



IBO

Strategic Information for the
Life Science and Analytical
Instrument Industry

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Danaher to Become Major Player in Bioprocessing Market

Danaher announced this week that it will purchase GE's \$3.2 billion BioPharma business (see [Executive Briefing](#)). Danaher will pay \$21.4 billion, or \$20 billion after tax benefits. Danaher's largest acquisition to date, the purchase is in many ways a culmination of Danaher's commitment to the bioprocessing market. The acquisition will add GE BioPharma's approximately \$2.7 billion bioprocessing business to Danaher's existing Pall bioprocessing business, which has estimated sales of approximately \$1 billion, according to a 2018 Danaher investor presentation.

With a bioprocess business that will be an estimated \$2.8 billion (excluding cell and gene therapy products), Danaher’s footprint in the market will resemble Merck KGaA, Sartorius and Thermo Fisher Scientific. In 2018, Sartorius Bioprocessing Solutions recorded €1.2 billion (\$1.4 billion at €0.85 = \$1) in revenue. In the first nine months of 2018, Merck Life Science’s Process Solutions business generated €1.8 billion (\$2.1 billion) in sales. Annual revenues for Thermo Fisher Scientific’s Bioproduction business totaled \$1.3 billion (through the first quarter of 2018).

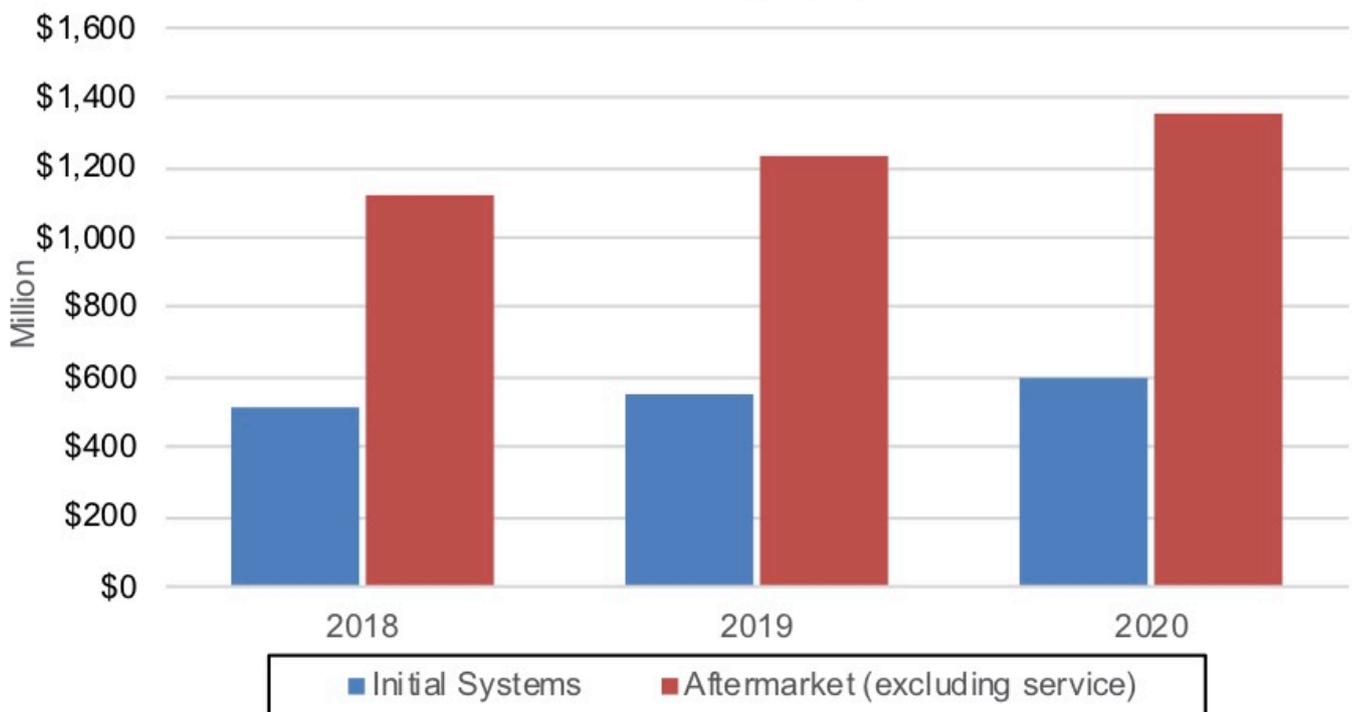
GE BioPharma will join Danaher’s \$6.5 billion Life Sciences business segment. As Danaher President and CEO Thomas P. Joyce, Jr. stated on a call with investors following the announcement, “We will have nearly doubled our exposure in the biologics end-market, which will represent approximately 50% of our Life Sciences revenue of \$10 billion.” Danaher has emphasized the strategic priority of biopharma manufacturing tools to the company due to the rapidly growing market for biologic drugs and the high percentage of consumables sales, which are also specified into product manufacturing going forward, providing captive user base. Seventy-five percent of GE BioPharma’s revenues are recurring.

New Opportunities

Danaher expects GE BioPharma’s core revenues to grow 6%-7% annually, according to the call, generally the same as its recent performance, which was characterized on the call as high single digits over the past three years. The BioProcess portfolio of GE BioPharma’s business is made up of product offerings for both upstream and downstream bioprocessing. With expected 2019 revenue of \$1.1 billion and an organic revenue growth rate of 5%-6%, GE BioPharma’s upstream offerings include cell culture and media, bioreactors and fiber cartridges for microfiltration.

GE BioPharma’s downstream business is estimated to record 2019 revenue of \$1.7 billion, according to the call, and currently has an organic revenue growth rate of 7%-8%. Downstream solutions include pilot and process LC systems, columns and resins, cell culture media, software and service. On the call, Danaher highlighted BioPharma’s process chromatography business, which considerably expands Pall’s LC business, as well as compliments Pall’s filtration business. “This combination will help increase our visibility to monoclonal antibody, vaccine and gene therapy projects in development, representing a growth acceleration opportunity in the future,” noted Mr. Joyce.

Process Chromatography Market



Source: SDI

According to SDi's recent market report, "[Bioprocessing Technologies 2018](#)," GE holds the largest market share in the process chromatography market (defined as systems, aftermarket and service). Competitors in this market include Merck KGaA and Novasep. "From a share position standpoint, we feel very good about not only the stability of the share position of the business on a downstream basis but the opportunities, again over a longer period of time, as we continue to advance our tools around funnel management and market visibility to enhance that share position, again, over time," commented Mr. Joyce.

The purchase also establishes Danaher's position in the cell culture media market for biotech manufacturing, where competitors include Thermo Fisher Scientific and Merck KGaA. SDi estimates that bioprocessing cell culture media and supplements demand topped \$2.5 billion last year. It follows other recent changes in the cell culture business for bioprocess manufacturing, such as Thermo Fisher Scientific's purchase of Becton, Dickinson's \$100 million Advanced Bioprocessing business last year (see [IBO 9/15/18](#)), which includes cell culture products, and Sartorius' decision to transition to supplying some of its own cell culture products, ending an exclusive agreement with Lonza (see [IBO 1/31/19](#)).

The BioProcess unit also offers single-use systems, including bags and tubing, connectors, process liquids, the FlexFactory configurable platform, and application services. Pall's single-use portfolio offers similar product types and the purchase will help provide end-to-end solutions for single use bioprocess, according to Mr. Joyce. Both Danaher and GE have noted in the past the rapid growth of its single use systems businesses. A recent Danaher presentation reported that Pall's single-use business totals approximately \$300 million.

In addition to the BioProcess, business, Danaher also gains two other GE BioPharma business segments, whose sales total \$400 million, according to the call. GE BioPharma's cell and gene therapy portfolio includes cell banking and cell processing products such as a cell separation system, a cell expansion system and cell culture media. The acquisition also includes GE BioPharma's research and pharmaceutical development portfolio, offering consumables such as sample preparation kits, genomics consumables and lab filtration, as well as system for electrophoresis, high-content imaging and SPR, among other products. This is expected to complement Danaher's existing offerings for biologics development and genomics workflows. The two businesses have organic growth rates in the low to mid-single digit core, led by cell therapy product sales, as stated on the call.

Financial Returns

The \$21.4 billion acquisition is valued at 17x 2019 estimated EBITDA. The deal will be financed by cash, new debt and credit facilities, as well as an equity offering. Danaher has already filed a share offering for \$1.35 billion of shares of common stock and \$1.35 billion of shares of Series A Mandatory Convertible Preferred Stock. Proceeds are anticipated to be \$1.31 billion and \$1.45 billion, respectively, excluding the underwriters' option to exercise shares. At the end of 2018, Danaher's consolidated debt totaled \$9.7 billion. Following the announcement, Moody's noted that upon completion of the deal, Danaher's pro forma debt to EBITDA will be 4x.

Annual costs savings for Danaher in the first three full years are estimated at over \$100 million, with a high-single digit return on invested capital expected in the fifth year following the purchase. But as a carve out from GE, Danaher is primarily focused on setting the business up as a standalone business, rather than immediate cost and sales synergies, according to Mr. Joyce. "The carve out components are really focused largely on the G&A side, IT, finance, HR, legal, etc.," he explained. "Keep in mind, the core direct components of this business we get [are a] tremendous R&D team, a fantastic commercial sales and marketing team, and so we'll be focused on other areas to take cost out on a non-customer facing basis." GE BioPharma's carve out from GE Healthcare will lead to a simplified structure and greater focus, emphasized Mr. Joyce. He expects most sales and channel synergies with the Pall bioprocess business to play out over the long term.

In connection with the deal, Danaher also announced changes in its plans for its Dental business spin-off (see [IBO 7/31/18](#)). The spin-off will now be completed via an IPO, with Danaher stating that this change gives it greater balance sheet flexibility. Although the final number of Dental shares to be offered is not yet finalized, on the call, the company estimated an initial offering of 19.9% of shares. The spin-off remains scheduled for the latter half of this year.



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Year Forecast

- This report provides detailed data on every major life science and analytical instrument technology in the industry, enabling you and your staff to make accurate evaluations and informed decisions.
- Includes market sizing for **2018 and forecasts through 2023**.
- Each instrument technique includes data and discussion of market segmentation by **product, industry, function, and region**.
- **Vendor share data** for 2018, a chart of vendor participation versus product area for all significant suppliers.
- A brief description of **related business developments** and/or significant product introductions for each instrument technique section.

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Dairy Testing: Feeding Molecular Spectroscopy Demand

As with many sectors of the food market, the dairy and dairy product industry is evolving. A growing world population, rising standards of living in developing nations and increases in product variety are reshaping the industry. In addition, food safety issues and the industry's need to increase productivity are influencing the requirements of dairy processors and producers. In 2018, milk output alone totaled 827 million tons, a 2.0% increase, according to the UN Food and Agriculture Organization. A 2018 report from the OECD stated that fresh dairy product consumption will increase 2.1% annually over the next 10 years, while consumption of processed dairy products will increase 1.9% annually.

Molecular spectroscopy is widely used in dairy processing, particularly for QA/QC, where techniques such as FTIR and NIR rapidly and inexpensively screen milk to quantify compositional components, most prominently, protein, fat and total solids. Such techniques are non-destructive, require little to no sample preparation and can measure several components simultaneously. The interest in the market from molecular spectroscopy companies is evident by acquisitions in recent years and ongoing product innovation. As part of its expanding footprint in the food market, PerkinElmer acquired Perten Instruments in 2014 (see [IBO 11/30/14](#)) and Delta Instruments two years later (see [IBO 2/29/16](#)), both of which provide FTIR and NIR systems specifically made for dairy testing. Last year, Bruker added to its molecular spectroscopy offerings for dairy testing with the purchase of milk analyzer company Lactotronic (see [IBO 7/15/18](#)). Other companies providing dedicated milk testing systems include FOSS and Unity Scientific.

In this article, **IBO** examines what has made the QA/QC dairy testing end-market so attractive to molecular spectroscopy companies, finding that technology advances, new applications and novel product types are making testing more critical.

