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VISION focus

Gigapixel multispectral microscopy unravels complexity of cell biology

plus...

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- OmniVision shareholders back buy-out
- European machine vision group appoints new leader
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- EM Imaging develops optical agent to detect CRC cancer earlier
- Sentinel satellite returns 'game-changing' multispectral imagery

...and the latest product launches

Cover photo credit: Antony Orth/RMIT.

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Gigapixel multispectral microscopy unravels complexity of cell biology

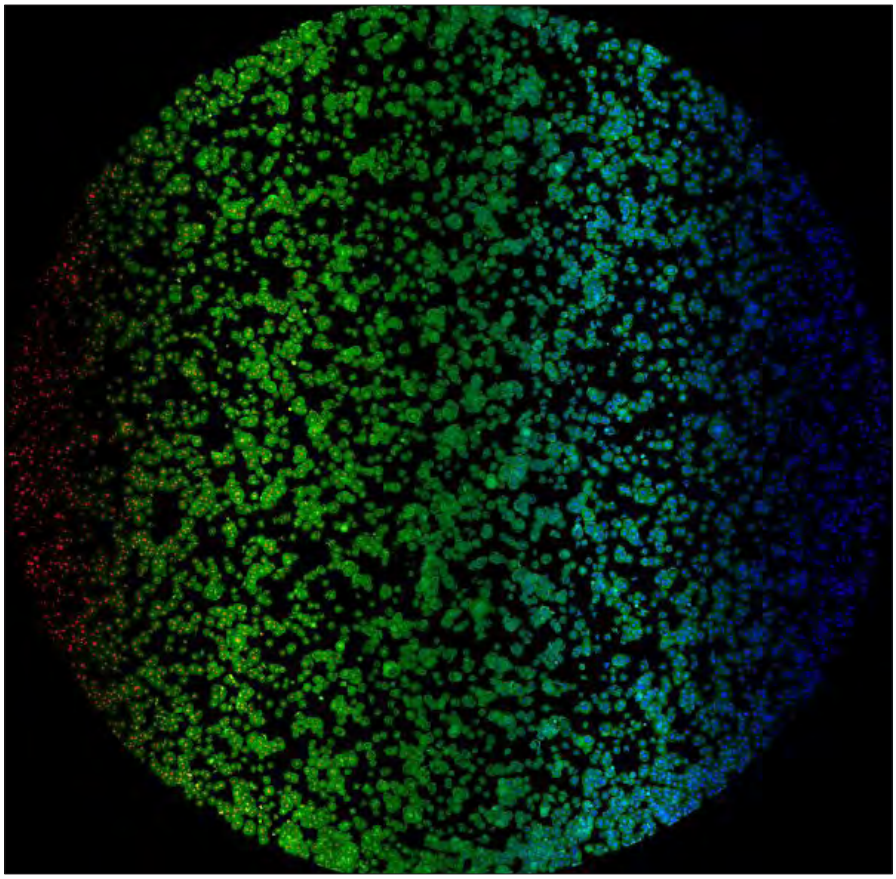
RMIT University platform could speed up image-based assays during drug development.

Multispectral imaging techniques are designed to capture optical data at several specific frequencies during the same analysis, an approach which allows a higher density of both spectral and spatial information about a sample to be gathered compared to more conventional fluorescence microscopy methods.

This has always had potential advantages for high-content imaging assays in biology, where large numbers of cells need to be analyzed for multiple parameters. But in practice, different multispectral imaging approaches have their own drawbacks.

Reading the spectra sequentially from one line of pixels at a time is relatively slow and disperses the light from each spatial point over several pixels, while analyzing the spectrum from each pixel individually - known as "whiskbroom" imaging after an analogy with the sweeping pattern involved - is even slower.

Now a team including researchers from the Centre of Excellence for Nanoscale Biophotonics (CNBP) at RMIT University in Melbourne, Australia, has developed a multispectral microscopy platform that could improve matters considerably. The work was published in Optica.



Credit: Antony Orth/RMIT.

The gigapixel multispectral microscope records nearly a million spectra every second.

It employs a centimeter-scale microlens array to massively parallelize a whiskbroom multispectral approach, effectively recording the spectra from thousands of points in the sample simultaneously, rather than the individual point examined at each stage of a traditional whiskbroom method. Use of a single physical aperture provides the confocal filtering necessary for successful multispectral imaging.

"If you use a regular microscope objective, you have to construct a large image mosaic by recording small fields of view, one at a time," said Antony Orth of RMIT. "Every time you record an image, you need to bring the sample stage to a halt, refocus and change through all your various filters, which is inherently slow for large samples. Our microlens array spreads out imaging over a larger area, enabling continuous scanning and image collection. We are able to record large images with fewer mechanical motions, which saves a lot of time."

The full potential of this approach becomes clear when there are different types of fluorophores in one sample, in which case the quantity of data involved can be substantial. The team reported multispectral image cubes (ie. positional and color data for individual points) of up to 1.3 gigapixels in the spatial domain, with as many as 13 spectral samples recorded per pixel and six independent fluorescent channels - making a total image size of 16.8 billion spatial–spectral samples.

"We have never previously seen any multispectral or hyperspectral microscopy dataset larger than a standard field of view, say five megapixels or so," commented Orth. "I don't think anyone had previously

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Gigapixel multispectral microscopy unravels complexity of cell biology

attempted to create such a large multispectral image because the hardware to do it efficiently simply didn't exist."

Although the new dataset sets a benchmark in microscopy, Orth pointed out that the astronomy community has a history of creating massive datasets with many spectral windows, and the cross-pollination between the two different fields can be considerable. A technique called objective prism spectroscopy uses an analogous technique to measure several spectra within a telescope's field of view (FOV).

A chicken-and-egg problem

In the RMIT platform, post-processing techniques separate out the signals from a multiplicity of fluorophores. This brings its own data-handling challenges, when file sizes from a single experiment can routinely run up to 100 GB.

"There are two main computational aspects here: image stitching and spectral unmixing," noted Orth. "Spectral unmixing has been around for a while, so we more or less implemented it directly in our system; but image stitching was a bit more involved. As far as we know, no one had ever stitched together upwards of 10,000 multichannel images before. So we had to write some custom routines for that task, addressing issues such as equalizing the exposure of each small image."

The clinical impact of the system could ultimately be considerable, especially in fields such as drug discovery. Assessing the impact of a new drug involves testing large numbers of cells with different doses under various conditions, and imaging can be a significant bottleneck in the process.

But despite the appeal of multispectral imaging, systems have not to date been purpose-built for large FOV imaging and high-throughput screening.

"I think there has been a bit of a chicken-and-egg problem," commented Orth. "Researchers won't develop assays with more than a few fluorophores because they know that they can't read out the assay with their microscope, while microscope manufacturers are reluctant to spend R&D and marketing money on a microscope for which the market is not already well established. Being an academic institution, we were able to take the risk and develop this microscope to the point where we have shown that it works well."

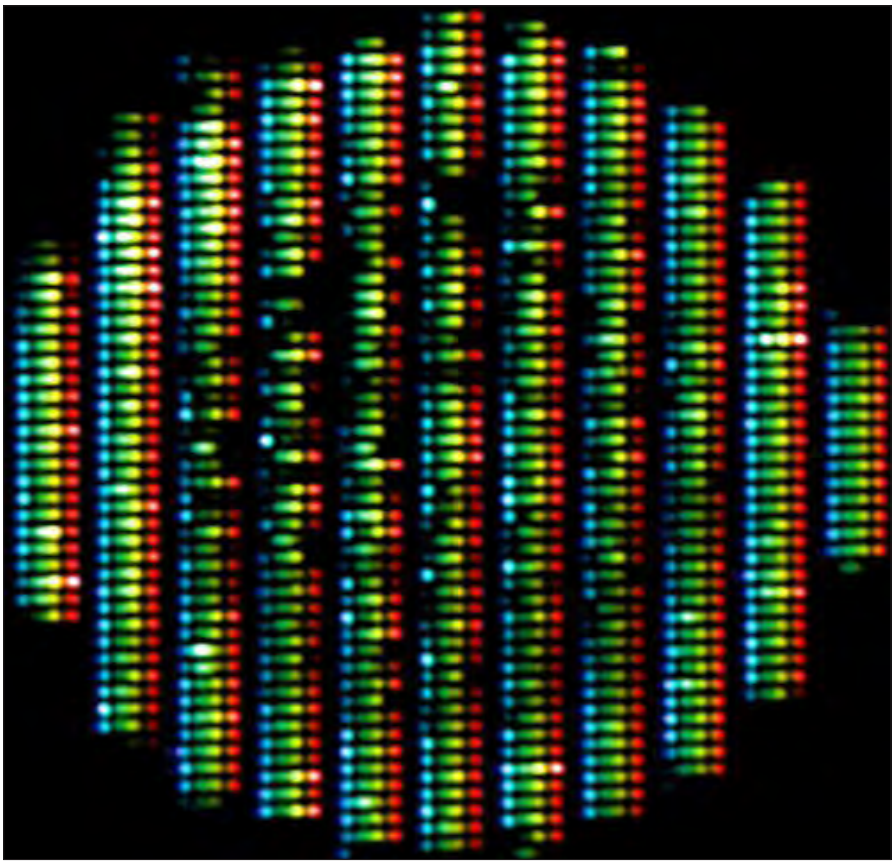
Recent developments and price-cuts in both machine-vision and computing power also played a part, with the team employing a USB3-connected camera costing under $1000 for this research but still not pushing it to its limits.

