BIOMEMS & NON-INVASIVE SENSORS: MICROSYSTEMS FOR LIFE SCIENCES & HEALTHCARE 2018

Market & Technology report - August 2018

A new wave of sensors, responding to the challenge of global healthcare transformation, opens new business opportunities for mobile healthcare and emerging non-invasive devices.

KEY FEATURES

- How healthcare is transforming, and the impact on MEMS/ BioMEMS sensors
- Key drivers for BioMEMS device usage
- BioMEMS sensors used: key application per device type (pressure sensors, accelerometers, microphones, microfluidics, ultrasonic sensors, etc..)
- Global bioMEMS market: key metrics, in volume and value for the period 2017 - 2023, market dynamics ($CAGR_{2017-2023}$)
- Focus on components: market forecast, major players, market share, supply chain
- Technology trends contributing to new healthcare applications
- How are emerging non-invasive sensors responding to healthcare's new challenges?

WHAT'S NEW

- Focus on mobile healthcare (mHealth) and sensor requirements
- Sensor technology trends for mHealth and the Internet of Medical Things (IoMT)
- Specific section on non-invasive sensors
- Introduction of new sensor technologies: printed electronics
- Changes in business models, and value chain impact
- Integration of optical MEMS sensors
- Description of emerging MEMS: ultrasonic sensors (CMUT & PMUT), neural implants, and more

MEMS TECHNOLOGY IS CONSOLIDATING ITS HEALTHCARE MARKET PENETRATION, AND FOR THE NEXT FIVE YEARS WILL CONTINUE ITS HUGE 14.8% GROWTH

More than ever, companies are showing a growing interest in the healthcare domain. In the last 2 - 3 years, major players like Google, Apple, and Amazon have highlighted challenging projects, i.e. measuring blood glucose via smartwatches or smart lenses. Also, sensor makers are developing new technologies and platforms to answer the specific requirements of medical grade products.

Demand for MEMS devices is increasing exponentially thanks to a democratization of medical devices that's bringing them closer to consumers and creating a high demand for portable and wearable devices enabling patient monitoring at the point of need. In order to satisfy demand, almost all MEMS foundries are proposing manufacturing services dedicated to healthcare applications.

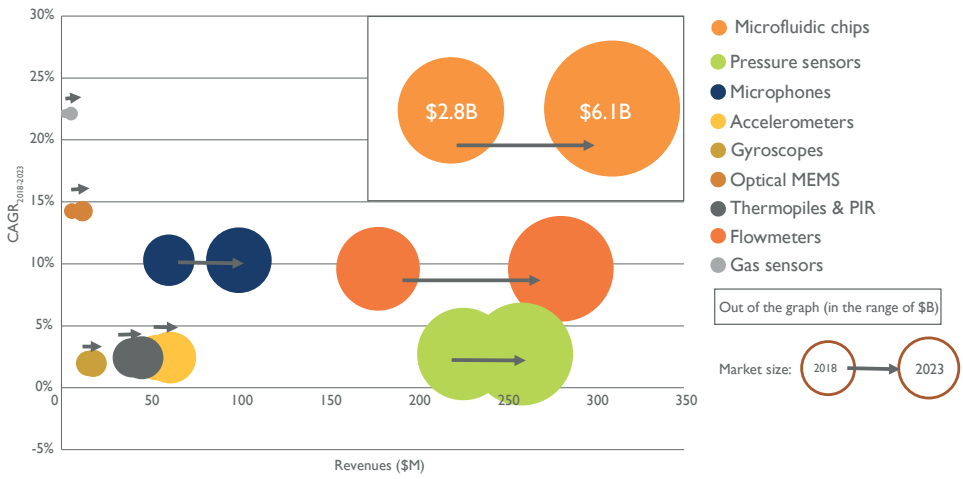
With the addition of microfluidic chips (Si-based, polymer-based, glass-based) the BioMEMS market, represented by silicon MEMS devices used for life sciences and healthcare applications, is expected to more than double - from $3B in 2017 to $6.9B in 2023, with a CAGR of 14.9% from 2017 - 2023. This makes bioMEMS a must-have for today's global sensor makers.