Selected Parameters Measured by FTIR and NIR in Dairy Products

added water, butterfat, casein, citric acid, density, free fatty acids, lactose, moisture, protein, nonfat solids, nonprotein nitrogen/calculated urea, other carbohydrates, pH, salt, total solids, true protein

Source: Company information

[Click to enlarge](#)

Improvements in the instruments themselves have enhanced the use of FTIR and NIR techniques for dairy QA/QC. Steve Holroyd, PhD, technical manager—Analytical, at Forterra, a global milk and dairy product company, highlighted for **IBO** improvements in the stability of different units of the same instrument from the same supplier. “Each instrument would give us a slightly unique result; similar but slightly unique,” he observed. “Over the last 10 years, we’ve seen a lot of progression toward the instruments being more similar to each other.” This has improved confidence in testing results. “A company like Fonterra, and this is true of any global key accounts that the vendors have, we have lots of instruments in different sites, and we want to know that they all go for the same result or very similar result.” He admits, “It’s not perfect. There’s still considerable room for improvement.”

Instrument Stability

The improvements in instrument stability have also enabled greater utilization and productivity for dairy processors through faster calibration and greater connectivity, according to marketing manager Dagmar Behmer, MarkNIR & Process Technology, Bruker Optics. “The more stable an instrument setup is (i.e., no drifting with temperature, more robustness in terms of vibrations, etc.), the more likely a calibration model set up on one instrument can be ported to other instruments of the same kind, even across different models without any modification. Here, systems utilizing cube corner interferometers have a distinct advantage.” These improvements have also enabled a higher degree of multi-instrument control. “Robust instruments are a prerequisite for universal calibration models. Part of our business is to develop calibration models, e.g., for the dairy industry, that can run with the same performance in a large network of FT-NIR instruments,” she explained.

Bruker provides FT-NIR and IR lab and process testing systems for dairy product QA/QC. “Bruker developed over the last years a unique portfolio—from standard IR analyzers for raw milk, processed milk and other basic liquid products, like skim milk, whey and cream, to sophisticated FT-NIR solutions for any liquid, semi-solid and solid samples,” noted Ms. Behmer. “Bruker’s MPA II-D FT-NIR spectrometer offers significant advantages compared to classical FT-MIR analyzers: It can measure liquid samples types even with higher viscosity like whey protein concentrates, infant formula liquid and sweetened condensed milk. With the same instrument setup, solid and semi-solid samples like milk powder, cheese, yogurt or butter can be analyzed. We believe to gain bigger market shares, thanks to this unique technology.”

Wopke Beukema, Dairy Market manager for PerkinElmer, attributes the greater instrument stability to changes in both hardware and software. “On hardware, the real breakthrough with FTIR spectroscopy came with the implementation of lasers (in the ‘80s) into the optical system to track mirror movement. Since then, there have been many improvements to optics quality, detectors and reductions in electronic noise.” PerkinElmer uses the same type of optics in all its IR dairy analyzers, explained Mr. Beukema. “Other hardware variations have been reduced to an absolute minimum. This is a great advantage with spectra among different types of instruments being shared and used for building better calibrations.”

Software

On the software side, and its impact on instrument stability, Mr. Beukema noted the changes in chemometrics and data processing made possible by faster computer processing speeds and the use of PCs. “As processor speeds have increased, so has the ability to perform more complex data analysis and calibration algorithms,” he noted. “These algorithms further help reduce ‘uninteresting’ sources of variation, such as instrument and sample matrix (i.e., natural variation of food products not associated with measurement of interest—protein, fat, etc.)”

PerkinElmer provides FTIR, MIR, FT-NIR, and NIR systems for dairy testing, including several dedicated systems, as part of the company's wider offering of food analysis solutions. "With food regulations always on the rise and growing consumer awareness and demand around food safety, quality and nutrition, advanced food analysis is key for the dairy and food industry, and PerkinElmer has the technologies, software and services to help," stated Mr. Beukema. "With Delta and Perten's history in dairy, PerkinElmer is well-positioned to provide scientists and other testers/analyzers with specific features and applications for current and future dairy products." The company's dairy analysis products include Perten's LactoScope FTIR Milk Analyzer and the PerkinElmer DairyGaurd FT-NIR system.

Software development has led to cost saving as well as greater automation, Dr. Holroyd observed. For example, he said, instead of individuals calibrating instruments separately in labs around the world, instrument calibration is now done remotely. "We've put in a lot of investment and work with the vendors on networking instruments together so we can support large networks of instruments. [This] saves a company like Fonterra a lot of money."

In addition to improved networking and instrument control, other software developments are emerging. "Moving forward, the actual instrumentation itself will be an important component of required solutions, but only a component," explained Mr. Beukema. "System integration (including on-line analyzers), data handling, data access, database management, material tracking, and rapid response support services and calibration/method development will all help molecular spectroscopy techniques to proliferate in dairy."

Applications

Noting other areas of improvement in the use of FTIR and NIR for dairy QA/QC, Dr. Holroyd also cited cost of ownership and vendor support. "The vendors have put a lot of work into making sure [the instruments] don't need a lot of maintenance, or if they do, the predictive maintenance is really up to scratch, so the instruments don't break down or fall over—that [the vendors] should understand the performance of the instrument over a lifetime and how to adequately support it without putting a significant burden onto the customer." These improvements also include instruments that are easier to maintain.

The greater stability and usability, and thus higher confidence in results, is even more important now, as the technology is being asked to do more complex applications, according to Dr. Holroyd. "[W]e're increasingly using applications for these instruments that utilize much more of the spectral range of the instrument," he explained. "Because we're using lots of information, very small differences between the instruments can mean significant differences in results."

Describing such an application, Dr. Holroyd explained, "Typically, they are new QA-type applications. So we might be looking at detecting, for example, something like food fraud." Food fraud can take the form of adulteration, mislabeling and counterfeiting, among other types. "The addition of melamine to falsely augment protein in China in 2008 (see [IBO 12/15/08](#)) was a classic example, but the addition of water or other substances that appear to enhance milk fat or protein levels are all risks," he said.

Mr. Beukema also highlighted the analysis of adulterants as an increasingly important application for compositional testing of dairy using FTIR and NIR. "[A]dulterants analysis is one of the fastest growing applications, as the conversation around food safety is increasingly in the public eye and driving more consumer education and awareness daily," he noted. "The melamine issue in China is one example that readily comes to mind. Rapid and robust test solutions are important here to identify adulterants across the dairy product ecosystem."

"Typically, the instruments have been designed for targeted applications in QA/QC, but as we roll out more and more non-targeted applications the requirements of the instrument are more stringent."

Such an application is also an example of new types of non-targeted QA/QC analysis that are being implemented by dairy processors. "Typically, the instruments have been designed for targeted applications in QA/QC, but as we roll

out more and more non-targeted applications the requirements of the instrument are more stringent,” explained Dr. Holroyd. “We collect liquid milk in 14 different countries and when you are looking at different geographies, each one has a different potential risk. So, I wouldn’t say we’re looking for specific things, but we’re really looking for something out of the ordinary. [W]e can identify what’s good and normal milk, and then we would set the application up that flags if something is somewhat abnormal.”

Another trend affecting food testing is the growing demand for dairy products in new regions. “Dairy products have globally become a very popular part of the diet. In the past, the demand was driven mainly by population growth and increased prosperity,” said Ms. Behmer. “Today, in addition, the milk and dairy consumption is rising fast in developing countries and also especially in Asia.” Demand from different regions as well as changing consumer preferences have resulted in new variations of dairy products. “With the growing amount of different products and recipes, a thorough quality control is essential to optimize plant efficiency and avoid costly recalls,” she added.

Among Ms. Behmer’s examples of regional changes is the greater consumption of cheese in Asia and the broader variety of products. “Today, more and more types of cheese get on the market with a wide range of compositions. Here the quality control with FT-NIR is ideal, since various recipes can be analyzed with the same set of calibrations,” she said.

Beyond changing regional consumption, responding to new consumer preferences has resulted in changes in the composition of dairy products that QA/QC testing must accommodate. This includes the addition of whey proteins to dairy products for nutritional enhancement. “We see a clear trend that whey proteins are today becoming increasingly popular as a general health trend beyond muscle growth and sports nutrition,” said Ms. Behmer. “FT-NIR offers an ideal solution for monitoring the liquid concentrates and the spray drying process, either directly online or offline in the production lab.”

She also listed growing diversification and specialization of recipes for infant formula as a trend. “Here, composition analysis during the process and final product testing is most essential,” she explained. “FT-NIR also has additional capabilities, e.g., the analysis of edible oils which can replace partly milk fat and, as a more recent trend, the quality control of fish oils such as omega-3 fatty acid additives to infant formula.”

Mr. Beukema also listed consumers’ increasing interest in health benefits as influencing dairy product composition and thus testing requirements. “We’re also seeing a growing need for different types of fatty acid analysis in the lab around health interests like Omega 3 and 6, as well as cow feeding approaches for de novo, mixed and preformed fatty acids.” FTIR and NIR analysis are used not only for final product control by processors but also for the analysis of raw milk by producers. “The ability to measure de novo fatty acids is helping farmers better manage their herds for both improved efficiency and output, as well as better animal welfare.”

Online Testing

Another trend, according to Mr. Beukema, is the use of online FTIR and NIR systems, in addition to testing in the lab or at-line, for dairy product QA/QC due to the goal of further guaranteeing product quality. “While online analysis is not yet widespread in dairy processing, it is a key goal and we’ll continue to see the industry moving towards it to help create continuous flow production,” he commented. “For example, real-time blending of milk streams to target fat levels is an important type of online analysis helping to create a more uniform, consistent final product. Likewise, real-time analysis of the spray drying processes for dairy powder production helps producers optimize drying times, thereby reducing energy use (which can be very costly) and providing a more consistent final product when it hits the shelves.”

“What we’ve found is that the number of instruments we’ve got has increased over time.”

Dr. Holroyd also noted the increase in online testing. “There is a trend towards some more online testing, but we’re still doing as much at-line, so the benchtop testing as we’ve always done.” Nonetheless, this has led the need for

more instruments. “What we’ve found is that the number of instruments we’ve got has increased over time. We’ve kept the old ones that might be doing benchtop testing, and we’ve introduced new ones to do some online testing,” he said. Nonetheless, use of at-line testing is also rising. “But overall we have benchtop instruments doing more measurements at more phases of our processing.”

Ms. Behmer also expects an increasing need for online testing and accompanying technology improvements. “Due to the increasing production capacities and faster throughput, process control will become more important and we expect major investments in this field,” she said. “Here, the recent addition of dedicated probes for liquid dairy products and solids like milk and whey powders will strengthen our position in the market.” She added, “Overall, the dairy industry will gain more and more importance for our in-process business.”

Whether in the lab, at-line or online, the progress in FTIR and NIR’s use for dairy QA/QC is also evident in new international standards, according to Dr. Holroyd. “Those standards are really a very important part of global adoption of different ways of testing,” he noted. “There’s still a lot to do on that. The standards often lag the state of technology, but it’s an ongoing area of work.” He pointed to the International Dairy Federations’ (IDF) recently updated guidance for NIR in dairy products as an example.

Ms. Behmer also noted the impact of new standards, particularly for NIR. “The role of molecular spectroscopy in the dairy industry has grown substantially over the recent years. The capabilities were massively expanded by utilizing NIR for almost any kind of sample type, including raw milk and other liquid samples types in general,” she explained. “This was one of the reasons to update the ISO 21543 IDF 201 guideline for NIR, where Bruker took the lead of the project team, and which now covers all applied measurement options and product types.” New developments continue to enhance the technique’s recognition. This year, a new version of the standard will be released internally by the IDF, with ISO approval expected in 2019. “In addition, an IDF bulletin with a summary of various applications and sample types is close to release,” noted Ms. Behmer.

Summing up the attractive market for FTIR and NIR instrument in dairy testing, Mr. Beukema commented, “A demand for greater product diversity, efficiency improvements, further and stricter regulations and online analysis will all continue to drive growth here. The versatility, speed and ease-of-use of molecular spectroscopy is an ideal technique to meet many of these testing requirements in concert with classic IR and NIR techniques.”

NSF and USDA Receive Sizeable Increases in US FY19 Budget

This month, the US Senate Appropriations Committee announced agreements on remaining FY19 appropriations packages for the US federal budget. This final package consists of appropriations bills for six government agencies including Agriculture, Rural Development, the FDA and Related Agencies; Commerce, Justice, Science, and Related Agencies; and Interior, Environment, and Related Agencies.

The package was signed into law on February 15, avoiding another government shutdown. The information below has been extracted from various federal documents, including explanatory reports and appropriations bills. (For information on the NIH and DoE’s budget, see [IBO 9/30/18](#) and [IBO 10/15/18](#), respectively.)