"Five years ago the camera and computer portion of this system probably would have cost five- to ten-times what it does today," Orth said. "The computing power needed to record, store and recall the data is now available in more or less standard desktop computers."

The next leap

The implicit compromise that the new gigapixel platform still brings with it is the one between imaging speed and the achievable resolution. The microlenses used by the team for illumination and collection have a numerical aperture (NA) of about 0.24; going higher would mean either reducing the focal length or increasing the size of the microlenses, and neither change is ideal.

"Reducing the focal length is tricky because of the working distance needed to focus through the sample coverslip, while increasing the microlens size means that there will be fewer microlenses within a field of view," Orth noted. "This in turn decreases the imaging speed - which is one of the main advantages of our system. We settled on using an NA of about 0.24 with one-micron resolution, because high-throughput screens typically have a Nyquist-limited resolution of about that size."



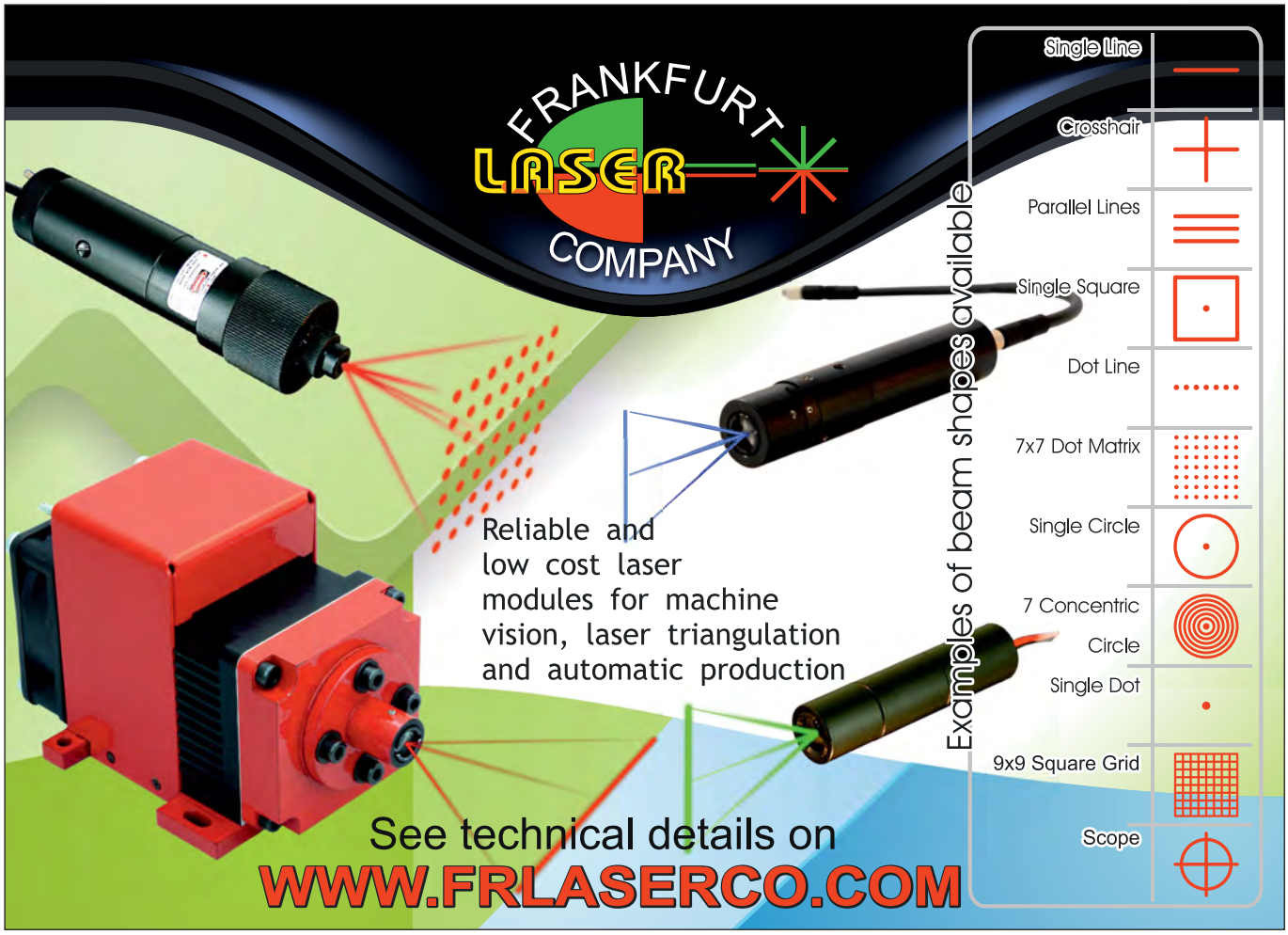
Credit: Antony Orth/RMIT.

Multispectral fluorescence image of an entire cancer cell culture. A gradient wavelength filter is applied in post processing to visualize the full spectral nature of the dataset - 13 discrete wavelengths from red to blue.

Having now completed its proof-of-principle study, the project is seeking partners to invest in the IP and implement the technology. Pharmaceutical companies are among the obvious candidates, since bringing the system into their production pipelines should bring a competitive advantage in terms of assay speed.

"Whoever embraces the next leap in high-content imaging will be developing drugs more quickly and at a lower cost," commented Orth. "I think there is a big commercial opportunity here."

http://optics.org/news/6/7/27



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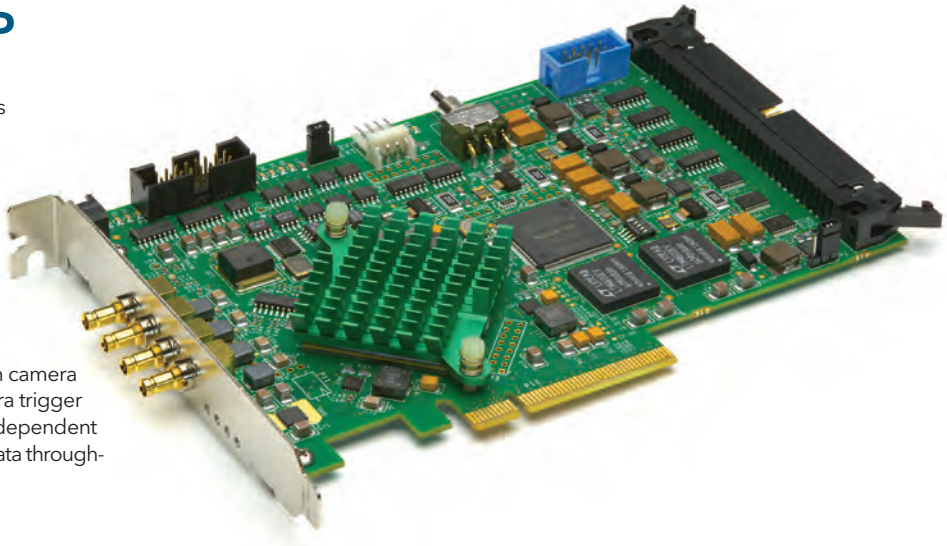

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The optics behind a new reality

Freeform prisms, LED arrays and optical tracking systems are among the photonics technologies advancing the capability of 'augmented reality' applications.

Augmented reality (AR) is finding increasing use in a variety of commercial, civil and military applications – and photonics technology is playing a key role. But exactly what kinds of components are needed, and how are they being used? Andrew Williams reports:

Surgical assistance

One of the major prospective applications for AR is medicine. A team of researchers at Kettering University in Michigan, US, is working on a project to develop innovative software tools that simulate surgery to aid physicians with pre-operative planning and intra-operative navigation, as well as training for robotic and minimally invasive surgery.

For many years a key trend has been the evolution of "key-hole" laparoscopic procedures, helping to minimize post-operative trauma for the patient. However, this typically involves complex equipment and setups, which make the procedure more challenging for surgeons – something that has prompted the development and integration of computer-based tools and robotic aids.

