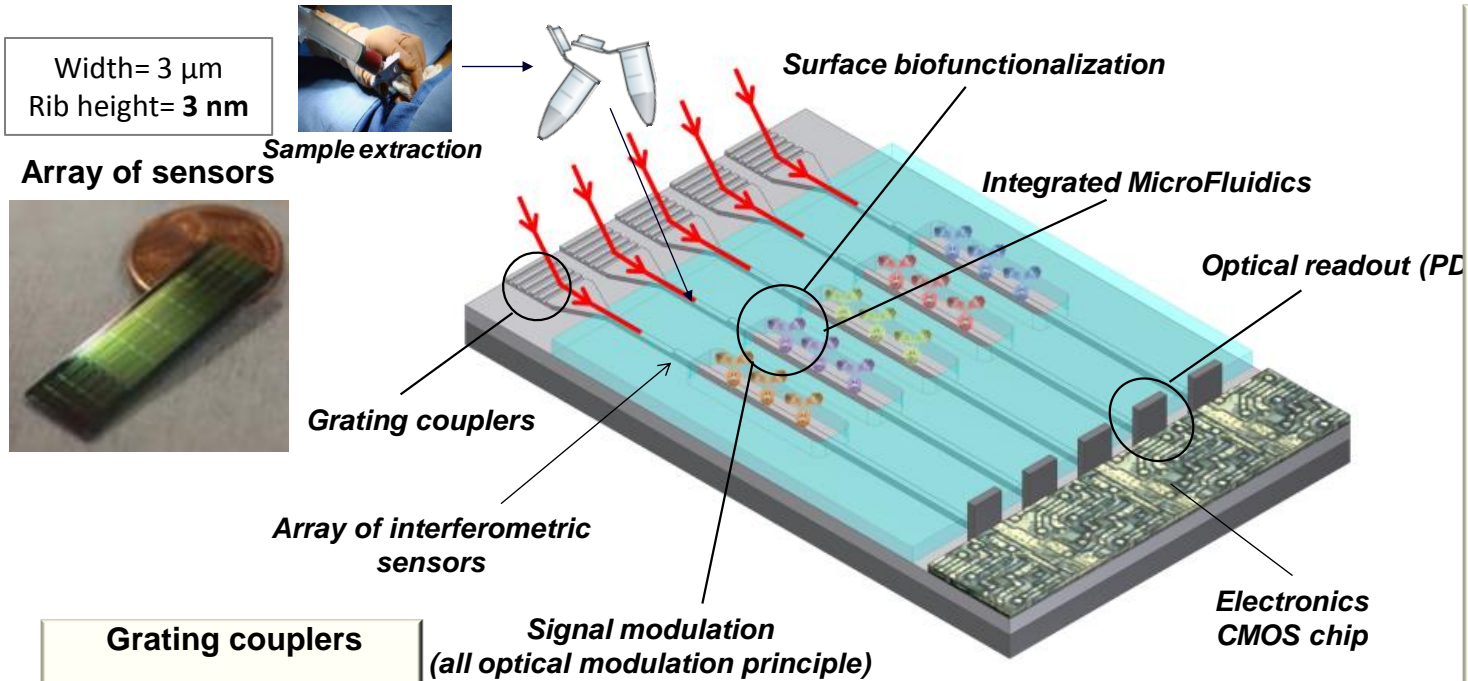
Biosensor devices based on integrated optics (silicon photonics, evanescent wave label-free sensing) offers an unique opportunity



