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Opportunities and Challenges: Thermo Fisher Scientific, Waters and Shimadzu Focus on the Future

On the occasion of Pittcon 2018, ***IBO*** spoke with three of the analytical instrument and lab product industry's largest companies about the major trends affecting their businesses and the evolution of each company's products and strategies.

Shimadzu Scientific Instruments (SSI), Thermo Fisher Scientific and Waters each have information technology high

on their agendas, with approaches that encompass not only specific instruments but laboratory operations in general. The companies are also deeply involved in driving new end-markets addressing their respective set of solutions. In addition, the companies discussed the short-term challenges, all of which reflect key market opportunities and industry changes. Finally, the companies commented on the latest internal developments, ranging from new initiatives to customer communication to differentiation.

Thermo Fisher Scientific

Dan Shine, senior vice president and president of Thermo Fisher's Analytical Instruments Group, cited structural biology as an emerging application for his division, precipitated by the 2016 purchase of electron microscopy firm FEI (see ***IBO*** 5/31/16). "I think the most exciting [application] is structural biology. It's still very early, but we have a leading presence with our Titan Krios cryo-electron microscope," he told ***IBO***. Growing the market will in part depend on ongoing innovation and a workflow focus. "The next step is helping our customers build out workflows and get more structures imaged. Right now, getting a clean structure can take several months, so we're challenging ourselves on how we can optimize that process. Our users are all trying to figure it out on their own, so how do we make it more repeatable and much more predictable?"

Cryo-EM is also an example of technology synergies within the company, as MS-derived information can help such analyses. "Another challenge for structural biologists is how to ensure they are getting a good sample to the analyzer," explained Mr. Shine. "Mass spectrometry can help determine if this is the protein that you're looking at and are trying to analyze, so you're sure you've got the right sample. The cryo-EM is expensive so you don't want to waste time analyzing a bad sample."

> ***"When we talk about $900 million of R&D [spending], typically a third or so is software related."***

An area of high focus for Thermo Fisher currently is what it terms "digital science." Current projects include the Thermo Fisher Cloud, building in new instrument-maintenance and diagnostic capabilities, and web marketing. "When we talk about $900 million of R&D [spending], typically a third or so is software related," noted Mr. Shine. "We continue to build up centralized capabilities, like the Thermo Fisher Cloud, but we also connect those capabilities back into the individual product lines. It's important to make sure we get the benefit from the scale investments the overall company is making," he added. "Once they have our product, we look for ways that we change the way we service our customers. Once we have connected systems, it allows us to do more remote diagnostics and change the nature of our service."

As Jakob Gudbrand, vice president and general manager, Chromatography, for Thermo Fisher Scientific, explained, "We have hundreds of thousands of customers who are producing lots of data on our technologies. It's not the data that they have proprietary access to that we're interested in; it's the uses of the technology for the workflows or whatever experiment they are doing, how they interact with that data we have access to, and our ability to mine that data and make something intelligent out of it." As Mr. Shine and Mr. Gudbrand stressed, digital science encompasses multiple facets and opportunities. "We are only scratching the surface," said Mr. Gudbrand. "It's about how we harness that. We've created a digital science business unit in the company that reports up to the most senior level."

Discussing the challenges for the instrument and lab product industry itself and Thermo Fisher in particular, Mr. Shine commented on the opportunities created by the new US tax law, as capital purchases can now be depreciated over 1 year rather than the typical 5–7 years, thus stimulating new purchases. "I am excited by the tax law change, especially for capital equipment with the new accelerated depreciation rules. We're still working with our customers to explain what that means for them as they look to purchase new instruments," noted Mr. Shine. "So, basically, it gives customers that immediate tax deduction on new purchases. We haven't seen the changes in buying pattern yet, but it's still early. In the long term, we're optimistic that the tax change will favorably impact demand in our industry."

A past challenge was the downturn in industrial markets, such as metal and oil, of recent years. However, as Mr. Shine told ***IBO***, Thermo Fisher's diversity of end-markets isolated the company from any severe effect. "The

industrial markets are cyclical by nature. What's nice about Thermo Fisher is the breadth of end-markets that we serve. Diagnostics and health care are different from industrial or academic and government," he emphasized. "So as long as we're balanced, we are a bit insulated from economic shifts because of our size. One of our end-markets can slow down or accelerate and it can be buffered by the other markets we serve."

> ***"Flexibility and modality in our systems that we talked about are critical for our customers to future proof their investments."***

Even though Thermo Fisher now participates in the semiconductor industry via its electron microscopy product lines, that industry's cycles are less impactful on R&D purchases. "We're quite differentiated with our technology serving these customers. The semiconductor companies are focused more on creating the next generation of devices and how electron microscopes can help them advance their research," explained Mr. Shine. "Even though the semiconductor industry is known to be a cyclical market, we have seen that R&D investments are not quite as volatile for the products we supply."

Along with diversity in end-markets, product offerings also drive Thermo Fisher's strategy. As Mr. Shine highlighted, the company has a unique advantage by being able to integrate a wide range of technologies, all its own, into workflows to maximize productivity. As he put it, "You might have multiple technologies connected together—how does that change the information the user gets about the sample? Because we have all of these technologies under one roof, it's a lot easier for us to work together than it is for two separate companies with a different set of priorities."

Another path to improving labs' productivity is future proofing solutions, according to Mr. Gudbrand. He pointed to the Thermo Scientific Vanquish Duo UHPLC system and Dionex ICS-6000 HPIC systems, both launched at Pittcon, as examples of built-in flexibility to accommodate a lab's present as well as future needs. In the case of the ICS-6000, for example, new pesticide regulations may call for increased IC/MS testing in the future, which the ICS-6000 can more easily accommodate than previous models. "Flexibility and modality in our systems are critical for our customers to future proof their investments." He added, "Although we create targeted specific analyzers, and there is a need for those for select workflows, there's a more important argument for flexibility and modularity, where you can lock down a system to do a specific application while opening it up when you need to do something that is required tomorrow and safeguard your investment."

Waters

For Waters, emerging applications with bright prospects are medicine, food and materials sciences. As Mike Harrington, Waters's senior vice president of Global Markets, told ***IBO***, these areas need "more and better measurement." As he explained, " In medicine, this [need] ranges from the discovery of new medicines to how they are manufactured and monitored for safety, efficacy and stability." Likewise, testing demand in the other two markets are driven to basic health and safety needs. "In materials science, the need for specialty measurement is increasing due to demands for higher-quality, higher performing materials and consumer products in the wake of declining natural resources. Finally, in food, the desire for everyone to have safe, nutritious and affordable food puts demand on measurement tools that can assure these desires are met."

A prime example of these needs rapidly growing is China. Asked for an example of how Waters has directly benefited from the country's latest five-year plan, Mr. Harrington discussed the nation's investments in health and safety. "Firstly, the Chinese focus on health care, and specifically the Generics Evaluation project, has resulted in significant investment in Waters' LC systems and software. Empower has been a vital asset to them in ensuring that they are building compliance into their development of this important industry sub-segment," he explained. "Secondly, the Chinese Government's investment in developing a third-party testing laboratory infrastructure has resulted in several large investments in Waters' LC and LC-MS/MS workflow solutions."

> ***"In 2017, Asia represented 37% of Waters' worldwide revenue and delivered 60% of sales growth over the past three years."***

Software and informatics are part of such workflow solutions, and one that Waters is attuned to by meeting labs' growing requirements in this area, particularly as part of a package offering. "Waters' informatics portfolio strategy is focused on satisfying customers' needs to globalize, standardize and centralize laboratory systems. We have integrated our informatics platform with application workflows, instruments and innovative chemistries to ensure a coherent customer experience and maximum customer impact," noted Mr. Harrington. These needs are particularly evident in regulated labs. As he stressed, "Furthermore, our leadership position in data integrity is a result of being attuned to regulated laboratory needs and gives our customers increased confidence in the quality of their data."

As for challenges, new user requirements and customer profiles are defining the company's strategies. "We see three key market shifts that are shaping our strategic focus. First, customers' measurement needs in the life, materials and food sciences are becoming more application specific, and customers are demanding simpler, more robust and usable integrated workflow solutions," commented Mr. Harrington.

The continuing regional shift in demand is also significant. "Second, industry growth is being driven more and more from Asia," noted Mr. Harrington. "In 2017, Asia represented 37% of Waters' worldwide revenue and delivered 60% of sales growth over the past three years."

> ***"How well we engage our changing customers and employees will be pivotal in our ability to sustain success."***

Likewise, changes in the demographics of the company's customers require ongoing re-evaluations. As Mr. Harrington explained, "Third, our customers and employees are getting younger, more diverse, and looking for new ways to access knowledge and interact. How well we engage our changing customers and employees will be pivotal in our ability to sustain success."

Another important change at Waters has been new leadership, with Chris O'Connell joining the company as CEO nearly three years ago (see ***IBO*** 6/30/15). Asked about these changes, Mr. Harrington told ***IBO*** that Mr. O'Connell has quickly learned about the company's technology and customers. "I attribute that to him committing to visiting customers every month and spending many hours in 'Coffee with Chris' sessions with our employees at every level of the company." In addition, Mr. O'Connell has brought new processes to the company, according to Mr. Harrington. "To his credit, Chris is bringing and sharing highly effective management practices to Waters which are sharpening our collective capabilities. By adopting more systematic processes and strategies, Chris is setting up Waters to continue to be successful for many decades to come."

Shimadzu Scientific Instruments

Shimadzu Scientific Instruments (SSI), the US division of Japanese firm Shimadzu, discussed its challenges and industry issues from a US perspective. Speaking to the challenges the industry faces in general, Scott Kuzdzal, PhD, vice president of Marketing for SSI, told ***IBO***, "Maintaining continuous growth is challenging, especially in more mature markets with increasing competition. Additional challenges include future US economic stability, responding quickly to emerging markets and unifying global marketing messages."

Rapid growth of the company's division has led to other challenges, notably customer support. "We have always prided ourselves on great customer support. We treat somebody who has 1 instrument the same as somebody who has 100 instruments. We never walk away from them. We're always there to support them with free phone support," emphasized Dr. Kuzdzal. "As Shimadzu continues to grow, that becomes challenging to provide that same level of technical support. So we've been adding not only more service people, we've been adding tech support people and even boosting up our applications groups to provide that support."

> ***"If we provide the entire solution with the methods, the consumables and the informatics, [the labs are] all using the same things, so it is much easier for our support team to provide support."***

SSI's increasing presence in the aftermarket also affects support services. "If we provide the entire solution with the methods, the consumables and the informatics, [the labs are] all using the same things so it is much easier for our

support team to provide support," he added.

Shimadzu's expansion of its consumables business has been focused on partnerships and an acquisition (see ***IBO*** 6/30/17). Dr. Kuzdzal commented on the changes in regard to SSI, "We've been doing a lot with Restek and third-party manufacturers. We've hired a product manager for consumables. That's something Shimadzu has never had before, and we recognize the aftermarket business is something we need to expand our efforts into."

An example of new consumables products addressing the biologics market provided by Dr. Kuzdzal is the nSMOL (nano-Surface and Molecular Orientation Limited proteolysis) Antibody BA Kit. "The nSMOL Antibody BA Kit is a ready-to-use reagent kit for collecting monoclonal antibodies from blood or other biological samples using immunoglobulin collection resin, and then performing selective proteolysis of the Fab region of these antibodies via trypsin-immobilized nanoparticles," said Dr. Kuzdzal. The kit is designed to accelerate method development.

Beyond instruments, Shimadzu continues to introduce new software solutions for biopharmaceuticals. Targeting cell culture analysis, the company released the Cell Culture Profiling Method Package for LC/MS/MS. Discussing SSI's informatics strategy, Dr. Kuzdzal told ***IBO***, "Recently, an increasing demand for food safety, environmental analyses, pharmaceuticals and integrated omics data analyses has led to a dramatic increase in the number of samples being analyzed which, in turn, has resulted in demands for faster, easier-to-use instruments and software. Also, today's scientists want to combine data from many different types of instruments, with data integrity assurance, complete support for regulatory compliance and total lab data management."