Microfluidics demand still drives the BioMEMS market thanks to point of care applications and an increasing demand for next generation sequencing. Also, the "acquisitions race" by large diagnostics companies is still ongoing. Pressure sensors are more mature sensor devices used in respiratory and blood monitoring, still reaching volumes of several hundred million units per year. Nevertheless, these mature devices are expected to enjoy a new wave of interest thanks to fresh demand for smart connected objects like inhalers and sleep apnea monitoring systems.

It is also worth noting that the transformation of global healthcare is spurring strong efforts to acquire new functionalities and access to new diagnostic capabilities with micromachined ultrasound transducers (CMUT and PMUT) and gas sensors. Moreover, MEMS sensor innovation has triggered developments in neurotechnologies, with neural implants for therapeutic applications (still at research level today) paving the way for better quality-of-life for patients with neurodegenerative diseases.

This report describes in detail the different sensor types, markets, and trends, as well as a global overview of the dynamic BioMEMS market, from 2017 - 2023.

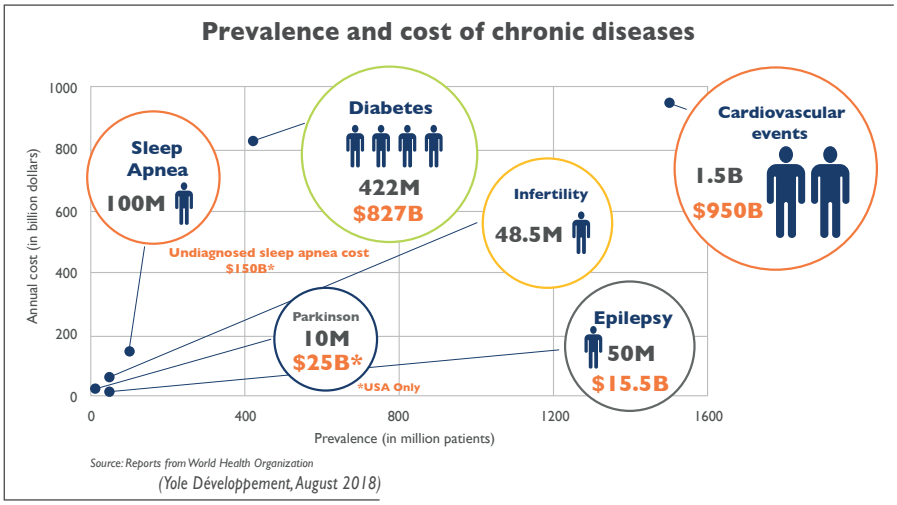
BioMEMS market dynamic: 2017 - 2023 forecast



(Yole Développement, August 2018)

HEALTHCARE TRANSFORMATION: AN OPPORTUNITY FOR BIOMEMS DEVICES

Healthcare is rapidly changing thanks to a convergence of factors: economical, societal, and technological. First, cost of care has risen to an incredible level for health organizations and governments. Budgets have reached a critical threshold while demography is exploding and chronic diseases are the scourge of industrialized countries. According to the World Health Organization (WHO), 422M people have diabetes, and 1.5B are at risk for cardiovascular events.



The $2T yearly cost of chronic diseases supported by society is now unsustainable.

Second, people have easier access to information through apps and the web via smartphones and tablets. More than 2B smartphones are used worldwide, ready to connect with smartwatches or ear pods measuring heartbeat and analysing gestures.

Third, MEMS technology is now mature enough to offer medical-grade measurement with miniaturized and low power-consumption sensors, at a lower price than conventional technologies.