Already, a range of optical technologies are being used - including software that allows surgeons to visualize an individual patient's anatomy in 3D, and so-called "surgical navigators" that can be integrated in the operating room, providing additional modes and capabilities such as a real-time 3D view while surgical tools are in position.

Project leader Giuseppe Turini, an assistant professor of computer science at Kettering, says there are several different ways to use optics and laser technologies in this field. These include stereo laparoscopic camera systems, auto-stereoscopic 3D displays, a variety of depth sensors, marker-based optical tracking systems, and camera systems based on structured light.

Turini's team has used optical tracking systems to detect the position of surgical instruments in real-time during surgery, and recently won a major research instrumentation program grant to acquire a marker-based optical tracking system called the NDI 3D Investigator.

Ergonomics

He and colleague Justin Young have since used that tracking system to conduct ergonomics studies of touch-free gestural human-computer interactions, but there is the potential to do much more. "In the future I may use this system, or a consumer depth camera, for example the Microsoft Kinect, to integrate real-time tracking in my virtual simulators," Turini says.

Each of the devices used by the team features different optical technologies. Marker-based tracking systems typically use infrared sensors to determine the 3D position via time-of-flight data. Alternatively, depth cameras can use different approaches - for example, the first version of the Kinect system uses structured light to retrieve a depth image, while version two employs a time-of-flight approach.

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The optics behind a new reality

"Obviously, in order to use optics and laser technologies in a surgical scenario we need to consider that occlusions may happen during the intervention," Turini says. "This is always an issue with optical systems, and usually it is solved using redundant cameras and sensors or addressing the gaps in the marker detection in software."

Freeform prisms aid Marines' training

Another field of application with obvious potential is the military, and US-based SA Photonics has recently developed what it calls a low-cost augmented reality system (LARS) for use by the US Marines in outdoor training exercises.

LARS is a transparent binocular head-mounted display (HMD) that provides high-resolution images and a wide field of view, and which is designed to minimize any obscuration of peripheral vision while maximizing situational awareness.

user's eyes in bright conditions, as well as adjustments for fore/aft and vertical positioning, and inter-pupillary distance.

That adjustment terminology refers to the need for the optics to be at exactly the correct distance from the pupils, and since everybody has a slightly different-shaped head (including where their pupils are in relation to where the headset rests on their head), those adjustments need to be made when the HMD is first worn.

The optical system inside LARS is based on a freeform prism component, developed to combine a wide horizontal binocular

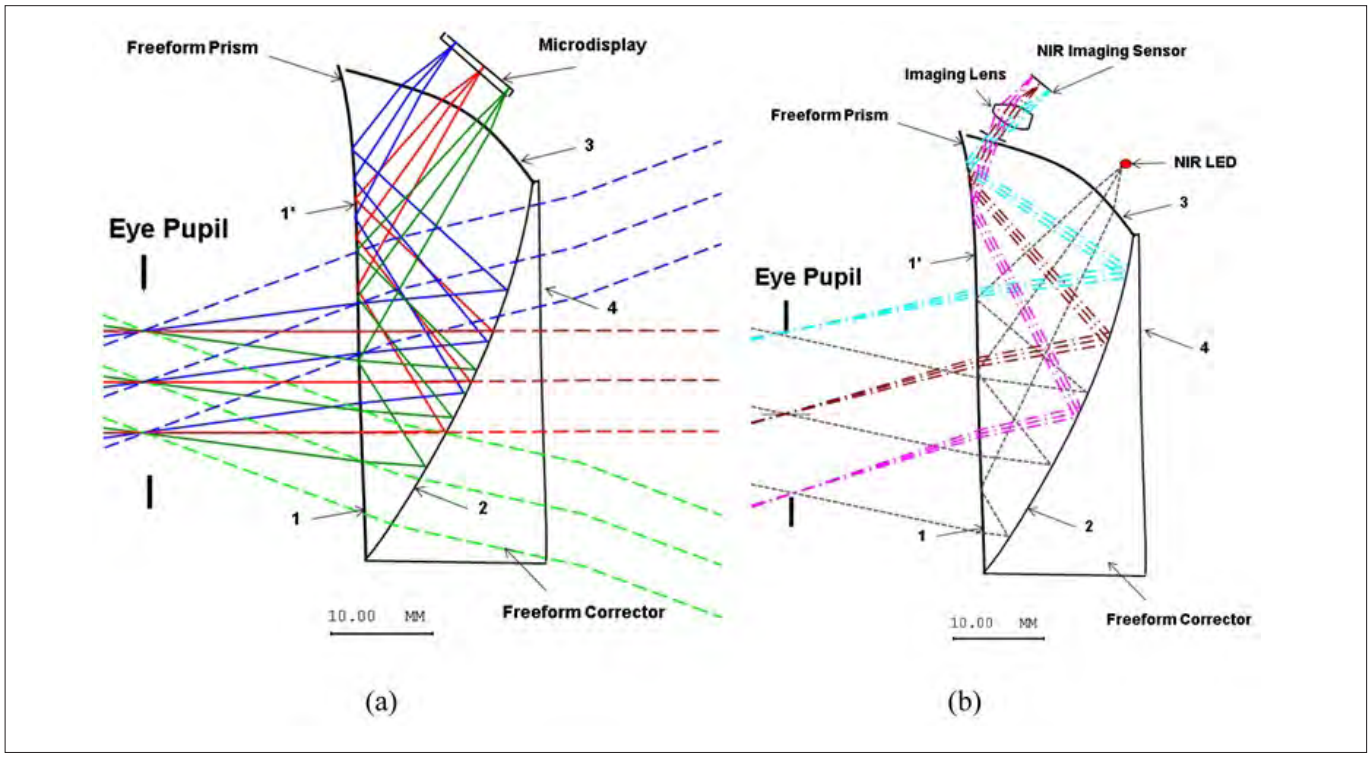

Image: SA Photonics.

Ray-tracing analysis of the freeform prism component that sits at the heart of the SA Photonics 'LARS' technology, enabling a combination of high-resolution imagery with a wide, binocular field of view.

He believes that the ongoing advances in depth-sensing technology will lead to major innovations in computer-assisted surgery. In future, that could enable seamless and robust tracking of all the surgical instruments and other tools in the operating room, without imposing any constraints on either the patient or the surgical team.

"[A]t the moment all the surgical simulators I have developed can be used only in the research field," Turini points out. "In order to develop a commercial product for the medical and surgical field, a significant investment is required to cover all the expenses related to safety [and] regulations."

Each eye sees 1920 x 1200 resolution, full-color video imagery that is overlaid with the wearer's own view - similar to a pilot looking through an aircraft head-up display (HUD), but with a wider field of view.

Although LARS was initially designed to be fixed to a helmet, Ben Mall, director of business development for vision products at SA Photonics, explains that it can also be "soft-mounted" on a headset using a standard, commercially available night vision goggle (NVG) mechanism.

This means that the device can be easily flipped up to a secure position when not in use. LARS also features a semi-transparent, "snap-down" visor to control light to the

field of view with full-color 1920 x 1200 pixel resolution for both eyes.

Low weight; large FOV

Mall says that the optical relay and combiner systems that are more commonly used in such displays rely on polarization effects, and typically result in an extremely bulky and heavy binocular assembly, with limited transparency and more difficult adjustment to the individual user.

But because LARS is based on a freeform prism with a corrector element optical system (see diagram), it can combine a

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The optics behind a new reality

wide field of view and higher transmission with a much lower weight - crucial for military applications.

"This prism provides very good performance in terms of modulation transfer function, exit pupil and eye relief while maintaining a small form factor," Mall said. "The result is a small and lightweight optic. When integrated with a high-resolution microdisplay it is comparable to wearing standard binocular NVGs. The user sees the 'real world scene' overlaid with video and symbols with minimal obscuration."

So far, LARS, which was developed under a Small Business Innovation Research (SBIR) contract from the Office of Naval Research (ONR), has been used in both field and simulated training environments.

Mall says that SA Photonics has future plans to develop HMDs that could provide binocular fields of view in excess of 140 degrees, combined with image resolutions greater than 5000 x 1200 color pixels.

LED arrays to brighten AR displays

Another example of photonics technology pushing forward AR comes from France, where researchers at CEA-LETI have recently developed very-high-brightness LED arrays for use in next-generation HUD applications.

Ludovic Poupinet, head of the CEA-LETI optics and photonics department, told optics.org: "One of our photonic labs, which specializes in display technologies and display systems, noticed that the main limitation in displays for augmented reality was the brightness of the display. So we decided to study the application of an LED matrix to transparent head-mounted displays."