Selected FY2019 Department Budget Figures		
	2019 (\$M)	% Chg.
Agriculture	\$152,191.8	0.6%
USDA, Agricultural Programs	\$7,407.9	6.3%
Agricultural Research Service	\$1,684.5	25.4%
FDA	\$3,080.5	0.6%
Interior & Environment	\$35,613.7	-2.7%
EPA	\$8,058.5	0.0%
Science	\$29,582.5	3.8%
NSF	\$8,075.0	4.0%
Commerce	\$11,413.8	2.5%
NIST	\$985.5	-17.8%

[Click to enlarge](#)

Agriculture, Rural Development, Food and Drug Administration

The Department of Agriculture, Rural Development and the FDA received a total of \$152.2 billion, a nominal increase of 0.6%. Of this, funding for USDA agricultural programs increased 6.3%, reaching \$7.4 billion. Programs that are part of the USDA include the Agricultural Research Service, whose funding spiked 25.4% to \$1.7 billion; the National Institute of Food and Agriculture, with \$1.5 billion in FY2019 funding, a 4.5% increase; and the Animal and Plant Health Inspection Service, whose funding rose 3.0% to \$1.0 billion.

The bill provides an 11.5% increase to \$240.1 million for biologics within the FDA, which includes \$198.1 million for the Center of Biologics Evaluation and Research. The budget authority for human drugs also jumped, rising 33.8% to \$662.9 million, with \$524.7 million allocated to the Center for Drug Evaluation and Research. Food funding also increased, though not as dramatically, growing 1.7% to \$1.1 billion.

Interior, Environment and Related Agencies

With a total FY2019 budget authority of \$35.6 billion, funding for the Department of the Interior, Environment and Related Agencies fell almost 3%.

The EPA's budget remained unchanged at \$8.1 billion for FY2019. For EPA Science and Technology programs, \$706.5 million was allocated for projects such as Air and Energy research, which will be receiving \$94.9 million. Chemical Safety and Sustainability research received \$126.9 million, which includes efforts by the Agency to advance methods for the evaluation of chemical hazards and exposure. The bill also provided \$5 million for extramural research grants for the funding of water quality and availability research conducted by nonprofit organizations that frequently collaborate with the EPA.

In regards to programs within the EPA, clean air received \$273.1 million, while toxic risks review and prevention activities was allocated \$92.5 million. Water quality protection funding, which includes the WaterSENSE program, was provided \$210.9 million. Once it is fully implemented, \$27 million per year will be provided to the Toxic Substances Control Act modernization legislation.

Commerce, Justice, Science and Related Agencies

Within the Department of Commerce, which received a 2.5% budget increase to \$11.4 billion in FY19, funding for the National Institute of Standards and Technology (NIST) dropped almost 18% to \$985.5 million.

Of this, \$724.5 million was allocated to scientific and technical research services, the same figure as FY18. This funding is intended for a variety of programs, including advanced manufacturing and material measurements, quantum science, biological science and health measurements, and environmental measurements, as well as the NIST Center of Excellence Program and NIST User Facilities. Additionally, \$106.0 million was provided for the construction of research facilities, plummeting 66.8%. Science received an almost 4% boost to nearly \$30 billion, with \$5.5 million for the Office of Science and Technology Policy, the same funding figure as FY18.

The NSF's budget increased 4.0% to \$8.1 billion, with \$6.5 billion allocated to Research and Related Activities, a 3% increase. This includes \$175.7 million for the Established Program to Stimulate Competitive Research.

Major Research Equipment and Facilities Construction (MREFC) received a sizeable increase, skyrocketing 61.2% to \$295.7 million. Included in this agreement was \$1 million for heightened oversight of MREFC projects.

Danaher to Buy GE Biopharma for \$21.4 Billion

Washington, DC 2/25/19; Washington, DC 2/26/19; Boston, MA 2/25/19—Science and technology company Danaher has agreed to acquire GE's BioPharma business in a deal valued at \$21.4 billion (see [Danaher to Become Major Player in Bioprocessing Market](#)). The company will pay \$20 billion in cash and finance the purchase through existing cash and debt, as well as new debt. Danaher will also assume \$4 million in GE pension liabilities. Part of GE Healthcare's Life Sciences division, the BioPharma business generated 2018 sales of \$3 billion, a 7.1% increase, and \$1.1 billion in EBITDA. The business supplies process chromatography solutions, cell culture media, single-use technologies, instruments and consumables for drug development, and services. "GE Biopharma is renowned for providing best-in-class bioprocessing technologies and solutions," commented Danaher President and CEO Thomas P. Joyce, Jr. "This acquisition will bring a talented and passionate team as well as a highly innovative, industry leading product suite to our Life Sciences portfolio, providing an excellent complement to our current biologics workflow solutions."

The purchase is anticipated to reduce Danaher's GAAP diluted net EPS by \$1.15-\$1.20 and be accretive to non-GAAP adjusted diluted net EPS by \$0.45-\$0.50 in the first full year after closing. GE will retain the \$17 million Pharmaceutical Diagnostics business of GE Life Sciences. The acquisition is expected to close in the fourth quarter.

The acquisition will boost Danaher's position in the bioprocessing tools market, giving it a wider range of solutions for upstream and downstream workflows and a more complete range of end-to-end solutions. Currently, the company has a smaller market presence in process chromatography and cell culture media compared to other major bioprocess instrument and consumables suppliers. Danaher had previously approached GE about a possible purchase of the Life Sciences business (see [IBO 4/30/18](#)). As a result of the sale, GE will be able to pay down more of its debt, which has weighed down its balance sheet and concerned investors. The Wall Street Journal reported that GE is now reconsidering the IPO of the remainder of the Healthcare business (see [IBO 6/30/18](#)).

Thermo Fisher Scientific Halts Sequencer Sales in Xinjiang

New York, NY 2/20/19; New York, NY 2/21/19—[The Wall Street Journal](#) has reported that Thermo Fisher Scientific will cease sales and service of its NGS systems in China's Xinjiang region, following reports of the government's use of a DNA database for surveillance and human rights abuses in the area. "We recognize the importance of considering how our products and services are used—or may be used—by our customers," wrote the company in a statement to the paper. A [New York Times](#) article published the same week detailed allegations that DNA collection and profiling are used to monitor the Xinjiang's Uighur ethnic group. The regional government denied the reports, stating that the sequencers are for "internal use." Thermo Fisher told [The New York Times](#) that it is working with the US government to ascertain how its NGS technology was used in the region.

Thermo Fisher's sales of the systems were the subject of a US Department of Commerce investigation last year that

found the company did not violate foreign licensing rules related to supporting crime control in China. The investigation was undertaken at the request of a Congressional committee (see [IBO 8/31/18](#)).

Spectris Commits to Malvern Panalytical

Egham, UK 2/19/19— Spectris, which provides productivity-enhancing instrumentation and controls, has announced that it is undertaking a strategic review of its business portfolio in order to focus and simplify the company. “As such, work is ongoing to identify a group of operating companies which can deliver greater shareholder value creation, with sales growth, margin expansion and working capital efficiency as the key goals, underpinning growth in operating cash flow,” stated the company in its year-end earnings press release. Spectris announced that three of its current businesses, Malvern Panalytical, HBK and Omega, which together represent 60% of revenues and adjusted operating profits, will remain intact.

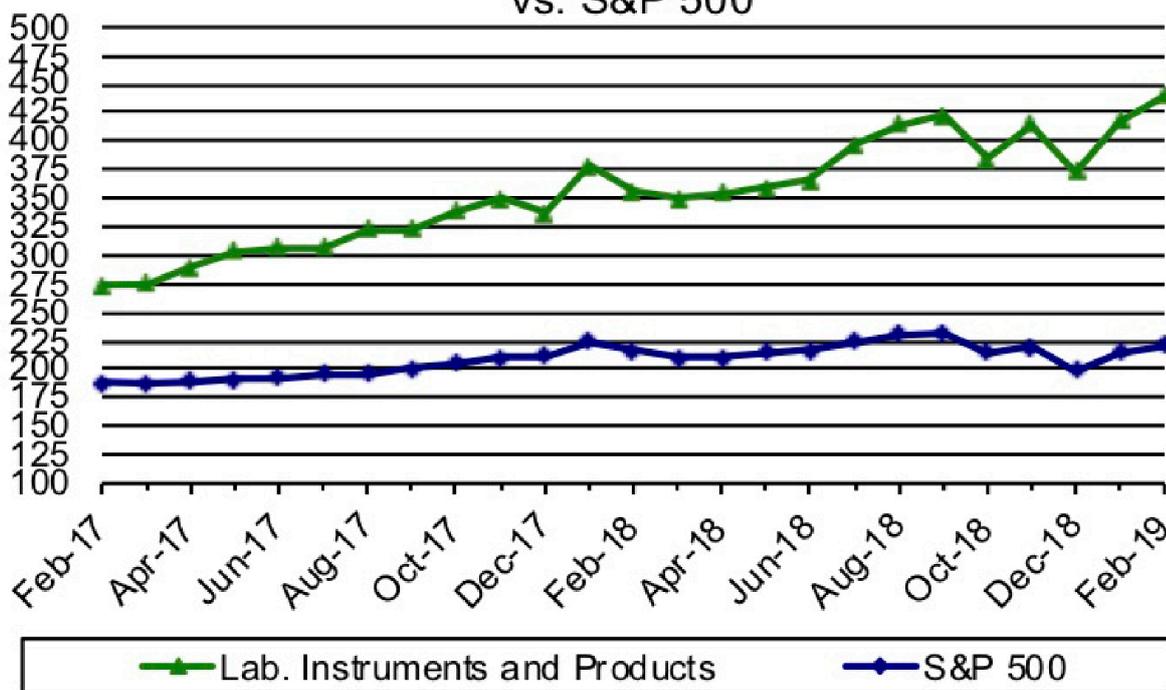
Analytical instrument firm Malvern Panalytical provides atomic spectroscopy and materials characterization solutions. HBK (formerly Brüel & Kjær Sound & Vibration and HBM) sells test and measurement and weighing technology, with measurement solutions designed for industrial and lab settings. Omega is a distributor of products, or products for process measurement and control of temperature, humidity, pressure, strain, force, flow, level, pH and conductivity, including products for lab testing. Options for the other businesses include scale reduction, realignment or divestment. Spectris has highlighted its efforts to improve operating margins, which declined three-tenths of a percentage point organically in 2018 to 15.5%, and implementation of cost reduction plans.

On the company’s earnings conference call, CEO Andrew Heath stated, “We serve a diverse and wide set of end-markets. And whilst that diversity offers us some protection from weakness in any particular industry, it has also brought complexity and a lack of clarity. In essence, we’re looking to simplify and focus the group around a number of scaled platforms. Those platforms will be durable through the cycle and will deliver increased shareholder value.” He noted Malvern Panalytical, HBK and Omega have desirable business characteristics in that they serve high-growth markets, have good gross margins, are asset light, produce strong free cash flows and hold strong potential going forward. Consequently, these three companies will also be the target of future investments and acquisitions.

IBO Stock Indexes Continue Positive 2019 Performance

US markets continued their early year rally in February, thanks to the continued progress of trade talks between the US and China and the Fed continuing its conservative language regarding interest rate hikes. Both the Dow Jones Industrial Average and S&P 500 finished the month with their best two month starts since 1987 for the Dow, and 1990 for the S&P 500. On February 28, the US Commerce Department issued its fourth quarter GDP growth estimate of 2.6%. Despite the overall improved performance in the market, investors are still concerned about the US-China tariff issue despite the delay of the March 1 tariff deadline. The Dow Jones, S&P 500 and NASDAQ finished the month up 3.7%, 3.0% and 3.4%, respectively.

IBO Laboratory Instruments and Products Stock Index vs. S&P 500



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Laboratory Instruments and Products Stock Index

The *Index* advanced 5.2% to \$439.56 this month and is up 17.7% for the year. The *Index's* performance was mixed, with most companies trading higher this month. The top performing company for the month was **Fluidigm**, which jumped 27.9%. The worst performing company for the month was **Kewaunee Scientific**, declining 25.5%.

In other news, **Agilent Technologies**, on February 20, reported fiscal first quarter financials (see [Bottom Line](#)). The company forecasts fiscal second quarter adjusted EPS to be \$0.70-\$0.72. In rating news, on February 12, Deutsche Bank upgraded Agilent to a "buy" rating and raised the price target to \$85.00, a 10.1% upside from its February 12 price of \$77.17.

On February 5, **Becton, Dickinson (BD)** reported its fiscal first quarter financials (see [IBO 2/15/19](#)) and reaffirmed its fiscal 2019 adjusted EPS guidance of \$12.05-\$12.15. The company feels confident of the EPS guidance due to the expectations strong revenue growth and solid operating income performance, as well as benefits from a lower tax rate.