> ***"Shimadzu is also the only large analytical instrument manufacturer that also manufactures medical instruments, and this has enabled us to develop powerful, hybrid technologies that integrate analytical and medical technologies."***

In particular, the company has worked to connect its various its range of analytical technologies. "Shimadzu has continued innovating our cross-platform LabSolutions informatics offering, with expanded multi-data report creation functions that allow users to prepare reports with combined data from various instruments. Not only can reports be created for LC, GC, MS, FTIR, UV, balances and other instruments individually, but they can combine data from several disparate instruments."

Discussing promising applications, Dr. Kuzdzal also noted the company's focus on cannabis testing and its expansion to new types of analyses and customers. "Cannabis testing for us and most of the market right now is 95% quality control testing, where you're looking for things like contaminants; however, we're seeing that expand far beyond quality control testing to areas like academic research," he explained."Some universities absolutely cannot touch the plant, still. They're afraid of losing federal funding. However, they can work with reference standards and things that are DEA [Drug Enforcement Administration] exempt, so they can really help with the chromatography and the analytical challenges."

Clinical is another emerging application for SSI and one that has driven new investments. "Recent applications that enable multiplexed measurements by mass spectrometry for clinical research and diagnostics offer new opportunities for Shimadzu," Dr. Kuzdzal told ***IBO*** in regards to LC/MS solutions. He emphasized that Shimadzu's differentiation compared to other instrument companies in this end-market due to Shimadzu's internal capabilities provided by its Medical Systems Division, which makes imaging systems**.** "Shimadzu is also the only large analytical instrument manufacturer that also manufactures medical instruments, and this has enabled us to develop powerful, hybrid technologies that integrate analytical and medical technologies." Asked about the kit development for the diagnostic market, he said, "We are interested in kit development toward Class II FDA status. But now we provide a Class I registered [MS] medical device and we're working on developing the kits with markers."

Pittcon 2018 Press Conference and New Product Trends: Innovation Meets Productivity

Held in Orlando, Florida from February 26 to March 1, the 68th annual Pittcon conference encompassed 713 exhibitors over 150,000 ft^2 (13,935 m^2) of exhibition space and 2,000 technical presentations, including 68 symposia.

According to preliminary numbers, attendance is estimated at 11,500, which would make it higher than last year's show in Chicago, Illinois (see ***IBO*** 3/15/17). The top five countries with attendees from outside the US were China, Canada, Japan, the UK and Germany.

The exhibition consisted of 713 exhibitors from 33 countries occupying 1,247 booths. Among the exhibitors were 92 companies new to Pittcon, such as Leica Microsystems. Companies that exhibited last year but did not return this year included Beckman Coulter Life Sciences, Olympus and PerkinElmer.

A number of vendors with which ***IBO*** spoke suggested the show be held every two years, perhaps alternating with Analytica (which will take place this April), to stem declining attendance. This year, also notable was the decline in press attendance. For some companies with which ***IBO*** spoke, press coverage is an important factor in exhibiting.

Bruker, Shimadzu Scientific Instruments, Thermo Fisher Scientific and Waters continued their Pittcon tradition of holding press conferences early in the conference. Each company highlighted products launched at the show and in the prior year. Innovation was a theme that each company discussed, as well as the desire to provide customers with a combination of their instruments, consumables, software, service and application support. Solutions for the environmental, food and biopharmaceutical markets were highlighted in line with Pittcon's scientific focus.

At the Waters press conference, Jeff Mazzeo, PhD, vice president of Marketing at Waters, stated that Waters' "sole focus is innovation," and stated that the company has over one thousand R&D employees. The company disclosed the sale of 2,047 units of the Waters ACQUITY Arc system in 30 months, with nearly half going into the QC market. By region, Asia, Europe and the Americas accounted for 54%, 27% and 19% of sales, respectively.

The company noted its launch earlier this year of the latest version of its ACQUITY Arc Bio system, a bio-inert version of the Arc (see Pittcon 2018 New Products: Part 1). In addition, the company announced it has introduced a new program to expand ACQUITY UPLC and QDa mass detector sales in the academic end-market. The company's TA Instruments business highlighted three new products, including two new DMA (Dynamic Mechanical Analysis) systems (see Pittcon 2018 New Products: Part 1).

Shimadzu Scientific Instruments' press conference detailed seven new products introduced in recent months, including GC, FT-IR, HPLC, MALDI, and XRF systems. For many of the systems, the company highlighted simplified maintenance, speed of analysis and software integration. In particular, the company discussed the Nexera Mikros LC/MS' (see Pittcon 2018 New Products: Part 1) UF-Link for microflow column installation without affecting the ESI spray needle's position, as well as the ClickTek nut on the Next GC-2030 for one-step access to the injector port without tools.

Bruker also presented a parade of recently introduced products that spanned applied to research to life science and clinical end-markets. These include the MPA II FT-NIR system for pharmaceutical QC (see Pittcon 2018 New Products: Part 1) including method development as well as two micro-ESA-based dedicated analyzers for food-related analyses (beer freshness, edible oil analysis). The company also announced the expansion of its IVDr-by-NMR solution for phenomics research to biobanking applications for metabolic testing of urine samples. Bruker President and CEO Frank Laukien, PhD, noted this system's high throughput and low cost per sample compared to LC/MS analysis. In addition, at the press conference, Professor Jeremy Nicholson, PhD, of Imperial College London gave a talk discussing his research on molecular phenotyping using both MS and NMR for applications such as the structural elucidation of unknown biomarkers.

Thermo Fisher Scientific discussed a broad swath of new products, covering GC, IC, LC, molecular spectroscopy, atomic spectroscopy and EM, as well as its Chromeleon CDS and cloud capabilities. Dan Shine, senior vice President and president of the company's Analytical Instruments Group, spoke to the company's innovation as well, citing that 6.6% of Thermo Fisher 2017 manufacturing revenue was invested in R&D. The company discussed new products as well as its service offering, noting figures of over 7,000 service engineers and 2,800 support personnel. Application areas discussed included biopharmaceutical workflows and food testing. Jakob Gudbrand, vice president and general manager, Chromatography, for Thermo Fisher Scientific, cited the company as having one of the broadest portfolios of Food Solutions, encompassing techniques such as GC, LC, IC, isotopic and elemental analysis, and molecular spectroscopy.

Other companies holding press conferences at the show included JEOL, which provided updates on its NMR and SEM product lines. At its press conference, Anton Paar discussed its latest product and company developments, including its recent US office openings in Houston, Texas, and Los Angeles, California, and plans to expand into the

Midwest next year. CEM and Metrohm held their press conferences on the exhibit floor. CEM launched the EDGE (see Pittcon 2018: Top New Products) as well as announced $100 million in annual revenues. Metrohm USA gave out its 2018 Young Chemist Award and revealed its work with various standards organization on four new IC methods.

Pittcon is always a chance to examine product trends, particularly in regards to system design and productivity improvements. "Two-in-one" combination instruments continue to multiply. One form such systems take is the ability to do two or more different types of analyses in one system. At this year's show, examples included HORIBA's Duetta, IKA's ElectraSyn 2.0, MOCON's PetroAlert Series 9200 (see Pittcon 2018 New Products: Part 1) and Microtrac's Sync system (see Pittcon 2018: Top New Products). In the case of Thermo Scientific's Vanquish Duo UHPLC systems, two systems for performing the same analysis are combined into one instrument, provided cost savings as well as a back-up system.

The shrinking size of instrumentation continues to be a theme among product introductions. Exhibiting at Pittcon this year were the latest wave of portable GCs from Nanova Environmental and Zebra Analytix (see Pittcon 2018 New Products: Part 1). Portable LC systems, a novel area for miniaturization, were also on display from Axcend and PolyLC (see Pittcon 2018 New Products: Part 1).

Pittcon 2019 will be held in Philadelphia, Pennsylvania, from March 17 to March 21. The conference was last held in the city in 2013. In subsequent years, the show will move between previous locations, before heading west to San Diego, California, in 2024.

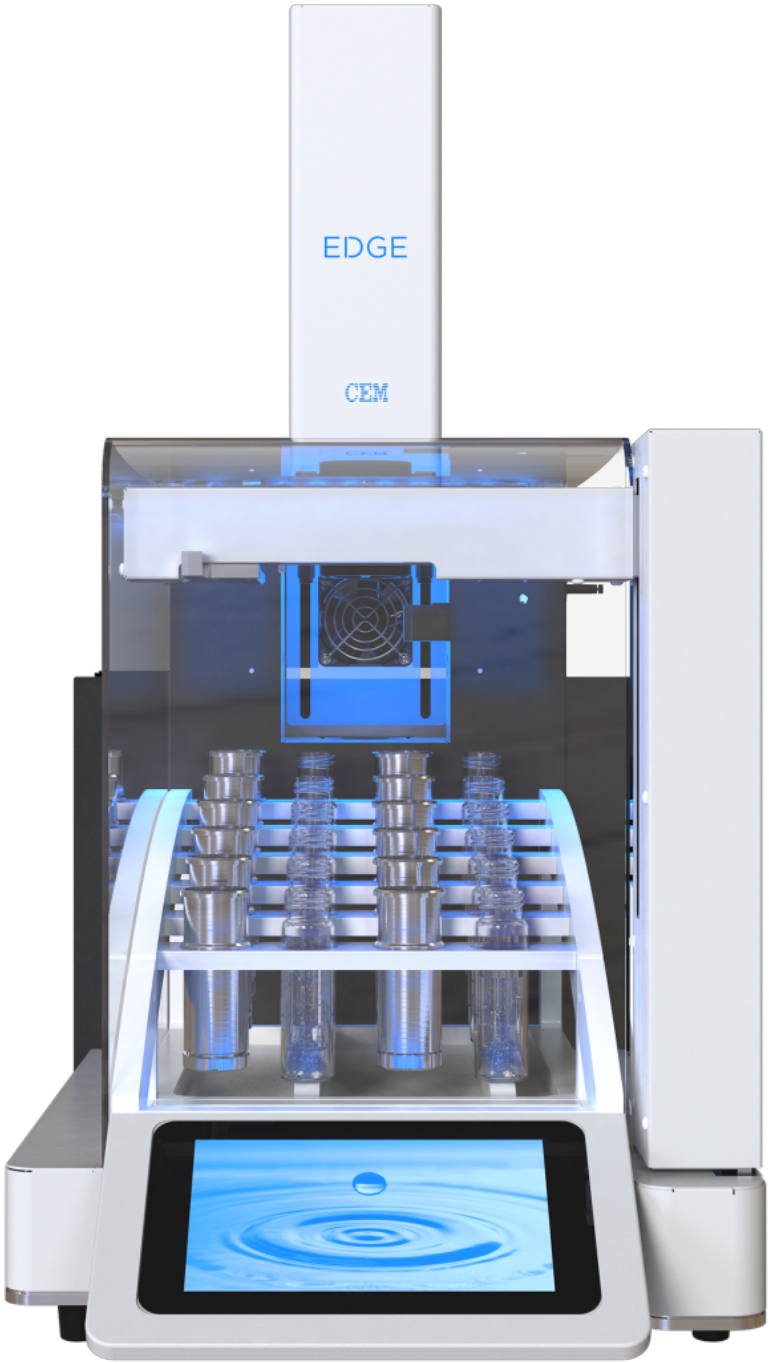
Pittcon 2018: Top New Products

As part of our regular Pittcon issue, ***IBO*** recognizes three new products (introduced or shipping as of the beginning of the year) from the show that demonstrate technical advancement, innovation and a high potential for commercial success. This year's selections represent a range of approaches to further productivity gains in the lab; specifically, faster and easier workflows in the first case, dual-analysis capabilities on one instrument in the second case, and, in the third case, the ability to test a smaller size of analytes.