More specifically, this has involved the development of novel patterning technology for gallium nitride (GaN) LED epiwafers, to produce micro arrays of LEDs with a 10 µm pitch (or less), and fewer process steps to create an LED matrix with a high fill-factor.

"The disruption comes from the fact that we had to find a wafer-level technology to fabricate millions of micron-size pixels. In this work we benefited from the synergies between our display lab and our lighting lab," Poupinet explains.

Improving on Google Glass

The main applications targeted by the CEA-LETI team with this new technology are transparent displays such as multimedia glasses. Poupinet and colleagues are confident that such devices represent the future of the human/digital content interface, despite the lukewarm impact so far of products like Google Glass. They believe that their novel LED matrix will help to overcome the limitations of those devices, which have yet to make much commercial headway.

To combine a large field of view with a small form factor for the optical system is a real challenge."

He points out that this is one of the objectives of the European project HIDO, in which CEA-LETI is also involved. "At the user interface level, we want to interact naturally with the digital content," Poupinet said. "Everything must be intuitive with no learning curve. A 3D imaging device and the computational power to analyze gestures and position digital content correctly depending on head and eye positions are required."

That means another challenge is power consumption, which must be kept very low to allow the use of small batteries and long periods of autonomy. Everything must be optimized to reduce power

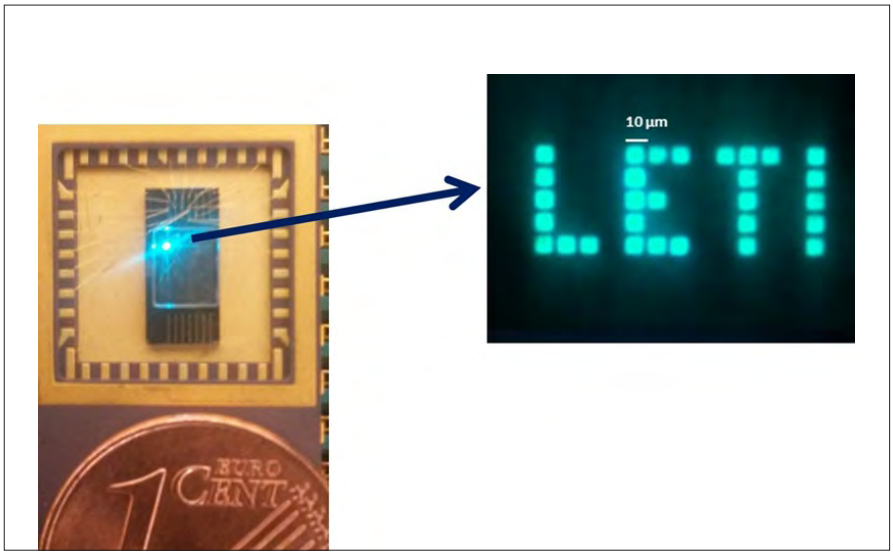

Image: CEA-LETI.

CEA-LETI researchers in France are working to develop an array of tiny LEDs to deliver brighter images and a wider field of view for Google Glass-like products.

"Our main challenge now is to develop color displays," Poupinet said. "We are studying different alternatives for color emission, from thin, pixelized color conversion to direct color emission by the pixels themselves. The main challenges are to provide glasses with high transparency, a large field of view, and good visual comfort."

He added: "What is or was acceptable for military use of head mounted displays is not [necessarily] acceptable for everyday life applications.

"The key purpose of the glasses are first to let our hands be free (unlike with smart phones) and second to let us interact with digital content [within] a large field of view. consumption and heat dissipation, which as Poupinet says is not acceptable near the head.

Currently investigating a range of different uses and commercial development opportunities for the LED matrix technology, the CEA-LETI team sees professional applications where hands-free displays can provide real advantages as the likely starting point.

http://optics.org/news/6/8/19

OmniVision shareholders back buy-out

Acquisition of the imaging sensor firm by Chinese private equity group still subject to regulatory approval.

Shareholders in OmniVision Technologies, the Nasdaq-listed provider of imaging sensors that is subject to a Chinese private equity buy-out, have voted overwhelmingly in favor of the deal.

After a special meeting of stockholders convened in July, more than 97 per cent of the votes cast approved the planned $1.9 billion cash acquisition, equivalent to $29.75 per share.

Led by Hua Capital Management, the acquisition still faces a number of regulatory hurdles before it can be completed, including antitrust reviews in both the US and China, as well as clearance from the Committee on Foreign Investment in the US. The OmniVision board had already approved the sale in May.

OmniVision said that it now expected the deal - one of several recently announced buy-outs of Western photonics firms involving Chinese private equity (see related stories) - to close before the end of its current fiscal year, which runs until April 2016.

The Santa Clara-headquartered company uses foundry partners to produce image sensors in huge volumes, for applications in consumer electronics applications like smart phones and tablet devices, and increasingly for vision systems in cars and for medical use.

For its full fiscal year 2015, it posted sales of $1.4 billion, down from $1.5 billion in fiscal year 2014. Net income of $94 million was down only marginally on the previous year's total.

Photo: OmniVision.

OmniVision co-founder and CEO Shaw Hong.

Fluctuating business

When announcing those results in May, CEO Shaw Hong highlighted the dynamic market fluctuations that the company was subject to, telling investors:

"We saw a great deal of changes in our business in fiscal 2015. Our pursuits of opportunities in emerging markets and our efforts in diversifying our supply chain have yielded favorable results. We have also made significant progress in advancing our technologies, which ultimately resulted in the introduction of our most advanced PureCel-S products."

Released back in March, the PureCel-S combines stacked-die chip technology with a pixel size of 1 µm to deliver 16 megapixel image resolution for smart phone and tablet applications.

The company believes that the market for those devices will double over the next two years as consumer electronics companies start adopting the higher-resolution format en masse.

Senior product marketing manager Kalai Chinnaveerappan said at the time: "The OV16880 is the industry's first 1/3-inch 16-megapixel image sensor, putting it in the forefront of this high-growth market segment. The sensor enables slim devices to transition from a 13-megapixel to 16-megapixel camera while maintaining excellent image quality and pixel performance."

More recently, OmniVision has teamed up with Fujikura and Precision Optics Corporation to help develop a tiny CMOS imaging module designed specifically for endoscopy applications.

The module produces 400x400 pixel images at a rate of 30 frames per second from a package with an outer diameter of just 1.6 mm, and is said to be suitable for a wide range of endoscopic devices - from bronchoscopes for lung examinations to laparoscopes used in keyhole surgery applications.

Medical imaging is seen by the company as a key growth application, as well as one that can command higher profit margins than the highly competitive consumer electronics sector.

http://optics.org/news/6/7/30

European machine vision group appoints new leader

EMVA refocuses for growth with Adimec founder Hermann elected as president.

Jochem Herrmann, co-founder and Chief Scientist of Dutch camera manufacturer Adimec has been appointed as new President of the European Machine Vision Association (EMVA). Herrmann has been EMVA Board member since 2013 and takes over the presidency from Toni Ventura-Traveset (Datapixel, Spain).

Photo: Adimec.

Adimec develops high-performance cameras for applications including machine vision, medical imaging, and outdoor imaging.

Herrmann has been Chief Scientist at Adimec Advanced Image Systems since October 2010. He co-founded the company in 1992 and previously served as its Chief Technology Officer.

For over a decade, Herrmann's company has focused on "developing high-quality product platforms and selecting the best technologies, based on a continuous focus on customers and their applications".

EMVA noted the importance of Herrmann's diverse abilities, enabling him "to link relevant technological evolutions to the continually changing needs of customers contributes significantly to Adimec's success".

Adimec develops high-performance cameras for applications including machine vision, medical imaging, and outdoor imaging. Founded in 1992, the company partners with major OEMs around the world to co-develop specialized cameras. Adimec's own True Accurate Imaging technology provides high precision and accuracy for vision systems. Adimec has offices around the world focused on creating customer value and satisfaction through local, personalized support.

Looking forward

The EMVA Board and the General Manger thanked outgoing president Toni Ventura for his successful tenure and continuous support of the EMVA since its founding in 2003.

"The transition period now clearly lies behind us and for EMVA it is now time to expand our activities and further grow the association. I am looking forward to further develop EMVA together with my fellow Board members and the whole EMVA team", said Hermann.

As well as Hermann, the EMVA members elected an extended Board of Directors during the General Assembly on 11 June in Athens. New members of the Board and previous members who have resumed their posts are:

- **Dr. Kai-Udo Modrich**, Managing Director of Carl Zeiss Automated Inspection *(new)*, and
- **Prof. Dr. Bernd Jähne**, who heads the Heidelberg Collaboratory for Image Processing of Heidelberg University *(new)*.

