

## Report from Yole Développement

# “LifescienceIC”: Analysis of the applications and added value of semiconductor devices in Life Sciences

Life Sciences industry explained to the semiconductor industry leaders

Price: Euro 1,990  
Publication date: April 2006

A very futuristic approach of Life Sciences is on the way. New in vitro diagnostics systems, new therapy strategies, genetic diseases treatment, targeted and intelligent drug delivery, artificial pancreas... are health improvement promised to the future generations, enabled by semiconductor and MEMS technologies. The Life Sciences industry is already facing very important challenges to take its way to this expected innovation breakthrough.

Such future of Life Sciences will be possible by bringing together many different technologies like microelectronics, mechanics, optics, physics, molecular biology... Indeed microelectronics that has led to the explosion of consumer electronics sales could now bring its added value to different to the Life Science applications. The key challenge for microelectronics is to make complexity invisible, to make technology accurate, reproducible and intuitive for a natural use. They are already used for drug delivery dedicated products as illustrated in figure 1.

### ChipRx Inc. (USA): Self Regulating Responsive Therapeutic System

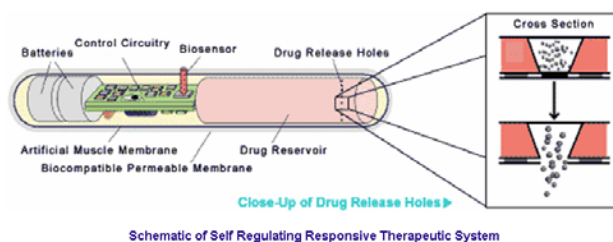


Figure 1: Example of implantable system using microelectronics technology

This expected evolution in the Life Sciences field requires thus teams from different background to collaborate and to understand the challenges each other is facing in its own domain. It involves being able to understand the biological ins and out as well as challenges to work together in identifying an innovative solution to propose.

To take part in this innovation process, it is very important to understand the technology and industrial trends by having a good view on the current technologies used, their limits and advantages, the applications and the way Life Science is working.

The Life Sciences field is considered as a very attractive field to target for the next innovation to launch. Some companies already succeed as shows the Affymetrix success story. In a little more than 10 years, using its technology coming from the semiconductor field and with key agreements with Life Science companies (Roche, Novartis, Aventis, BMS, bioMérieux...), Affymetrix is now dominating the biochip market worldwide with more than 70% market shares.

Several semiconductor companies are involved in Life Sciences like STMicroelectronics, Philips, Agilent... and several others have stopped their activity like Motorola, Infineon... Entering the Life Sciences field could be complex since it is a very broad field including many different industries like **drug discovery, in vitro diagnostic, medical devices, instrumentation...**

The market is much segmented in term of applications, technologies and medical use. Each field has its own specificity in term of industry organization, added value chain, industrial players, R&D activities, drivers and market entry barriers, entry point in the supply chain, position in the value chain... For example, selling devices is not always the best way to maximise the added value compared to a module/function approach. One of the main challenges in entering the Life Sciences field is to define the value of the technology to propose in this business.

**The purpose of the report is to provide a better understanding of Life Sciences to semiconductor and MEMS companies, with a detailed analysis of the different application fields, market evaluation and strategy analysis for semiconductor and MEMS companies.**

**This report presents and describes the biological challenges ins and out. It highlights the specificities of the different Life Science industries and the business opportunities for semiconductor and MEMS companies. It also answers the question: “how could IC and MEMS companies become a key leader of the Life Sciences field?”**

LifescienceIC report will introduce you to molecular biology with basic concepts presentation as illustrated in figure 2 so that you get a better understanding of the biology field and challenges. We particularly describe biological compounds (nucleic acids, proteins, peptides, glycanes etc...), their size scales and interaction to highlight and make understandable the biological complexity.

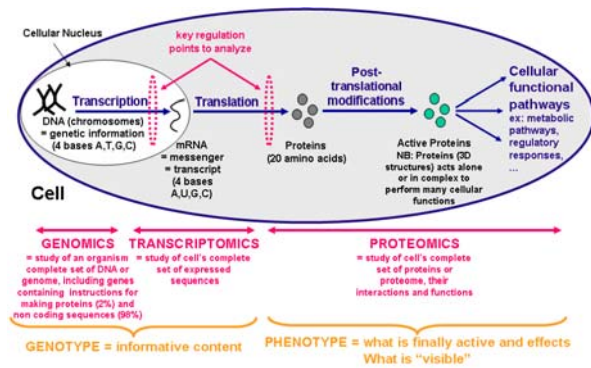


Figure 2: Example of biology background description

A part of this report is also dedicated to the different existing techniques used today in molecular biology. We highlight the gold standard technologies per application field. Such information is required to get a technological and commercial competitive advantage. Sample preparation, PCR amplification, nucleic acids and proteins separation and detection, immunoassays, HPLC columns and mass spectrometry are examples of technologies described.

