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Instrument Business Outlook

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Pittcon 2017: Companies Emphasize Ease of Use and Applications

Pittcon returned to Chicago, Illinois, this year, the conference and exhibition's first visit to the city since 2014 (see ***IBO*** 3/15/17). Attendance was up, as the total number of conferees rose 19.3% to 8,800 (the latest numbers available from Pittcon as of the morning of March 9) compared to last year when the show was held in Atlanta, Georgia (see ***IBO*** 3/15/16). However, this is a decline of around 16% from 2014. Nonetheless, exhibitors with whom

IBO spoke talked about good traffic on the exhibition floor and the advantages of Chicago for day-trip visitors.

Familiar themes were evident at the show, notably, software and informatics, ease of use and application-targeted systems. There were fewer press conferences this year and, as has been an ongoing pattern, fewer new product launches, as vendors showcased products introduced throughout the year. MilliporeSigma and Thermo Fisher Scientific were among the companies launching significant new products at the show.

Product Themes

The opportunities made possible by cloud computing were highlighted the first day of the show with two major announcements. Thermo Fisher Scientific announced the acquisition of Core Informatics (Thermo Buys Data Management Firm), a provider of LIMS, ELN and SDMS systems, which brings greater cloud capabilities to the company. At its press conference, the company used the term "digital science solutions" to describe its integrated informatics solutions, which include tighter integration of its Chromeleon CDS and SampleManager LIMS systems. The same day, Waters announced the launch of the cloud version of its Empower CDS, providing what it called the basic building blocks for cloud IT, such as networking features and data storage. In addition, the company is offering professional service experts to work with customers using the system.

The emphasis on ease of use, driven in part by software interfaces, was apparent in many new products on the exhibit floor, including the Thermo Scientific iCAP TQ ICP-MS and CEM's ORACLE Fat Analyzer. In discussing ease of use, many companies emphasized the ability of such features to make technologies more broadly accessible, thus opening up new application spaces and a broader base of users, as well as to increase productivity and time savings.

Likewise, several companies highlighted application-based systems that utilize software, ease of use, tailored instrument design and a turnkey solution to serve specific applications areas. Examples were Shimadzu's Cannabis Analyzer for Potency Testing and Bruker's MALDI PharmaPulse 2.O system for primary drug screening. However, for other technologies, notably atomic spectroscopy and materials characterization techniques, instruments with broad-based applications are still a mainstay. Such products at the show included PerkinElmer's NexION 2000 ICP-MS and TA Instruments' SDT 650 DSC/TGA.

Press Conferences

At Waters' morning press conference, CEO Chris O'Connell highlighted the company's emphasis on "transformational engineering" to realize more complete solutions that work together as one, noting that only 40% of the company's revenue is now from instruments. He also noted that although technologies have advanced, applications of these technologies remain immature, with further market development needed.

At its press conference, Thermo Fisher discussed the value of the company's broad product portfolio for creating workflow-based approaches, particularly for industries such as food and pharmaceuticals. The company also highlighted new products for the materials sciences, noting its ability to provide a multi-modal, multi-scale workflow for the field.

Shimadzu at its press conference emphasized its growing US manufacturing footprint and the ability of the company to draw on its medical systems division to inform product development for customers moving from analytical to clinical analyses. In addition, US management changes were announced.

Bruker announced at its Pittcon press conference the opening last month of its new Center of Excellence in Beijing, China, which will serve as the company's Chinese headquarters and center of its Beijing operations. The company also discussed products for both the pharmaceutical and applied markets, including the announcement of its first UHPLC system. Bruker President and CEO Frank Laukien, PhD, noted at the press conference that the product will serve as a valuable front end for its MS product line.

Also debuting at Pittcon this year was the DURAN WHEATON KIMBLE brand, consisting of the formerly separate WHEATON Industries, Kimble Chase and DURAN brands, as well as UK-based SciLabWare, which are all owned by private equity firm One Equity Partners. Together, the companies will be known as DWK Life Sciences. Combined, the companies have 1,770 employees and offer 30,000 labware products, with manufacturing distributed globally.

The company also announced new management, led by the appointment of new president of WHEATON industries, David Koi. He was formerly senior vice president, Global Portfolio Management, for the Fisher Scientific Channel at Thermo Fisher Scientific.

Pittcon 2018 will be held February 26–March 1 in Orlando, Florida.

Industry Leading Companies Share Insights

At Pittcon, ***IBO*** sat down with executives of three of the world's largest instrument and lab product manufacturers. The conversations focused on some of the dominant issues shaping the industry's growth prospects as well as company developments.

> *"The biggest challenge, and a challenge we are meeting, is scaling up our organization at the same rate the business is growing."*

A major growth driver for the industry in general, and especially for food safety, is China. Discussing the challenges in China, Mike Harrington, PhD, senior vice president, Global Markets, at Waters, told ***IBO***, "The growth has been so fast that building the necessary infrastructure [is an ongoing challenge]. I'll give you an example: two out of every five mass spectrometers that we manufacture are sold in China. . . . So as the volume grows, how do we bring on board fast enough really well trained and expert service engineers and scientists to train our customers?" The company continues to grow in the country to meet this need. "The biggest challenge, and a challenge we are meeting, is scaling up our organization at the same rate the business is growing." Also, he noted the country's size and diversity of customer locations, stating "You've got everything [there], from intense urbanization to remote locations."

Rajat Mehta, vice president and general manager, Applied Technologies, at Thermo Fisher Scientific, explained that although macro-economic growth concerns for China remain, individual end-markets are healthy. "[T]he technologies and markets where we participate—food, as an example, we see good growth drivers as consumer awareness around food safety is increasing. The consumer purchasing power continues to increase over there and is driving growth. Environmental—soil and air pollution are some real issues that have not only an impact on quality of life, but also an impact on the industrial productivity."

In China, the company seeks to participate not only in the country's high-end instrument market but also the broader market in general, according to Jakob Gudbrand, president, Chromatography and Mass Spectrometry, at Thermo Fisher. This is accomplished through a strong local presence. "We have two important platforms for that in China: we have our China Innovation Center and our China Manufacturing Center." He noted, "We manufacture in China. Just in our chromatography and MS space, we manufacture some ICs there, some GCs there, some AAs there, some ICPs there. . . . So with a manufacturing footprint in China plus an innovation center in China, we're able to take a more local view of the market." Such innovation is also utilized on a global basis. "The AAs, the ICP, the GC, the ion chromatographs—are all manufactured in China. The IC and the GC, part of it, are innovated in China. But all of them are sold globally."

While China has certainly been a success story for the industry as a whole, the weakness of industrial end-markets, such as oil and mining, in recent years has been a challenge for many companies and the world economy in general. As Jim Corbett, executive vice president and president, Discovery & Analytical Solutions, at PerkinElmer, told ***IBO***, the ability to access strength in different end-markets has been an advantage for his company in dealing with slower industrial growth. "You try to pivot to markets whose spend might be more robust. Pharma and biotech have been strong over the last few years. We're starting to see academic come back a little bit more, not as strong as I would like it, but it's there," he explained. "You pivot and you shift your resources to try to go after that. And then you look at your long-term product roadmap and try to say, 'Ok, am I building the next generation products for the right end-markets to get those needs met?' And you have to adjust the R&D investment as well." As for the industrial markets specifically, he told ***IBO***, "Industrial has impacted us globally, but more so in a lot of the Asia Pacific [countries] because we are otherwise doing so well there."

Similarly, Dr. Harrington cited the diversity of Waters' end-markets as a factor in growing sales despite slower industrial markets. "What tends to happen is our business shifts around a little bit. We've never seen meteoric growth in that segment, but neither have we seen some sort of cataclysmic fall. It tends to come from different segments at different times," he explained. The company's technologies also allow it to respond to different market needs. "The technology we sell into the different segments is quite similar. . . . [It is] subtle variations on a common platform. As a result, our experts in sales and marketing and support are quite flexible to be deployed into different segments as the need arises."

> *"Now more than ever, our customers in these areas are looking for new products that help accelerate their innovation and drive productivity in their processes"*

According to Dan Shine, president, Analytical Instruments, at Thermo Fisher, the company has adjusted to the industrial market's slowness with new products. "We are focused on helping our customers navigate through this environment. Now more than ever, our customers in these areas are looking for new products that help accelerate their innovation and drive productivity in their processes," he cited. He cited the Thermo Scientific ARL Quant'x EDXRF spectrometer and the Thermo Scientific iXR Raman Spectrometer as two new products addressing this market. He added, "In China, we continue to see good demand in all of our end-markets. We have leveraged our Thermo Fisher scale to help expand our sales and service capabilities in this region—as well as further develop local product development and manufacturing capabilities in order to more quickly respond to the unique needs of our China and Asia-based customers."

For the companies themselves, responding to evolving end-markets can also involve internal transformations. Last year, PerkinElmer reorganized the company into two new divisions, Diagnostics and Discovery & Analytical Solutions (see ***IBO*** 9/30/16). Asked about the reorganization, Mr. Corbett said, "There are some end-market synergies that make a lot of common sense, particularly in pharma, biotech and academia, where sales and service in our front-end channel could really be organized more appropriately to deliver that customer base a full suite of our products." The change also affected R&D. "We've got some leverage from how we are organizing our R&D organization, so now when we look across the entire portfolio, we are aligned by instrument platforms. We've also aligned under what I call our Digital Solutions group, which also includes our informatics solutions, to go across our portfolio."