CEM's EDGE

The first choice for ***IBO***'s top Pittcon product introduction is CEM's EDGE (Energized Dispersive Guided Extraction) system for molecular analysis. The system presents a new automated sample preparation solution for LC or GC analysis, addressing sample preparation challenges, such as speed and cost, in a system that integrates automation and a simple user work process.

The EDGE is designed to provide a faster extraction sample preparation solution, requiring less solvent and producing less waste compared to QuEChERS, PSE, soxhlet, automated soxhlet and ultrasonic extraction. It also eliminates the need for different extraction techniques for different sample types. Based on Q-Cup Technology, which combines pressurized fluid extraction and dispersive SPE, run time is five minutes per sample (including filtering, cooling and washing) for up to 30 g. Twelve samples can be processed at a time on one system. The small footprint is attractive for high-throughput labs wanting to use multiple systems.



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System components for ease of use include a three-piece sample holder; disposable Q-Discs consumables, which in addition to sorbents are also available in other materials, such as C18; a built-in heating method, eliminating the need for external gases or pressure; and self-cleaning. Once loaded, an autosampler transfers the sample holder to a chamber where solvent is added at the top and bottom. The chamber is then heated internally and pressurized, and the sample extracted. The extract is filtered, cooled to room temperature and collected. The holder is removed and the chamber is rinsed.

Applications include pesticide monitoring, fat analysis and phthalate testing. The system is priced at $35,000 and began shipping earlier this year. The company expects to ship over 50 units in the next 3–4 months.

Microtrac’s Sync System

Microtrac’s new Sync system provides two different types of particle measurement in the same system, laser diffraction and image analysis. The instrument is quite notable for having these measurements not merely sequential, but virtually simultaneous at the same point in the path of the dispersed particles. The laser diffraction system uses 3 lasers and 2 detectors to capture information at multiple angle separations, while an LCD white light source provides illumination for a high-speed digital camera recording images at roughly 60 frames per second.

This is rapid enough that multiple images of the same particle are recorded as they pass through the measurement segment, allowing for robust measurements of 3D particle shape. This can be blended with the laser diffraction data to provide a fuller picture of the particles in the sample. These complementary measurements of size and morphology will be a great boon to a broad class of applications, particularly when particles are improperly dispersed or form aggregates–these situations can be picked up immediately from the image data–while the diffraction data is already a well-established standard in the marketplace.

Click to enlarge

The system covers the particle size range from 0.01 µm to 4,000 µm. At the smaller end, the data is generated primarily by laser diffraction; conversely, for larger particles, image analysis provides better information. The system can handle both wet and dry samples, and converting between sample types is relatively simple. Some of the system components are manufactured by a 3D printing process. Many different industries can benefit from the system, including pharmaceuticals, additives, pigments, ceramics, cement and the growing 3D printing market itself. The Microtrac Sync will be ready for shipment in April with a price point around $60,000.

Fluid Imaging Technologies’ FlowCam Nano

Fluid Imaging Technologies’ FlowCam Nano has been selected largely due to its technological innovation. As the first and only flow imaging system for nanoparticles, the FlowCam can detect and produce high-resolution images of 300 nm to 10 µm particles. Similar competitive products typically measure particles down to about a micron in size, so this new product has broken the 1 µm limit and passed into the nanoscale. The system utilizes the company’s oil-immersion microscopy for flow imaging spectroscopy technology to analyze the actual size from the image.

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The system can also automatically measure 40 different parameters, including size, count, concentration, grayscale, and other morphological characteristics, in real time. It can be used to image protein agglomerates, silicon oil droplets, glass shards and other opaque/transparent sub-visible particles. Among its drug development applications are the measurement of colloidal stability and its resistance to aggregation, especially in therapeutic protein formulations, lyophilized biologics and injectable drugs. With the addition of FlowCam Nano, the FlowCam product line now has six different models that can analyze particles with a size range of 300 nm–5 mm.

Pittcon 2018 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—it provides an overview of many of the new products introduced at Pittcon, mostly those introduced since the beginning of 2018, and that will be officially launched in coming months. Part 2 will appear in the March 31 issue.

Atomic Spectroscopy

Elvatech showed off its newest handheld XRF instrument, the ProSpector 3, which it characterizes as being the lightest and fastest system available. Improved detector sensitivity and signal analysis allows for a very high count rate, and the total weight is just over 1 kg. The control display is on a hinge, allowing for ease of viewing, with an optional benchtop stand still under development. The system is expected to ship in about three months, but the price is still being determined. The company also displayed the Elvax 3 benchtop ED-XRF system with a powerful 60 kV source, which debuted about six months ago.

The new Atlas N model in **iXRF**'s Atlas line of microspot XRF systems provides options for as many as 4 separate detectors and boasts a small spot size of just 5 µm. A few of the newer versions have already shipped earlier this year, at a price ranging from roughly $150,000–$300,000 depending on the number of detectors and other options.

LECO displayed two new carbon/nitrogen analyzers. The 928 Series was released a few months ago for larger "macro" samples up to 3 g of soils, coal and other solids. The system is based on combustion and features a 100-

position autoloader and extended reagent lifetimes. The 928 is priced at about $50,000-$60,000. LECO had a preview showing of the 828 Series, which is expected to begin shipping in the second or third quarter of this year at a price likely in the high $30,000s. This system is designed for samples under half a gram, generally for food, feed and other agricultural samples, and shares some of the technological advantages of the 928 Series.

Malvern PANalytical introduced a new version of its benchtop Epsilon EDXRF instrument. The new Epsilon 4 has an improved SDD detector and detector electronics, making measurement faster. It is designed to handle large samples individually or smaller samples in a carousel, and can perform measurements in ambient air or a helium purge. The system began shipping at the end of January at a price of $65,000–$120,000.

Electrochemistry

Hanna Instruments launched a new generation of titrators with a 50% smaller footprint. The HI931 and HI932 feature an exchangeable Clip Lock burette system which makes it easier to switch between reagents and prevent cross contamination. These instruments are aimed at food and beverage analysis, chemical process and academic research. The HI932 has a double burette for multiple analysis, while the HI931 is designed for single analysis. The price for the HI932 and HI931 is estimated to be around $9,500 and $4,500, respectively. Both titrators will be ready for shipment this summer.

IKA introduced the ElectraSyn 2.0, which combines three instruments in one. This new system is designed as a potentiometer, an analytical device and a stirring plate in one complete system. The instrument is aimed at discovery-scale synthetic organic chemistry, which includes medicines, materials, agrochemicals and natural products. The ElectraSyn 2.0 is ready for shipment with a price tag between $1,400 to $2,000.

United Scientific Supplies introduced the Emerald, an ISO certified electronic burette that features three different dispensing speeds, including high-accuracy drop-wise dispensing. The device is equipped with an easy-to-use interface, which controls the dispensing, and also a recirculation system that enables quick purging without loss of the reagent. Available in three different sizes, the Emerald has a price tag around $1,255 and is currently available on the market.

Gas Chromatography

MOCON, a division of **AMETEK**, launched a new addition to its PetroAlert product line. The Series 9200 combines GC with a total hydrocarbon analyzer in one compact instrument. This system is designed particularly for the oil and gas industry, especially to analyze hydrocarbon in the well logging process. It is also equipped with 4 columns that can run 4 different analyses simultaneously. The Series 9200 is ready for shipment with a price range of $33,000–$42,000.

Nanova Environmental introduced a portable GC with a focus in environmental testing, particularly air and water quality analysis. The Novatest P100 is a two-dimensional mobile GC system with 8 hours battery life and 2.5 minutes average run time for each analysis.

Omniscent actively promoted its OMNI-2000 VOC analyzer, based on MEMS technology. The micro-GC system is designed as a fixed-site gas detector for monitoring the perimeters of refineries. An important application relates to a new EPA rule that requires monitoring of benzene emissions. The system is expected to begin installations next quarter, and the business model is a lease arrangement for $1,500 per month per system.

Shimadzu Scientific Instruments introduced the Nexis GC-2030, which emphasizes a user friendly interface and easy column installations, with a ClickTek connection and nut. The Nexis GC-2030 is a multiple-channel system with 3 inlets and 4 detectors. The new system also includes an “Eco mode” which optimizes the use of carrier gas such as helium, and reduces electricity use when idle. The Nexis GC-2030 has been commercially available in Japan since May 2017, and shipment to the US began last August with a $20,000-$25,000 price tag.

Zebra Analytix showcased its latest product, a miniature GC system equipped with a MEMS chip as an “electronic nose.” As the smallest GC system on market, it offers an order-of-magnitude lower price alternative to a regular GC

system, according to the company. The Zebra-GC Model L comes with a complete system, including Bluetooth communication to a PC or smartphone, while Model M is a versatile modular mini GC system. Zebra GC is still in development and not yet available for commercial purchase.

General Analytical Techniques

A&D Weighing introduced the new Apollo Series with its GX-A/GF-A model. This multi-functional balance system is equipped with three new features that enhance weighing results even under challenging conditions. The new features are: electronically controlled load, impact shock detection and flow rate display. Typically, these types of balances are used heavily in the food and beverage industry, but with A&D Weighing's new improvements, the system will also be a good fit for academic and pharma sectors. The Apollo Series will be ready for shipment in April, with a price range of $25,000–$46,000.

Adam Equipment unveiled two new balance series, the Equinox and Solis Series. The Equinox Series features an easy to use touch screen display that is equipped with a formulation/recipe function and a three thousand item database. The Solis Series is designed for simpler measurements, with 99 formulations stored within the system. These balances are mainly applied in food testing, forensics analysis and pharmaceutical manufacturing. The balances will be ready for shipment in May with a price range of $1,000–$5,000.

Lab Automation

Scinomix showcased its new automation capper that will officially launch in the US in the fourth quarter of 2018. It can cap up to 48 vials in 6 minutes and uncap them in 4 minutes, and is particularly well suited for working with cryovials. The system can be used standalone or integrated with a robotic arm.

Sirius Automation introduced its MiniTasker for everyday lab tasks, such as analytical weighing, sample ID, sorting, dilutions, standard preparation and aliquoting. With times of 3 sec/sample for sorting and 6 sec/sample for weighing, this small footprint system can host up to 20 microplate racks. The system costs between $37,000 and $70,000 depending on the configuration.

Teledyne Cetac launched its SimPrep automated system for preparing samples, diluting standards and dispensing. It features a wide range of syringes from 20 µL to 50 mL to serve multiple applications. It is designed to serve environmental, mining, pharmaceutical and soil laboratories.

Lab Equipment

In January, **Corning** launched its LSE Microcentrifuge that operates at a fixed speed of 6,000 rpm and is designed for quick spin downs of micro-samples. This product can be used worldwide, as it comes with universal power adaptors, and is calibrated to comply with ISO 8655 (international pipette standards). The price tag is $259.

Edstrom Industries launched its PICO water purification system, which is manufactured in the UK. The $5,000 system can be customized as a type II or type III unit. The system has a user friendly design, what with its ease of use and cartridges that can be changed once a year by the user. This small footprint instrument has a 35 L reservoir tank and is sold online through the company's website, as well as Amazon.

Eppendorf launched its Centrifuge 5425, which features a variety of optional rotors (from tubes to PCR strips) as well as high-throughput operation, all while keeping a small footprint. This model includes an innovative system for passive heat removal that prevents contamination risk and lowers noise levels, as the cooling air does not need to get into the bowl. The system is sold in the US starting from $2,200.

Eppendorf introduced in January its refrigerated centrifuge 5910 R with universal adaptors that can hold containers from spin tubes to plates. The innovative technology allows more accurate temperature control to preserve sample temperature fluctuations, and its compact footprint allows cell culture customers in academia and

industry flexibility in regards to bench placement. The low-noise system starts at $12,000 in the US.

Gate Scientific launched in February its innovative Precision HotPlate series with smartSENSE technology, a wireless temperature sensing stir bar. The stirrer can be controlled from any internet-connected device. The system is designed to be used in GMP environments, and each bar has a unique identification number. The temperature sensing bar allows the user to determine the actual temperature of the sample as opposed to the temperature on the hotplate. The price in the US is $2,275 for the system and $49 for each individual stir bar purchased separately.