The industrial fields where semiconductor technology could be used will be presented, highlighting the **market potential (\$)** (see figure 3), **players involved, and key specificities**. The report also defines the attractive functions from semiconductor devices. It is illustrated by current products and developments (as presented in figure 1).

The applications of semiconductor and MEMS devices are under analysis in the following markets:

- Life Sciences research
- Pharmaceutical industry
- Diagnostic
- Medicine

With devices such as microarrays, microfluidic-based devices, lab-on-chips, drug delivery devices, pressure sensors, accelerometers...

**Best practices to enter the Life Sciences field are proposed in this report.** They are based on analysis of industry key players: Affymetrix, Agilent, microParts, STMicroelectronics. The report also analyses past experience from Motorola to understand why such company has stopped its investments in Life Science applications.

The position of semiconductor companies in the **value chain** is discussed.

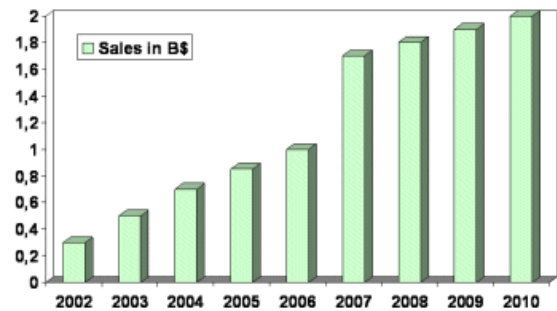


Figure 3: Example of market forecast - microfluidics case

The report is bringing a lot of value to IC manufacturers, MEMS manufacturers, materials and equipment suppliers as well as system manufacturers so as to understand the **business potential, the technology status and who is doing what for strategic and marketing decision making.**

### Report Benefits for Life Science companies

- Provides a complete analysis of current developments of IC and MEMS for Life Science applications
- Highlights the hottest potential technologies, i.e. who's working on what devices?
- Help define commercialization opportunities, the technical bottlenecks and which company could be the right partner

### Report Benefits for IC and MEMS Manufacturers

- Highlights markets to target and in-depth analysis of when and how to access that business
- Gives quantitative component volume figures (detailed forecasts)
- Help define the right commercialization approach in terms of specifications and position in the added value chain

## CONTENT OF THE REPORT

### LifescienceIC 2006

**Report name:** LifescienceIC

**Publication date:** April 2006

**Number of pages:** 160+ slides (PowerPoint presentation)

**Price:** Euro 1,990

#### About Yole Développement.

Yole Développement is a market research and strategy consulting company, specialised in MEMS with a team specially dedicated to Life Science applications. Yole Développement offers various kinds of services:

- Custom market research and technology/strategy analysis
- Marketing and communication services through MicroNews
- Market reports

Founded in 1998, Yole Développement is the world leader in the analysis of the microtechnologies and compound semiconductors markets. Each day, Yole's team of 18 consultants is in contact with the worldwide key industrial companies, R&D institutes and investors in order to help them to understand the markets and technology trends. In our analysis, we take into account the complete value chain including materials and equipment suppliers, device & system manufacturers and devices users.

#### Purpose of the report

- Give microtechnologies' industry and research players keys to understand biology and be able to address new business and to interface in the frame of multidisciplinary team
  - Introduce biology's main elements and concepts
  - Present molecular biology's main approaches and associated techniques
- Present an overview of Life Science applications and markets
- Give an overview of MST added value in the Life Sciences field
- Present examples of breaking technologies and products released thanks to MST approaches for Life Science applications
- Provide keys to understand what are the main opportunities and entry barriers in these markets
- Present trends for the future

#### Content of the report:

##### The world of Biology - Definitions

- Cell, DNA, Proteins ... Who's who?
- Biology and Micro/Nano Technology comparative scale

- Molecular Biology, a complex world
- Levels for Molecular Biology analysis: The OMICS World
- Main technologies and applications

#### Presentation of the gold standard techniques used today in Life Sciences

- Cell culture
- Sample preparation
- PCR amplification
- Electrophoresis
- Western Blotting
- Sandwich immunoassays or ELISA
- High performance liquid chromatography (HPLC)
- Mass spectrometry (MS)

#### What is the Life Sciences field?

- Main industrial domains and related applications
- Overview of the main markets in Life Sciences field
- Focus on Pharmaceutical industry
- Focus on In Vitro Diagnostic industry
- Focus on Medical Device industry

#### Why semiconductor devices and MEMS could be useful for Life Science applications?

- MST materials and their added value for Life Science applications
- MST added-value in the Life Science markets
- What are BioMEMS & Biochips? Yole Développement's definitions
- Detailed analysis of microtechnology-based devices for Life Science applications
  - Drivers in Life Science markets MST may answer
  - Existing applications and future MST products in the Life Science markets
  - Players and products example
- BioMEMS market size potential 2005 – 2010

#### Value chain analysis for biochips

#### Examples of companies' success stories

#### Conclusion

- Synthesis and challenges for the future
- Key ingredients to succeed in this field

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