Bruker, on February 11, reported solid fourth quarter 2018 and full -year 2018 financials (see [IBO 2/15/19](#)). Revenue growth and margins performance exceeded the company's expectations. Bruker forecasts full-year non-GAAP EPS to be \$1.54-\$1.58, resulting in 10%-13% growth.

On February 7, **Mettler-Toledo** reported fourth quarter 2018 and full-year 2018 financials (see [IBO 2/15/19](#)). For the first quarter, the company forecasts an adjusted EPS range of \$4.00-\$4.05, resulting in 7%-8% growth. The company attributed this forecast to its expectation of a local currency growth of 5.5%. For full-year adjusted EPS, Mettler-Toledo increased its guidance to \$22.50-\$22.70, a \$0.10 increase for both its low range and high range, ultimately resulting in 11%-12% growth. Despite the increase in EPS guidance, the company predicted a 1.4% currency headwind to EPS for the year. The company still expects local currency sales growth of 5% for 2019.

On February 4, **MTS Systems** reported its fiscal first quarter financials (see [IBO 2/15/19](#)) and reaffirmed its guidance for its fiscal full-year of GAAP diluted EPS of \$2.30-\$2.60, which would represent 20% growth.

QIAGEN, on February 5, reported its fourth quarter 2018 and full-year 2018 financials (see [IBO 2/15/19](#)) and

forecast its full-year adjusted EPS to be \$1.45-\$1.47, including a \$0.03 dilution from investments into digital PCR.

The following companies did not provide EPS guidance when reporting quarterly results: **Bio-Rad Laboratories**, **Bio-Techne**, **Fluidigm**, **Kewaunee Scientific**, **Luminex**, **Pacific Biosciences** and **Twist Bioscience**.

In other news, on February 26, **Thermo Fisher Scientific** declared a \$0.19 dividend, a 11.8% increase from the prior dividend of \$0.17.

Company	Date Rep.	Fiscal Quarter	2018 Adj. EPS	Analyst Consensus	Vs. Estimate	YOY Growth	2017 Adj. EPS	
Laboratory Instruments and Products Stock Index								
A	20-Feb	Q1	\$0.76	\$0.73	↑	\$0.03	15.2%	\$0.66
BIO	28-Feb	Q4	\$2.13	\$1.74	↑	\$0.39	12.1%	\$1.90
BIO	28-Feb	FYE	\$5.84	NA		NA	38.1%	\$4.23
BDX	5-Feb	Q1	\$2.70	\$2.70	→	\$0.00	8.9%	\$2.48
BRKR	11-Feb	Q4	\$0.54	\$0.54	→	\$0.00	5.9%	\$0.51
BRKR	11-Feb	FYE	\$1.40	NA		NA	15.7%	\$1.21
FLDM	7-Feb	Q4	(\$0.06)	(\$0.20)	↑	\$0.14	-25.0%	(\$0.08)
FLDM	7-Feb	FYE	(\$0.52)	NA		NA	-42.9%	(\$0.91)
KEQU	26-Feb	Q3	(\$0.01)	NA		NA	-103.2%	\$0.31
LMNX	4-Feb	Q4	\$0.04	\$0.12	↓	-\$0.08	-80.0%	\$0.20
LMNX	4-Feb	FYE	\$0.49	NA		NA	-27.9%	\$0.68
MTD	7-Feb	Q4	\$6.85	\$6.74	↑	\$0.11	1.6%	\$5.97
MTD	7-Feb	FYE	\$20.32	NA		NA	15.7%	\$17.57
MTSC	4-Feb	Q1	\$0.59	\$0.51	↑	\$0.08	-65.9%	\$1.73
PACB	11-Feb	Q4	(\$0.21)	(\$0.13)	↓	-\$0.08	16.7%	(\$0.18)
PACB	11-Feb	FYE	(\$0.76)	NA		NA	-12.6%	(\$0.87)
QGEN	4-Feb	Q4	\$0.40	\$0.40	→	\$0.00	-7.0%	\$0.43
QGEN	4-Feb	FYE	\$1.34	NA		NA	5.5%	\$1.27
TECH	5-Feb	Q1	\$1.06	\$1.00	↑	\$0.06	3.9%	\$1.02
TWST	7-Feb	Q1	(\$1.18)	(\$0.89)	↓	-\$0.29	-81.6%	(\$6.42)
Diversified Laboratory Stock Index								
AME	5-Feb	Q4	\$0.86	\$0.84	↑	\$0.02	22.9%	\$0.70
AME	5-Feb	FYE	\$3.29	NA		NA	26.1%	\$2.61
HON	1-Feb	Q4	\$1.91	\$1.88	↑	\$0.03	1.1%	\$1.89
HON	1-Feb	FYE	\$8.01	NA		NA	12.0%	\$7.15
ITW	1-Feb	Q4	\$1.83	\$1.82	↑	\$0.01	-931.8%	(\$0.22)
ITW	1-Feb	FYE	\$7.60	NA		NA	56.4%	\$4.86
ROP	1-Feb	Q4	\$3.22	\$3.13	↑	\$0.09	19.3%	\$2.70
ROP	1-Feb	FYE	\$11.81	NA		NA	25.4%	\$9.42

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Diversified Laboratory Stock Index

In February, the *Index* increased 9.1% to \$250.99, with all companies experiencing monthly gains. **Danaher** and **Roper Technologies** were the only companies in the *Index* to experience double-digit increases in share price. **Corning** experienced the smallest gains, rising only 4.7%.

On February 5, **AMETEK** announced its fiscal first quarter (see [IBO 2/15/19](#)) and full-year guidance. For the full-year, the company expects adjusted EPS of \$3.95-\$4.05, an 8%-11% increase. For the fiscal first quarter, AMETEK

expects the adjusted EPS to be \$0.95-\$0.97, a 9%-11% increase. In other news, on February 13, the company increased the authorized level for repurchases of its common stock by \$500 million. This increase will be added to the \$1 million that is currently available from an existing authorization approved by its Board in November 2016. The company claimed that this increase would assist in the flexibility of shareholder value when it felt the need to repurchase its common stock.

Honeywell reported its fourth quarter 2018 and full-year 2018 financials on February 1 (see [IBO 2/15/19](#)), and provided both first quarter and full-year 2019 adjusted EPS guidance. For the first quarter, the company expects an adjusted EPS of \$1.80-\$1.85, resulting in a 6%-9% growth. For the full-year, Honeywell expects an adjusted EPS of \$7.80-\$8.10, resulting in a 6%-10% growth. In rating news, on February 4, Deutsche Bank upgraded Honeywell to a "buy" rating with an analyst price target of \$160.00, a 9.8% upside from the February 4 price of \$145.75

Also, on February 1, **Illinois Tool Works** reported its fourth quarter 2018 and full-year 2018 financials (see [IBO 2/15/19](#)). The company reaffirmed its full-year GAAP EPS guidance of \$7.90-\$8.20, which was first announced in December 7, 2018. In addition, the company decreased its full-year organic sales growth to the range of 1%-3%. In ratings news, on February 5, Bank of America downgraded Illinois Tool Works from a "neutral" rating to an "underperform" rating. The bank lowered the company's price target to \$124.00, a 9.7% downside from the February 5 price of \$137.31.

Roper Technologies announced its fourth quarter 2018 and full-year 2018 financials on February 1 (see [IBO 2/15/19](#)). In addition, it projected its guidance for both first quarter and full-year adjusted EPS. The company expects first quarter adjusted EPS to be \$2.74-\$2.80, excluding the impact of future acquisitions. Meanwhile, full-year adjusted EPS is expected to be in the range of \$12.00 to \$12.40. On February 4, Wells Fargo upgraded Roper to an "outperform" rating and raised its price target to \$345.00, a 18.2% upside from the February 4 price of \$291.76.

In other news, on February 6, **Corning** declared a \$0.20 dividend, a 11.1% increase.

On February 25, **Danaher** announced it would begin a public offering \$1.35 billion share of common stock and \$1.35 billion shares of Series A Mandatory Convertible Preferred Stock. The company will use the proceeds to fund a portion of the \$21.4 billion purchase price of its pending acquisition of the Biopharma business from GE Life Sciences (see [Danaher to Buy GE Biopharma for \\$21.4 Billion](#)).

International Stocks

For the month, the Asia Pacific markets were mostly positive except for India's Sensex, which had a 1.07% decline. China's Shanghai Index was the only Asia Pacific market index to expand in the double digits, up 13.79%.

Prices for the Pacific region companies in the **IBO** Stock Table were mixed, with most companies experiencing monthly gains. **Precision System Science** and **Shimadzu** were the only companies whose share prices increased in the double digits, increasing 27.4% and 10.0%, respectively. The two companies with monthly declines were **JEOL** and **Yunnan Energy**, decreasing 7.5% and 7.8%, respectively.

European equity markets were positive in February. France's CAC 40 and Italy's FTSE MIB Index expanded 4.96% and 4.71%, respectively. London's FTSE 100 experienced the smallest gains with a 1.52% increase.

Prices for the European stocks in the **IBO** Stock Table were mixed as well, with most companies showing gains in February. **Scientific Digital Imaging** had the highest growth this month with a 21.6% increase, followed by **Tecan** which rose 12.9%. In contrast, **Horizon Discovery** was the biggest loser, declining 5.8%.

In other news, the **Sartorius** announced on February 14 that it will declare a €0.61 (\$0.69 at €0.88 = \$1) dividend per ordinary share and a €0.62 (\$0.70) per preference share, a 21.9% and 21.6% increase, respectively.