The change also builds upon the company's established OneSource business as well as its strength in the pharmaceutical market. "Our OneSource Services are a great anchor for us in the research market. Clearly, we've got great capabilities there. We've continued to see nice growth. Now we can complement that with the full suite of products that go into the pharma market." These opportunities include products across the division "Some analytical products are sold into QA/QC and other areas. Now that we have a commercial front-end that is going to be more organized around that end-market, we think we're going to continue to do well."

PerkinElmer's technologies can also serve both the Diagnostics and Discovery & Analytical Solutions division. As Mr. Corbett told ***IBO***, the triple-quadrupole MS technology gained by PerkinElmer through its purchase of Ionics (see ***IBO*** 9/30/16) was launched as the QSight system in China last fall, targeting applications such as high-volume food testing and testing for pesticides. "At the same time, the Diagnostics business, which utilizes mass spec in newborn screening, will then offer that to customers. So it accommodates both sides of the business," he explained.

For Thermo Fisher, collaboration also extends across businesses. "We connect our teams (whether R&D or product management) to work in new, exciting ways to bring our capabilities to the market that allow us to compete in a new segment," noted Mr. Gudbrand. "Like food, for example, or pharma and environmental, we bring our product teams together to present our value proposition in the most compelling way. Obviously, from a growth perspective, we think about driving growth. We would select the application areas where we are better differentiated and where the markets are growing faster." He cited pesticide analysis as an example, saying, "Whether in environmental or food, which is around a $450ish million market, our chromatography, MS, and trace elemental [analysis] technologies are relevant."

All three executives commented on the potential of informatics and software solution to drive market growth, a fact borne out by the investments companies are making in the area. "It's a huge area for us. It's the single largest investment we make in product development," stated Dr. Harrington. In particular, he noted, software demand is being driven by regulatory needs. Regarding the company's Empower CDS, he said "If you look at the FDA, MHRA

(Medicines and Healthcare Products Regulatory Agency), PIC/S (Pharmaceutical Inspection Co-operation Scheme), and the World Health Organization, they have all issued new guidance in 2016 about the management of data in enterprises in regulated environments. . . . It really plays to our strength."

The company is also developing its software to change the user experience. "We are working very hard, especially in our mass spectrometry solutions with UNIFI, on building out a whole new user experience that simplifies what is an extraordinarily complex set of analyses that [scientists] have to do," said Dr. Harrington. In addition, the company is working toward "complete system intelligence." As he explained, this is "trying not just to use informatics to handle a challenge of data interpretation, results and decision making, but also using software and analytics to help you to understand and predict the health of your instrument." He added, "Building from the health of individual instruments, we hope to draw information from our thousands of instruments all over the world, to be able to predict, inform and troubleshoot instrument health ahead of time."

Likewise, Mr. Corbett sees enormous potential in informatics. "Increasingly, our customers are generating more and more data, so how we can help them utilize that data in more compelling ways is really going to be the driver for the analytical laboratory moving forward," he said. "We've been on this path with informatics, acquiring different assets to get a comprehensive suite of capabilities, like our electronic lab notebook. We complement that with our TIBCO Spotfire capabilities. So now we're able to help our customers aggregate different data sets and allow them to utilize that in a more compelling way."

> *"I don't think the need for information management is going to slow down at all, and so I think as a laboratory supplier it is critical we have that offering to help customers"*

These opportunities will continue to affect how the customers' lab works as well as the company's product development. "I don't think the need for information management is going to slow down at all, and so I think as a laboratory supplier it is critical we have that offering to help customers," said Mr. Corbett. "So we continue to invest in that part of the portfolio. We're looking for broader applications than in the pharma market and we're starting to do that, and I think with the R&D organization reorganized, the cross pollination across the end-markets is going to occur."

Thermo Fisher's announcement at Pittcon of its acquisition of Core Informatics demonstrated the company's ongoing investments in the area. As Mr. Gudbrand explained at the company's press conference, this purchase supports Thermo Fisher's investment in software for private and true SaaS cloud offerings, and enables it to offer software from discovery through informatics. The company is also addressing the fragmentation of software offerings.

Top New Products of Pittcon 2017

Each year, ***IBO*** selects the top three new products (defined as launched within the past six months) introduced at Pittcon, the largest analytical instrument show in the US. ***IBO*** evaluates new products based on technological advancements, commercial potential and innovation. This year's winners demonstrate novel performance or testing capabilities that position them for market success.

JEOL CryoARM TEM

IBO has selected JEOL's seventh generation TEM, the CryoARM, as the best new product at Pittcon 2017. The selection is based on the best-in-class status and potential commercial opportunities for cryo-TEM. There is substantial interest in the field of structural biology to constantly lower the resolution limits in order to solve protein structures using cryo-TEM techniques and make them competitive to X-ray crystallography techniques, which require the tedious prerequisite of crystal formation.

The Cryo-ARM TEM product line is offered in two models, the ARM200F and ARM300F, with 200 kV and 300 kV voltage sources, respectively. They feature full automation capability, enabling the high-throughput imaging of specimens unattended for 24 hours using a 12-sample autoloader.

The system's cold Field Emission Gun (cFEG) option, designed particularly for life science applications, reduces the contrast level significantly, paving the way for the structural determination of macromolecules down to 3.2 Å resolution. With a maximum resolution of about 50 pm at 300 kV, the CryoARM now owns the title of the TEM with the highest resolution in the world. The first CryoARM 300F will be installed in Japan next month, at a price of $4–$5 million.

CEM ORACLE Fat Analyzer

IBO has also chosen CEM's ORACLE Fat Analyzer as one of the best new products at Pittcon 2017. ***IBO*** has selected the product due to its ease of use and unique analytical capabilities that can be expected to expand the market. Released last fall at a price of $65,000, the NMR-based system enables fat analysis on any food type with no method development. This provides time and labor savings compared to wet chemistry and IR techniques, and even other NMR-based systems, according to the company. Consequently, end-users can test any sample without knowing its composition or having to correlate it to reference chemistry. The system is available in rapid and high-throughput models.

The system has an advanced software screen and touchscreen features, allowing for timely results and analysis with one touch. It requires no operator involvement, and no chemicals or solvents. Consequently, it is expected to drive

wider application of NMR-based fat testing.

ACD/Labs LUMINATA

IBO's third choice for a top new product at this year's Pittcon is ACD/Labs's LUMINATA platform. The software provides new capabilities for impurity profiling, compiling chromagraphic and spectral information from multiple instrument platforms, enabling retrospective searches and easier data management. The system can save time and money, for example, by reducing the need for retesting as well as eliminating Excel-based file searches.

LUMINATA characterizes the substance impurities and allows standardization of the analytical data for impurities in order to improve real-time tracking for better traceability. According to the company, the efficient assembly of analytical, chemical and process information in an enterprise informatics environment is aimed at companies that want to establish impurity control strategies, along with offering the ease of gathering visual experimental data for regulatory bodies. It will be available this summer.

Pittcon 2017 New Products: Part 1

Each year, ***IBO*** provides a summary of new products (defined as having begun shipping in the last six months) at Pittcon. The list is not designed to be comprehensive. Part 2 of the list will appear in the March 31 issue.

Atomic Spectroscopy

PANalytical unveiled the Aeries benchtop powder XRD, presented in four different models for specific applications: cement, minerals, metals and research. The new instruments offer a fully automated operation mode, three- or six-sample changer, a unique geometry, easy handling and a user friendly interface with a built-in touchscreen. Moreover, it needs no external cooling system as all necessary cooling requirements are fulfilled internally. The device is already on the market and priced at $80,000–$120,000.

PerkinElmer announced a new single-quadrupole ICP-MS, the NexION 2000. It is capable of handling any sample matrix and interference, running any gas, including pure ammonia and other reactive gases, and detecting any particle size with an acquisition speed at 100,000 points per second. In addition, it minimizes required maintenance. For example, by applying the LumiCoil technology in the solid-state RF generator of the device, the coil needs no cooling or maintenance.

The iCAP TQ from **Thermo Fisher Scientific** is an ICP-MS instrument equipped with a triple-quadrupole mass spectrometer. Thermo Fisher developed the new product to address about 10% of applications in the market, which up to now could not be handled properly due to the detection limit of single-quadrupole ICP-MS, including detection of titanium in serum samples, and arsenic in food and environmental samples. It emphasizes ease of use and features the ability to switch between single- and triple-quadrupole modes. The system is scheduled for shipment on April 1 and has a price tag between single-quadrupole ICP-MS and high-resolution ICP-MS systems. The iCAP TQ has the same footprint as the company's single-quadrupole ICP-MS.

XOS showcased the Sindie +Cl, which uses monochromatic wavelength dispersive XRF technology to measure total sulfur and total chlorine in petroleum samples with the push of a button. It is primarily designed for use in refinery labs, pipeline terminals, additive plants and inspection laboratories. Released in January, the instrument sells for about $170,000.

Chromatography

Bruker entered the UHPLC market with the introduction of the Elute series of UHPLC systems, which offers 1300

bar performance. Models include the Elute OLE UHPLC, which adds online extraction to ultrafast separation, and the Elute HT system, which uses the PAL3 autosampler. Depending on the model and configuration, prices range from mid-$50,000 to mid-$70,000.