Liquid Chromatography

A recently established company, **Axcend**, introduced a new portable nanoLC system. The Focus LC is the culmination of research by Dr. Milton Lee and his research team at Brigham Young University. The compact system has a flow rate of 100 nL–10 µL per minute, which generates negligible waste and consumes less solvent. Equipped with a UV detector, the portable system offers a comparable result with benchtop instruments, according to the company. The Focus LC is directed towards forensics applications and also industrial in-line QC. The price of this system, available later this year, is estimated to be around $30,000.

Kromasil introduced its SFC XT columns, featuring improved separation power and additional interactions between analytes and the stationary phase surface. They provide orthogonality for the regular SFC 2EP phase, which results in alternative selectivity. Typical applications of this product include small molecules analysis, chemicals and natural product extraction.

PolyLC, an HPLC aftermarket manufacturer, introduced its first HPLC system with the SMART HPLC and SMART LifeLC. Both systems offer a compact portable HPLC system with nine hours battery life, which is rechargeable even with a car power outlet. The mobile system is intended for on-site environmental and diabetes testing. Both systems are ready for shipment with a price range of $9,000–$15,000.

Shimadzu Scientific Instruments introduced the Nexera Mikros Microflow LC-MS/MS. It incorporates the high sensitivity one would expect from a low-flow system with the ruggedness of HPLC, covering the complete range from micro to semi-micro. Its enhanced sensitivity is the result of the reduced diameter of the column. The instrument also allows for reduced mobile phase consumption and less waste. Useful for quantitative protein assays, the MS is best coupled with the Shimadzu LC-MS 8060.

Thermo Fisher Scientific debuted a new addition to the Vanquish HPLC series. The Vanquish Duo UHPLC system is designed to improve throughput with a dual LC system that allows two different samples to run simultaneously. The system is dedicated to fulfill high throughput demand, especially in the pharmaceutical and biopharmaceutical sectors.

Waters introduced the Acquity Arc Bio system, a new addition to its Acquity Arc product line. The system is designed specifically for efficient transfer and improvement of biomolecule separation. It utilizes iron-free bio-inert and non-stainless steel materials for its flow path, which minimizes undesirable protein interactions and improves operation under extreme salt and pH levels. The Arc Multi-flow path technology is compatible with both HPLC and UHPLC methods. The system also includes the new BioResolve column with smaller particle size, which improves sensitivity, resolution and speed of analysis, particularly for monoclonal antibodies and antibody-drug conjugates. The Acquity Arc Bio will have a price tag of around $60,000.

Materials Characterization

Earlier this year, **Anton Paar** began shipping its RapidOxy 100 oxidation stability tester. The system provides elevated temperature and oxygen pressures to accelerate the testing of the stability of materials in the presence of oxygen. Commonly used to test edible oils, other foodstuffs, cosmetics, fragrances and other consumer products, the system has an upper temperature range of 180°C and pressure range of 1,800 kPa, and is priced under $10,000.

TA Instruments, a **Waters** company**,** introduced three new products. The high-pressure TGA system, HP TGA 750, is equipped with patented top loading magnetic suspension balance, which promotes weight stability over wide

range of pressures and temperatures. It also has a user friendly interface with its One-Touch-Away functionality. High-pressure TGA is typically used in fuel/biomass classification and catalysis process.

TA Instruments also introduced new additions to its DMA product line. The DMA 850 has higher sensitivity than its predecessor and is able to measure smaller displacements. The DMA 3200 is a new product developed based on Electroforce technology, which provides 10 times higher force than other DMA instruments, according to the company. The DMA 3200 can perform both DMA and fatigue testing for physically larger and stiffer samples. All new products are ready for shipment with a price point of around $100,000 for the DMAs and $150,000–$200,000 for the HP TGA 750.

Molecular Spectroscopy

Bruker introduced the next generation model of its MPA Multipurpose Analyzer, the MPA II, which employs FT-NIR spectroscopy for quantitative analysis in pharmaceutical QC labs. It is also optimized for use in agriculture and food, cosmetics and chemical applications. Attached to the instrument are two fiber optic probes that can be used to measure solid or liquid samples directly from the container. The cost of the unit ranges from $70,000 to $200,000, depending on how it is customized.

HORIBA introduced its new Duetta two-in-one spectrometer, which is able to simultaneously analyze a sample using both fluorescence emission and UV/Vis absorption spectroscopy. The instrument is able to create a molecular fingerprint by collecting emissions spectra and producing a 3D Excitation Emission Matrix (EEM) with a wide dynamic range in less than one second, much faster than traditional spectrofluorometers. For a variety of sample types, there are also numerous sample trays available that can easily slide into the unit. Ideal for analysis in pharmaceuticals and foods, the Duetta has begun shipping for a price of $23,500.

HunterLab displayed its new Aeros spectrophotometer, designed to overcome the challenge of color measurement for inconsistent or heavily textured samples. Featuring a large rotating sample platform, the unit collects the average color of a sample through a series of fast, noncontact measurements. It features automatic height positioning between sensor and sample, a high-resolution touch screen and on-board software that does not require connection to a PC. The Aeros sells for less than $20,000 and became available for sale with its launch at Pittcon.

Thermo Fisher Scientific introduced a new range of GENESYS UV/Vis spectrophotometers, which replaces earlier GENESYS models. The GENESYS 50 UV/Vis spectrophotometer uses a single cell and is designed for low-throughput laboratories. The GENESYS 150 adds to the capabilities of the GENESYS 50 by incorporating automation and room-light resistance, while the GENESYS 180 enhances the GENESYS 150 with an eight-cell carousel for high-throughput applications and resistance from room lighting. The prices of these models range from $5,500 to $6,800. Thermo Fisher also introduced the BioMate 160 UV/Vis spectrometer, which adds to the capabilities of the GENEYS 150 model by providing pre-programmed methods for life science researchers.

Danaher Buys IDT, Entering Oligo Business

Washington, DC 3/9/18—Danaher**,** a global science and technology innovator, has signed an agreement to acquire Integrated DNA Technologies (IDT) for an undisclosed amount. IDT, which has 1,200 employees and more than 100,000 customers, manufactures custom DNA and RNA oligonucleotides for applications in molecular biology, qPCR, NGS, synthetic biology, gene editing and molecular diagnostics. IDT will join Danaher's Life Sciences platform, and operate as a standalone company and brand. "IDT expands our presence into the highly attractive genomics market, and will help play a central role in accelerating our customers' research and time to market as they develop critical diagnostic tests and potential life saving therapies," stated Rainer Blair, executive vice president of Danaher's Life Sciences platform. "IDT's historical double-digit core revenue growth and strong margins are a testament to the team's commitment to the highest standards of quality, service and technical expertise." The purchase is expected to close in mid-2018.

The deal was valued at close to $2 billion with Danaher beating out other bidders, according to Buyouts on PE Hub. Among the applications for oligonucelotides are research (CRISPR, NGS, PCR, synthetic biology), diagnostics and

therapeutics. Danaher looks positioned to benefit from all three end-markets with manufacturing capabilities and technical expertise new to the company. Also notable is that this is Danaher's first purchase of a purely genomics-focused company, as it continues its efforts to expand its Life Sciences consumables offerings.

*Agilent Technologies (see **IBO 9/30/16**) and LGC Genomics (see **IBO 4/15/17**) are among the other companies announcing recent investments in oligonucleotide manufacturing, citing the future demand for oligo therapeutics.*

Agilent Buys Capillary Electrophoresis Firm

Santa Clara, CA 3/7/18—Agilent Technologies has agreed to acquire Advanced Analytical Technologies, Inc. (AATI) for $250 million in cash. AATI provides automated CE technology for the separation of biomolecules, such as nucleic acids, proteins, carbohydrates and small molecules, for analysis. "Technology advances in genomics, metabolomics and proteomics are driving growth and demand for innovative new solutions," commented Dr. Stefan Schuette, vice president and general manager of Agilent's Liquid Phase Separations Division. "The value of this acquisition is in the expanded capabilities for emerging applications that Agilent and AATI together can offer." Based in Iowa, AATI has 101 employees.

*Asked about the benefits of AATI's systems, Knut Wintergerst, Agilent's Marketing and Support manager for its Microfluidics Business, told **IBO**, "AATI's product portfolio provides offerings for QC of long-read libraries, automated sample QC and compelling fg/µL sensitivity. We will also be adding a talented team to help advance our R&D and assay development efforts."*

In describing application areas in which AATI has gained traction, outside of NGS library QC, he cited a number of QC applications. "AATI's portfolio offers great strengths to expand into adjacent segments where QC is required, among which are DNA fragment analysis, QC of oligos, but also QC of proteins once suitable assays have been developed. This allows Agilent to cover all aspects of biomolecule QC in genomics, metabolomics and proteomics workflows."

The acquisition looks to position Agilent for an expanded range of solutions for omics markets, and to supplement its CE business for NGS QC.

Bio-Rad Extends 10-K Filing Date

Washington, DC 3/2/18—Bio-Rad Laboratories has delayed the filing of its 10-K SEC form, the company's year-end regulatory financial report, stating it "has not yet completed its assessment of the effectiveness of its internal control over financial reporting." The filing deadline was March 1. The company cited time needed to complete the assessment of its internal controls and procedures resulting from adjustments to its third quarter 2017 results. The adjustments were previously disclosed. The company noted the conversion of its European business to a new ERP system earlier in the year.

*In its third quarter 2017 10-Q filing, Bio-Rad stated it had identified two items recorded in the third quarter that should have been recorded in the second quarter as a result of the European ERP conversion. The company stated, "Our review controls and our user acceptance testing controls were not sufficiently designed to identify these items on a timely basis." The company disclosed there was no material impact on its financial results and the deficiencies were being addressed. Since remediated, weaknesses in the company's internal controls were also identified in 2010, 2012 and 2013 (see **IBO 3/31/14**).*

Following Acquisition, IBO's Parent Company Forms

Science and Medicine Group

BioInformatics Inc., a provider of market research and consulting services, and the publisher of ***IBO***, has expanded. BioInformatics Inc. announced on March 13 the purchase of IMV Publishing, a market research company serving the medical imaging and clinical diagnostic instruments markets.

IMV joins a family of properties—BioInformatics Inc., Strategic Directions International, the Science Advisory Board and ***IBO***—to form the Science and Medicine Group. Services include business intelligence and market research, digital media and marketing, publishing, and access to curated online communities of scientific and medical professionals.

"Over the next 5 to 10 years, we see a world where instruments and diagnostics—including analytical, imaging and clinical—will converge to lead a precision medicine revolution," commented Science and Medicine Group CEO Craig Overpeck.

For more information, see the announcement.

Fourth Quarter Results: Fluidigm, HORIBA, Merck KGaA, NanoString, Pacific Biosciences

Double-Digit Growth for Fluidigm in Fourth Quarter 2017

Q4 2017

Fourth quarter 2017 sales for Fluidigm advanced 10.6%, driven by strength in mass cytometry and high-throughput genomics products. Strong sales for the quarter were partially offset by declining single-cell genomics sales. Research customers accounted for approximately 64% of total sales, while applied customers represented 36%.