The EMVA members also confirmed the re-election of previous Board members:

- **Gabriele Jansen** (Vision Ventures, Germany),
- **Michel Ollivier** (Tiama, France),
- **Toni Ventura-Traveset** (Datapixel, Spain) and
- **Dr. Jean Caron** (Euresys, Belgium).
- **Michel Ollivier** is new EMVA Vice President, and
- **Dr. Jean Caron** takes over the position as treasurer.
- **Dirk Käseberg** (Mettler-Toledo Garvens, Germany) has resigned from the Board to concentrate on increased responsibilities in his company, but will continue to work closely with the EMVA Board in a less formal manner.

http://optics.org/news/6/6/30

Photo: EMVA.

EMVA's newly-elected Board of Directors: (left to right) Dr. Jean Caron; Dr. Kai-Udo Modrich; Gabriele Jansen; Jochem Herrmann; Michel Ollivier, Toni Ventura-Traveset. (Not in photo: Prof. Dr. Bernd Jähne).

JAI A/S

New JAI Sweep + prism-based color line scan cameras

JAI's color line scan camera series is now available with large, 20-micron pixels for exceptionally low noise images. The SW-2000T/Q models feature 80 kHz line rate for high-speed throughput and an optimized lens perfectly matched to the prism technology for best possible image sharpness. (3-CMOS RGB model - SW-2000T or 4-CMOS RGB+NIR model - SW-2000Q.

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- Or 4-CMOS x 2048 pixels
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Read more on: http://www.jai.com/EN/NewsEvents/News/Pages/new-color-line-scan-cameras-Sweep-Plus-Series.aspx

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LED pattern projector from EFFILUX

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Further benefits are: No speckle, High resolution, long lifetime, all wavelengths.

In addition to the new EFFI-Lase, FRAMOS presents its extensive portfolio of imaging components including the GigE camera series from SMARTEK Vision, high-speed camera HS-2000 from Emergent Vision and CoaxLink frame grabbers from Euresys.

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Varioptic - a Business Unit of Parrot

NEW ! Autofocus module for Microscopy

This compact Autofocus objective is dedicated to microscopy applications and includes the popular Arctic 316 Liquid Lens.

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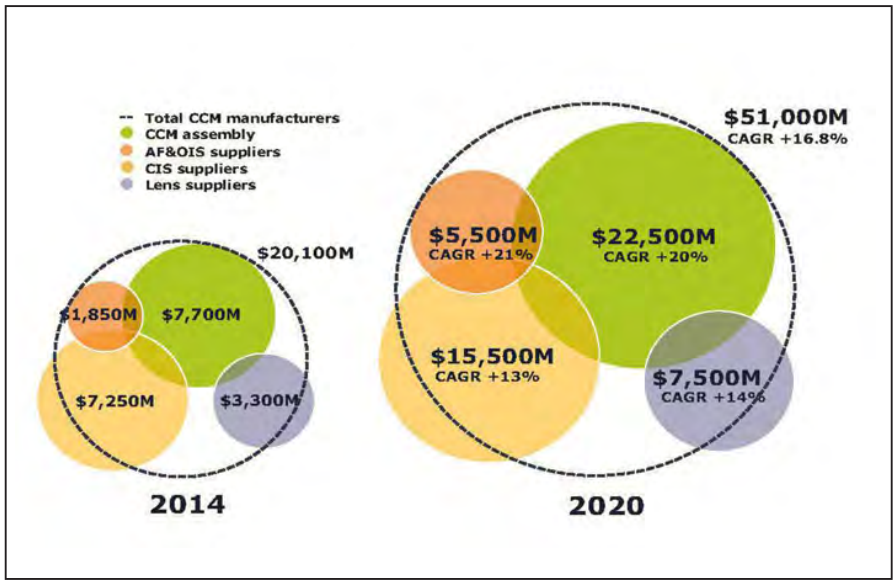
Compact camera sales forecast to double by 2020, hitting $51bn

Applications of CCMs in the mobile phone and automotive sectors are fueling camera module revenues.

Driven by the mobile phone and automotive sectors, the sales value of the Compact Camera Module (CCM) industry will grow by a factor of by 2.5 over the next five years, reaching a total revenue of $51 billion by 2020. This is the headline conclusion of a new market report from Yole Développement (Yole), Lyon, France.



Graphic: Yole Développement.

Significant growth is forecast for the compact camera module market.

Entitled Camera Module Industry, the report states that the largest contributing market segment, mobile phones, will continue to grow from 72% to 74% of all revenues due to improving specifications and average selling prices. "Therefore mobile phone manufacturers will meet the increased market demand for higher quality photos and propose innovative products with more and more efficient camera modules," the document states.

Yole also highlights the CCM price increase. Pierre Cambou, Activity Leader at Yole, commented, "This trend is a real surprise. At Yole, we have followed the electronic components market for the mobile phone industry for a long time and we know the strategic importance of pricing in this sector."

Market demand is partly explained by the penetration of technologies auto focus (AF) and optical image stabilization (OIS) applications, which are together forecast to reach $5.5bn in 2020, with 21% CAGR expected between 2015 and 2020. Such figures highlight the strategic importance of the AF and OIS applications in the mobile phone sector and the implication of those technologies in likely future sensing applications, Yole commented.

Technology trends

Yole's Camera Module Industry report is said to be the first technology and market analysis focused on the camera module market and technologies, performed by Yole's analysts. It has been performed in collaboration with Jean-Luc Jaffard, formerly of STMicroelectronics and part of Red Belt Conseil.

In the report, both experts also present a comprehensive overview of the CCM applications (including mobile, Digital Single Lens Reflex (DSLR), automotive,

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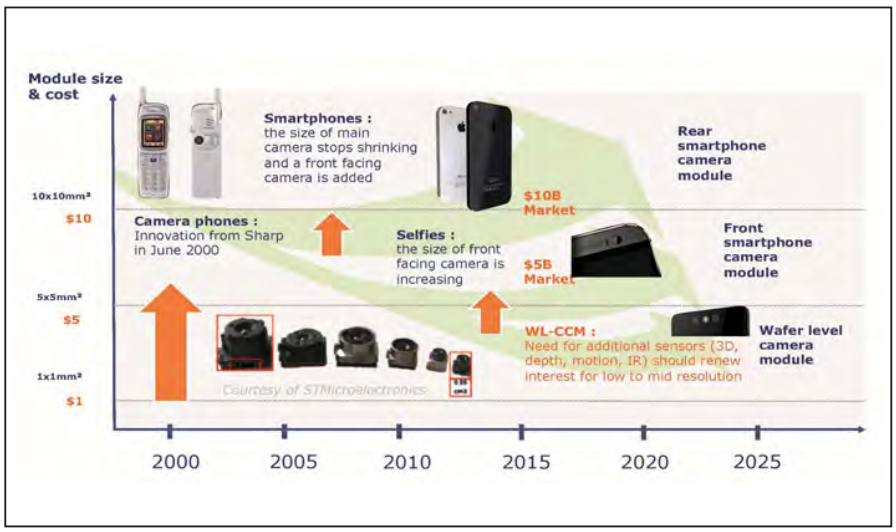

Graphic: Yole Développement.

Camera module: market and technology trends through 2005.

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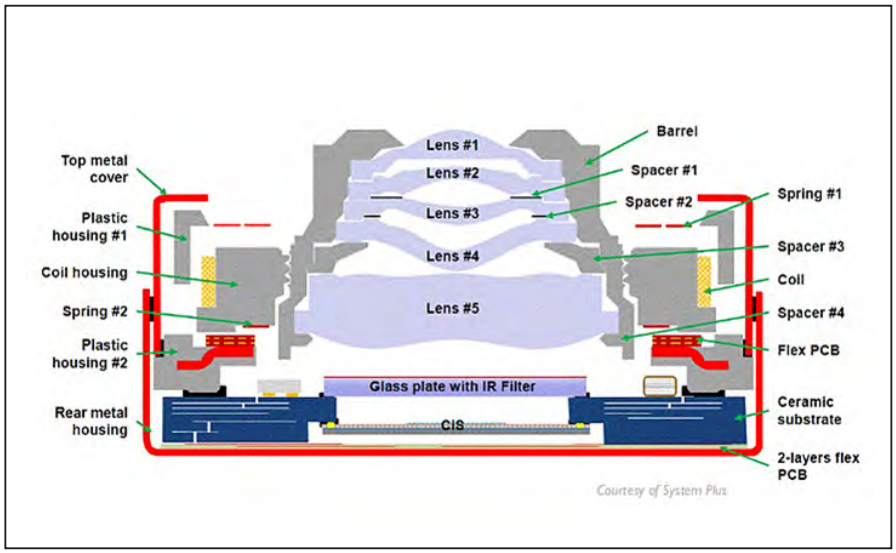
Compact camera sales forecast to double by 2020, hitting $51bn

medical, security, and machine vision) and the key market players. The report includes revenue forecasts, as well as volume shipment numbers and sub-component breakdowns by application.