Company: Exchange	Market Value (USM)	52-Week Range		Price 2/28/19	Change 1 Month	Change YTD	P/E (ttm)	EPS (ttm)
		Low (\$)	High (\$)					
Laboratory Instruments and Products								
Agilent Technologies: n	\$25,304	60.42	79.84	\$79.44	4.5%	17.8%	28	2.79
Becton, Dickinson and Company: n	\$66,740	208.62	265.87	\$248.79	-0.3%	10.4%	22	11.19
BioNano Genomics: o	\$40	3.50	10.00	\$3.97	-9.2%	-24.2%	NM	-0.63
Bio-Rad Laboratories: n	\$6,735	220.05	345.15	\$270.90	8.4%	16.7%	46	5.85
Bio-Techne: o	\$7,323	132.75	206.04	\$193.90	11.1%	34.0%	42	4.59
Bruker: o	\$6,129	26.10	38.66	\$38.21	9.0%	28.4%	27	1.40
Fluidigm: o	\$539	4.65	11.57	\$11.06	27.9%	28.3%	NM	-1.02
Illumina: o	\$45,977	221.49	372.61	\$312.77	11.8%	4.3%	55	5.72
Kewaunee Scientific: o	\$66	22.00	38.80	\$24.00	-25.5%	-27.8%	20	1.22
Luminex: o	\$1,136	19.20	35.37	\$25.48	-8.6%	10.3%	52	0.49
Mettler-Toledo: n	\$17,053	500.74	694.00	\$680.91	6.7%	20.4%	33	20.36
MTS Systems: o	\$953	38.42	57.00	\$53.30	6.5%	32.8%	25	2.14
NanoString Technologies: o	\$785	5.87	25.49	\$25.47	14.5%	71.7%	NM	-2.45
Pacific Biosciences: o	\$1,088	2.02	7.84	\$7.31	5.6%	-1.2%	NM	-0.77
PerkinElmer: n	\$10,474	70.83	98.33	\$94.16	4.0%	19.9%	26	3.62
QIAGEN: o	\$8,707	0.00	39.45	\$38.43	3.8%	11.6%	29	1.34
Quanterix: o	\$418	13.00	25.26	\$24.71	17.3%	35.0%	NM	-8.30
Thermo Fisher Scientific: n	\$104,497	199.85	260.11	\$259.57	5.7%	16.0%	23	11.12
Twist Bioscience: o	\$608	12.38	34.46	\$21.77	-5.9%	-5.7%	NM	-7.77
Waters: n	\$18,347	167.94	242.53	\$242.22	4.8%	28.4%	29	8.33
Diversified Laboratory								
AMETEK: n	\$18,472	63.14	81.92	\$79.58	9.2%	17.5%	25	3.13
Corning: o	\$27,862	26.11	36.56	\$34.81	4.7%	15.2%	19	1.79
Danaher: n	\$89,029	94.59	127.84	\$127.02	14.5%	23.2%	28	4.52
Honeywell: n	\$114,056	123.48	162.52	\$154.07	7.3%	16.6%	19	8.01
Illinois Tool Works: n	\$47,806	117.75	171.83	\$144.08	4.9%	13.7%	19	7.60
Roper Technologies: n	\$33,448	245.59	324.67	\$323.65	14.3%	21.4%	27	11.81
Teledyne Technologies: n	\$8,516	177.68	250.87	\$236.04	5.3%	14.0%	26	9.01
Xylem: n	\$13,578	60.65	82.44	\$75.55	6.0%	13.2%	27	2.84
Laboratory Instruments and Products								
				\$439.56	5.2%	17.7%	31	
Diversified Laboratory								
				\$250.99	9.1%	0.7%	24	
Dow Jones Industrial Average				\$25,916.00	3.7%	11.1%		
S&P 500				\$2,784.49	3.0%	11.1%		
NASDAQ Composite				\$7,532.53	3.4%	13.5%		
Region	Market Value	52-Week Range		Price	Change	Change	P/E	EPS
Company	(Local M)	Low (L)	High (L)	2/28/19	1 Month	YTD	(ttm)	(ttm)
Pacific Shares								
GL Sciences: t	¥17,546	¥1,170	¥1,990	¥1,568	4.0%	21.8%	6	¥246.37
Hitachi High-Technologies: t	¥583,329	¥3,130	¥5,300	¥4,235	8.0%	22.6%	5	¥817.36
HORIBA: t	¥239,869	¥4,155	¥9,590	¥5,640	5.8%	25.6%	11	¥526.98
JEOL: t	¥89,218	¥1,493	¥2,595	¥1,826	-7.5%	10.2%	39	¥46.90
Precision System Science: os	¥9,677	¥236	¥679	¥386	27.4%	44.0%	NA	¥0.91
Shimadzu: t	¥812,712	¥2,008	¥3,670	¥2,745	10.0%	26.3%	26	¥106.20
Yunnan Energy: hk	HKD 782	HKD 1.9	HKD 5.2	HKD 3	-7.8%	-16.5%	NM	(\$0.01)
European Shares (London)								
Abcam: l	£2,640	£1,006.00	£1,588.00	£12.85	-3.2%	17.9%	43	£0.30
Halma: l	£5,900	£1,136.00	£1,555.00	£15.54	11.0%	13.9%	31	£0.50
Horizon Discovery: l	£218	£128.00	£252.00	£1.45	-5.8%	-17.1%	NA	£0.14
Oxford Instruments: l	£580	£676.00	£1,116.00	£10.10	12.3%	11.0%	16	£0.61
Scientific Digital Imaging: l	£38	£11.76	£46.60	£0.42	21.6%	20.7%	22	£0.02
Spectris: l	£3,049	£1,924.50	£2,957.00	£26.39	1.5%	15.8%	16	£1.65
European Shares (Other)								
Biotage: st	SEK 8,228	SEK 68.40	SEK 145.00	SEK 126.20	9.0%	15.8%	27	SEK 4.75
Datacolor: s	CHF 118	CHF 700.00	CHF 900.00	CHF 705.00	-4.7%	-4.7%	18	CHF 38.54
Expedeon: g	€ 52	€ 0.70	€ 1.40	€ 1.01	-3.5%	10.4%	NM	€ 0.00
Merck KGaA: g	€ 11,712	€ 75.26	€ 100.10	€ 90.62	-0.5%	1.0%	20	€ 4.46
Sartorius: g	€ 4,624	€ 90.40	€ 140.50	€ 123.50	6.0%	28.6%	20	€ 6.10
Tecan: s	CHF 2,665	CHF 179.30	CHF 256.00	CHF 226.40	12.9%	18.7%	71	CHF 3.18

The IBO Stock Indexes are weighted by market capitalization. The Indexes' averages for the financial ratios presented are also weighted statistically to reflect the relative sizes of the constituent companies. Laboratory Instruments and Products Index: 12/30/11 = 100. Diversified Laboratory Index: 12/30/11 = 100. Exchanges: n = NYSE; o = NASDAQ; t = Tokyo; hk = Hong Kong; l = London; g = Germany; s = Switzerland; st = Sweden; no = Nordic Market; os = Osaka Securities. N/A = not available; NM = not meaningful.

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Fourth Quarter 2018 Results: Agilent Technologies, PerkinElmer, Shimadzu, Spectris, Waters

Please note that the quarterly IBO Sales Indexes will appear in the March 15th issue.

Low Chinese Sales Cannot Hinder Agilent's Strong Quarterly Performance

Agilent Technologies' fiscal first quarter revenues included a 2.2% decline and 1.5% growth from currency and acquisitions, respectively (see [Bottom Line](#)). Consumables, services and informatics, together accounting for 56% of sales, increased 1%. Instrument sales grew double digits, accounting for 43% of sales.

Gross margin rose 56.9% to \$553 million offsetting a \$4 million headwind from Chinese tariffs. Agilent's operating margin performance also increased making it the 16th consecutive quarter of year-over-year improvement.

Agilent Technologies Q1 FY19				
	Rev. (M)	Chg.	Organic Chg.	% of Rev.
Total	\$1,284	6.0%	6.1%	
Life Sciences & Applied Markets	\$607	1.8%	1%	47%
Agilent CrossLab	\$442	8.3%	10%	34%
Diagnostics & Genomics	\$235	13.5%	12%	18%

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By end-market, pharmaceutical, environmental/forensics and diagnostics and clinical demand led Agilent's revenue growth, increasing double digits.

Pharmaceutical and biotech sales rose 10% to account for 30% of company sales, with broad-based growth across all segments and regions. Product lines showing strength included cell analysis and Nucleic Acids Solutions Division products.

Chemical and energy sales grew a modest 2% due to flat instrument sales, which were slightly offset by mid-single-digit growth of services and consumable sales.

Environmental/forensic sales grew 10% due to double-digit growth for Agilent CrossLab and single-digit growth for Life Science & Applied Markets. Highlights included strong demand for GC, GC/MS, atomic spectroscopy, consumables and services. This end-market accounted for 12% of company revenues.

Diagnostics and clinical sales increased 11%, which included strong demand for pathology-related products and double-digit growth for the company's NGS portfolio. This end-market accounted for 15% of company revenues.

Sales in the food end-market declined 1% to account for 10% of company sales, while academic and government sales were flat, representing 9% of company sales. A contributing factor to the flat sales of the academic and government end-market was the US government shutdown that began in late December 2018. This affected the end-market's sales performance substantially since the US government is Agilent's largest customer.

Agilent Technologies Q1 FY19		
	Chg.	% of Rev.
Americas	7.6%	45%
Europe	-1.0%	40%
Asia Pacific	10.1%	15%
China and Hong Kong	0.8%	19%

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Geographically, Agilent saw broad-based gains across all regions. Chinese sales increased a slight 0.8%, which was attributed to both the US government shutdown and the Chinese New Year occurring at the same time. The shutdown resulted in Agilent not possessing an export license for some of its products bound for China. Excluding the Chinese food end-market, which is going through regulatory transitions, Chinese sales grew in the mid-single digits. Other Asia and Japan revenue increased 13%.

Agilent Technologies Q1 FY19	
	% of Rev.
Instruments	43%
Con., Svcx., Informatics	57%

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Life Sciences and Applied Market Group revenue grew modestly, up 0.8% against a tough comparison of 11% from last year. Despite the slower sales growth, there was demand in the pharma and environmental/forensics end-markets.

Sales for the Agilent CrossLab Group included broad-based demand across all end-markets and regions.

Diagnostics and Genomics Group revenue growth also saw broad-based demand across all end-markets and regions. Highlights included the pathology and NGS portfolios' double-digit sales growth. The segment also saw strong demand for the cancer diagnostics testing portfolio.

Agilent Technologies Q1 FY19		
	Op. Margin	Chg. (bps)
Total	23.1%	124.81
Life Sciences & Applied Markets	26.1%	20
Agilent CrossLab	23.9%	270
Diagnostics & Genomics	14.0%	230

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Agilent expected its fiscal second quarter revenues to total \$1.25-\$1.27 billion with organic growth of 5.0%-6.0%. A currency headwind of 2.9% is anticipated, partially offset by an M&A contribution of 2.0%-2.2%. For fiscal full-year guidance, Agilent forecast revenue to total \$5.15 billion-\$5.19 billion with organic growth of 5.0%-5.5%, up \$20 million on both the low and high end of the range. The company anticipates a 1.8% currency headwind, partially offset by an M&A contribution of 1.6%-1.9%.

PerkinElmer's Strategic Business Moves Generate Strong Organic Growth for the Year

Q4

PerkinElmer Q4 FY18						
	Rev. (M)	Chg.	Currency	Acq./ Div.	Org. Growth	% of Rev.
Total Company	\$756.3	17.9%	-2%	12%	7%	
Discovery & Analytical Solutions	\$459.9	2.6%	-2%	0%	5%	61%
Diagnostics	\$296.5	53.3%	-3%	43%	14%	39%

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PerkinElmer's fourth quarter 2018 sales grew mid-single digits organically, exceeding the company's revenue guidance by 2%. Discovery & Analytical Solutions (DAS) division revenue grew in the mid-single digits, while Diagnostics division sales grew double digits organically (see [Bottom Line](#)). All figures below are given on an organic basis.

PerkinElmer Q4 FY18				
	Adj. Op. Profit (M)	Chg.	Adj. Op. Margin	Chg. (bps)
Total Company	\$164.3	21.4%	11.3%	178
Discovery & Analytical Solutions	\$92.7	-0.6%	20.2%	114
Diagnostics	\$85.8	45.7%	28.9%	-104

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Geographically, all major areas experienced revenue growth with double-digit sales growth in the Americas, high single-digit sales increases in Asia and low single-digit sales growth in Europe. This was PerkinElmer's sixth consecutive quarter of organic revenue growth in all major geographic areas it serves. The emerging market regions represented 40% of total sales, driven by double-digit revenue growth.

DAS sales were led by mid-single digits sales in life sciences and applied markets. Life sciences sales were driven by demand for imaging product lines and informatics. Revenue growth for applied markets was led by high single-digit sales growth in the environmental and academic markets, mid-single digit revenue growth in the food market and low single-digit revenue growth in the industrial market.

Diagnostic division sales were led by the reproductive health and immunodiagnostics businesses. Specifically, the reproductive health business grew in the high single digits due to the 50% growth of the genomics testing business. Tulip Diagnostics revenue grew 20%, which contributed to the immunodiagnostics' revenue growth.

The company expects its first quarter 2019 revenues to be \$643 million, representing 4% growth. This includes a foreign exchange headwind of approximately \$27 million.

FYE

PerkinElmer FYE 18						
	Rev. (M)	Chg.	Currency	Acq./ Div.	Org. Growth	% of Rev.
Total Company	\$2,778.0	23.1%	1%	14%	7%	
Discovery & Analytical Solutions	\$1,693.2	7.3%	1%	0%	7%	61%
Diagnostics	\$1,084.8	59.9%	0%	49%	10%	39%

[Click to enlarge](#)

PerkinElmer's full-year 2018 sales grew high single digits organically for the company as well as for the DAS division. Meanwhile, Diagnostics division sales grew in the double digits. Product and Service revenues rose 31.0% and 8.1% to make up 70% and 30% of sales, respectively. All figures below are given on an organic basis.

PerkinElmer FYE 18				
	Discovery & Analytical Solutions		Diagnostics	
	Rev. (M)	% of Sales	Rev. (M)	% of Sales
Americas	\$680.1	40%	\$385.0	35%
Europe	\$494.7	29%	\$283.4	26%
Asia	\$518.4	31%	\$416.4	38%

[Click to enlarge](#)

Geographically, the emerging markets regions accounted for 40% of total revenues, up from 28% in 2014. Products wise, consumables, services and software represented 70% of sales, up from 55% in 2014. The acquisition of Dani Analytica (see [IBO 10/31/18](#)), which expanded the company's GC portfolio, and China-based Spectrum Instruments (see [IBO 5/31/18](#)) assisted in the change in geographical and product portfolios.

PerkinElmer FYE 18				
	Adj. Op. Profit (M)	Chg.	Adj. Op. Margin	Chg. (bps)
Total Company	\$323.9	9.6%	5.5%	178
Discovery & Analytical Solutions	\$230.5	12.3%	13.6%	114
Diagnostics	\$153.2	4.3%	14.1%	-104

[Click to enlarge](#)

Market wise, the breakdown of total revenues shifted due to PerkinElmer executing specific business strategies in 2018. This included focusing R&D spending in genomics, infectious diseases and digital solutions; introducing new imaging reagents and software product lines for life science customers; and expanding the food analysis portfolio. As a result, 80% of the company's revenues is in the diagnostics, food and life science markets, a 30-percentage point increase from 2014. This resulted in the environmental and industrial markets representing less than 20% of total revenues last year, a 25-percentage point decrease from 2014. Specifically, in the food analysis segment, PerkinElmer generated \$200 million for 2018. In addition, the US experienced strong sales in the pharma/biotech market, especially sales in detection and imaging, and enterprise solution. In Diagnostics, the genomics testing business generated \$10 million in sales.