Ellutia Chromatography Solutions unveiled its 500 series GC, which uses ultrafast GC to drastically speed-up analysis times for a variety of laboratories. The single-column instrument uses a compact air-blown oven and low-energy heat recovery system that significantly reduces energy consumption for end-users, thus saving costs. It is available with an optional autosampler, to which a second 500 series GC can be added if higher throughput is needed.

Shimadzu displayed its Cannabis Analyzer for Potency Testing, which is an HPLC analyzer that works on three different methods. The instrument has the capacity to analyze 11 different target cannabinoid compounds found in cannabis products, and requires no method development and a simple setup to be operated.

Informatics

LabVantage Solutions displayed its LabVantage Pharma 8 package, which can be successfully implemented within three months, based on user requirements, according to the company. The LabVantage Pharma 8 is validated using GAMP 5 guidelines to ensure experimental conformance to best lab practices. It also includes a set of pre-configured laboratory documentation templates that are designed as per customer-specific business process workflows. It is priced at approximately $100,000.

Laboratory Products

Eppendorf exhibited their new Multipurpose Centrifuge 5920 R, a benchtop centrifuge with a high capacity. It offers features that allow the spinning of both tubes and plates simultaneously by a simple change of an adapter, and not the bucket itself. Its Dynamic Compressor Control (DCC) allows for controlling the cooling performance. It began shipping in October 2016.

Glas-Col's Zip Vap 4 automatic evaporator was launched in November 2016. The unit can accommodate up to four 96-well plates at once, ideal for high-throughput labs. The user can set the gas flow and temperature of the manifold and the plate. The system can store up to 15 recipes with 10 steps each. The unit is priced at $24,868.

The MicroFlow III class I ductless hood workstation was launched by **HEMCO**. The system includes a carbon filter and a fan, and is intended to use in laboratories and clinical settings for light-duty fume removal of non-hazardous chemical vapors and particulate filtration. Fan speed can be easily controlled by the user. The filters of this unit need to be changed after approximately 80 hours of usage at a price of $300 for two filters. The system is priced at $3,000.

The new Milli-Q IQ 7000 system from **MilliporeSigma** is the seventh generation Milli-Q water purifier. The unit features a variety of innovations, including being the first with mercury-free UV lamps for the photo-oxidation of organic contaminants. It also includes purification cartridges 33% smaller than in previous versions, which allows the same performance with less waste resulting in a 30% reduced footprint; four ergonomic and precise dispensers (Q-Pod) with a wide range of water dispensing options (from drop by drop up to 2 L per minute); and a data management system that archives 100% of the events for better traceability. It replaces the Milli-Q Advantage A10 system. The company will start shipping the system in April.

Materials Characterization

Anton Paar added to its family of Litesizer particle analysis systems with the Litesizer 100, designed to characterize nano- and microparticles in dispersions and solutions through dynamic light scattering. It is considered a streamlined version of the Litesizer 500, which was released last year.

Retsch Technology introduced the CAMSIZER X2 for particle size and particle shape analysis. Specifically

designed for additive manufacturing applications, including 3D printing, the instrument is able to overcome the problem of analyzing oversized or undersized particles that tend to agglomerate. The price range is between $80,000 and $90,000.

TA Instruments introduced the Discovery Simultaneous Differential Scanning Calorimeter (DSC)/Thermogravimetric Analyzer (TGA), the SDT 650. It is the only system capable of simultaneous TGA/TGA, a dual-sample mode that delivers independent TGA measurements on two samples. Without an autosampler, the instrument is priced at about $80,000. With the addition of a 30-position linear autosampler, the price is about $100,000.

Molecular Spectroscopy

B&W Tek introduced the i-Raman Pro ST, a benchtop and portable spectrometer that allows the identification of materials inside visually opaque containers, such as white plastic bottles or paper envelopes. The system began selling this month for around $55,000.

Thermo Fisher introduced the Thermo Scientific iXR Raman Spectrometer. Built from the DXR microscope family, it is designed specifically for multimodal analysis and is capable of coupling to other analytical instruments, thus allowing simultaneous measurement of Raman spectra along with another technique. This setup can yield multifaceted information that describes the relationship between a sample's molecular composition, and structural or surface performance.

Thermo Fisher also introduced the new Nicolet iN5 FTIR microscope, designed to quickly identify small particles, contaminants and defects that occur in production processes. It is ideal for QC laboratories and small analytical labs. The microscope requires minimal user training and features an optical setup that allows for sample viewing simultaneous with chemical data collection.

Thermo Buys Data Management Firm

Waltham, MA and Bradford, CT 3/6/17—Thermo Fisher Scientific has purchased Core Informatics for an undisclosed amount. Core Informatics provides cloud-based LIMS, ELN and SDMS (Scientific Data Management Solutions). "The scientific community is rapidly adopting cloud-based laboratory and scientific data management capabilities," said Thomas Loewald, senior vice president and chief commercial officer of Thermo Fisher. "Integrating the leading technologies of Core Informatics is part of our strategy to set the standard for digital science solutions, from life sciences discovery to applied markets and manufacturing."

*Tom Loewald, chief commercial officer of Thermo Fisher Scientific, told **IBO**, "Core Informatics brings a range of innovative cloud capabilities to Thermo Fisher. The Platform for Science (PFS) is a cloud-based informatics platform, providing the underlying data management infrastructure for lab workflows, allowing end-to-end sample and specimen tracking across experiments, assays and processes. Core Informatics' LIMS, ELN and SDMS as well as its communication products, Core Connect and Core Collaboration, run on the platform." He added, "PFS provides the scientific community with a flexible, cost effective and secure way to collect, store, analyze and share information. Customers in regulated environments can use Core Informatics' validated cloud offering, which includes Installation Qualification (IQ) for the cloud infrastructure that is used to host the Platform for Science, and is complemented by Core's Operational Qualification (OQ) validation services." The company also noted that its LIMS business has been stronger on the industrial side and Core Informatics' strength is discovery applications. Among Core Informatics' customers are genomics and biopharmaceutical companies. HartfordBusiness.com reports that the company has about one hundred employees.*

Sartorius Adds to Analytical Instrument Business

Göettingen, Germany 3/3/17—Pharmaceutical and lab equipment provider Sartorius has acquired Essen BioScience from SFW Capital Partners for $320 million in cash. Essen BioScience provides instruments and reagents for real-time, live-cell analysis. The 150-employee company is expected to record $60 million in revenues in 2017. "With the Essen real-time, live-cell analysis platform, we will add another key technology for advancing and accelerating drug discovery applications to our lab divisions' portfolio," stated Sartorius CEO Joachim Kreuzburg. The acquisition is expected to close in the first quarter.

Essen BioSciences' IncuCyte ZOOM System enables high-definition phase-contrast, green fluorescence and red fluorescence imaging for quantitative analysis of cellular processes in real time, including cell monitoring, cell viability and live-cell assays. The purchase is Sartorius' third in the past year of an analytical instrument provider serving the cellular analysis market.

Four Bio-Rad Board Members Resign

Washington, DC 3/13/17; Hercules, CA 3/13/17—In an SEC filing, life science research and diagnostics products provider Bio-Rad Laboratories has disclosed the resignation of four Board members, Louis Drapeau, Robert M. Calchione, Joel McComb and Deborah J. Neff. In a letter to company Chairman, President and CEO Norman D. Schwartz, the resigning Board members stated that they declined to stand for re-election "due to disagreements with the management of the company regarding executive personnel and corporate governance matters." In a press release, Bio-Rad stated that the decision "was not related to any issues regarding the integrity of the Company's financial statements or accounting policies and practices." As replacements, Bio-Rad intends to nominate Jeffrey Edwards, former CFO of Allergan; Gregory Hinckley, president of Mentor Graphics; and Arnold Pinkston, formerly general counsel of Allergan. It is also continuing to identify additional independent directors.

No further details were provided. However, in regard to executive personnel, Bio-Rad's former general counsel, Sanford Wadler, was recently awarded almost $11 million, including $5 million in punitive damages, after a U.S. District Court for the Northern District of California jury found that the company fired him in retaliation for reporting potential violations of the Foreign Corrupt Practices Act, which Bio-Rad later settled with the SEC (see ***IBO*** *11/15/14).*

IR Microscopy Firm Acquired

Rome, Italy 3/7/16; San Diego, CA 3/7/17—Leonardo, a publicly listed Italian company serving the aerospace, defense and security markets, has agreed to acquire Daylight Solutions for $150 million. Daylight Solutions provides mid-IR lasers and systems based on quantum cascade laser technology for molecular detection, imaging and illumination systems used in scientific research, life sciences, industrial process control and defense applications. "This acquisition will allow Leonardo DRS to extend the range of advanced solutions to civil and military customers around the world, integrating the Daylight Solutions laser technology in the core business of electro-optical and infrared sensors and systems," said Leonardo CEO and General Manager Mauro Moretti. Applications of the companies' IR technology will include medical and industrial applications, such as imaging for cancer diagnostics and chemical detection. Daylight Solutions will retain its three cofounders and remain in San Diego, California.