Pierre Cambou added, "There is a different market trajectory for the lens and sensor markets, which are now maturing at approximately 14% CAGR with the emergence of giant billion-dollar companies. CCM and auto-focus manufacturing markets, which are still very fragmented and growing at roughly 20% CAGR, should experience consolidation over the next five years."



Compact camera modules : technology overview and key components.

Graphic: Yole Développement.

The report comments that the stakes in the CCM market are high, "since the mobile phones market is maturing and micro-cameras are key differentiators. The consumer appetite for slimmer mobile devices is forcing CCM players into a major technological race while at the same time demanding massive investment to keep up with volume.

Imaging to sensing transition

"The CCM industry greatly benefited from the adoption of high-resolution cameras in mobile phones, since doubled by the adoption of front-facing ones.

Current revenues are mainly driven by the increasing resolution of both rear and front-facing mobile cameras. But new applications, especially in the automotive area, are starting to play an important role.

"Automotive has a long way to go: technologies are just good enough to enter the current market as they reach consumer expectation", added Cambou. "The technology will quickly evolve and serve the autonomous vehicle trend. Automotive has had a significant impact on the CCM ecosystem. Automotive cameras have shifted from an add-on feature to must-have standard equipment, and regulations in the European Union and the United States are encouraging this transition."

Automotive module revenue reached US$1.2 billion in 2014, and growing at a CAGR of 36% should reach US$7.9 billion by 2020. This exceptional growth has mainly benefited the CCM industry's second-tier players, but the response of market leaders will be worth watching.

As the camera module application moves from imaging to sensing, the automotive Advanced Driver Assistance System (ADAS) application is the perfect barometer of what's to come for the entire camera module industry.

The computing sector is also an area analyzed by the market research and strategy consulting firm, Yole. This market is important in value but its growth is stable. According to Yole's analysts, the computing sector could expect a large growth with the addition of innovative sensors (3D, depth, motion, IR). New applications in video interaction are to revolutionize computing camera usages.

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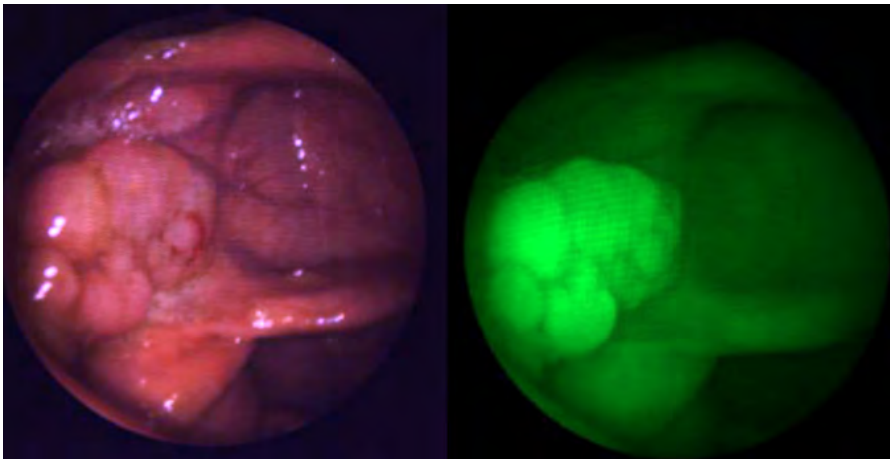
EM Imaging develops optical agent to detect CRC cancer earlier

Signs licensing agreement with GE Healthcare; EM can now complete development of agent.

Edinburgh Molecular Imaging ("EM Imaging"), which develops and commercializes novel optical imaging agents, has signed an exclusive global license for a novel optical imaging agent that it says could improve the detection of early-stage colorectal (bowel) cancer.

EM Imaging signed the licensing agreement with GE Healthcare and will now complete the development of its imaging agent known as EMI-137, which can help doctors identify the cancer. In a recent scientific study, reported in Nature Medicine, the EMI-137 agent allowed doctors to see more early-stage colorectal cancer and precancerous tumors, which can then easily be removed via colonoscopy. The company says that conventional screening with a colonoscope, which is currently the most common investigative method, can miss up to 25% of precancerous growths, especially smaller, flat lesions.



Photos: EM Imaging.

EM Imaging's optical agents visualize pathology in vivo by lighting up cells, enzymes and receptors present in disease, reducing the time to diagnose patients, enabling early intervention.

Dr James Hardwick, the lead investigator, commented, "Of the 47 precancerous polyps detected in this study, 12 were missed using a standard colonoscope. This underlines how unreliable this method can be, and we therefore welcome life-saving new technology like EMI-137. This agent has the potential to make polyps light up like light bulbs, allowing clinicians to detect and remove more polyps, prevent more cancers and save more lives."

Evidence that colorectal cancer can be prevented by the removal of pre-cancerous lesions and polyps is strong. The EMI-137 agent can help doctors more easily identify these suspicious lesions, take a sample (biopsy) or remove the lesion completely. Colorectal cancer is the second most common cause of cancer in women and the third most common in men, and is a major cause of death.

Agent and study technique

The Phase I/IIa study, described in the Nature Medicine article, involved 35 subjects (20 healthy volunteers and 15 patients with high risk of CRC) and it demonstrated that optical molecular imaging using the fluorescent agent specific for c-Met is feasible and safe.

Fluorescence colonoscopy in patients receiving intravenous EMI-137 enabled the visualization of all neoplastic polyps that were visible with white light, and additionally, detected previously missed polyps that were not visible with white light alone, said the research team: "This approach enables the detection of polyps missed by other techniques."

EMI-137 is a water-soluble compound consisting of a 26–amino acid cyclic peptide, conjugated to a fluorescent cyanine dye, that binds to human tyrosine kinase c-Met, a receptor frequently overexpressed during cancer growth. EMI-137 has the potential on intravenous administration to image a wide range of cancers including, breast cancer, oesophageal cancer, ovarian cancer, thyroid cancer, bile duct carcinoma and lung cancer, due to its specific targeting of the c-Met–receptor.

Lab set-up: EM Imaging has patents covering the platform technology as well as on probes that can image infection, inflammation, fibrosis and cancer.

Dr Neville Young, Programme Manager at the UK's Colorectal Therapies Healthcare Technologies Cooperative, said, "The NIHR funded Colorectal Therapies HTC, based at the University of Leeds, UK, drives a national network of clinicians and academics who are funded to support the development innovative new technologies that have the potential to benefit patients affected by colorectal disease. We are excited to be working with EM Imaging to help demonstrate both the cost effectiveness and clinical efficacy of their new colorectal tumour tagging peptide. This technology offers the possibility to identify and remove more easily any cancerous polyps in a patient undergoing a colonoscopy."

