

## Event review

**Title: COMSWORLD 2021**

**Strap: Commercialisation of emerging technologies**

**Dates: September 16—17**

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This international conference was sponsored and organised by the Micro-Nano Commercialization and Education Foundation (MANCEF) and the Chinese company Hanking Electronics.

Due to the ongoing virus pandemic that inhibited travel to China and worldwide time zone differences, MANCEF, in agreement with Hanking Electronics, decided to have both a live event in China and a concurrent virtual event 12 hours later in the US time zone. Unfortunately, due to a rise of delta COVID-19 (COVID) infections in Shenyang a week before the live conference, the government banned large gatherings, so it was postponed until a later date.

### **The COMSWORLD virtual conference**

Presentations were given by 21 expert speakers from seven countries at the two-day conference, which comprised the following five sessions: semiconductor supply chain and infrastructure, microelectromechanical systems (MEMS), sensors, biotechnology and medical devices, and funding and infrastructure. All topics were dedicated to commercialisation issues. A selection of key presentations is summarised below.

The conference was opened with a welcome from the MANCEF President, Todd Christenson. He also announced the signing of a letter of intent between MANCEF and Hanking Electronics for discussions on the setting up of a MANCEF-China Chapter. It took place at the Hanking MEMS Campus where a poster session for the live event was located.

### **Sessions**

#### Semiconductor supply chain and infrastructure

*Moderator and keynote speaker:* Doug Sparks

*Keynote:* A decade of semiconductor and MEMS supply chain improvements in China

*Summary:* The opening keynote presentation was given by Doug Sparks. It covered the major players, technology, investment and challenges relating to semiconductors and MEMS capabilities in China. There has been a surge in the growth of infrastructure for semiconductors and MEMS manufacturing in the last decade. Semiconductor equipment suppliers have installed significant resources to support the industry in China and the surrounding region. A significant portion of this will be going to the sensors and MEMS segment. A MEMS manufacturing transition from 100 and 150 to 200 mm wafers as well as a transition from government institute fabs to commercial MEMS fabs and foundries are taking place.

The keynote talk was followed by talks given by five invited international speakers who highlighted the latest impact and causes of semiconductor and MEMS supply chain problems, some of which are related to infrastructure issues in China, Vietnam and India. The problems associated with the growth of wafer fabs across Asia in China, South Korea and Taiwan are well-known. Several speakers discussed new wafer fabrication processes, which are key to the commercialisation of new technologies based on silicon wafer micromachining.

*Speaker:* Tom Nguyen

*Talk:* MEMS, semiconductor and sensor development in Vietnam

*Summary:* A discussion on how the Vietnam government has prioritised investment and development to create a high-tech industry for advancement of the country's economic growth.

*Speaker:* Chetan Arvind Patil

*Talk:* The status of semiconductor manufacturing in India

*Summary:* An overview of the past and present status of semiconductor manufacturing in India, as well as the opportunities for making the country a global destination for semiconductor manufacturing. India must increase its semiconductor manufacturing to share the US\$500 billion global market.

## MEMS

*Speaker:* Leonardo Sala

*Talk:* COVID 19 impact on MEMS applications: shift in products, new directions and new opportunities

*Summary:* A summary of the different ways that COVID has affected the global MEMS market. For example, the impact on medical and telecommunications has been positive, whereas automotive and transport have been adversely impacted. During the pandemic, some MEMS products used in thermal cameras or contactless thermometers, have seen a huge surge in demand, driven by temperature monitoring. In parallel, microfluidic devices for DNA sequencing PCR diagnostic tests are coming to market prominence, propelled by the need to accurately detect the presence of the virus. Also, there is a huge demand for pressure and flow meters for ventilators from hospital intensive care units (ICUs).