Eric Takeuchi, senior director for Business Development at Daylight Solutions, told **IBO** *that part of the motivation for Leonardo for the purchase was Daylight Solutions' non-defense businesses, which include lasers and sensors for scientific instrumentation, as well as the Spero IR microscope.*

Takara Finalizes Purchase of WaferGen

Mountain View, CA 3/1/17—Takara Bio USA (TBUSA) has completed its acquisition of publicly held WaferGen Bio-systems (see ***IBO*** 3/15/16). WaferGen provides technology for isolating and processing single cells. The final purchase price was $35.9 million. "We are excited about the synergy between WaferGen's technologies and products for isolation and processing of single cells and our RNA-seq and T-Cell Receptor profiling technologies," commented TBUSA President Carol Lou. "WaferGen's technologies are highly complementary to our reagent portfolio and the combination presents new opportunities for us in genetic analysis including clinical and applied markets."

This month, WaferGen announced preliminary 2016 revenues grew 48.6% to $10.7 million. The company estimated accumulated operating losses of $119.8 million, as of September 30, 2016. With the purchase, Takara Bio obtains microfluidic technology, including systems for NGS sample preparation. WaferGen delisted from the NASDAQ Stock Exchange on February 28.

Fourth Quarter 2016 Results: Pharma Stays Strong

Order Timing Limits Bio-Techne Growth

For the fiscal second quarter ending December 31, 2016, Bio-Techne sales advanced 9.0%, 2% organically, to $131.8 million. Sales were roughly in line with company expectations but were negatively impacted by lower OEM demand within the Diagnostics division.

Sales for the Biotechnology segment improved 2% organically, including low single-digit sales growth for proteins, and mid-single digits sales growth for antibodies and assays. The company highlighted demand for Novus antibodies especially through its web offering. Meanwhile, assay sales were aided by the expanded offering of Luminex instruments in addition to its consumables. However, this growth was partially offset by slower demand for PrimeGene due to China's FDA regulatory changes, as well as a decline in large custom projects from US biopharmaceutical customers. On a standalone basis, sales for the acquired Advanced Cell Diagnostics (ACD) business (see ***IBO*** 7/15/16) climbed more than 50%.

Bio-Techne's Protein Platforms segment continued its streak of double-digit organic growth as sales climbed 12%, including growth in all three major product categories: Western blot, multiplex ELISA and Biologics. Biologics sales advanced in the strong double digits, led by continued demand for the new iCE system, Maurice. While multiplex ELISA kit sales were slightly slower than previous quarters due to customer project timing, SimplePlex sales benefited from increased customer utilization, as cartridge sales grew roughly 50%. Finally, Western blot sales were boosted by Wes placements, which increased in the strong double digits to 72 units for a total installed base of 600 systems.

Diagnostics sales contracted 5% due to the uneven ordering pattern of OEM products, which were also impacted by the company's assay offering with varying shelf life.

Bio-Techne Q2 FY17

	Rev. (M)	% of Rev.	Rev. Growth	Org. Growth	Op. Profit (M)	OP Growth
Biotechnology	$86.0	65%	13.3%	2%	$39.5	-1.3%
Diagnostics	$24.3	18%	-5.4%	-5%	$5.8	-20.5%
Protein Platforms	$21.5	16%	11.4%	12%	$1.8	20.6%

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For the total company, which excludes the OEM diagnostic business, sales in Europe grew in the high single digits, including mid-teens and low single-digit sales growth from biopharmaceutical and academic customers, respectively.

APAC sales maintained strength despite continued pressure on PrimeGene sales. Specifically, sales in China advanced in the mid-single digits, as lower PrimeGene sales was offset by double-digit sales growth for the Western product line. Japanese sales, which were flat, reversed a declining trend experienced over the last several years. Excluding China and Japan, Asia Pacific sales grew in the mid-teens, led by strength in South Korea.

US sales, which grew in the low single digits, slowed compared to the previous few quarters, especially from biopharmaceutical markets. While the company noted continued strength in biopharmaceutical orders for the region, average order size declined due to timing of projects.

Adjusted operating margin contracted nearly six percentage points as a result of acquisition and strategic investments. The company maintained its fiscal 2017 organic sales growth outlook of 6% or slightly higher. Fiscal third quarter organic sales growth for the Protein Platforms and Diagnostics divisions are projected to grow at a similar pace as the fiscal second quarter, while sales growth for the Biotechnology division is anticipated to accelerate.

Merck KGaA Q4 Growth Slows

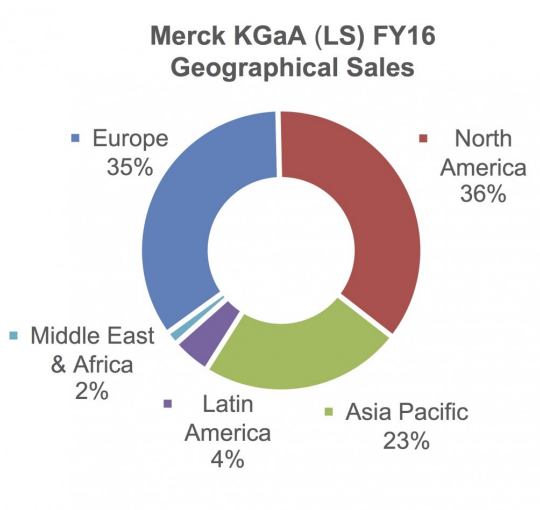
Q4 2016

Fourth quarter 2016 sales for Merck KGaA's Life Science division (LS) climbed 32.8%, 3.7% organically, to €1.44 billion ($1.55 billion = €0.93 = $1) to make up 38% of company revenues. The Sigma-Aldrich acquisition (see ***IBO*** 9/30/14) and currency contributed 28.8% and 0.3% to revenue growth, respectively. All sales figures below are based on organic growth.

Revenue growth for the LS segment experienced a sloping trajectory for the year as bioproduction demand decelerated in the fourth quarter 2016 due to delayed orders. Nevertheless, Process Solutions sales grew 4.1%, led by demand for single-use products and services. The Applied Solutions business recorded its strongest quarterly revenue growth for the year, advancing 6.0% due to demand for biomonitoring products in the EU and US. Sales for the Research Solution business slipped 0.6% organically, as strength in Europe and Asia were mostly offset by weakness in the US.

Geographically, LS sales in Latin American remained strong, climbing 13.3% organically.

Sales in Asia Pacific and Europe advanced 8.2% and 15.7%, respectively. Sales in the Middle East and Africa region improved 4.2%. Conversely, sales in North America contracted 11.1% because of political and budget uncertainties. LS adjusted operating margin slipped 29 basis points to 21.2%.



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2016

Full-year 2016 sales for Merck LS climbed 68.6% to €5.66 billion ($6.29 billion = €0.90 = $1), including 63.1%

growth from Sigma-Aldrich and currency headwinds of 0.8%. Organic sales expanded 6.3%, slightly above the company's initial guidance, due to strength in biopharmaceutical markets and increased revenue synergies from the acquisition.

Process Solutions sales expanded 10.5%, led by global activity for large-molecule production and demand from developing biotechnology start-ups. Research sales grew 1.2% as growth was hindered by weak demand in North America. Applied Solutions sales climbed 4.3% due to strong demand of biomonitoring products to pharmaceutical customers and higher sales of analytical testing products.

Driven by strength within the Process Solutions business, LS European and Asia Pacific sales advanced 11.0% and 8.1%, respectively. Research Solutions sales also grew double digits in Europe. Sales growth in Latin America, as well as the Middle East and Africa climbed 12.7% and 6.9%, respectively. Applied Solutions sales were particularly strong in Latin America. Overall, North American sales contracted 1.3% due to slower academic demand.

LS adjusted operating margin expanded 248 basis points to 24.3% due to the acquisition. The company recorded annual cost synergies of €105 million ($116.7 million), roughly €15 million ($16 million) ahead of projections. In addition, revenue synergies are projected to increase, resulting in total synergies of €280 million ($300 million) in 2018. The company projected 2017 LS organic sales to continue to grow above the market rate.

Merck KGaA Life Science FY16						
	Q4			FY		
	Rev. (€M)	% of Rev.	Org. Growth	Rev. (€M)	% of Rev.	Org. Growth
Research Solutions	€ 514.5	36%	0.6%	€ 2,054.7	36%	1.2%
Applied Solutions	€ 384.5	27%	6.0%	€ 1,457.2	26%	4.3%
Process Solutions	€ 541.9	38%	4.1%	€ 2,146.1	38%	10.5%

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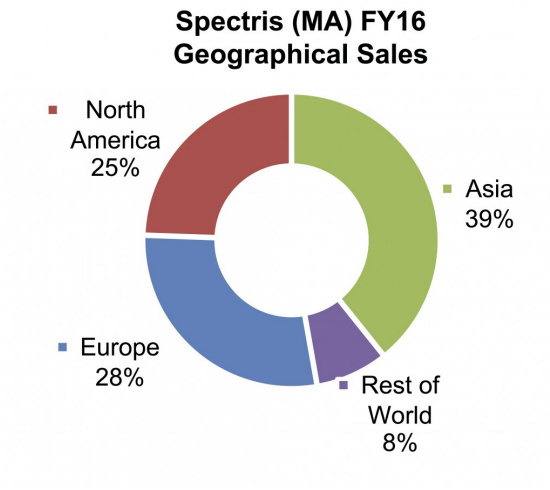
Currency Magnifies Spectris Growth

Second-half 2016 sales for Spectris Materials Analysis (MA) jumped 22.4% to £243.3 million ($311.9 million = £0.78 = $1) to account for 32% of sales. However, currency and the acquisition of CAS Clean Air Service (CAS) boosted sales growth by 17% and 2%, respectively. Nevertheless, organic sales improved 3% compared to flat growth in the first half of the year.