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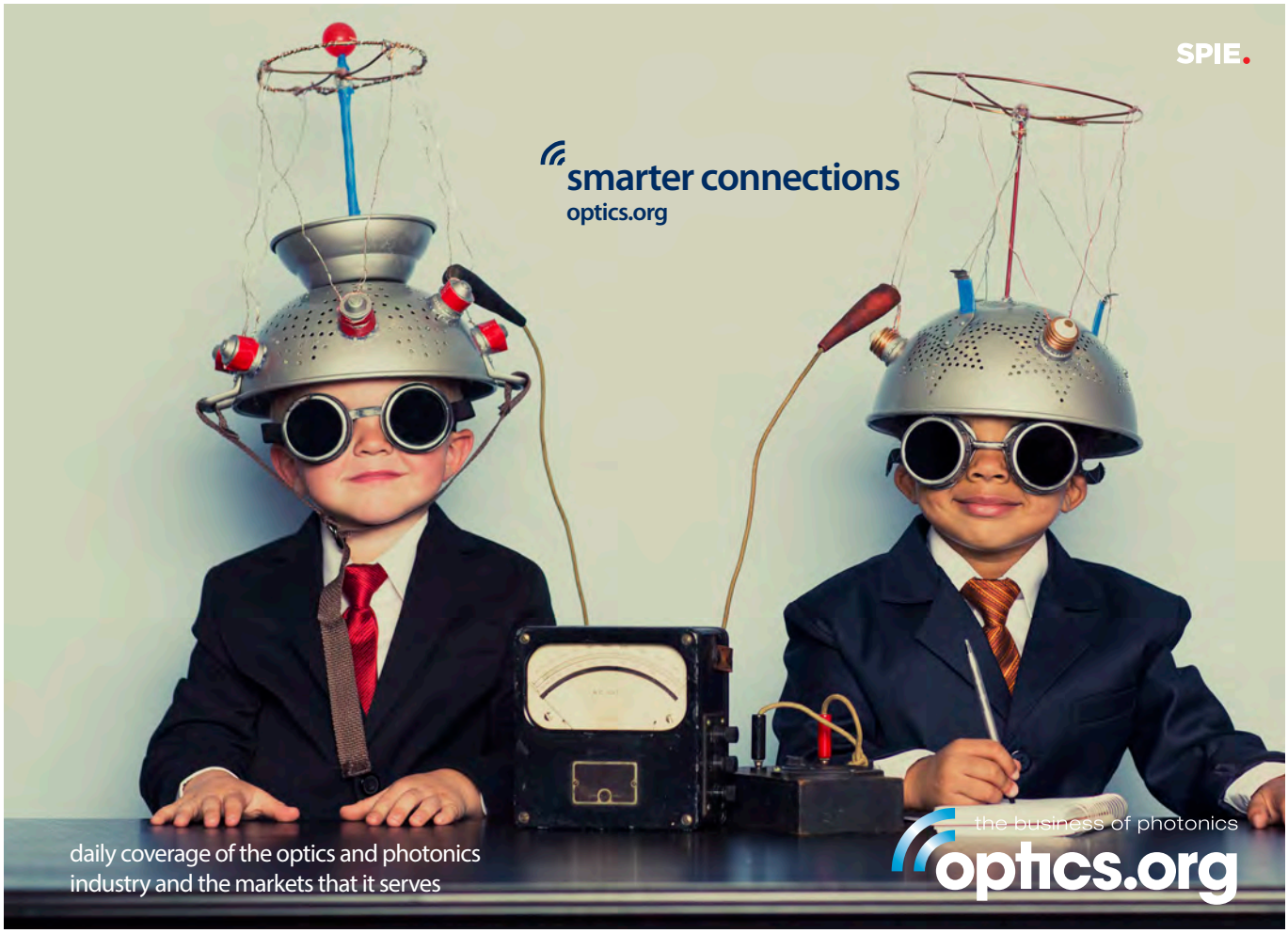
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ISG is the first firm to Announce the New SONY IMX250 Pregius 5Mp Global Shutter LightWise™ Allegro USB3 Camera

The new LightWise Allegro USB3 SONY IMX250 based cameras deliver excellent image quality and high speed performance. A variety of applications will be improved using this camera.

The SONY IMX250 Pregius™ CMOS Image Sensor delivers unparalleled image quality with extremely low-noise with a global shutter. It has 2464 x 2056 resolution (5.1Mp) and can run at up to 100 fps in 12-bit mode or 150 fps in 8-bit mode. These features are implemented in the LightWise™ Allegro USB3 Camera and are available now by calling ISG. Available in color or monochrome.

Unique features differentiate these cameras from the competition, such as the ISG Image Pipeline, large on-board FPGA & 256MB of extra memory.

Since LightWise cameras are easier to integrate, you will get your OEM vision systems to market faster and with better performance.

The cameras support the USB3 Vision™ standard, have triggers & strobes, Analog & Digital Gain Control, Auto-Exposure, ROI & binning capabilities and are available with a C-Mount or as a board level solution.

"The SONY IMX250 global shutter image sensor in our LightWise™ cameras offer best-in-class image quality in low light conditions, very high frame rates at a very reasonable cost," according to Kerry Van Iseghem, Co-Founder at Imaging Solutions Group.

The Imaging Solutions Group offers many different custom camera platforms offering a wide variety of interfaces, functions and programmability. This family is designed for low cost machine vision & microscopy applications.

About Imaging Solutions Group of New York, Inc.

Imaging Solutions Group, a privately held NY Company, is the leader in the design and manufacture of high-resolution intelligent machine vision and custom designed cameras. With over 24 years of video design experience, the Imaging Solutions Group product design team has accumulated an impressive array of intellectual property that they use to rapidly develop new products. Imaging Solutions Group is located in the Rochester, NY suburb of Fairport, NY in the Finger Lakes Region of NY.

For more information call Kerry Van Iseghem at (585) 388-5220 x101 (kerry@ISGCameras.com) or visit our website at http://www.isgcameras.com/ for data sheets, sample images and pricing.

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New hardware integration platform - well-priced and powerful

EVT presents with the combination of the hardware construction kit called „Raze" and the various camera modules a powerful integration platform for machine vision solutions.

The series of Raze1 and Raze2 are ZYNQ boards, which can be used with a multiplicity of line- and matrix-sensors. Raze1-15 and Raze1-30 system-on-chip (SoC) module combines Xilinx's Zynq-7000-series All Programmable SoC device with fast DDR3 SDRAM, NAND flash, quad SPI flash, a Gigabit Ethernet PHY and an RTC and thus forms a complete and powerful embedded processing system. Additionally Raze1 combines the flexibility of a CPU system with the parallel processing power and real-time capabilities of an FPGA system.

The same characteristics are true for Raze2 with the only difference, that it has a ZYNQ-7020. Of course every „Raze & sensor" combination supports the EyeVision machine vision software.

The series of Raze1 and Raze2 are ZYNQ boards, which can be used with a multiplicity of line- and matrix-sensors.

Therefore it offers a ready-to-use machine vision solution. No matter if GigE, USB, Bluetooth, etc. the software supports every platform. And the graphical user interface (GUI) stayes the same on every platform, consisting of 3 main parts. For one, the Toolbox with the image processing commands, which are displayed as icons. Those icons can be dragged into the Program Editor, where the commands are carried out by the software from top to bottom. The live image and the overlay can be seen in the Camera Viewer. The user can also create custom process displays.

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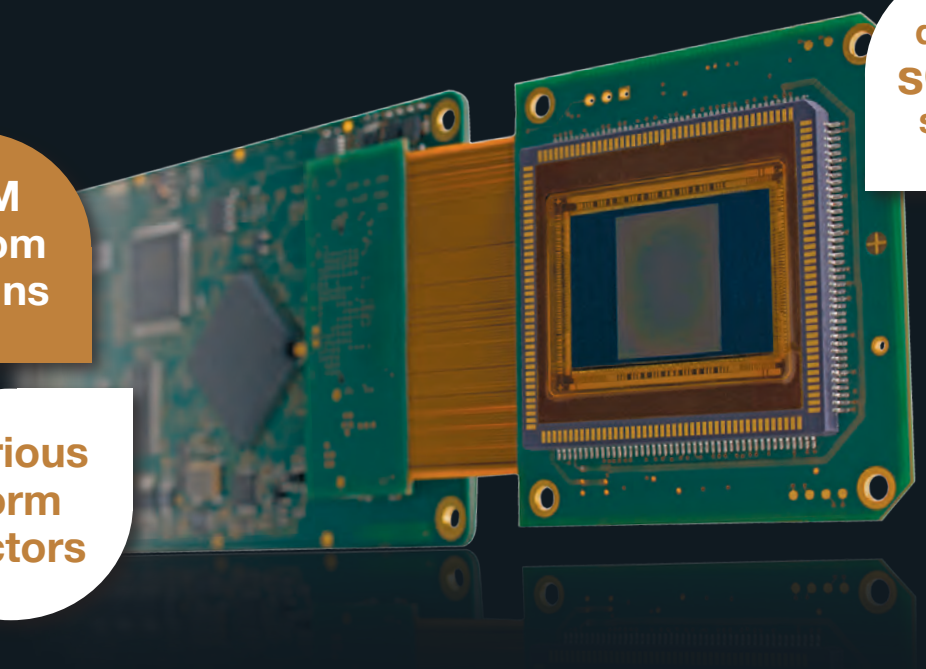

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Sentinel satellite returns 'game-changing' multispectral imagery