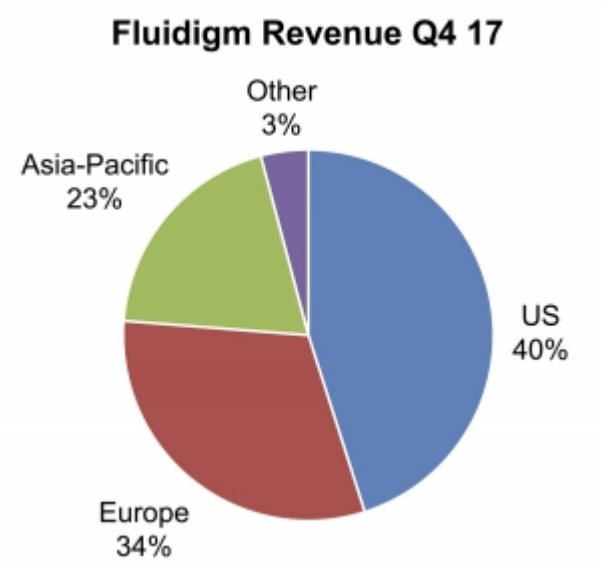
Fluidigm Q4 FY17			
	Rev. ($M)	% Rev. Growth	% of Rev.
Instruments	$11.3	6.3%	41%
Consumables	$11.7	14.0%	42%
Service	$4.7	14.8%	17%
License and Grant	---	---	0%

Click to enlarge

Instrument sales rose 6.3% to $11.3 million, supported by strong mass cytometry revenue. High-throughput genomics instruments revenue also contributed to segment growth. However, weak single-cell genomics instruments sales partially offset the growth.

Consumables sales increased 14.0% to $11.7 million, heavily driven by mass cytometry consumables and high-throughput genomics sales. Service revenue also performed well, up 14.8% to $4.7 million. Service sales were strong due to higher mass cytometry instrument sales.

Total product revenue amounted to $23.0 million. Genomics product revenue fell just 0.8% to $12.3 million, mostly due to decreased single-cell genomics sales. Mass cytometry product sales, however, advanced 25.6% to $10.8 million, driven by both instrument and consumables sales.



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Geographically, fourth quarter 2017 sales in the US fell 15% to $11.2 million. The decrease in US sales were primarily due to lower mass cytometry and single-cell genomics sales. As for sales in Europe and Asia Pacific, sales advanced 41% and 29% to $9.5 million and $6.3 million, respectively. Both regions' strong performance was primarily driven by increased demand for mass cytometry products.

FY 2017

Sales for the year fell 2.4% to $101.9 million, primarily lowered by weak single-cell genomics sales.

Fluidigm FYE 17			
	Rev. ($M)	% Rev. Growth	% of Rev.
Instruments	$42.5	-9.2%	42%
Consumables	$41.9	-0.7%	41%
Service	$17.3	14.1%	17%
License and Grant	$0.2	-20.2%	0%

Click to enlarge

Instrument sales decreased 9.2% to $46.8 million, as a result of lower-than-expected genomics instrument sales. However, mass cytometry sales were strong, partially offsetting the decrease.

Consumables revenue slid 0.7% to $41.9 million due to weak genomics consumables sales. However, sales of mass cytometry consumables continued its strong growth. Service sales grew double-digits for the year, up 14.1% to $17.4 million, driven by increased service contracts.

Product revenue totaled $84.4 million, with mass cytometry product sales up 38.0%. Mass cytometry sales for the year amounted to $39.6 million, driven by both instrument and consumables revenues. However, genomics product sales fell 25.7% to $44.8 million due to decreased demand for single-cell genomics products.

Geographically, sales in the US fell 13.0% to $45.8 million, accounting for 45% of total company sales. US sales were lower due to weak single-cell genomics revenue. European sales represented 32% of total company sales at $32.6

million, an increase of 9.8%. Sales in the Asia Pacific also grew high-single digits, up 8.3% to account for 20% of total sales. Sales in all other regions of the world represented 3% of total sales.

For the first quarter of 2018, sales are expected to remain flat, between $24 million and $27 million.

HORIBA Instrument Revenues Remain Steady into Fourth Quarter

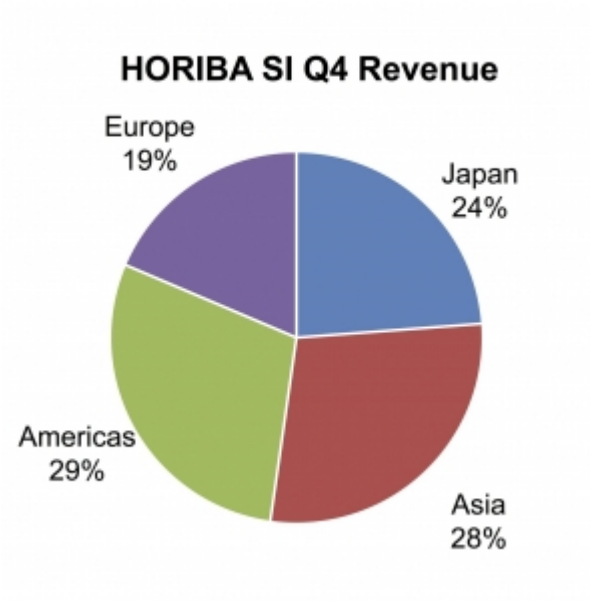
Q4 2017

Fourth quarter 2017 sales for HORIBA's Scientific Instruments & Systems segment (SI) climbed 9.6% to ¥8,343.0 million ($78.5 million at ¥106 = $1), representing 13% of total company sales.

HORIBA Q4 FY17			
	Rev. (M)	% Rev. Growth	% of Rev.
Process & Environmental Instruments & Systems	¥5,398.0	9.2%	9%
Scientific Instruments & Systems	¥8,343.0	9.6%	13%

Click to enlarge

Geographically, SI sales in Asia grew the fastest, up 52.7% to ¥2,374.0 million ($22.3 million). Sales in the Americas also advanced double digits, rising 13.7% to ¥2,433.0 million ($22.9 million). Sales for the regions accounted for 28% and 29% of segment revenue, respectively. In Japan and the European region, sales decreased, down 1.9% and 18.0%, respectively.



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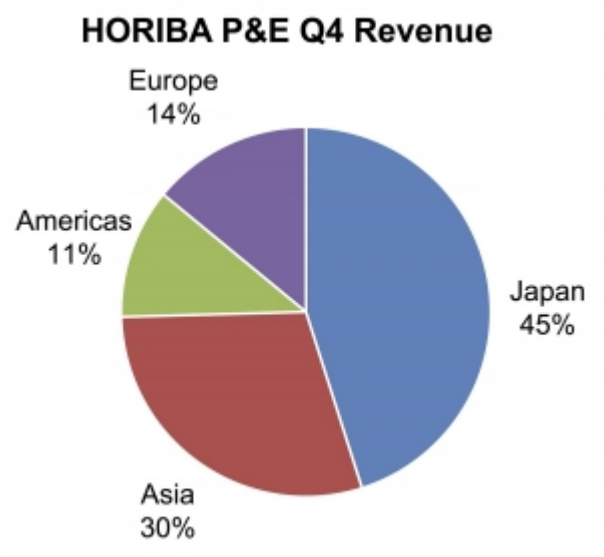
Sales for HORIBA's Process & Environmental Instruments & Systems segment (P&E) rose 9.2% to ¥5,398.0 million ($50.8 million). P&E sales accounted for 9% of total company sales for the quarter.



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Geographically, P&E sales in Japan skid 4.0% to ¥2,434.0 million ($22.9 million); however, they still represented the largest portion of sales at 45%. Sales in Asia accounted for 30% of segment revenue, with sales of ¥1,591.0 million ($14.9 million). Asian P&E sales advanced 31.2%. Sales in the Americas and in the European region both grew double digits, up 12.8% and 16.6%, respectively. Sales in the Americas represented 11% of segment sales, while European sales accounted for 14% of segment sales.

FY 2017

2017 sales for HORIBA's SI segment slid 1.5% to ¥26,117.0 million ($245.8 million), primarily affected by slow sales in Japan and Europe. Segment operating income dropped 47.2% to ¥498.0 million ($4.7 million) due to a large increase in R&D expenses.

HORIBA FYE 17			
	Rev. (M)	% Rev. Growth	% of Rev.
Process & Environmental Instruments & Systems	¥17,433.0	4.1%	9%
Scientific Instruments & Systems	¥26,117.0	1.5%	13%

Click to enlarge

Geographically, SI sales in Japan fell double digits, down 13.8% to ¥6,471.0 million ($60.9 million), making up 25% of segment revenue. Conversely, sales in Asia and the Americas both rose double digits, up 20.2% and 10.4%, respectively. Asian sales amounted to ¥7,312.0 million ($68.8 million), while sales in the Americas totaled ¥7,244.0 million ($68.2 million). Both regions accounted for 28% of segment sales. European sales slid 8.9% to ¥5,088.0 million ($47.9 million), representing 19% of segment revenue.

In contrast, sales for HORIBA's P&E segment increased 4.1% to ¥17,433.0 million ($164.0 million). The solid sales growth was primarily supported by strong stack gas analyzers revenue, partially offset by weak process-measurement equipment sales. Operating income for the segment fell 29.0% to ¥1,094.0 million ($10.3 million) due to the low process-measurement equipment sales.

Geographically, P&E sales in Japan rose moderately, up 3.5% to ¥9,387.0 million ($88.3 million). The increase in Japanese sales was driven by healthier consumer spending, along with an overall robust economic recovery trend.

Japanese sales represented 54% of segment revenues. Sales in the Asia Pacific advanced the fastest, leaping 38.0% to ¥3,792.0 million ($35.7 million). The accelerating sales growth was primarily driven by China's economy and supported by various government policies. Asia Pacific sales accounted for 22% of segment revenue. Sales in Europe also performed well, up 9.6% to ¥2,194.0 million ($20.7 million), despite looming uncertainties over policies. Sales in the Americas, however, dove 30.0% to ¥2,058.0 million ($19.4 million), now accounting for just 12% of segment sales.

For the full-year 2018, HORIBA expects its entire sales to increase by ¥14,600 million ($137.4 million), or 7.5%, to ¥210,000.0 million ($1,976.1 million). As for its total operating income, the company projects an increase of 8.1% to ¥29,000.0 million ($272.9 million).

Process Solutions Drive Merck KGaA Life Science

Q4 2017

Merck KGaA's Life Science segment (LS) delivered fourth quarter 2017 sales of €1,496.2 million ($1,850.4 million at €0.81 = $1), an increase of 3.8%, driven by solid Process Solutions sales. Currency effects unfavorably impacted sales growth by 5.5%, while acquisitions added 0.4%. Organic sales for the quarter grew 8.9%.

Merck KGaA Life Science Q4 FY17

	Rev. (€M)	% of Rev.	% Rev. Growth	Currency	Acq./ Div.	Org. Growth
Process Solutions	€ 579.2	39%	8.5%	-5.5%	0.4%	14.4%
Research Solutions	€ 510.8	34%	-0.4%	-5.5%	-0.1%	5.2%
Applied Solutions	€ 406.2	27%	3.0%	-6.0%	-1.8%	6.2%

Click to enlarge

Process Solutions sales advanced 8.5% to €579.2 million ($716.3 million), accounting for 39% of LS sales. Organically, sales grew 14.4%, driven by increased demand for single-use products.

Research Solutions revenue dipped 0.4% to €510.8 million ($631.7 million), making up 34% of total LS sales. Organically, sales rose 5.2%, supported by strong eCommerce business sales.

Applied Solutions sales grew 3.0%, 6.2% organically, to €406.2 million ($502.4 million). The strong organic growth was driven by an overall increase in demand from all regions and businesses.

Geographically, LS sales in Europe grew 5.0% to €527.7 million ($652.6 million), for which currency effects adversely impacted growth by 0.8%. Acquisitions added 0.3% to sales growth. Organic sales growth for the region amounted to 5.5%. European sales for the quarter represented 35% of LS sales. Also accounting for 35% of LS sales was North America. Sales for the region advanced 2.3% to €517.7 million ($640.3 million). Organically North American sales rose 10.7%.

Sales in the Asia Pacific also grew double digits organically, rising 10.5% to €361.0 million ($446.5 million). Currency effects and acquisitions both negatively affected sales by 6.1% and 0.3%, respectively. Reported sales for the quarter grew 4.2%. Latin American sales fell 1.6% to €63.1 million ($78.0 million); however, sales for the region were up 6.5% organically. In the Middle East & Africa region (MEA), both reported and organic sales soared, up 23.4% and 24.8%, respectively.