*Speaker:* Taguhi Yeghoyan

*Talk:* Lithography and bonding equipment in growing MEMS and sensors market for consumer and automotive application

*Summary:* A look at how MEMS and sensors represent a vast number of device technologies that are present in all megatrends, including consumer and automotive. COVID had a profound influence on these two end-markets. In 2020, the consumer end-market size decreased by 2.6 percent and the automotive end-market size decreased by 27.5 percent. Nevertheless, by 2025, the COVID influence should fade away and the MEMS device market should increase by 7.4 percent compound annual growth rate (CAGR). Despite the strong MEMS market size decrease, the lithography and bonding equipment market serving it is stable.

## Sensors

*Moderator:* Andrew Oliver

**Keynote speaker:** Roger Grace

**Talk:** Commercialisation of printed, flexible, stretchable and functional fabric sensors  
**Summary:** The latest sensor technologies have matured enough to be ready for commercialisation. Emphasis was placed on how their low cost and ability to conform to complex three-dimensional shapes make them especially well-suited to internet-of-things (IoT) and wearable applications. Also highlighted was the growing number of new products now in the market that use different types of sensors.

**Speaker:** Andrew Oliver

**Talk:** Micro-optical devices and their applications in light detection and ranging (LiDAR) applications

**Summary:** A review of the use of state-of-the-art MEMS mirrors in commercial LiDAR applications. In automotive applications, long-term liability testing is required before products are accepted. Failure limits their commercial viability. The potential market for LiDAR can be examined using Porter's five forces analysis framework, the five forces being customers, suppliers, substitutes, new entrants and competition in the marketplace.

**Speaker:** Tom Chang

**Talk:** Challenges and opportunities in integrating optical sensors into systems

**Summary:** A look at how the smartphone has become the most important device in daily human life and what this means for the optical sensor market. Consumers want to have a large display ratio, good panel image quality across different ambient light conditions and better camera capability than the compact digital camera. Optical sensors play important roles in enabling these performance improvements.

## Biotechnology and medical applications

**Moderator:** David Tolfree

**Keynote speaker:** Janusz Bryzek

**Talk:** Sensor-based transformation of healthcare

**Summary:** A presentation that began by highlighting the expectation that in the coming decade there will be a disruption in healthcare produced by a transformation from sick care to healthcare, and that that transformation will be driven by artificial intelligence (AI)-enabled, data-driven healthcare companies such as Amazon, Apple, Facebook, Google, Microsoft, Walmart, etc., as well as some start-up companies. The enablers for this transformation will be exponential technologies that include sensor systems for collecting personal health information, ranging from simple single sensing for vital signs to advanced sensing of DNA structures.

**Speaker:** Malcolm Wilkinson

**Talk:** Animal testing replacement could be the biggest market for organ-on-a-chip microphysiological systems by 2027

**Summary:** A reminder that the use of animals for testing the safety and efficacy of chemicals and pharmaceuticals is unethical, uneconomic and outdated from a scientific perspective, and that alternative technologies are now available, including microtechnology, which could replace the use of animals in academic and pharmaceutical research. The market size for this by 2027 will be \$529 million.

## Funding and infrastructure

*Moderator:* David Tolfree

*Speaker:* Nicolas Sauvage

*Talk:* Corporate venture capitalists accelerating success of high-tech start-ups

*Summary:* An overview of TDK Ventures, a venture capital (VC) fund that invests globally in early-stage innovative start-ups that leverage fundamental material science to produce a sustainable future, as well as insight into how such start-ups can tailor their messaging towards corporate venture capitalists for the best result.

*Speaker:* David Tolfree

*Talk:* Emerging and enabling technologies and the knowledge transfer networks (KTNs) funding infrastructure in the UK

*Summary:* An examination of infrastructure based on Innovate UK's KTNs as well as examples of key programmes and projects supported by the KTNs' emerging and enabling technologies teams working with the electronics, photonics, sensor, quantum and information communications technology (ICT) sectors. Particular reference was made to the commercialisation challenges brought about by COVID.

*Speaker:* Steve Walsh

*Talk:* Maturity of venture capitalists in North America, Europe and Asia

*Summary:* A summary of the various corporate and institutional venture capital (VC) funding options available, and how they compare in the regions of North America, Europe and Asia. An open discussion of the issues raised was held after the presentation.

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