PerkinElmer FYE 18		
Endmarket	Discovery & Analytical Solutions	Diagnostics
Diagnostics	—	\$1,084.8
Life Sciences	\$934.7	—
Applied Markets	\$758.5	—

[Click to enlarge](#)

Shimadzu AMI Orders Decrease in Japan

Shimadzu Analytical & Measuring Instruments' (AMI) fiscal third quarter 2019 sales rose 5.2% to make up 61% of total company revenues (see [Bottom Line](#)). Orders for AMI products decreased 2.5% overall despite increased orders in all regions except Japan.

Shimadzu AMI Q3 FY19		
	Rev. (B)	% Chg.
Total	¥58.2	2.3%
Key Models	¥32.8	-3%
Other	¥25.4	7%

[Click to enlarge](#)

By product line, sales increased for all key models, defined as LC, MS and GC. Orders for key models grew 5%, excluding exchange rate effects. MS revenue growth was significant in food safety, environmental testing and clinical medicine markets. Geographically, LC and MS sales showed strength in North America, South America and Europe, but sales of both product lines in Japan decreased.

However, overall AMI sales in Japan increased, thanks to strong sales of testing machine and non-destructive inspection systems. India also experienced slow sales of LCs due to complications involving pharmaceutical regulations, especially those related to generic drugs. Environmental measurement instrument sales increased in China due to the government enforcing anti-pollution measures. As for GC, geographically, sales rose significantly in China, while MS sales in the country grew double digits.

Shimadzu AMI Q3 FY19	
	% of Rev.
Academic/Govt.	18%
Materials/Machinery/ Electrical/Automotive	21%
Pharma/CRO/Health Care/Foods	29%
Other	32%

Click to enlarge

By end-market, combined AMI sales to three main sectors were mixed. In the pharmaceuticals/contract analysis/healthcare/foods category, contract analysis sales grew globally, while pharma sales were strong in China and Europe. In the materials/machinery/electrical/automotive category, there was broad-based demand in many fields, especially petrochemical, steel and machinery. In the academia/government category, sluggish sales continued in Japan as well as globally. However, government demand increased to 41% of sales in China, in comparison to 45% in the previous quarter. AMI sales in the Other category increased due to the expansion of the analytical instrument customer base.

Shimadzu AMI Q3 FY19			
	Chg.	Local Currency Chg.	% of Rev.
Japan	-4.1%	-4.0%	36%
Americas	7.1%	8.0%	13%
Europe	16.9%	19.0%	12%
China	2.8%	3.0%	25%
Other Asia	11.5%	12.0%	12%
Other	-17.6%	-17.0%	2%

Click to enlarge

Sales outside of Japan represented 64% of AMI revenues. Geographically, North America sales rose 9.0% in local currency to ¥6.5 billion (\$57.6 million at 112.76 = \$1). South American sales remained flat in local currency at ¥1 billion (\$8.9 million).

Shimadzu AMI Q3 FY19				
Op. Profit	Chg.	Local Currency	Chg. Op. Margin	Chg. (bps)
¥8.9	3.5%	6.0%	15.3%	15

[Click to enlarge](#)

For fiscal year 2019, AMI's sales growth forecast remains the same with a 9.4% increase bolstered by changes in currency effects.

Semiconductor and Pharmaceutical Lead Spectris Materials Analysis Sales

Spectris Materials Analysis FYE 18					
Rev. (M)	Chg.	Acq.	Currency	Organic Chg.	% of Rev.
£541.1	16.4%	10%	-2%	9%	34%

[Click to enlarge](#)

Spectris Materials Analysis (MA) revenue grew in the double digits in 2018 to make up 34% of company sales, thanks to strong demand in the semiconductor and pharmaceutical industries.

Spectris Materials Analysis FYE 18			
Adj. Op. Profit (M)	Chg.	Adj. Op. Margin	Chg. (bps)
£95.4	9.3%	17.6%	-12

[Click to enlarge](#)

Geographically, there were strong MA sales in Asia, particularly China, South Korea and India. Most of the region's revenue was generated in the second half of the year. In addition, North America and Europe sales were up, with most of the revenue generated in the first half of the year for both regions.

Spectris Materials Analysis FYE 18	
	% of Rev.
Pharma & Fine Chemicals	37%
Metals, Minerals & Mining	21%
Academic Research	12%
Semicon, Telecoms & Electronics	13%
Other	17%

[Click to enlarge](#)

Spectris MA reported strong sales in the pharmaceutical/fine chemicals industry in North America, Europe and Asia. The company credited Asia's strong regional sales to China and India, as both countries increased regulation of and

investment in the pharmaceutical sector. The metals/minerals/mining industry generated solid sales but was flat in North America and Europe due to weak demand for metals. Sales in the academic research industry improved after a weak 2017, thanks to improved economic conditions and increased government funding in both North America and Asia. Lastly, the semiconductor/electronics industry saw strong demand from battery and electronic customers in China, Taiwan and South Korea.

Spectris Materials Analysis FYE 18		
	Chg.	% of Rev.
UK	249%	9%
Germany	19%	5%
France	17%	3%
Rest of Europe	6%	14%
USA	5%	19%
Rest of North America	22%	3%
Japan	-2%	6%
China	13%	15%
South Korea	18%	5%
Rest of Asia	11%	13%
Rest of the World	5%	7%

[Click to enlarge](#)

Spectris did not provide a first quarter or a full-year forecast.

US and Asia Saves Waters from Soft Sales in Europe

Q4

Waters Q4 FY18			
	Rev. (M)	Chg.	% of Rev.
Total	\$715.0	4.0%	
Waters Div.	\$625.1	3.8%	87%
TA	89.92	6.0%	13%

[Click to enlarge](#)

Waters' fourth quarter 2018 revenues grew 5.0% in constant currency, as constant currency sales for the Waters Division and TA instruments increased 5.0% and 7.0%, respectively (see [IBO 1/31/19](#)). All figures below are in constant currency. Instruments led product line sales, rising 4%, followed by service and chemistry sales, increasing 6% and 8%, respectively. Overall sales were impacted by one additional calendar day in the quarter, which slightly affected service revenue.

Waters Q4 FY18				
	Rev. (M)	Chg.	Constant Curr. Chg.	% of Rev.
Asia	\$262.9	8.4%	9%	37%
Americas	\$248.5	5.4%	6%	35%
Europe	\$203.6	-2.6%	-1%	28%

[Click to enlarge](#)

Waters experienced broad-based revenue growth in every market category, with particularly strength in the pharmaceutical market. The pharmaceutical market's performance was led by China's double-digit revenue growth, which was partially offset by soft sales in Europe and India. Strong demand for material science products drove overall sales increases in the industrial market. The academic/government market's revenue growth was led by both Asia and pharmaceutical discovery research. Geographically, Asian sales offset low sales in Europe and the Americas, while Asian pharmaceutical discovery research sales offset weak demand for biomedical research applications.

Waters Q4 FY18				
	Rev. (M)	Chg.	Constant Curr. Chg.	% of Rev.
Pharmaceutical	\$396.9	6.3%	7%	56%
Industrial	\$219.2	1.0%	2%	31%
Govt. & Academic	\$99.0	1.9%	3%	14%

[Click to enlarge](#)

On a geographical basis, Chinese demand rose 15%, thanks to the pharmaceutical and academic/government markets, followed by solid sales in South Korea and Japan. Despite soft sales in India, the country achieved its second most profitable quarter in the company's history due to strong demand in the pharmaceutical market.

Americas sales were driven by broad-based growth by market and product, primarily in the US, where revenue rose 5%. Though Europe had solid sales in the pharmaceutical market, and in Central and Southern Europe, the region was unable to offset overall soft sales due to socio-economic factors such as Brexit and low demand in both the industrial and government/academic markets.

Waters Q4 FY18			
Adj. Op. Profit (M)	Chg.	Adj. Op. Margin	Chg. (bps)
\$244.5	6.1%	34.2%	65

[Click to enlarge](#)

Product wise, Waters Division sales were driven by its chemistry product line, whose revenue increased 8%. LC and LC/MS instrument sales remained consistent with a 3% increase thanks to QA/AC demands in drug production. Demand for MS increased exponentially due to strong sales associated with the pharmaceutical market.

Demand for the TA-branded product line was due to instrument and service sales, which increased 6% and 9%, respectively. Thermal analyzer sales rebounded after soft sales in the previous quarter. Waters forecasts first quarter 2019 organic sales to increase a 4%-6%, with currency subtracting 2%-3% growth.

FYE

Waters FYE 18			
	Rev. (M)	Chg.	% of Rev.
Total	\$2,419.9	4.8%	
Waters Div.	\$2,139.3	4.5%	88%
Instrument Systems	\$1,000.6	1.2%	41%
Chemistry	\$400.3	7.6%	17%
Service	\$738.4	7.5%	31%
TA	\$280.6	7.3%	12%
Instrument Systems	\$204.1	6.6%	8%
Service	\$76.5	9.2%	3%

[Click to enlarge](#)

Waters' full-year 2018 revenues grew 4.0% in constant currency, as sales for the Waters Division and TA Instruments increased 3.0% and 7.0%, respectively (see *IBO* [1/31/19](#)). All figures below are in constant currency. Instrument sales rose 1.0%, and service and chemistry sales both rose 6.0%.

Waters FYE 18				
	Rev. (M)	Chg.	Constant Curr. Chg.	% of Rev.
Asia	\$922.3	6.9%	6%	38%
China	\$443.3	14.5%		
Japan	\$173.4	3.6%		
Asia Other	\$305.6	-0.9%		
Americas	\$835.2	3.1%	3%	35%
United States	\$683.6	2.1%		
Americas Other	\$151.6	7.7%		
Europe	\$662.5	4.1%	1%	27%

[Click to enlarge](#)

Waters' 2018 overall sales were driven by the pharmaceutical market, specifically strong demand for both small molecule analysis and large molecule analysis, partially offset by soft sales to biomedical research customers. Specifically, small molecule analysis comprised two-thirds of the company's pharmaceutical business, while one-third was related to biomolecular development.

Waters FYE 18				
	Rev. (M)	Chg.	Constant Curr. Chg.	% of Rev.
Pharmaceutical	\$1,365.7	5.5%	4%	56%
Industrial	\$737.1	2.2%	1%	30%
Govt. & Academic	\$317.1	8.1%	7%	13%

[Click to enlarge](#)

On a geographical basis, China's double-digit growth was attributed to strong demand from the pharmaceutical and government/academic markets. Central and Southern Europe performed well for the year, but could not offset the soft sales in Northern Europe, as well as in the UK, Ireland and Benelux. Waters also noted its contingency plan regarding Brexit since 4% of its global revenues are from the UK.

Waters FYE 18			
Adj. Op. Profit (M)	Chg.	Adj. Op. Margin	Chg. (bps)
\$739.8	11.7%	30.6%	189

[Click to enlarge](#)

Market wise, revenue growth in the academic/government market was largely driven by the US and Asia, but overall had soft sales due to Europe.

Waters expects its 2019 organic sales to increase 4%-6%, with currency subtracting 1%-2% growth.

Chromatography Data Systems

A chromatography data system (CDS) is a software program that automates instrument control, data acquisition, data processing, data filtering, data storage and database management for HPLC, LPLC, IC, GC, SFC and other chromatography instrumentation. CDS allows multi-instrument control and multi-user access for use in secure network environments. With this software, end-users can control menu management, form displays, validation, data entry, text editing, data pre-processing and the generation of reports.

There are two types of CDS architectures available in the market: the workstation (standalone) version and client/server (multi-user) version. A workstation architecture allows CDS software to be run on only one PC and usually can control up to five instruments. A client/server architecture offers multiuser capabilities, increased data storage and a database. This architecture usually involves a dedicated server networked with several PCs or terminals that serve as clients, and additional servers or PCs can be easily added to the network. CDS integration with a cloud-based system provides a better and faster solution for many enterprises.