Full-year 2016 MA sales similarly benefited from currency, as reported sales advanced 15.0% to £418.9 million ($566.1 million = £0.74 = $1) to account for 31% of revenues. Excluding currency and acquisition contributions of 12% and 1%, respectively, organic growth improved 2%.

Despite a strong comparison, pharmaceutical and fine chemical sales advanced on a currency-neutral basis, led by demand in China, India and Japan. Excluding currency, sales for this market were modestly higher in both North America and Europe. The acquisition of CAS further contributed to the company's bioproduction growth.

Sales in metals, minerals and mining markets declined across most geographic regions except for Germany, the UK and Japan. Demand from cement and building materials customers in North America and Europe also slowed. However, the company noted positive aftermarket sales for safety and productivity applications to mining customers.



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Academic research sales improved slightly, as positive growth in North America and Asia was partially offset by weakness in Europe and a sharp decline in the UK. Combined currency-neutral sales to the semiconductor, electronics and telecom industry improved at a strong rate due to significant growth in Asian regions outside of China and India. However, these markets experienced weakness in North America.

MA sales were driven by demand in Asia, for which sales grew roughly 13% excluding currency. Specifically, demand in China and Japan were particularly strong. Developed regions were challenged, as currency-neutral sales declined slightly in Europe and North America. Sales in Rest of World also declined, excluding currency.

Excluding currency, MA adjusted operating margin expanded 345 basis points to 18.2% as a result of product mix and restructuring actions.

VWR Growth Slows

Q4 2016

Fourth quarter 2016 sales for VWR improved 1.6%, 1.0% organically, to $1.13 billion. Acquisitions added 2.2% to sales growth, but were partially offset by currency headwinds of 1.6%. All sales figures below are based on organic growth.

The slower quarterly growth compared to the previous quarter was encumbered by a strong comparison and one less billing day. In addition, biopharmaceutical sales declined roughly 1% due to weakness for instrumentation in the US. Government sales, which grew roughly 3%, also slowed following a significant jump in the third quarter. Conversely, education and healthcare sales growth accelerated compared to the previous quarter, advancing roughly 1% and 5%, respectively. Industrial sales remained steady with growth in the low single digits, led by demand from food and environmental customers. By product, chemicals sales grew in the low single digits, while sales of equipment and instrumentation, and consumables were each roughly flat.

Sales for VWR's Americas segment declined 0.9% due to one extra billing day in the previous year and a low single-digit decline in biopharmaceutical sales. However, healthcare and government sales climbed in the mid-single digits each, and sales to education and industrial customers improved in the low single digits each. By product, chemical sales grew in the mid-single digits, while consumables, and equipment and instrumentation sales each declined in the low single digits.

VWR's EMEA-APAC sales advanced 3.6% organically, driven by strength in the industrial and healthcare markets, for which sales grew in the mid-single digits each due to sturdy consumables demand. Sales to biopharmaceutical, education and government customers increased in the low single digits each. Despite strength for private label products, growth within the biopharmaceutical market was hampered by lower demand from large pharma companies. Meanwhile, education and government sales both benefited from the timing of orders. By product,

segment sales of consumables as well as equipment and instruments advanced roughly 5% each, and sales of chemicals improved roughly 2%.

VWR gross profit margin expanded 13 basis points to 27.8% due to product mix and improved pricing. Adjusted operating margin was roughly flat at 9.9%.

VWR Q4 2016						
	Rev. ($M)	% Total Rev.	Rev. Growth	Currency	Acq.	Org. Growth
Americas	$668.4	59%	2.5%	0.0%	3.3%	-0.9%
EMEA-APAC	$461.9	41%	0.4%	-3.8%	0.6%	3.6%

Click to enlarge

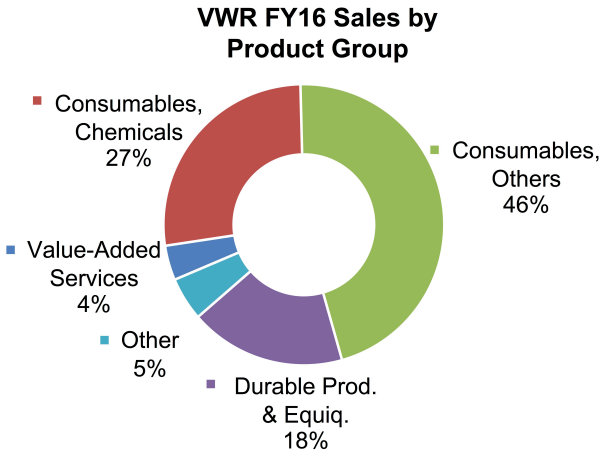
2016

Full-year 2016 sales for VWR expanded 4.5%, 3.2% organically, to $4.51 billion. Acquisitions contributed 2.5% to revenue growth, while currency headwinds reduced growth by 1.1%. Demand was again strong for the company's private label products, and custom manufacturing and services, for which combined sales grew 8%–10% to account for 20% of revenues.

Despite slower biopharmaceutical demand in the second half of the year, such sales climbed roughly 5% to account for 45% of revenues. Healthcare and government sales each grew in the 4% range to make up 7% and 5%, respectively. Accounting for 22% of sales, industrial revenue advanced roughly 3%. Education sales, which represented 14% of revenues, declined in the low single digits.

By product, chemicals sales grew in the strong mid-single digits, while sales of consumables as well as equipment and instruments advanced in the low single digits each.

Sales for VWR's Americas and EMEA-APAC segments climbed 3.0% and 3.4% organically to account for 61% and 39% of revenues, respectively. Gross margin improved 23 basis points to 28.0% due to higher pricing and product mix. Adjusted operating margin was unchanged at 9.5%.



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Sales for 2017 are projected to grow 1%–2%, 2.5%–3.5% organically, to $4.56–$4.61 billion. By end-markets, organic sales in the biopharmaceutical markets are expected to grow in the mid-single digits, and advance in the low to mid-single digits in the industrial markets. Government sales should remain steady in the Americas but constrained in the EMEA-APAC segment. Healthcare demand is also expected to be pressured in the EMEA-APAC segment but strong in the Americas. First quarter organic sales growth is projected to be lower than the annual rate due to a strong comparison.

CY Q4 2016 Results								
	Revenues			Rev. Growth Summary			Adj. Operating Profit	
Company	Rev. (M)	% of Co. Rev.	Growth	Curr.	Acq./Div.	Org. Growth	(M)	% Growth
Bio-Techne	$131.8	100%	9.0%	-2%	9%	2%	$43.1	-7.4%
Merck KGaA (Life Science)	€ 1,441.0	38%	32.8%	0%	29%	4%	€ 304.8	31.0%
Spectris (Materials Analysis) (2H)	£243.3	32%	22.4%	17%	2%	3%	£55.2	41.2%
VWR	$1,130.3	100%	1.6%	-2%	2%	1%	$111.5	2.2%

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Electronic Laboratory Notebook

An electronic laboratory notebook (ELN) is a software program designed to act as an electronic version of a traditional paper lab notebook. Using it helps streamline documentation of lab activities by making the recorded scientific data easier to find and use. Additional features may include the creation of links between records, the ability to communicate and share data with other ELN users in a secure network and the option to program scheduling for routine instrument calibration or research-related timelines. Although ELN software can be installed independently, many are paired with Laboratory Information Management Systems (LIMS), software designed to streamline workflow and manage laboratory information.

Laboratory notebooks have always been a staple of laboratories in general, but the first electronic versions did not appear until the mid-1990s. Mostly targeted to pharmaceutical companies, they were quite expensive, and difficult to install and maintain at the time. The growing regulatory environment in the years that followed ensured the growth of the technology, particularly since it provided a means of enhanced data storage, traceability and security. As the installation of ELNs grew, they became significantly cheaper, easier to use and developed greater capabilities. While most ELNs are still designed to act as a general means of recording data and information, there are also some that exist for specific applications and techniques. The software is also not bound to a particular industry but rather exists broadly across a variety of laboratory types and end-markets, including foods, chemicals, utilities, plastics and much more.

Most ELNs are installed on-site, meaning the software is housed in the lab that uses it, or at least somewhere else in the same organization. Other ELNs exist as Software as a Service (SaaS), which means the software is centrally hosted but available to the user as a subscription. ELNs are also increasingly cloud based, although security concerns tend to hinder the adoption of this model.

The leading vendors include Agilent Technologies, BIOVIA, IDBS,LabVantage, LabWare and PerkinElmer. IDBS released in January the E-Workbook Cloud ELN, a web-based platform with eight modules. This month, Thermo Fisher Scientific acquired Core Informatics, which also sells a ELN. The acquisition is part of the company's efforts to adopt cloud-based laboratory and scientific data management capabilities. There are also numerous small-sized vendors offering ELN software online or to download, many of which cater to niche applications or subject areas. Aside from commercially available products, many labs opt to build custom ELN systems themselves.

The total market size for ELNs can be an ambiguous valuation since many leading systems are also bundled with LIMS or other informatics software. When isolated from such bundles, however, ***IBO*** estimates the total market to be about $160 million in 2016. Driven by rising demand from the food industry, the market is currently growing in the mid-single digits.