FY 2017

Full-year 2017 sales for Merck KGaA LS rose 4.0% to €5,881.4 million ($7,273.6 million). Organically, sales rose 5.3%, driven by high single-digit organic sales growth for Process Solutions.

Merck KGaA Life Science FYE17						
	Rev. (€M)	% of Rev.	% Rev. Growth	Currency	Acq./ Div.	Org. Growth
Process Solutions	€ 2,240.7	38%	6.0%	-2.0%	-0.1%	8.1%
Research Solutions	€ 2,066.0	35%	1.0%	-1.6%	-0.3%	2.9%
Applied Solutions	€ 1,574.7	27%	5.1%	-1.6%	1.9%	4.8%

Click to enlarge

Sales for the Process Solutions business increased 6.0% to €2,240.7 million ($2,771.1 million), making up 38% of LS sales. Organically, sales were up 8.1% for the year, driven by increased overall demand, along with rising production of large molecules. Additionally, sales to the pharmaceutical market also contributed to Process Solutions revenue growth. Over the course of 2017, Process Solutions sales were slow for the first half of the year, then accelerated towards the end of the year.

Research Solutions sales climbed slightly, up 1.0%, 2.9% organically, to €2,066.0 million ($2,555.1 million). Sales were mostly driven by Lab & Specialty Chemicals sales. Research Solutions revenue for the year accounted for 35% of LS sales.

Applied Solutions revenue for the year grew 5.1% to €1,574.7 million ($1,947.5 million), driven by biomonitoring products. Currency effects negatively impacted sales by 1.6%, while acquisitions pushed sales up by 1.9%. Organically, sales rose 4.8%, primarily propelled by demand for analytical testing products.

Geographically, North American LS sales grew 3.0% to €2,092.6 million ($2,587.9 million), accounting for the largest portion of segment sales at 36%. North American sales advanced 4.5% organically, driven by a 6.7% increase in Process Solutions demand. Research Solutions sales grew 2.7% for the region, driven by increased customer demand and contributions from the Sigma-Aldrich acquisition (see ***IBO*** 11/30/15). Applied solutions also added to the region's sales, with its sales increasing 3.4% due to strong demand in Analytics and Biomonitoring.

Sales in the European region also delivered healthy growth, up 3.2% to €2,022.5 million ($2,501.3 million). Organically European sales rose 3.9%, driven by strength in Process and Research Solutions. Overall, the region experienced positive growth across most of the portfolio.

Asia Pacific sales advanced 5.4%, 8.2% organically, to €1,395.4 million ($1,725.7 million). APAC sales were driven by Process Solutions sales. Upstream & Systems and Filtration & Chromatography sales contributed to the strong organic growth.

For the full-year 2018, Merck KGaA expects organic growth to be above market level, over 4%, with Process Solutions continuing its expansion.

Strong Finish for NanoString

Q4 2017

NanoString Technologies' total sales for the quarter totaled $35.2 million, an increase of 39.6%. Products and services revenues, however, rose just 3.3% to $21.0 million. Products and services sales were driven by solid consumables sales, partially offset by weak instrument sales.

NanoString Technologies Q4 FY17			
	Rev. ($M)	% Rev. Growth	% of Total Rev.
Instruments	$5.9	-21.3%	17%
Consumables	$11.5	4.9%	33%
In Vitro Diagnostics	$1.8	73.7%	5%
Service	$1.8	112.8%	5%
Collaborations	$14.2	190.7%	40%

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Instruments sales fell 21.3% to $5.9 million, but were up sequentially by 33%. Instrument sales experienced a tough comparison during the quarter, yet showed signs of recovery as SPRINT placements were up 30%. Instrument revenue accounted for 17% of total sales. Service revenue increased significantly, up more than double from the prior period to $1.8 million, driven by strength in the Digital Spatial Profiling (DSP) technology access program.

Collaborations revenue also delivered significant growth, up $9.3 million to $14.2 million. The strong growth in collaboration sales was derived from accelerated revenue from the Merck collaboration, along with the agreement with Lam Research (see ***IBO*** 8/15/17).

Consumables sales, excluding In Vitro Diagnostics (IVD) revenue, climbed 4.9% to $11.5 million. IVD sales for the quarter advanced 73.7% to $1.8 million. Total consumables sales recorded a 10.8% gain to $13.3 million.

FY 2017

NanoString sales for the year advanced 32.9% to $114.9 million, driven by consumables and services. Product and service sales rose 4.2% to $72.01, with growth partially offset by decreased Instruments sales.

NanoString Technologies FYE17			
	Rev. ($M)	% Rev. Growth	% of Total Rev.
Instruments	$20.8	-14.0%	18%
Consumables	$38.3	2.0%	33%
In Vitro Diagnostics	$6.7	61.8%	6%
Service	$6.1	91.6%	5%
Collaborations	$42.9	147.2%	37%

Click to enlarge

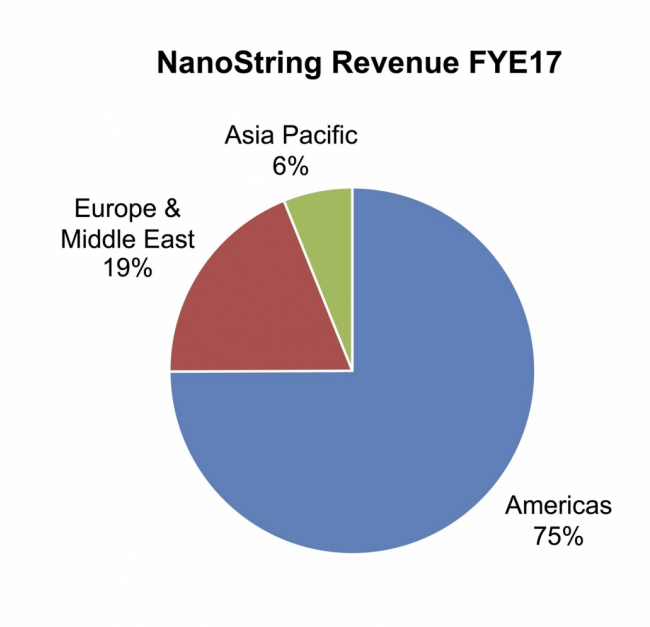
Instrument revenue fell 14.0% to $20.8 million for the year, driven down due to fewer instruments sold, along with lower average prices. A majority of instruments sold during the year were done so through distributors, resulting in the lower selling prices. In 2017, around 125 instruments were sold, a decline versus prior year's 140 instruments.

Service sales rose nearly double to $6.1 million, primarily driven by increased revenue through technology access fees, along with the number of instruments covered by service contracts.

Collaborations revenue also grew significantly for the year, up $25.5 million to $42.9 million, driven by the Merck

and Lam collaborations.

Consumables revenue, excluding IVD sales, climbed 2.0%, supported by solid growth related to nCounter Analysis systems. IVD sales increased 61.8% to $6.7 million, driven by increased testing volumes. Total consumables revenue rose 8.0% to $45.1 million.



Click to enlarge

Geographically, sales in the Americas grew the fastest, climbing 42.7% to $86.1 million. Sales for the region accounted for 75% of total company sales. Revenue in the EMEA region also delivered growth, advancing 17.8% to $21.8 million, accounting for 19% of company sales. Asia Pacific revenue, however, fell 8.4% to $7.0 million.

For the first quarter of 2018, NanoString expects products and service revenue to be between $16 million and $17 million, an increase of 4.4% on a mid-point basis. As for the full year, the company expects total revenue to be $100–$105 million, and its products and service sales to be $75–$80 million. This represents a decrease of 10.8% and 7.1% on a mid-point basis, respectively. Additionally, NanoString projects IVD sales to be $8–$9 million, while its collaboration revenue is expected to be $25 million.

Consumables Lift Pacific Biosciences' Product Growth

Q4 2017

Fourth quarter sales for Pacific Biosciences fell 3.1% to $24.9 million. Excluding contractual revenue, sales rose 2.3%, driven by Product revenue. During fourth quarter of 2016, Pacific Biosciences recorded $1.3 million of contractual revenue, as part of the Roche agreement.

Pacific Biosciences Q4 FY17			
	Rev. (M)	% Rev. Growth	% of Rev.
Product	$21.8	6.1%	88%
Service and Other	$3.1	-18.3%	12%

Click to enlarge

Product sales advanced 6.1% to $21.8 million for the quarter, heavily driven by consumables revenue. Consumables sales for the quarter vaulted 69.3% to $12.7 million, while instrument sales plunged 29.8% to $9.1 million. The strong consumables sales signifies an eighth consecutive quarter of consumables growth. Consumables sales accounted for 58% of Product sales, while instrument sales represented 42% of segment sales.

Service and Other revenue decreased 18.3% to $3.1 million, now accounting for just 12% of total company revenue.

FY 2017

Total revenue for the year increased 3.0% to $93.5 million. Excluding contractual revenue, sales jumped 18.9% with strong Product sales. In 2016, Pacific Biosciences benefited $12.1 million from contractual revenue due to the Roche agreement.

Pacific Biosciences FYE17			
	Rev. (M)	% Rev. Growth	% of Rev.
Product	$80.0	23.9%	86%
Service and Other	$13.4	-3.8%	14%

Click to enlarge

Product revenue leaped 23.9% to $80.0 million for the full year, driven by strong consumables sales. Consumables sales rose 74.7% to $41.4 million, driven by increased utilization on a rising installed number of Sequel systems. Instrument sales, however, decreased 5.8% to $38.6 million, primarily due to a large backlog of Sequel orders in late 2016 and early 2017. The company finished the year with over 370 PacBio systems.

Service and Other revenue slid 3.8% for the year, dropping down to $13.4 million. Service and Other revenues represented 14% of total company sales.

Geographically, sales in China accounted for 30% of total company sales. On another note, during the middle of first quarter 2018, many systems and businesses will halt due to Chinese New Years celebrations. As a result, Pacific Biosciences expects first quarter revenue to be sequentially lower than fourth quarter 2017 revenues, primarily due to a slowdown of sales in China. As for the full year, the company expects an increase of 20% to $112.0 million.

Automated Liquid Handling

Since the 1700s scientists have been using devices for volumetric analysis of liquid, but it was not until the 1960s that the first micropipettes were introduced. Handling liquids accurately is fundamental for the productivity of all life science laboratories and, therefore, significant technological advancements have been made since then. It was in the 1980s that the first true automated liquid handling workstation was introduced. These are systems that automatically dispense a select quantity of liquid into a container. The automation of repetitive liquid handling tasks ensures that laboratories reduce processing time, decrease sample contamination and increase accuracy. Included in this category are liquid dispensers, dilutors and XYZ workstations.

Liquid dispensers enable users to dispense an exact amount of reagent or sample into a microplate, tube or any other container. These are widely used for proteomics assays in high-throughput environments. Dilutors accurately dispense the medium or desired liquid into a container according to dilution instructions. This is particularly useful in microbiology and food testing laboratories, but other applications such as environmental analysis and forensics are also popular. The third type of instruments are XYZ workstations, the most popular in the liquid handling

category. These come in a variety of configurations that can suit any requirement and adapt to flexible throughputs. These systems act similarly to manual pipettes, holding and dispensing volume, typically with an arm that moves in the x, y and z directions, reaching across the platform.

The largest markets for automated liquid handlers are hospital and clinical, pharmaceutical and biotechnology labs. The need for accuracy in the clinical arena as well the large number of samples that those laboratories need to process daily make hospital and clinics a perfect target for automated liquid handling sales. The demand for routine tests, particularly nucleic acid–based ones as well as high-throughput ELISA applications, are fueling the demand in those industries. Pharma and biotech industries also have a particular need for precision in highly regulated environments that can be overcome by the use of automated systems to replace manual pipettes.