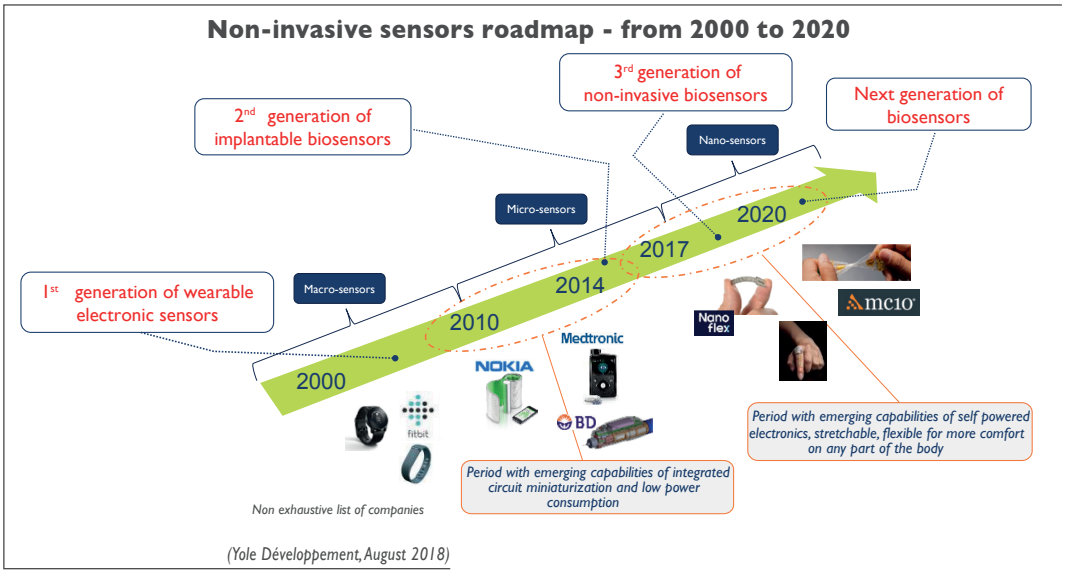
BioMEMS devices are key solutions for a high level of electronic integration, contributing to development of a new generation of easy-to-use medical devices for consumer and patients, with a lower rate of hospitalization and the ability to help avoid unnecessary visits. For example, asthma detection devices integrating MEMS microphones and accelerometers can prevent an asthma attack by alerting the patient through his smartphone at exactly the right moment, prompting him to take his medicine and thus avoid a medical emergency.

Trends for consumer healthcare and mHealth, as well as major trends for BioMEMS adoption, are explained in Yole Développement's (Yole) report.

WHAT DOES THE FUTURE LOOKS LIKE: THE NEXT GENERATION OF SENSORS AND EMERGING MEMS

Along with sensor miniaturization and replacing electret microphones for hearing aids with MEMS microphones, new MEMS devices are creating opportunities for next-generation medical devices. After years of development, ultrasound transducers based on capacitive detection (CMUT) or piezoelectric detection (PMUT) are finally emerging, with the first handheld imaging diagnostic systems announced by Butterfly Network. Microneedles are also attracting great interest as a minimally invasive device able to capture or dispense fluids in the skin's interstitial layers. This report describes the status of minimally invasive and non-invasive sensors, and provides a roadmap by application which highlights the requirements and challenges for non-invasive medical devices. Much effort is being invested in non-invasive devices for better patient comfort, and painless routines so that patients stick with treatment. For instance, Apple has invested lots of money and manpower to develop an optical non-invasive sensor in its smartwatch, which constantly checks the wearer's blood glucose level.

Exceeding "wearable", the next generation of sensor-integrating medical devices should be "forgettable": that is, sensors must adapt to all wearables, textiles, and other accessories. Flexibility and stretchability are pending parameters for the next sensor generation, likely in the form of body "stickers" that detect the presence of certain molecules in sweat. Meanwhile, electrochemical sensors are leveraging printed electronics development and new biocompatible substrate research, and should offer supplementary



data acquisition for the benefit of patients, i.e. early diagnosis. From development to manufacturability, through clinical test approval, there's still much hard work ahead. But with the promise of profoundly changing healthcare's integration with our daily life, we get closer every day!

OBJECTIVES OF THE REPORT

- Explain which MEMS are used in which healthcare applications, and why
- Provide an overview of the main players at every level of the supply chain, including market share
- Identify the threats and opportunities related to bioMEMS, along with market and technology trends
- Highlight promising technologies and booming applications
- Compare the bioMEMS market to the global MEMS market and explain the similarities/differences
- Discuss where and how bioMEMS will be used in the future

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Asma Siari works as a Technology & Market Analyst, Biotechnologies & Molecular Innovations, Asma Siari is involved in the development of technology & market reports as well as the production of custom consulting projects. After a Master's degree in Biotechnologies, Diagnostic Therapeutics & Management, Asma served as Research Assistant at the Moores Cancer Center (San Diego, CA). Asma is graduated with an Advanced Master's degree in International Strategy & Marketing BtoB from EM Lyon Business School (Lyon, France).

Find more details about this report here:

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