ELNs at a Glance:

Leading vendors:

- BIOVIA (Dassault Systèmes)
- PerkinElmer
- IDBS

Largest markets:

- Pharmaceuticals
- Biotechnology
- Chemicals

Software cost:

- $2,000–$500,000

Clinical

Thanks to declining prices, faster analysis speeds and strengthened bioinformatics capabilities, the use of clinical DNA sequencing is rapidly accelerating, especially for rare disease diagnosis. The European definition of a rare disease is an illness that affects less than 1 person out of 2,000 in the general population. Currently, approximately 7,000 rare diseases have been identified in medical research and literature, with 5 new diseases being added each week. Rare diseases affect an estimated 5% of the population, with 75% of rare diseases beginning during childhood years. Genomics and DNA sequencing is extremely useful in the realm of rare diseases, due to each rare disease having a strong genetic component. Genomics England's 100,000 Genomes Project has read the DNA of 16,150 people since 2015, with 20% to 25% of the analyses pointing towards "potentially actionable" diagnoses, in which the patient can treat a condition through therapy or lifestyle changes. To date, over 2,000 scientists around the world are participating in data analysis of the 100,000 Genomes Project.
Source: *Financial Times*

Government

In FY15, a cumulative $18.5 billion was spent on R&D by the 42 federally-funded R&D centers (FFRDC) in the US, an increase of 4.2%. Expenditures have bounced back after a decline in FFRDC spending in 2013 and 2014 to almost reach the 2010 expenditure figure of $18.9 billion. FFRDCs are privately operated R&D institutions that receive considerable or exclusive funding from the government, with 98% of 2015's FFRDC expenditures funded by government agencies. The remaining expenditures came from business ($209 million), nonprofits ($28 million), state and local governments ($18 million), and other sources, such as foreign investments and universities ($106 million). FFRDC R&D funding in 2015 from businesses declined 5.4%, while funding from nonprofits and state and local governments declined 24.7% and 35.0%, respectively. Approximately 39% of total FFRDC R&D expenditure was for applied research, while an estimated 38% was for development and nearly 22% for basic research.

Over 50%, or a combined $9.8 billion, of total 2015 FFRDC R&D expenditures came from six FFRDCs: the NASA-sponsored Jet Propulsion Laboratory and five DoE-sponsored National Labs focusing on environment, energy, national security and nuclear science. One FFRDC, the Centers for Medicare & Medicaid Services (CMS) Alliance to Modernize Healthcare, reported its second year of exponential growth since 2012, with a 138.6% increase to $168 million in R&D expenditure in 2015.

Source: *National Science Foundation*

Environment

The Trump administration recently announced plans to cut the US EPA's Office and Research and Development's budget by over 40% to $290 million. The cuts would specifically target research done in the fields of climate change, air and water quality, and chemical safety, with research spending falling 50.2% to $45.7 million and falling 30.7% to $61.8 million, respectively. In addition, water-related research would decrease 34.6% to $70.1 million, and the

budget for sustainable healthy communities will fall 45.7% to $75.8 million. With these cuts, the EPA's $50 million grant for academic environmental scientists at universities would completely disappear. The cuts are part of a larger plan to decrease the EPA's total budget by 25% to $6.1 billion and lay off 20% of the Agency's employees by FY18, beginning October 1. Furthermore, the EPA would no longer be a part of the multiagency US Global Change Research Program and funding for endocrine system-disrupting chemicals would fall significantly.

Source: *Science*

Germany

Government spending on R&D in Germany has increased approximately 50% between 2005 and 2015, according to a study by the Commission of Experts for Research and Innovation. The federal government set a target of R&D accounting for 1.15% of GDP by 2025, but based on the minimal increases in R&D spending over the past 12 years, it is unlikely that the goal will be met. The missing of the mark is attributed to higher federal expenditures associated with R&D, with the government contributing 59%, or €14.90 billion ($15.8 billion), of total funding in 2015, as opposed to the 41%, or €10.18 billion ($10.78 billion), contributed by state governments. In 2016, a €15.8 billion increase was announced for federal R&D spending; however, if state governments do not contribute more than they have in the past, the yearly R&D share is estimated to fall to a 0.84% share of the country's GDP.

Historically, the majority of public R&D expenditure has been allocated to academia, which represented 39% in 2015. Since 1991, the sector with the largest decrease in R&D expenditure has been defense, which has fallen 11.1% over the last 25 years. Energy, agriculture and nutrition research have flourished since 2005, with an average annual growth rate of 8.4% between 2005 and 2015.

Source: *ZEW (Center for European Economic Research)*

UK

Earlier this month, the UK government released the federal budget for 2017, which includes £4.7 billion ($5.7 billion) for UK R&D and innovation from the Northern Powerhouse Investment Fund (NPIF). The NPIF will be distributed over the next four years and is aimed at promoting R&D, discovery, development and commercialization in the UK. The Industrial Strategy Challenge Fund (ISCF) was also announced, which is dedicated towards developing "disruptive technologies" that can positively influence and drive the UK's economy. With an initial investment of £270 million ($329.8 million) over the next year, the ISCF will focus on the development and manufacturing of batteries for electric vehicles; intelligence and robotics platforms to operate in extreme environments (i.e., outer space, deep mining); and new drug manufacturing technologies to increase the efficacy of new drugs and treatments. In order to achieve this, the NPIF will invest £250 million ($305.4 million) in talent funding over the next four years. This includes £90 million ($110 million) for an additional one thousand PhD placements in Industrial Strategy, of which 85% are in the science, technology, engineering and math fields. Forty percent, or £36 million ($44.0 million), of the £90 million will be reserved for strategies to improve industrial partnerships between academia and the private sector. The remaining £160 million ($195.5 million) is for new grants for Industrial Strategy researchers.

The UK government will also invest more than £100 million ($122.2 million) over the next four years to attract global research talent, with £50 million ($61.1 million) of NPIF funding for global fellowship programs, and £50 million from established global research funds to attract researchers from emerging markets such as India, Brazil, China and Mexico. In order to drive R&D and innovation in the region, the UK government also indicated that it will make administrative changes to the R&D Expenditure Credit to streamline claims for small- to medium-sized enterprises.
Source: *UK Government*

Indonesia

Although current Indonesian president Joko Wikodo made a pledge in 2014 to double the nation's R&D funding, the 2017 Indonesian budget for R&D has decreased 40.1% to IDR 150 billion ($11.2 million), marking the first time that the country's research budget has been cut. Indonesia's overall R&D expenditure is approximately IDR 10 trillion ($748 million) per year, or 0.09% of its GDP. Traditionally, until this budget cut, the government allocated IDR 1.395 trillion ($104 million) to the country's national research program, which includes academic institutions and other research institutions. To prepare for the cut in funding, a consortium led by the Sepuluh Nopember Insitute of Technology in Subraya, East Java, will be formed, comprising a coalition of over 40 state and private universities known as the Eastern Part of Indonesia-University Network, or EPI-NET. Researchers hope to collaborate on similar or the same research topics, and share the limited funding and human resources. President Wikodo has called for more applied research, specifically in marine, food and renewable energy.

Source: *University World News*

MS & LC/MS

Company Announcements

In January, MS software provider **Protein Metrics** announced that sales doubled in 2016 and that Chief Business Officer Eric Carlson, PhD, was named president and CEO. He replaces Christopher Becker, PhD, who continues as a Scientific Advisor.

Protein Biosciences announced in January a renewal of its collaboration agreement with **Protein Metrics.**

In February, **Protein Metrics** and **Bruker Daltonik** signed a formal comarketing agreement. The companies will comarket biopharmaceutical software solutions using the Protein Metrics software in combination with Bruker's maXis-II UHR-QTOF and rapifleX MALDI-TOF/TOF MS systems. They will also develop workflow solutions for challenging assays.

Contract research and manufacturing organization **Albany Molecular Research** (AMRI) announced in February a strategic alliance with **Bruker Daltonics** and **HighRes Biosolutions** to develop new applications for using HT MS for drug discovery. AMRI acquired a MALDI PharmaPulse system, on which protocols will be developed. AMRI will also extend the utility of the system to encompass complex cell-based assays and an expanded portfolio of MS-based biochemical assays.

Protea Biosciences entered a comarketing agreement with **MatTek** in January, enabling it to offer MatTek's human cell–based in vitro tissue models with its molecular imaging services.

In January, **PharmaFluidics**, a developer of µPAC micro-chip–based chromatography cartridges, raised €2.7 million ($2.9 million) of additional funding.

Microsaic Systems named Professor Eric Yeatman as interim chairman in January.

In February, **908 Devices** announced a coexclusive, two-year Value Added Reseller Agreement with **Thermo Fisher Scientific**. Thermo Fisher will sell 908 Devices' ZipChip as a complimentary front-end separations platform for the Q Exactive series, Orbitrap Elite and LTQ Orbitrap XL MS systems.

In February, **Biognosys** obtained an exclusive license from **ETH Zurich** for Limited Proteolysis technology to study protein structural changes. Biognosys is developing applications for the technology, including identification of small molecular binding sites and proteome-wide discovery of induced structural change. Biognosys plans to commercialize the technology as a contract research service later this year.

Waters announced in February that the **Centers of Innovation Program at the Bioprocessing Technology**

Institute, a research institute under Singapore's **Agency for Science, Technology and Research**, joined the Waters Center for Innovation Program. It is the first research institute focused on glycobiology to join the Program.