In 2017, the automated liquid handling market was around $900 million. Tecan is the market leader, with its Fluent automation solutions, first introduced in 2015, joining the well-known Freedom EVO and the Tecan D300e Digital Dispenser. The new systems have a precision down to 200 nL and rapid set-up of normalization, sample transfer and reagent distribution. Fluent Gx, a system specifically designed for regulated environments such as clinical laboratories, will be launched in 2018. PerkinElmer is the next largest vendor, with its JANUS workstation, which has been on the market for the last decade. Festo recently launched a novel capping/de-capping option as an add-on for the JANUS. The latest market releases were in February and include the MiniTasker from Sirius Automation and the SimPrep from Teledyne Technologies.

Automated Liquid Handlers at a Glance

Leading Vendors:

- Tecan
- PerkinElmer
- Beckman Coulter (Danaher)

Largest Markets:

- Hospital and Clinical
- Pharmaceutical
- Biotech

Instrument Cost:

- $10,000–$180,000

Biotechnology

Advances in stem cell biology have greatly accelerated research in regenerative medicine, defined as “a field that involves replacing, engineering, or regenerating human cells, tissues, or organs to establish, restore, or enhance normal function.” While there is still much progress to be made, specifically more widespread clinical benefits, the usage of cell-based products in regenerative medicine is key to innovation in the field.

The US FDA issues and enforces regulations to prevent the introduction and spreading of infectious diseases, and because the regulatory framework is based on risk levels, human cells, tissues, and cellular and tissue-based products are split into categories that require and do not require premarket approval. Biologic products are regulated under this framework as requiring to be studied for investigational new drugs, with manufacturers of biologics needing to submit a biologics license application to the FDA for approval before marketing the product or using it in clinical trials. This process can be drawn out and cumbersome, so the FDA has established expedited programs for new therapy development, especially if the therapy is aimed at life threatening conditions. One of these programs is the expedited program for Regenerative Medicine Advanced Therapies (RMAT), part of the 21st Century Cures Act. As of the end of 2017, the FDA had processed 43 requests for products to designated as RMAT and receive expedited approval, acting on 35 of them and granting the designation to 13 of them.

The FDA is also incorporating new expedited processes for companies to obtain approval, such as providing tools to

incentivize small groups of doctors to collaborate on a regenerative medicine product, which will lead to each of the members of the groups receiving a biologics license. The manufacturers of the product would need to agree on a common manufacturing process and a common clinical trial process, and then the sites that are participating in the clinical trial would submit efficacy data as part of a biologics application. If there is a favorable benefit-risk profile, the FDA may use that data to determine the safety and efficacy of the drug, expediting the process.

Source: *The New England Journal of Medicine*

Pharmaceuticals

Artificial Intelligence (AI) is predicted to be a major driver of growth in the pharmaceutical industry, and drug manufacturers and technology companies are investing billions of dollars in AI due to its promise to make drug discovery more cost effective and efficient. On average, the timespan for taking a drug from research lab to commercialization is 10 years, with a price tag of approximately $2.6 billion. Using AI in drug discovery can provide numerous benefits and address many challenges in the process, and hopefully speed up the time and lower the price that is needed to bring a drug to market. As of the end of February, Toronto-based biotechnology firm BenchSci cited 16 pharmaceutical companies and over 60 startups as using AI for the drug discovery process.

Some of the major challenges in drug discovery lie in the early stages of R&D; specifically, the time it takes to establish a possible disease target, which is usually in the form of a protein within the body, and conduct tests to determine if the drug candidate will be able to reach that disease target. Generally, this process can take 4–6 years. Many AI groups are aiming to lessen that time dramatically such as ATOM, a private-public AI consortium, which is aiming to compress the process into just one year. London-based BenevolentAI, known as the largest AI company in Europe, has estimated that its AI capabilities can slash drug discovery costs by 60% and lessen drug design time from 3 years to 1. AI has also proven to help with effective combination therapies for HIV, hypertension, infectious diseases and cancer.

While the potential of AI is extremely promising, a major challenge that remains is ensuring the data the AI is working with is reliable, as AI is only as good as the data that it processes. Scientists will still have to train the computers on what to look for to ensure that the algorithms the AI is using are actually meaningful.

Source: *NBC News MACH*

Government

Earlier this month, the NIH announced the development of a “Strategic Plan for Data Science” for establishing its objectives and implementation methods for the modernization of data science, defined by the NIH as “the interdisciplinary field of inquiry in which quantitative and analytical approaches, processes and systems are developed and used to extract knowledge and insights from increasingly large and/or complex sets of data.” Genomics data in particular is forecast to grow exponentially, equaling or exceeding data from astronomy, YouTube and Twitter, the three major data producers. Moreover, advances in computer technology are aiming for exascale-level computing, which computes a quintillion, or 10^{18}, calculations per second. These supercomputers are thought to open new doors for biomedical research, which will be the main driver of the advanced technology due to its data-intensive nature. Programs likely to adopt exascale-level computing include the All of Us Research Program and the Cancer Moonshot program of the Precision Medicine Initiative, as well as the Human Connectome project and the BRAIN initiative.

In order to manage the vast amounts of data needed to advance biomedical research, the NIH posited in its Strategic Plan five overarching goals: the need for a common software-as-a-service data infrastructure that individual researchers, institutions and scientific communities will be able to access and build upon; a modernized data ecosystem with improved integration of clinical and observational data into biomedical data science, as well as enhanced storage and sharing of datasets; better data management, analytics and tools to drive efficiency and more

productive workflows, including improved discovery and cataloguing resources; an expanded NIH data science workforce; and the establishment of policies for a data system that is Findable, Accessible, Interoperable and Reusable (FAIR).

Source: *NIH*

Korea

Korea: Korea's 2018 R&D budget grew 1.1%, totaling $19.66 billion. With the federal government's budget at $428.8 billion, the raise in R&D funding is minimal at best, and is mostly due to a general slowing of economic growth, youth unemployment and increased welfare demand. The largest portion of the 2018 R&D budget is allocated to the Ministry of Science and ICT, which received $6.73 billion, or 34% of the entire budget. The Ministry of Trade, Industry and Energy was allocated $3.16 billion, or 16%, while the Defense Acquisition Program Administration received $2.9 billion, or 15%. Approximately 9% of the R&D budget, or $1.74 billion, was given to the Ministry of Education, and the Ministry of SMEs and Startups received $1.91 billion, representing 6% of the total budget. These five ministries were allocated approximately 80% of the entire budget, and the remaining capital was received by the Rural Development Administration, Ministry of Oceans and Fisheries and other departments.

Out of the nine scientific fields (biotechnology; information and electronics; space, aviation and oceans; energy and resources; machine, manufacturing and production; basic science; materials and nanotechnology; construction, transportation and safety; environment; and others), biotechnology R&D received the greatest amount at $2.86 billion. Information and electronics followed with $2.60 billion, and energy and resources was allocated $1.60 billion. Basic science received $1.31 billion, while materials and nanotechnology was allocated $1.01 billion.

In 2018, the government intends to spend $1.52 billion of its R&D budget on advances in technology development, focusing on five investment categories: basic science, including brain science and industrial mathematics; core technologies, including AI, big data and IoT; communications such as mobile communications and semiconductors; convergence technologies like self-driving vehicles and drones; and laws and policies for fields such as AI ethics and data IP.

Source: *Korea Institute of Science & Technology Evaluation and Planning*

EU

Companies and authority agencies in the EU are slowing phasing out the usage of dangerous chemicals and substances, thanks to Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) regulation, according to the European Commission in a review published earlier this month. REACH has issued 18 restrictions for various dangerous substance groups while providing safer alternatives, and also has promoted non-animal testing for chemical hazard assessment, providing approximately €40 million ($49.7 million) per year between 2012 and 2016 for research on alternative testing methods.

In the review, the Commission concluded that REACH is steadily attaining its initial expectations, although there is still some progress to be made. The review stated that the registration process for companies, especially small- and medium-sized enterprises, to authorize the usage of certain chemicals needs to be more efficient and less bureaucratic to help encourage companies to update their dossiers of registered chemical substances. It also stated that substances of concern in the supply chain are to be monitored, with the possibility of creating a tracking system to improve the usage of Substances of Very High Concern (SVHC). The Commission, European Chemicals Agency and member states are also called to facilitate a substitution for SVHCs through the establishment of collaborative networks and encourage R&D investments in more sustainable innovations. The Commission will consider further recommendations by the first quarter of 2019.

Source: *European Commission*

Italy

With the mixed results of the Italian election in earlier this month, Italian researchers are worried that science will not receive a boost in funding. The lack of a coalition government results in uncertainty for scientists, as most parties have not put an emphasis on accelerating science, and the state of R&D in the country is in a precarious condition.

Although Italy excels in biomedicine and particle physics, consistently low budgets, overly bureaucratic academic hiring processes and politically limited research organizations have contributed to the stagnation of Italy's science and research system. The center-left coalition government, led by a member of the Democratic Party, has proposed initiatives such as establishing the Human Technopole, a €1.5 billion ($1.9 billion) Milan-based research center for genomics and personalized medicine.

Italian research institutions require higher budgets to fulfill their goals, but the country, which has traditionally been on the lower end of R&D spending in the EU, has not experienced a rise in funding, with its R&D spending plummeting 20%, or €1.2 billion ($1.5 billion) since 2008 to total €8.7 billion ($10.8 billion) in 2016. Over the same time period, university funding has also dropped approximately 20% to €7 billion ($8.7 billion). Public research institute funding has remained the same since 2008, a 9% decline in real terms. The country also has an extremely high deficit, making it unlikely that the science funding system will change in the near future.

Source: *Nature*

Surface Science

Company Announcements

In February, AFM firm **Park Systems** celebrated the grand opening of its European headquarters in Mannheim, Germany. The site features a fully equipped AFM nanoscience lab.

In February, **Prior Scientific Instruments**, a manufacturer of precision optical and mechanical instrumentation, announced the purchase **Queensgate Instruments** from **Elektron Technology** for £0.8 million ($1.1 million) and additional cash based on a future sales target. Queensgate is a leading supplier of high-precision nanopositioning systems and sensors. For the fiscal year ending January 31, 2017, Queensgate's revenues totaled £0.7 million ($0.9 million).

The Saudi Gazette reported in March that the **King Abdullah University of Science and Technologies** (KAUST) has officially opened a new Center for Excellence for Optical Microscopy, a partnership between KAUST and **Leica Microsystems**. Systems to be used at the Center include Leica's SP8 confocal platform for super-resolution microscopy.

Product Introductions

Oxford Instruments Asylum Research introduced in January the price-competitive MFP-3D Origin+ AFM, which complements the existing Origin AFM with a broader range of imaging modes and accessories. The package includes the AFM, a 120 µm range X-Y closed-loop scanner and more than 20 imaging modes.

In February, **Oxford Instruments Asylum Research** announced the development of an interferometric displacement sensor that provides a direct measure of AFM cantilever displacement. According to the company, the sensor will be useful in characterizing and advancing techniques for nanomechanics.

In January, **Olympus** launched two new Olympus TruResolution objectives for its multiphoton laser scanning microscopes, which deliver what the company calls an industry-first automatic spherical aberration compensation function that also compensates for Z-shifts when operating the collection collar. For use with the FLUOVIEW FVMPE-RS microscope, the new objectives were developed jointly with the **RIKEN Brain Science Institute** in Japan to address challenges in neuroscience.

EDAX, an **AMETEK** company, released in January the latest revision of its APEX Analysis software, which is now available for the Octane Elect EDS system as well as the Element EDS system. New features include advanced reporting, drift correction and dynamic element mapping.

In February, **PicoQuant** and **Ionovation** announced an integrated platform combining their respective MicroTime 200 time-resolved microscope platform and PicoTweezers optical tweezers. This allows the use of time-resolved fluorescence microscopy on fixed cells.

Camera designer and manufacturer **Photometrics**, instrument manufacturer **Cairn Research** and system developer **Mizar Imaging** announced a partnership in February creating the MizarTILT light-sheet fluorescence microscopy conversion system combined with Photometrics' Prime 95B CMOS camera. The combination maximizes the light gathering effectiveness of high-power objectives, and allows high magnification and high-resolution imaging.