The market for CDS reached over \$400 million in 2018 with a projected low single-digit growth rate for 2019. This market includes standalone software, software packages and add-ons, and training and other technical support. The slow growth expected in the CDS market is partially the result of market maturity, as the software has become a part of the standard package for most initial systems. There is not much room to grow, as CDS technology itself has become customary and ubiquitous.

In recent years, CDS functionality has focused more on system automation and broad integration with other instruments or other lab data management software, such as LIMS and MS software. Some software packages also include informatics and data visualization features to provide a comprehensive results analysis in addition to controlling the chromatography instrument itself. Version upgrades and customized add-ons for specific applications also sustain the growth of the market. Since a CDS is needed to control almost all chromatography systems, typical customers for this software are the same as end-users in the overall chromatography market. In particular, pharmaceutical, chemical and academic labs are the top three end-user markets. The client/server CDS type is common in the pharmaceutical and industrial sectors due to a large number of users involved in R&D or QC, while the standalone version is largely used in academia and other smaller analytical labs.

Users generally employ the CDS that comes with their particular chromatography instruments. That is why top chromatography vendors such as Agilent Technologies Thermo Fisher Scientific and Waters also offer well-known CDS products. Waters leads the market with its Empower 3 software, which provides a complete data management system for HPLC, UHPLC, and GC, along with cloud-based integration. Agilent is competing with its OpenLab product line, while Thermo Fisher offers its popular Chromeleon 7 software. These software packages are usually compatible with both the respective company's instruments and also other vendors' products.

CDS at a Glance:

Leading Vendors

- Waters
- Agilent Technologies
- Thermo Fisher Scientific

Largest Markets

- Academia
- Chemicals
- Pharmaceuticals

Software Cost

- \$2,000-\$30,000

Food

Due to widespread and small-scale food-related illness incidents and recalls last year, the food industry and US FDA are facing increased pressures to improve food safety. However, because of contracting budgets and the government shutdown earlier this year, which affected routine FDA inspections, federal and state agencies' efforts to combat food contamination have slowed down.

The Food Safety Modernization Act (FSMA) (see [IBO 9/30/14](#)) was established to diminish food-related illnesses through prioritizing prevention over inspections. Many important provisions, however, have yet to be adopted by the food industry, including the Produce Safety Rule and the Foreign Supplier Verification Program. An example of this is the importance of utilizing clean water for agricultural purposes, as last year, romaine lettuce and other leafy crops in Arizona were watered using E. coli contaminated canal water, leading to an outbreak of illnesses and recalls of romaine. While certain provisions are scheduled to be enacted in 2019, rules relating to agricultural water have been delayed by an extra 2-4 years to confirm that the standards are suitable to be adopted by farmers all over the US, a point of contention for many food safety advocates. Experts predict that many more recalls of leafy crops are inevitable if the FDA does not shorten compliance deadlines for agricultural water requirements.

Numerous FSMA regulations for companies and farms are going into effect in 2019. These include: the Produce Safety Rule, which requires US and foreign farms to have processes in place to prevent contamination for the growing, packing and holding of fruit and vegetables (excluding agricultural water); Foreign Supplier Verification Program, requiring US importers to confirm the food they import meets the same safety standards created for US-produced items; Intentional Adulteration Rule, aimed at protecting food supplies and products from harm; and Voluntary Qualified Importer Program, which provides US companies greater control over their import supply chains' expedited reviews and the importation of foods.

The FDA also plans in 2019 to improve food recalls, disclosing GMO ingredients on food products and possibly drafting regulations for cell-based meat.

Source: [Food Quality & Safety](#)

R&D

Total global gross expenditures on R&D in 2019 are forecast to grow 3.6% to \$2.3 trillion in purchasing power

parity, based upon spending figures of the 116 countries that have R&D investments of over \$20 million. Although R&D spending in the US continues to rise annually, globally, the US' share of R&D investments is contracting in the face of other countries increasing R&D spending at a higher rate. For example, a decade ago, the US accounted for 34% of global R&D spending, while China made up around 12.5%—currently, the US represents approximately 25%, while China contributes over 22%. In general, US and European R&D investments as a share of global R&D spending have been progressively falling over the past 10 years, while Asian R&D investments, especially in China, have been steadily growing.

In fact, other than Asia, regions are expected to experience decreases, however nominal, in their contribution to global R&D spending. In 2019, North America is projected to account for 27.07% of global R&D spending, a decrease of 22 percentage points, while South America's share of global R&D spending will fall 5 percentage points to 2.22%. European R&D spending accounts for 20.31% in 2019, a 33 percentage point drop. Similarly, R&D spending in Russia, the Middle East and Africa also slightly will drop to 2.79%, 2.50% and 0.87%, with decreases of 12, 2 and 1 percentage point, respectively. In contrast, Asia's share of 2019 R&D spending is forecast to grow 71 percentage points to account for 44.24% of worldwide R&D spending.

The US is forecast to invest 2.7% more in R&D in 2019 to total \$581.0 billion, largely due to increases in federal research funding in the FY19 budget (see [NSF and USDA Receive Significant Increases in US FY19 Budget](#)). Of this amount, \$154.4 billion will come from the federal government, \$375.8 billion from industry, \$22.3 billion from academia, \$7.4 billion from other government sources and \$21.1 billion from nonprofits, signaling increases of 6.2%, 1.1%, 4.7%, 5.7% and 2.4%, respectively.

Source: [R&D Magazine](#)

Energy

After more than 100 years of intense growth, global energy demand is expected to plateau in the next 11 years, due to renewable energy pervading the global energy mix. Changes in energy usage patterns will also contribute to the plateau of energy demand in 2030, with a switch to service industries offsetting previously rising energy demand. Experts predict that after 2035, over 50% of energy generation will be from renewables.

Oil demand for road transport will also fall by 2035, as the number of electric vehicles sold is forecast to surpass 100 million, with a possible 2 billion electric vehicles used for road transport by 2050. Overall, oil and coal demand growth is slowing and is expected to peak in the early 2030s. Gas is expected to maintain its growth until 2035, when demand will also begin to flatten and then decline.

Due to increased living standards in non-OECD countries, building-related electricity demand is also expected to spike, jumping 80%–85% between 2016 and 2050, thanks to higher usage of space cooling and appliances. This increased usage is predicted to account for approximately 40% of total building-related electricity demand growth, with around 33% of the increase coming from the growing middle class across Africa.

China is a major player in the changing energy landscape, with the nation's gas-demand growth being larger than that of the next 10 countries, including the US. Because of this, China will account for almost 50% of gas-demand growth through 2035. The country will also significantly affect coal prices, as coal demand is forecast to drop 40% by 2050 due to slowdowns in the Chinese power sector. The decrease in coal usage will help spur a 20% decrease of global energy-related emissions, after emissions peak in 2024.

Source: [McKinsey&Company](#)

Portugal

In 2018, Portugal's higher education, research and innovation (HREI) budget totaled €2.7 billion (\$3.1 billion), a 5.6% increase. Approximately €2.6 billion (\$3.0 billion) came from the Ministry of Science, Technology and Higher

Education, with €504 million (\$573.6 million) designated for functioning and investment, and the bulk, or €2.1 billion (\$2.4 billion), allocated for higher education, which includes universities and polytechnics' block funding, and social support.

The Ministry of Economy contributed €512 million (\$582.7 million) of total HREI spending through European Structural and Investments Funds (ESIF), and €9 million (\$10.2 million) came from the Ministry of Defense for defense R&D support. The remainder of funding came from various ministries for the state labs that come under their purviews, contributing €137 million (\$155.9 million) from national funds and €2 million (\$2.3 million) from ESIF funds.

ESIF funding for HREI has been steadily increasing. Previous to 2014, ESIF funding was approximately 21% of national research and innovation funding; currently, it accounts for nearly 33%. Including national co-funding, total funding through ESIF instruments represents almost 50% of all public funding support for research and innovation, indicating the high proportion of EU policy funding in Portugal's public HREI spending. This makes Portugal less reliant on ESIF funds for R&D investments than countries such as Estonia, Latvia or Poland, but more reliant than countries such as Spain and Italy. Total ESIF investment, which includes EU and federal co-funding, accounted for 23% of government expenditure on R&D and almost 50% of public funding support for research and innovation.

For the 2014-20 period, excluding higher education, research and innovation funding from ESIF totaled €3.6 billion (\$4.1 billion), approximately €513 million (\$583.8 million) per year and nearly 20% of total ESIF in the country.

Source: [OECD](#)

Vietnam

The Vietnamese government has issued a decree allowing for corporate tax cuts and exemptions, credit incentives, and lessened or exempted land and water surface-lease fees for science and technology companies in the nation. Effective March 20, the decree is expected to increase incentives and support policies for the over 380 domestic companies classified as science and technology firms and 43 certified high-tech organizations.

According to the decree, companies that have generated income from the development or commercialization of products created as a result of scientific and technological R&D will be eligible for corporate tax reductions and exemptions, an incentive similar to that given to R&D projects with new investments. These science and technology companies will be exempt from corporate taxes for the next 4 years, as well as receive a 50% reduction in corporate taxes for the next 9 years. In order to qualify for tax incentives for the fiscal year, these companies' science and technological projects must make up a minimum of 30% of total revenue.

Companies will also be offered credit incentives, with projects funded by the federal National Technological Innovation Fund and the Science and Technology Development Fund qualifying to receive loans with competitive interest rates or guarantees allowing for loans from banks. The decree also offers import and export tax incentives for R&D, production and other company operations. In addition to the financial incentives, science and technology companies will not be required to pay fees for utilizing equipment and facilities at national labs, federally owned research and technology facilities, and technology incubators, as they will only be obligated to purchase the raw materials needed to conduct R&D activities.

Source: [Vietnam Briefing](#)

Russia

In November, the Russian government announced that RUB 635 billion (\$9.7 billion) is planned to fund the National Project for Science until 2024, with the state government contributing RUB 405 billion (\$6.2 billion) and RUB 231 billion (\$3.5 billion) coming from "extra-budgetary resources." Approximately RUB 135 billion (\$2.1 billion) has already been approved for the next three years, and the government expects that R&D expenditures from all sources

will grow faster than Russia's GDP.

A key priority of the Project is upgrading research facilities and equipment, as well as the establishment of a minimum of 15 leading science and education centers. Improving and advancing research infrastructure is a significant goal of the Project, with all leading scientific centers in the country to receive cutting edge equipment, as 50% of the instruments are expected to be upgraded or replaced. President Putin announced a focus on equipping facilities with instruments that can accelerate technological innovation.

Additionally, the government has allocated RUB 9.9 billion (\$150.6 million) in federal subsidies to increase the global competitiveness of 21 Russian academic institutions. The funding is part of the extra federal support to universities to improve their international standings, an initiative that began in 2013. This year, RUB 861 million (\$13 million) will be allocated to the National University of Science and Technology MISIS and the Moscow Institute of Physics and Technology.

Simultaneously, the Ministry of Science and Higher Education is decreasing red tape at universities, including simplifying bureaucratic processes required to obtain experimental materials or prepare financial reports required for grants. The Ministry is expected to present its recommendations to streamline procedures in the first three months of 2019.

Source: [University World News](#)

Broad-based Companies

Company Announcements

Blacktrace announced in November 2018 that it has opened a new office in Kanagawa, Japan, doubling its sales team.

Dr. Barthold Piening joined **QIAGEN's** Executive Committee in December 2018 as the new senior vice president, head of Global Operations. His experience includes positions at **STADA**, **ALTANA Pharma**, **Nycomed** and **Takeda**.

Xylem's fourth quarter 2018 sales for its Test segment grew 2% organically. Full-year Test sales increased 4% organically to \$344 million to make up 23% of its Measurement & Control Solutions revenue (see [IBO 1/31/19](#)).

In January, **Shimadzu** announced plans to build the ¥8.6 billion (\$7.8 million) 161,459 ft² (15,000 m²) SHIMADZU Future Collaboratory at its Technology Research Laboratory in Keihanna Science City, Japan. The new lab will focus on several core themes, including AI, innovative biotechnology, brain science and the five senses. Construction on the facility is scheduled to last from July 2019 through August 2020.

In February, **Eppendorf** named Thomas Heydler, CEO of software firm **Definiens**, as a member of its Supervisory Board, succeeding Michael Schroeder, who resigned for personal reasons.

In February, **Agilent Technologies** presented its Agilent Thought Leader Award to **Monash University** Professors Paul Bonnington and Kimbal Marriott in support of their innovative research into data analytics.