Product Introductions

In January, **Waters** announced the CE marking of the Waters MassTrak Vitamin D Solution for the quantitative measurement of 25(OH) D_2 and D_3 (25-OH-VitD) from human plasma and serum. It is currently only available for sale in Europe. The company called it the first CE-marked, single-vendor solution to measure vitamins both independently and accurately from human plasma and serum in a single analysis. The solution includes the ACQUITY UPLC I-Class/Xevo TQD IVD System, MassTrak Vitamin D Kit and MassLynx (IVD) Mass Spectrometry Software.

908 Devices released in January enhancements to its ZipChip system for front-end separation for MS. It now features an integrated autosampler, built-in chip recognition intelligence and applications-specific assay kits (ZipChip Antibody Kit, Peptide Kit and Metabolite Kit).

In January, **Bruker** introduced Biopharma Compass 2.0 software for the automation of biopharmaceutical characterization workflows for high-resolution MS. It unifies data from MALDI TOF/TOF and ESI-UHR-QTOF. New features include a 3D feature finder, 21 CFR Part 11 compliance, full integration of UV and MS data, and easy-to-use wizards.

In February, **Bruker** introduced the new MALDI PharmaPulse 2.0 solution, which enhances the automation capabilities of the rapifleX MALDI-TOF MS. It can measure up to 10 different samples per second. New features include an Assay Development module and a Screening module.

SCIEX launched in January the X500B QTOF System, its latest in the X-Series QTOF MS platform. It is designed for standardized biotherapeutic characterization during drug development. It is specifically developed to deliver ease of use for high-resolution standardized workflows. It features SCIEX OS Software and BioPharmaView 2.0 processing software, including SWATH 2.0 data independent acquisition.

In March, **Agilent Technologies** introduced the Agilent 6545XT AdvanceBio LC/Q-TOF MS System, optimized to address analytical workflows commonly used in biopharma. It is optimized for use in profiling intact proteins, mapping peptides and identifying PTMs. The company also released the AdvanceBio Peptide Plus column for LC/MS peptide separations utilizing superficially porous particle technology.

Agilent Technologies unveiled in March the Agilent 6495B Triple Quadrupole LC/MS System. Compared to the 6495A, it provides improved mass range, scan speed and polarity switching. It also incorporates a new gate valve for quicker and easier removal of the inlet capillary.

In January, **Veritomyx** launched PeakInvestigator 2.0 Software Services, featuring fully automated peak detection with mass and abundance confidence intervals.

In March, **JEOL** launched a new FilterSpray module for its AccuTOF-DART MS system, making it possible to spot a sample on a disposable paper triangle for analysis by ambient ionization.

Extrel launched in March the MAX300-CAT lab gas analyzer, a quadrupole MS system designed for high-precision quantitative analysis of every component in a gas or vapor mixture. It can be equipped for fully automated sampling of up to 16 gas channels.

For its expression CMS (Compact Mass Spectrometer), **Advion** introduced in March a vAPCI (Volatile Atmospheric Chemical Ionization) source for gas phase sample analysis with no additional sample preparation required.

In March, **Biognosys** released the free QuiC QC monitoring tool, which generates LC/MS readouts from raw files of various proteomics workflows (SRM/MRM, PRM, DIA, DDA), allowing researchers to track data quality and instrument performance across multiple experiments.

Molecular Spectroscopy

Company Announcements

In December 2016, **Flash Photonics** announced it will exclusively distribute **SPECTRAL Industries**' UV-CMOS Echelle Spectrometer in the US and Canada.

In January, **TimeGate Instruments** named **Flash Photonics** as the exclusive US and Canadian distributor for its TimeGate Raman Systems.

In February, **Applied Photophysics** appointed COO Louis Madden as CEO.

In February, **Princeton Instruments** named **ROSH Electroptics** as its exclusive distributor for Israel.

Product Introductions

Wiley released in November 2016 the Wiley Spectra Lab Desktop edition and Wiley Spectra Lab Server edition. The Desktop edition provides access to 2.3 million reference spectra and allows scientists to build their own knowledge bases. The Server edition offers centralized storage and controlled access for an entire organization.

HORIBA Scientific released in December 2016 the Aqualog Datastream Dashboard, developed with Eigenvector Research, for its Aqualog spectroflorometer. It facilitates automated analysis and reporting of organic matter parameters for managing and optimizing drinking water treatment processes.

HORIBA Scientific introduced an enhanced ParticleFinder module for its LabSpec 6 Spectroscopy Suite, enabling a new level of automation and full characterization of a particle.

HORIBA Scientific released in February a new EasyNav package, with the NavMap, NavSharp and ViewSharp modules, for rapid Raman chemical imaging.

In December 2016, **Nanophoton** relaunched its RAMANforce Raman microscope, featuring a newly designed spectrograph, and the latest optical technologies for improved spatial resolution and sensitivity.

Sichuan Changhon Electric, in cooperation with **Analog Devices** and **Consumer Physics**, announced in January the Changhong H2 mobile phone technology, based on NIR spectrometry, for molecular identification sensing. It will be released later this year.

In January, **Heptagon** introduced the Smart Handheld Spectrometer solution, the first in a family of Smart Spectral Solutions for industrial uses and consumer applications. Designed for use with smart phones, it acquires an IR reflection spectrum.

Perten Instruments, a **PerkinElmer** company, launched in January the 3C Solution for its Delta LactoScope FTIR dairy analyzer for monthly use in place of costly reference standard sets.

In January, **DeNovix** released the DeNovix DS-C Cuvette Spectrophotometer for UV-Vis analysis, extending the DS-11 FX Spectrophotometer/Fluorometer Series. It features lifetime calibration and EasyApps for full-spectrum UV-Vis measurements, nucleic acid and protein quantification, kinetic studies and microbial cell quantification.

Spectro Scientific introduced in January version 5 of its FluidScan portable IR oil analyzer technology. New features include lower detection limits, from 1,000 ppm to 300 ppm, on total water measurement for turbine oils, as well as an oil library that is double in size to more than 700 oils.

In January, **IRsweep** unveiled the IRspectrometer, calling it the first commercial table-top frequency comb spectrometer offering microsecond time resolution combined with a large spectral bandwidth and high spectral resolution. The company also calls it the first instrument to provide the advantages of dual-comb spectroscopy in a complete turnkey solution.

Ocean Optics introduced in February the Ocean FX spectrometer, with an acquisition speed of up to 3,000 scans per second. It is available in versions optimized for the UV-Vis, Vis-NIR and extended (200–1025 nm) wavelength ranges.

JEOL launched in March the ROYAL HFX probes for NMR, calling it the world's first liquid NMR probe with the capability to automatically switch between single-tune and dual-tune modes on the high-frequency coil without compromising single-tune performance. It can be used with routine 2-channel or with 3-channel systems.

In March, **Metrohm** released the Vision Air 2.0 universal software solution for Vis-NIR spectroscopy, featuring flexibility, two-click operation and precalibration for many parameters.

In March, **Renishaw** debuted the ultra-fast Centrus CCD detector for high-speed Raman analysis, available for the inVia range of microscopes and the RA802 Raman Analyzer. It features speeds of over 1,800 spectra per second.

Daylights Solutions debuted in March the Spero-QT, its second generation high-performance IR chemical imaging microscope, featuring the ability to produce twice the data in one-tenth of the time of the previous system. It also features a smaller footprint, a stage travel increased to accommodate up to three slides and an increase in sample compartment volume.

Surface Science

Company Announcements

In January, **Luxendo**, the developer of the Single Plane Illumination Microscopy technology, raised €8 million ($8 million) in a Series A round. The company released two systems last year and plans to introduce a new instrument for quantitative fluorescence imaging this year.

In January, **Leistungselektronik JENA** licensed to **Carl Zeiss Microscopy** rights to two patents related to LED fluorescence excitation in microscopy. The license covers the North American sale of the technology.

CryoCapCell announced in January the completion of a €1.5 million ($1.6 million) funding from the Quadrivium 1 seed capital fund managed by **Seventure Partners**. The company is developing correlative microscopy technologies for using high-pressure vitrification. The initial application will be for EM in cancer research.

In February, **Leica Microsystems** announced an educational partnership with **ASM International**.

Leica Microsystems announced in February that John Ossi will represent the company's microscopy solutions for forensic and government agency customers in Maryland, Washington, DC, and Virginia.

In February,**Raith** and the Microscopy business of **ZEISS** announced a sales partnership for the ZEISS ORION NanoFab helium ion microscope. Raith is a provider and manufacturer of systems for nanofabrication, electron beam lithography, focused ion beam nanofabrication, nanoengineering and reverse engineering.

attocube systems and **SPECS Surface Nano Analysis** announced a collaboration for quantum transport measurements at low temperatures. SPECS introduced a user friendly Nanomis Tramea system, allowing for the exploration of a very large phase space at cryogenic temperatures and high magnetic fields, 18 months ago.

Product Introductions

Thermo Fisher Scientific introduced in November 2016 the HeliScan MicroCT Imaging System for large-scale, high-fidelity 3D images of a sample for material analysis applications.