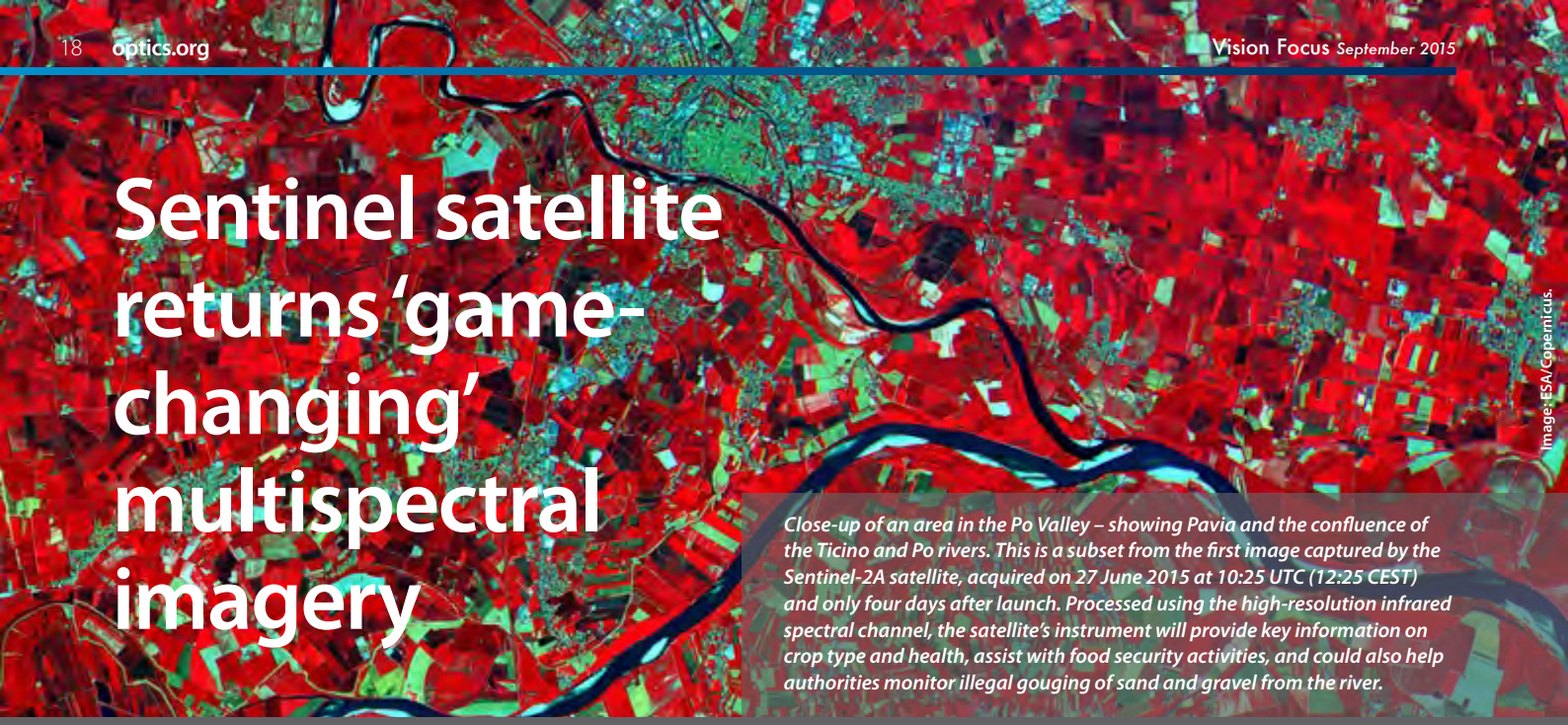

Image: ESA/Copernicus.

Close-up of an area in the Po Valley – showing Pavia and the confluence of the Ticino and Po rivers. This is a subset from the first image captured by the Sentinel-2A satellite, acquired on 27 June 2015 at 10:25 UTC (12:25 CEST) and only four days after launch. Processed using the high-resolution infrared spectral channel, the satellite's instrument will provide key information on crop type and health, assist with food security activities, and could also help authorities monitor illegal gouging of sand and gravel from the river.

Sofradir and e2v sensors helping to take remote land monitoring to unprecedented levels, says the European Space Agency.

High-resolution multispectral images captured by the optical sensors on board the Sentinel-2A satellite launched last week are already being beamed back to Earth – yielding views with unprecedented spectral detail and resolution.

High-resolution multispectral images captured by the optical sensors on board the Sentinel-2A satellite launched last week are already being beamed back to Earth – yielding views with unprecedented spectral detail and resolution.

The European Space Agency (ESA) payload, one of several that will eventually make up the "Copernicus" constellation, covers 13 discrete bands across the visible and near-infrared spectral regions and combines that with a 290 km swath width and a ground resolution of 10 meters per pixel.

Sentinel-2A's first image acquisition captured a view extending from Sweden to Algeria, through a large chunk of central Europe. It included a close-up the Po Valley in Italy, processed through the satellite's high-resolution infrared channel. The French company Sofradir provided 12 infrared sensors for Sentinel-2A.

Although the imager must now undergo around a three-month period of calibration, ESA says that the quality of these first images already exceeds expectations. Next year should see the launch of the Sentinel-2B partner satellite, for which Sofradir has also provided 12 short-wave infrared (SWIR) sensors.

Volker Liebig, the director of ESA's Earth observation programs, said: "Sentinel-2 will enable us to provide data for the program's land monitoring services and will be the base for a wide spectrum of applications reaching from agriculture to forestry, environmental monitoring to urban planning."

Philippe Brunet, director for space policy and defense, including the Copernicus mission, at the European Commission, added: "This new satellite will be a game-changer in Earth observation for Europe and for the European Copernicus program."

Spectral and spatial detail

ESA claims that the imager's 13 spectral bands will take remote land monitoring to an "unprecedented" level. "Sentinel-2 is the first optical Earth observation mission of its kind to include three bands in the 'red edge', which provide key information on the state of vegetation," says the agency.

That level of spectral detail can provide critical information regarding crop health, something that would be particularly important in the lower Po Valley. According to National Geographic, it features some of the most heavily cultivated land in Europe, but also suffers from illegal gouging of sand and gravel used for construction.

Now armed with an optical satellite imager that has already shown itself capable of pinpointing individual buildings in nearby Milan, authorities should be able to identify any such damaging activity in rapid fashion.

e2v technologies, the UK-based maker of CMOS imaging sensors, is also closely involved in the Copernicus program. Its devices are set to be used in five out of the six Sentinel satellite missions - including 2A - and its president of space imaging Matt Perkins said:

"Just four days after launch, Sentinel-2A has captured its first images of Earth. Here at e2v we are proud of the part we have played in Sentinel-2A, which has enabled it to capture these amazing images."

Sofradir said that the satellite is using its large-format SWIR sensors, described by the firm as highly complex devices. "Sofradir is the sole European manufacturer to have its infrared detectors deployed in space," claims the firm.

Its €6.7 million deal to provide the 15 µm-pitch mercury cadmium telluride (MCT) detectors for satellite builder and prime contractor Astrium SAS was extended by €2.5 million in early 2010.

As well as featuring photonics innovation in its imaging capability, the Sentinel missions are also equipped with high-speed laser links to ensure that the data-rich images can be sent and shared quickly.

ESA said that early results suggest that the data processing and transfer aspects of the mission are also working well, paving the way for the planned systematic dissemination of imagery in the future.

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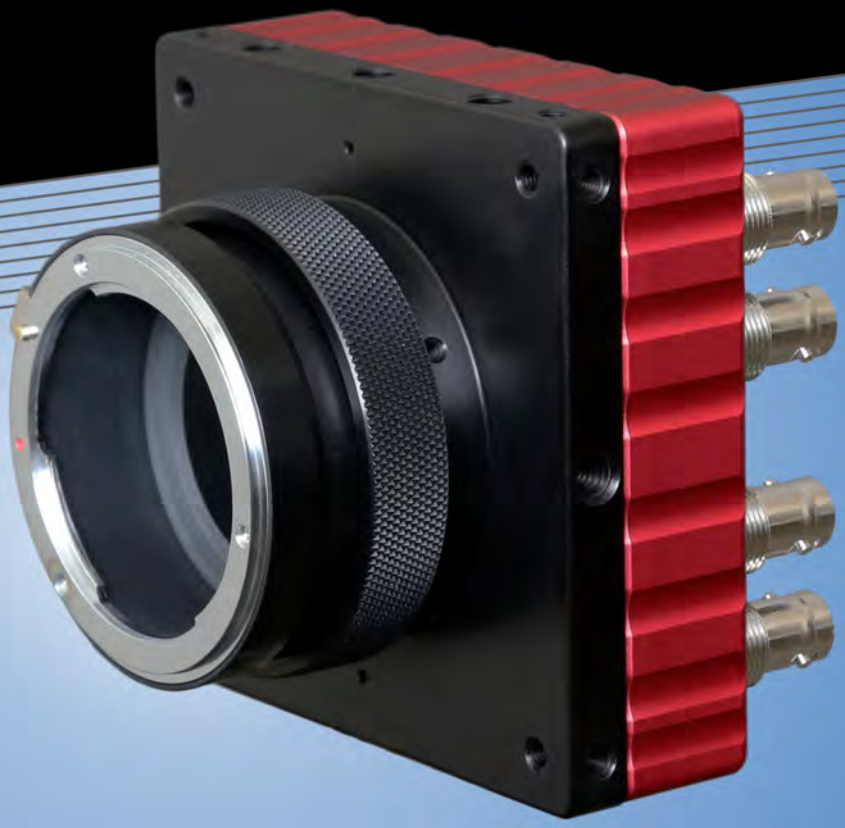

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