In March, **Thermo Fisher Scientific** launched the Thermo Scientific Verios G4 extreme high-resolution SEM for semiconductor applications such as determining root cause defects, yield losses, and process and product failures. The company also debuted the Thermo Scientific Hyperion II Fast Nanoprober, which, according to the company, is the only commercially available nanoprober based on an AFM.

Sales and Orders of Note

In February, **JEOL UK** announced that the **Scottish Cryo-EM consortium** chose its JEM-Z300FSC CRYO ARM 300 Cryo Electron TEM for the Scottish Centre for Macromolecular Imaging. The system will be supported by a second TEM, the JEOL 200 kV JEM-F200 "F2" Cryo-TEM.

The UK's **Rosalind Franklin Institute** announced a £1.55 million ($2.2 million) investment to develop a time-resolved high-resoultion TEM, manufactured by **JEOL**, as the first stage of a £10 million ($14.1 million) project to build a microscope that will be the first of its kind.

Broad-Based Companies

Company Announcements

Genedata, **HighRes Biosolutions** and **Titian Software** announced in January a partnership to automate an end-to-end screening solution for sample logistics for automation to analysis and back. HighRes' Cellario platform has been integrated with Genedata Screener, which is already integrated with Titian's Mosaic sample management solution.

Teledyne Technologies' 2017 revenues for its Environmental Instruments business grew 16.4% to $314.4 million, or 33% of the company's Instrumentation business segment.

Danaher announced in an **SEC** filing that Robert J. Hugin retired from the Board, effective February 19, in connection with his candidacy for the **US Senate**.

In February, **Bio-Rad Laboratories** announced in an **SEC** filing that John Goetz, executive vice president and COO, will retire, effective March 30.

Merck KGaA announced in February a $47 million investment over two years in manufacturing and distribution in

Asia. The company plans to open a new 109,000 ft^2 (10,126 m^2) facility in Incheon, South Korea, in the fourth quarter of 2019 that will include infrastructure to supply customers in the country as well as advanced cell culture media manufacturing capabilities. The company will also open a new 129,000 ft^2 (11,984 m^2) manufacturing and distribution center in Mumbai, India. In 2018, Merck KGaA will invest in a Mobius single-use manufacturing facility in Wuxi, China, to reduce lead time by 50%.

In February, **Merck KGaA Life Science** announced nine new or expanded partnerships with nonprofit organizations to accelerate scientific research and education.

In February, **Bruker** announced that Senior Vice President and CFO Anthony L. Mattacchione will resign effective March 16. He has accepted a position as CFO of **Albany Molecular Research**.

Bruker named Gerald N. Herman as interim CFO, effective March 17. Mr. Herman is the company's principal accounting officer.

In March, **Illumina** appointed Dr. Phil Febbo as Chief Medical Officer (CMO), effective March 26. He will be responsible for developing and executing on the company's medical strategy to drive genomic testing into healthcare practice. Most recently, he served as CMO of **Genomic Health**, which develops genome-based diagnostic tests.

Product Introductions

In February, **Agilent Technologies** announced on its quarterly conference call that it has launched Agilent Care to expand solution support past the traditional period of the first 90 days of ownership. The company also expanded its CrossLab Service Guarantee to its multivendor service business, which will replace a non-Agilent instrument that cannot be repaired with an Agilent instrument. The company also highlighted the launch of its ValueLab line of consumables in China.

Sales and Orders of Notes

In March, **Northern Illinois University** announced that its Division of Research and Innovation Partnerships has launched a five-year equipment-purchase program with **Shimadzu Scientific Instruments**. The University will receive the instruments at a discounted rate, a suite of software, and technical support and maintenance through the Shimadzu Partnership for Academics, Research and Quality of Life initiative. Instruments covered under the agreement are an XRF spectrometer, GC/MS system, and triple quadrupole and MALDI TOF MS systems.

Sample Preparation

Company Announcements

In December 2017, **Porvair** announced a collaboration with **Suzhou Tianlong Bio Technology**, together with **Swansea University** and **Xi'an Jiaotong University**, for the "Automating & Stratification of Epigenetics in Healthcare" project. The project combine's Porvair's Chromatrap solid state ChIP platform with Tianlong's expertise in automated robotic technologies and diagnostic multiplex PCR kits.

In February, **Zymo Research** announced a partnership with the **Blue Carbon Lab** academic research group for the TeaComposition H_2O project, which will link litter decomposition with the microbial communities driving the process in order to inform nature-based climate change–mitigation initiatives involving wetlands. Zymo is donating its DNA/RNA Shield collection devices, ZymoBIOMICS Microbial Community Standards and ZymoBIOMICS DNA Miniprep Kit, as well as providing services at a reduced cost.

In February, **VWR** agreed to exclusively offer **Hamilton Bonaduz**'s Hamilton Microlab Firefly NIMBUS and STAR

line of platforms as part of a packing with reagents from **Omega Bio-tek** (see below) in Europe.

Product Introductions

Promega introduced in November 2017 the Maxwell RSC PureFood Pathogen Kit for automated DNA purification for PCR-based testing of food pathogens. It can effectively purify DNA from 1–16 food matrix samples in 40 minutes.

LigaTrap Technologies announced in January that it now offers its protein purification platform in prepacked columns for fast protein LC. LigaTrap offers a novel series of affinity ligands specific for the purification of monoclonal and polyclonal immunoglobulins from various species.

In January, **Waters** launched the Waters Oasis PRiME MCX Cartridges and 96-Well Plates for LC and LC/MS quantification based on a mixed-mode (reversed phase and cation exchange) sorbent. Employing simple 3- and 4-step protocols, no conditioning or equilibration steps are required prior to use.

In February, **Analytik Jena** debuted a fully automated system solution for its SmartExtraction process based on the CyBio FeliX liquid handling system. SmartExtraction enables the modeling of the entire nucleic acid extraction process within one pipette tip using simple pipetting steps.

Phenomenex introduced in February the Strata DE, a new supported liquid extraction sorbent employing diatomaceous earth. It features a simple two-step method and removes interferences without emulsions.

Biotage introduced in February the ISOLUTE HYDRO DME+ fixed well plates and columns for the efficient removal of matrix components from urine using a simple pass-through workflow. The Dual Mode Extraction (DME) technology uses a combination of liquid partitioning and scavenging modes.

Omega Bio-tek launched in February the Mag-Bind Blood DNA HV Kit for the extraction of genomic DNA from large-volume blood samples (up to 10 mL) in a fully automated solution. It is used with the Hamilton Microlab STAR liquid handling platform.

In February, **Circulomics** announced early access to its kits for performing high–molecular weight DNA extraction for long read sequencing and genome mapping. The company's Nanobind technology uses a single magnetic disk that contains a high density of micro and nanostructured silica on the surface. Currently available are the Nanobind CBB Big DNA Kit as a beta kit and the Nanobind Plant Nuclei Big DNA Kit as an alpha kit.

In February, **Gilson** introduced the ASPEC Positive Pressure Manifold for SPE. The universal design makes it compatible with popular formats, including 1 mL, 3 mL and 6 mL SPE tabbed and tabless cartridges, and 96-well SPE plates.

Materials Characterization

Company Announcements

Spectradyne announced in December 2017 distribution agreements with **Meritics** for the UK and **Anasysta** for Europe.

In January, **Datacolor** announced the establishment of a sales and support organization in Ho Chi Minh City, Vietnam, its 14th branch office.

In January, **TA Instruments** named **Gulf Bio Analytical Group of Companies** as its exclusive distributor for Saudi Arabia.

FRITSCH announced in March the opening of FRITSCH Milling & Sizing, a new US sales and support center in North Carolina.

Product Introductions

In January, **PAC**, a **Roper Technologies** company, released the OptiMPP Mini Cloud & Pour Point analyzer, which uses 0.5 mL of sample. Results are available in 20 minutes for a -30ºC pour point.

In March, **PAC** introduced the Phase Technology DFA-70Xi calling it the first 4-in-1 analyzer that tests diesel fuel viscosity, density, cloud and pour point. It performs all 4 tests in under 25 minutes and does not require an external liquid bath.

Hitachi High-Tech Science introduced in February the EMA thermal analysis software, featuring a new guidance function that easily sets optimal measurement conditions for each testing method established by standards organizations. It includes a new image data editing function for images acquired using the sample observation option during thermal analysis.

In February**, Mitutoyo America** launched the HR-530 Series Hardness Testers, available in two models (HR-530 and HR-530L). A unique electronic control gives it capabilities for Rockwell, Rockwell Superficial, Rockwell testing of plastics (A & B) and Light Force Brinell hardness testing.

Grabner Instruments, part of **AMETEK Oil & Gas**, released in February the Cockpit Statistical Quality Control (SQC) software to support the MINIVAP VP Vision vapor pressure tester. The software certifies the quality of the stability, precision and accuracy of petroleum testing and is available under a freemium model. Cockpit SQC plots data in I-charts, MR of two-charts and normal probability charts. In contrast, Cockpit Basic includes features for device configuration, device calibration, firmware update and import of on-site measurements to a central database.

Sales and Orders of Note

In February, **PAC** announced the sale of 40 physical property testing instruments represented by PAC's Herzog- and ISL brands, via systems integrator **OCS**, to Malaysia-based **Petroliam Nasional Berhad (Petronas)**. They are scheduled to be installed mid-2018.

Reported Financial Results

$ in Millions USD	Period	Ended	Sales	Chg.	Op. Prof.	Chg.	Net Prof.	Chg.
Bioanalytical Systems (Products)	Q1	31-Dec	$0.9	-6.4%	($0.2)	4.5%	NA	NA
Brooks Automation (Life Science)	Q1	31-Dec	$47.0	42.0%	($0.1)	NM	NA	NA
IDEX (Health & Sci. Tech)	Q4	31-Dec	$208.9	10.9%	$45.0	29.6%	NA	NA
IDEX (Health & Sci. Tech)	FYE	31-Dec	$820.1	10.1%	$179.6	16.8%	NA	NA
Meridian Bioscience (Life Science)	Q1	31-Dec	$14.8	13.8%	$2.8	-14.8%	NA	NA
NanoString Technologies	Q4	31-Dec	$35.2	39.6%	($7.4)	25.3%	($8.8)	24.5%
NanoString Technologies	FYE	31-Dec	$114.9	32.9%	($38.2)	7.2%	($43.6)	7.5%
Other Currencies (in Millions)								
Borosil Glassworks (Scientificware)	Q3	31-Dec	INR 375.2	14.3%	INR 81.2	12.3%	NA	NA
Borosil Glassworks (Scientificware)	9 mo.	31-Dec	INR 930.5	5.3%	INR 176.0	1.2%	NA	NA
ChemoMetec	H1	31-Dec	DKK 53.6	26.2%	DKK 13.1	147.2%	NA	NA
Eurotech	FYE	31-Dec	€ 60.1	-1.6%	(€ 3.0)	46.4%	(€ 4.7)	7.8%
GL Sciences	Q3	31-Dec	¥5,919.3	16.2%	¥808.8	18.6%	¥400.9	9.1%
GL Sciences	9 mo.	31-Dec	¥16,737.3	15.9%	¥1,891.8	38.6%	¥1,173.9	47.4%
Jiangsu Skyray Instruments	FYE	31-Dec	CNY 791.8	84.0%	CNY 117.7	199.8%	CNY 97.5	74.9%
Merck KGaA (Life Science)	FYE	31-Dec	€1,496.0	3.8%	€156.0	122.9%	NA	NA
Tecan	FYE	31-Dec	CHF 548.4	8.3%	CHF 80.5	18.1%	CHF 66.5	22.0%
Tecan (Life Sciences)	FYE	31-Dec	CHF 306.9	9.5%	CHF 50.5	10.6%	NA	NA
Tecan (Partnering)	FYE	31-Dec	CHF 241.5	6.9%	CHF 42.6	26.2%	NA	NA

NA = not available; NM = not meaningful