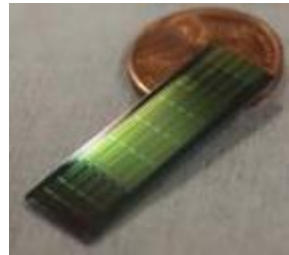
“Lab-on-a-chip” Biosensor platform



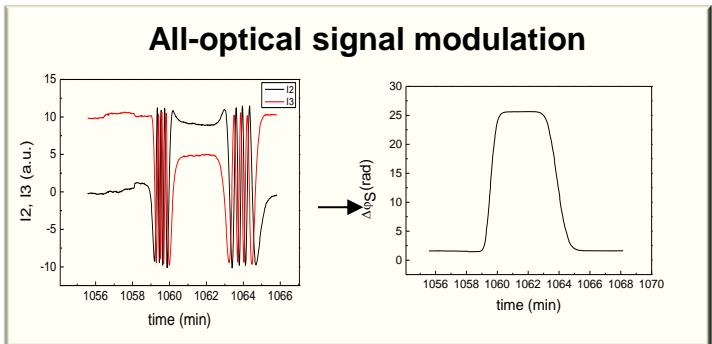
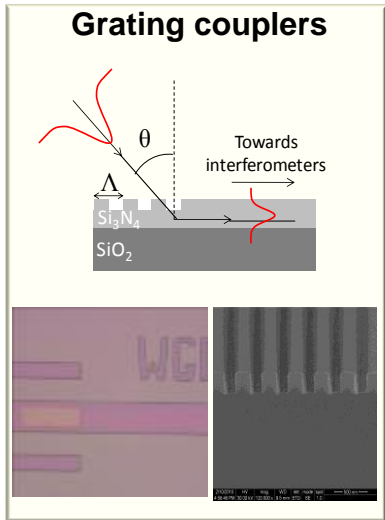
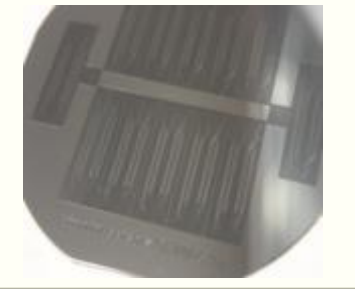
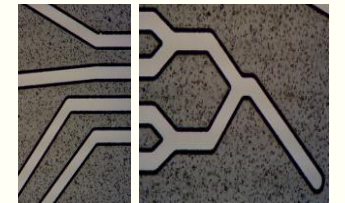
The integration of different components into a chip is a challenge. The integration is not trivial due to destructive integration processes and performance optimality.



Width = 3 μm
 Rib height = 3 nm



Integrated polymer microfluidics



Lab chip 12, 1987-1994 (2012)
IEEE Photonics J. 5, 3700108, 2013
J. Colloid Interface Sci., 2012
Optics Express, 20, 7195-7205, 2012

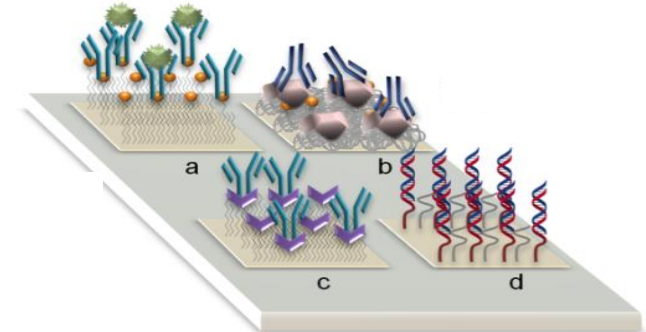
Biomedical and clinical diagnostics using POC

- Sensitivity
- Specificity
- Direct detection
- Fast analysis
- Multiplexing
- Low sample volume
- Simple & low cost



REAL SAMPLE

Surface Biofunctionalization

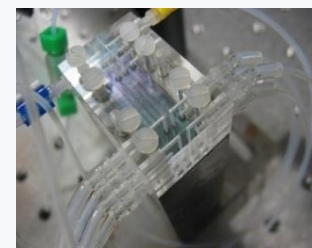
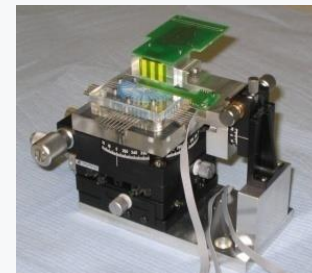


- Detection of toxic pollutants in water and food (at ppt level)
- Early detection of cancer by analyzing protein and microRNA biomarkers (colon cancer)
- Diagnosis of Malaria and Tuberculosis
- POC for celiac patients (gluten detection in urine).
- POC for allergic diagnosis.
- Diagnosis of hormones in human fluids. Diagnostic Kit for doping control.
- Direct identification of microorganisms (bacteria) down to 10 cfu/ml
- Multiplexed diagnosis of bacterial infections and bacteria antibiotic- susceptibility
- Detection of Protein biomarkers related to eye's diseases
- Detection of single-point mutations in DNA sequences related to cancer

Anal. Bioanal. Chem. 393 (4), 1173 (2009)
 Talanta 78, 1011-1016 (2009)
 Anal. Chim. Acta 647, 202-209, (2009)
 Clin. Chim. Acta 403, 56-62 (2009)
 J. Leukocyte Biol. 90, 399-408 (2011)
 Nucleic Acids Res 40, e56/1-11 (2012)
 Anal. Bioanal. Chemistry (DOI 10.1007/s00216-
 012-6321-z) ;Analyst DOI:
 10.1039/c2an36094b;Analyst (*In Press*); Anal.
 Bioanal. Chem. (ABC) (*In press*)

Nanobiosensors and Bioanalytical Applications Group

- **Plasmonics and Nanoplasmonics:** SPR, LSPR, MagnetoSPR
- **Integrated optics:** Nanophotonic biosensor (MZI & BiMW)
- **OptoNanomechanical** biosensors
- Biofuncionalization with biological receptors
- Microfluidics integration
- Lab-on-a-chip & point-of-care platforms
- Applications: clinical diagnostics, environmental control



MORE INFO

nanob2a.cin2.es