In December 2016, **JPK Instruments** launched the OT-AFM System, calling it the first combined system to provide optical tweezers and AFM in a single inverted light microscope platform. It features a specially designed OT-AFM ConnectorStage. Applications include cellular response, cell-cell or cell-matrix interactions, immune response and

bacterial/virus/nanoparticle uptake processes.

JEOL introduced in January the JIB-4700F Multi Beam FIB-SEM System, featuring a hybrid conical objective lens, GENTLEBEAM and an in-lens detector system for resolution of 1.6 nm at a low accelerating voltage of 1 kV. Sales of 20 units per year in the first year are projected.

In January, **JEOL** released the JX-8530FPlus Electron Probe Microanalyzer (EPMA), its third generation FE-EPMA, featuring an improved electron optical system and new software. Various X-ray spectrometers can be selected. In the initial year of release, the sale of 35 units are expected.

In February, **Oxford Instruments** introduced the Cypher VRS Video-Rate AFM, calling it the first and only full-featured video-rate AFM. It enables high-resolution imaging of dynamic events at up to 625 lines/second, corresponding to about 10 frames per second.

Oxford Instruments released in March the new, budget-priced SurfRider "HQ-Series" AFM probes, high-quality silicon probes exclusively manufactured by Asylum that can be used with all commercial AFM systems.

In March, **Hitachi High-Technologies** introduced the HT7800 Series TEM, featuring digital operation under normal room light conditions, a special ultra-resolution lens configuration, and new Image Navigation function. The company expects annual sales of 70 units.

Park Systems announced in February the availability of the single-click SmartScan software for its Park XE Series AFMs.

Life Science Instruments

Company Announcements

In January, **Singulex** entered into a strategic collaboration with **QIAGEN** for the development of companion diagnostics. QIAGEN will have access to Singulex's Single Molecule Counting immunodiagnostic platform and its CLIA-licensed lab.

Roka Bioscience announced in January the appointment of Mary Duseau as president and CEO. Previously, she served as senior vice president and COO. Former President and CEO Paul Thomas now serves as chairman.

Immunoassay platform company **Adarza Biosystems** closed a $17 million Series C financing in January, led by 3×5 RiverVest Fund II. The company also announced the appointment of Bryan Witherbee as president, replacing retiring CEO Dr. Rand Henke. Mr. Witherbee most recently served as scientific leader within the Genomics Division at **Becton, Dickinson**.

In January, **Sharp Edge Labs** and **Cell Guidance Systems** entered into an agreement to develop and market products for exosome research. Sharp Edge Labs will make its biosensor technology available to Cell Guidance Systems for use in its exosome detection platform.

Bruker announced in January a multiyear licensing agreement with **iTomography** for software for performing CT imaging using the theoretically exact image-reconstruction algorithm iTomo. Exact helical reconstruction will be available on a number of SkyScan instruments from Bruker microCT.

In February, **Scientific Digital Imaging** announced the retirement of Board member Jeremy Gibbs, effective April 30, and the appointment of Isabel Napper, previously a partner at **Mills & Reeve**, to the Board.

Silicon Kinetics, a provider of MIK-MS (Molecular Interaction Kinetics–Mass Spectrometry) technology, announced in February collaborations with application development firm **Biosys Technologies**, as well as **Tokyo University** and **St. Marianna University, School of Medicine.**

In March, **Biolog** appointed **MediLoc Laborsysteme** as a distributor for Germany and Austria.

Product Introductions

In February, **Bio-Rad Laboratories** launched the Bio-Plex Pro Mouse Chemokine Panel, a magnetic bead–based multiplex immunoassay. Up to 33 biologically relevant mouse chemokines and cytokines can be detected in a single run. It is designed for use with Bio-Rad's Bio-Plex 200, Bio-Plex 3D and Bio-Plex MAGPIX platforms.

Bionano Genomics introduced in February the Saphyr system for genome mapping and structural variation (SV) analysis. It combines NanoChannel arrays with optical genome mapping. Compared to the previous generation system, it requires fewer consumables, is higher throughput and easier to use, and offers higher data quality. It features the new high-throughput Saphyr Chip for performing deep heterozygous SV discovery in a single run.

IntegrenX released the RapidHIT EXT cartridge for its RapidHIT ID System for generating forensic DNA profiles. The new cartridge is designed to work with extracted and quantifed samples, and can work with samples containing down to 50 pg of DNA.

FUJIFILM VisualSonics launched in February the Vevo LAZR-X, calling it the world's only customizable imaging platform combining ultra-high-frequency ultrasound and photoacoustics for animal research applications. It features resolution down to 30 µm.

In February, **Meso Scale Discovery** introduced the V-PLEX immunoassays for the detection of biomarkers IL-17A, IL-21, IL-22, IL-23, IL-27, and MIP-3α in human cell culture supernatants, serum, plasma and urine. The company currently offers 46 human V-PLEX assays for its platforms.

Biosensing Instrument introduced in February the SPRm 200 SPR microscopy system, enabling label-free in vitro measurement of binding reactions and kinetics of individual cells in their native environment. The cells are grown on the sensor chip.

In March, **Unchained Labs** launched Uncle 2.0 software, adding two new applications, and offering differential scanning fluorimetry and label-free thermal melting in the same system.

Reported Financial Results

$US	Period	Ended	Sales	Chg.	Op. Prof.	Chg.	Net Prof.	Chg.
Bioanalytical Systems (Products)	Q1	31-Dec	$0.9	8.3%	($0.2)	13.5%	NA	NA
FLIR Systems (Detection)	Q4	31-Dec	$32.7	-5.8%	$9.4	-2.0%	NA	NA
FLIR Systems (Detection)	FYE	31-Dec	$124.1	7.7%	$33.8	25.8%	NA	NA
Meridian Biocience	Q1	31-Dec	$46.8	-0.7%	$10.1	-25.8%	$6.3	-29.4%
Meridian Bioscience (Life Sci.)	Q1	31-Dec	$13.0	9.6%	$3.3	1.0%	NA	NA
Repligen	Q4	31-Dec	$25.6	19.3%	$2.9	103.4%	$5.0	1797.7%
Repligen	FYE	31-Dec	$104.5	25.1%	$16.0	16.1%	$11.7	25.0%
Roper Industries	Q4	31-Dec	$1,010.8	7.1%	$289.1	3.7%	$182.1	-12.7%
Roper Indus. (Energy Systems & Controls)	Q4	31-Dec	$142.6	-9.7%	$45.9	-11.3%	NA	NA
Roper Indus. (Medical & Scientific Imaging)	Q4	31-Dec	$352.0	9.4%	$129.8	11.5%	NA	NA
Roper Industries	FYE	31-Dec	$3,789.9	5.8%	$1,054.6	2.6%	$658.6	-5.4%
Roper Indus. (Energy Systems & Controls)	FYE	31-Dec	$510.2	-13.2%	$129.6	-20.1%	NA	NA
Roper Indus. (Medical & Scientific Imaging)	FYE	31-Dec	$1,362.8	12.1%	$477.5	8.1%	NA	NA
Teledyne Technologies	Q4	1-Jan	$552.9	-7.0%	$71.1	-7.8%	$53.0	-4.5%
Teledyne Technologies (Instrumentation)	Q4	1-Jan	$224.6	-15.7%	$30.2	-32.3%	NA	NA
Teledyne Technologies	FYE	1-Jan	$2,149.9	-6.4%	$253.8	-9.9%	$190.9	-2.5%
Teledyne Technologies (Instrumentation)	FYE	1-Jan	$876.7	-16.6%	$109.8	-35.8%	NA	NA
Xylem	Q4	31-Dec	$1,095.0	10.2%	$109.0	-23.2%	$50.0	-56.1%
Xylem (Water Infrastructure)	Q4	31-Dec	$612.0	-2.7%	$105.0	-2.8%	NA	NA
Xylem	FYE	31-Dec	$3,771.0	3.2%	$406.0	-9.6%	$260.0	-23.5%
Xylem (Water Infrastructure)	FYE	31-Dec	$2,246.0	0.7%	$308.0	1.7%	NA	NA
Other Currencies								
Olympus (Scientific Solutions)	Q3	31-Dec	¥23,095	-7.8%	¥1,922	-14.5%	NA	NA
Renishaw	6 Mo.	31-Dec	£240.4	21.1%	£35.6	25.0%	£26.4	17.8%
Renishaw (Metrology)	6 Mo.	31-Dec	£227.1	22.8%	£41.6	35.9%	NA	NA
Renishaw (Healthcare)	6 Mo.	31-Dec	£13.3	-1.8%	-£6.0	-179.1%	NA	NA
Tecan	6 Mo	31-Dec	CHF 271.0	12.7%	CHF 40.4	-3.1%	CHF 31.1	-0.3%
Tecan (Life Sciences)	6 Mo	31-Dec	CHF 162.5	11.7%	CHF 33.5	-1.7%	NA	NA
Tecan (Partnering)	6 Mo	31-Dec	CHF 108.4	14.3%	CHF 12.9	0.4%	NA	NA
Tecan	FYE	31-Dec	CHF 506.2	15.0%	CHF 68.1	1.8%	CHF 54.5	-4.6%
Tecan (Life Sciences)	FYE	31-Dec	CHF 280.2	10.7%	CHF 45.7	0.6%	NA	NA
Tecan (Partnering)	FYE	31-Dec	CHF 226.0	20.7%	CHF 33.8	11.9%	NA	NA

NA = not available NM = not meaningful