Agilent Technologies named in February Diether Lambrechts, PhD, as a winner of its Agilent Thought Leader Award in support of his research in cancer genomics. Dr. Lambrechts directs the **VIB-KU Leuven Center for Cancer Biology** in Leuven, Belgium, and is a professor of human genetics at **KU Leuven**. His lab focuses on the discovery of genetic or epigenetic markers, either as susceptibility factors for cancer treatment development, prognostic markers to improve the molecular genetic annotation of cancer or markers for targeted cancer therapies.

For the fiscal first quarter ending in December 2018, **Biosciences** revenues within **Becton, Dickinson's Life Sciences segment** declined 2.8%, but was up 3.6% on a currency neutral basis, to \$281 million. Sales were led by research reagents and new instruments, partially offset by the unfavorable timing of tenders in EMA.

In February, **Science Exchange**, a provider of R&D services, announced a strategic partnership with **Thermo Fisher Scientific's** services business through a new online services marketplace.

Illumina named Sue Siegel to its Board effective February 5. She is Chief Innovation Officer at **GE** and CEO of **GE Ventures**. She previously served as president of **Affymetrix**.

In February, Australia's **University of Melbourne** signed a memorandum of understanding with **Illumina** focused on genomics-based biomedical and clinical research of cancer.

Mettler-Toledo's fourth quarter 2018 Lab sales rose 7%, excluding currency effects, to make up 52% of total revenues, or \$425.4 million (see [IBO 2/15/19](#)), with strong growth for analytical instruments, pipettes and process analytics, as well as in China. For 2018, Lab revenue rose 9% in local currency, 11% in US dollars, to 51% of sales, or \$1.5 billion. **Biotix** contributed 2% to segment growth (see [IBO 11/15/17](#)).

In February, **Mettler-Toledo** announced plans to name Marco Gadola to its Board in May. Mr. Gadola is CEO of **Straumann**.

Corning Life Sciences sales rose 5.8% in the fourth quarter 2018 to \$238.0 million. Full-year segment revenue increased 7.6% to \$946 million (see [IBO 1/31/19](#)). Labware and Cell culture products sales rose 2.3% and 15.5% to make up 57% and 43% of Life Sciences revenue, respectively. Full-year 2019 Life Sciences sales are expected to grow in the low to mid-single digits.

In February, **PAC's** Rotterdam, the Netherlands, site moved into a new 30,139 ft² (2,800 m²) facility. The **AC Analytical Controls** and **Antek** product lines will be developed, produced and tested for customers at the PAC brand center.

In 2018, **AMETEK's** Process and Analytical Instrumentation revenue totaled \$2,120 million to represent 70% of the company's EIG's business (see [IBO 2/15/19](#)).

Hitachi High-Technologies announced that Shinji Sato, senior vice president and executive officer, CSO and CMO, will be named representative executive officer, executive vice president and executive officer in April.

MS & LC/MS

Company Announcements

In January, **MRM Proteomics** granted **Biodesix** rights to utilize its iMALDI technologies by developing assays to further advance blood-based lung cancer diagnostics.

In February, **Plasmion** completed a nearly €1 million (\$1 million) investment round with a consortium that includes **Bayerische Beteiligungsgesellschaft (BayBG)** and **High-Tech Gründerfonds**. The company's SICRIT (Soft Ionization by Chemical Reaction in Transfer) MS ionization technology enables applications in the fields of chemical analysis, industrial QC and process control.

Portable MS maker **1st Detect**, part of **Astrotech**, named Vice President and COO Raj Mellacheruvu as president and CEO in February. Former CEO Thomas B. Pickens III continues to serve on the Board.

Product Introductions

In January, **Shimadzu** launched the CLAM-2030 fully automated preparation module for LC/MS. The module automates everything from the preparation of urine, blood and other biological samples to measurement, completing the process in 3-8 minutes. The module can be connected to four models of Shimadzu triple quadrupole LC/MS: the LCMS-8040, LCMS-8045, LCMS-8050 and LCMS-8060.

Microsaic Systems introduced in January the compact, point-of-need Microsaic MiD ProteinID technology for verification of target proteins throughout the whole bioprocessing value chain. It features a mass range of 50-3,200 m/z.

In January, **Shimadzu** released an MS system with a probe electrospray ionization unit. The optional dedicated unit, DPiMS-8060, enables PESI (probe electrospray ionization). As ionization is performed without a chromatograph, the time required for preparation and analysis can be reduced. The DPiMS-8060 PESI can be installed on three Shimadzu triple quadrupole MS systems: the LCMS-8060, LCMS-8045 and LCMS-8050.

Waters debuted in January the Kairos Amino Acid Analysis Kit, consisting of reagents, standards and analytical column and associated methodology, for the quantification of 40 or more amino acids in 10 minutes or less when used with compatible Waters UPLC systems and MS systems and the Waters Targeted Omics Method Library.

In January, **Waters** introduced the fit-for-purpose [BioAccord System](#), an TOF LC/MS system for analytical testing of biopharmaceuticals. The system is optimized for protein, released glycan and peptide monitoring applications.

In February, **Andrew Alliance** announced a new strategic partnership agreement with **Waters** to improve laboratory operations for mid- to small-throughput LC/MS sample preparation. New products will be launched in 2019.

In February, **IonSense** launched PIMISA Search Software for identification of drugs of abuse by DART. The software operates together with the DART-equipped **Waters** ACQUITY QDa detector. Using multiple ion fragmentation conditions for each analyte, the software matches a set of spectra against the drug spectral library developed in collaboration with **Cayman Chemical**.

Sales and Orders of Note

In January, **SCIEX** announced that the **San Francisco Office of the Chief Medical Examiner** acquired 3 SCIEX X500R QTOF MS systems and 5 SCIEX QTRAP 6500+ LC-MS/MS systems to accelerate caseloads and improve accuracy.

Informatics

Company Announcements

In December 2018, **Scailyte** raised CHF 2.75 million (\$2.75 million) in seed funding. Scailyte develops AI-based software for analysis of complex single-cell data to enhance biomedical research, pharmaceutical discovery and precision diagnostics. The company's software will launch this year.

In January, **Verily**, an **Alphabet** company, announced a \$1 billion investment round, led by **Silver Lake**. Verily is a life sciences research and engineering organization focused on improving health care outcomes by applying the latest scientific and technological advances to significant problems in health and biology.

Molecular simulations firm **Schrödinger** closed a \$85 million round in January, co-led by the **Bill and Melinda Gates Foundation Trust** and **WuXi AppTec's** Corporate Venture Fund.

In January, **MedEngine**, a company specialized in high-quality medical data science services, and **BC Platforms**, a provider of genomic data management and analytics, entered into a major strategic alliance to create turnkey research solutions for the pharmaceutical and health sectors. The alliance brings together BC Platform's global network of biobanks and MedEngine's expertise in medical research.

FACIT, a business accelerator for Ontario oncology innovations, announced in January a follow-on investment in **DNASTACK**, a provider of cloud-based genomic data sharing, access and management. DNASTACK currently has 20 employees.

MediSapiens, a developer and provider of genomic, biomedical and health data solutions, partnered in January with **Modul-Bio**, a provider of solutions for biological sample management, Biobank Information Management Systems (BIMS) and collaborative tools for sharing biological sample collections.

In January, **Scilligence**, a provider of mobile cheminformatics and bioinformatics for the life sciences industry, joined the **Accenture** research platform open partner ecosystem. Accenture's project has been developed in collaboration with **Merck** and **Amazon Web Services** to enhance innovation and collaboration between life science companies and software providers.

Eagle Genomics, a microbiome discovery platform company, closed a \$3.5 million investment in January, led by the **Environmental Technologies Fund**.

In February, **Eagle Genomics** was selected to join the latest cohort of the **Microsoft AI Factory**.

In February, scientific informatics solutions and services firm **Dotmatics** and **TetraScience**, which provides a data platform for life sciences R&D, formed a strategic partnership. As part of the partnership, TetraScience has built a Dotmatics data integration. The Dotmatics suite is now available as both a data source and data consumer via the TetraScience Integration Engine.

Genedata, a provider of advanced software solutions for biopharmaceutical R&D, announced in February that scientific instrument company **Bruker** has become a Genedata Ready-to-Run partner. Bruker will collaborate with Genedata to offer standardized integrations with the Genedata Biopharma Platform. Initial Bruker integrations include the Bruker SPR32 system and rapifleX MPP MALDI TOF/TOF MS.

In February, **DNAexus** closed a \$68 million financing, which will support the deployment of DNAexus Apollo, an advanced platform for multi-omics and clinical data exploration, analysis and discovery.

Autoscribe Informatics appointed **NV Genomics** as a distributor in India in February for the Matrix family of LIMS.

In February, biomedical data science company **Seven Bridges** announced it achieved 260% all-commodity volume growth in 2018 and maintained a 95% renewal rate.

Product Introductions

IOMICS released in December 2018 its first cloud-deployed analytics service, ASPEN, based on its FUSION Analytics Platform. ASPEN allows every bench scientist to automatically mine and model complex multiscale datasets to identify molecular signatures of pathogenic processes and disease progression critical to drug development, companion diagnostics and personalized patient profiling.

In January, **CloudLIMS** released an Instrument Module for its LIMS. The Instrument Module is for testing laboratories such as food and beverage, cannabis, clinical, and environment, enabling them to achieve ISO/IEC 17025:2017 accreditation. Additionally, it helps a laboratory monitor the status of its equipment and assure that an instrument is properly calibrated and ready to use for conducting tests

Certara launched in January v18 of its Simcyp Population-based Simulator. The Simulator's permeability-limited tumor models now combine knowledge of the tumor composition with the drug's physicochemical properties to simulate the distribution of small molecule drugs or biologics.

Genedata launched in January the new web-based Genedata Screener 16, featuring a completely redesigned user interface enabling a fully interactive and intuitive review of entire screening campaigns in the browser.

In February, **Genedata** released a new Request Management Module, which improves operational efficiency and monitors overall R&D operations by supporting the full life cycle of task scheduling. Used to submit and track requests from initiation through completion, it manages intergroup communications and centrally documents project progression in real time.

In February, analytics firm **Clarivate Analytics** introduced Cortellis Cloud, an integrated, scalable technology platform that serves as a single point of access to Cortellis, the company's suite of life science intelligence solutions.

Clarivate Analytics, which offers scientific information products, announced in February a global agreement with **Bioinfogate**, a health care data science organization, to cross-link the OFF-X translational safety intelligence portal

with Cortellis pre-clinical intelligence.

FreeLIMS released in February a new version of its free FreeLIMS software. New features and improved features include copying ability from parent to aliquot, pool samples to create derivative or aliquot, and import test results of samples tested for multi-analytes.

Sales and Orders of Note

STRmix in January announced five new customers, the **South Carolina Law Enforcement Division**, the **Colorado Bureau of Investigation**, **Bode Cellmark Forensics**, the **Nebraska State Patrol** and the **University of Nebraska Medical Center Human DNA Identification Laboratory**. The STRmix forensic software for resolving mixed DNA profiles is now being used by 43 federal, state and local agencies in the US.

Elsevier, the information analytics business specializing in science and health, announced in February that **Lundbeck**, a global pharmaceutical company specializing in brain diseases, has selected Elsevier's Reaxys and Reaxys Medicinal Chemistry to support the ambitions of its research organization and accelerate data sharing and mining.

Laboratory Products

Company Announcements

In December 2018, **Labviva**, an AI-powered digital marketplace for life science reagents, instrumentation and services, launched its platform to offer scientifically informed purchasing decisions. The website features scientific data and product validation information, and provides a seamless purchasing experience and integration with eProcurement platforms. Its listing features more than 500,000 products.

Lab Equipment

Company Announcements

Scientific Digital Imaging acquired **Fistreem**, a designer and manufacturer of water purification products and vacuum ovens, in September 2018 for £756,000 (\$994,737). Fistreem generated revenues for the year ending August 31, 2017, of £645,000 (\$848,684). Sixty-one percent of its sales are exports.

In December 2018, **KNF**, a provider of diaphragm pumps and systems for gases, vapors and liquids, established the KNF Digital Acceleration Center in Hamburg, Germany. The Center, home to a new company, is intended to be a driving force in the field of digitalization and to promote the culture of innovation, as well as the external impact of KNF.

Pipette.com, a pipette calibration facility and distributor, announced in December 2018 the addition of a new **Eppendorf** pipette, selected **Gilson** pipettes (the new Pipetman L, Gilson Pipetman and Microman) and all **Rainin** pipettes to its website.

Kewaunee Scientific Chairman William A. Shumaker retired on January 31, citing personal reasons. He had served as CEO until 2013.

In February, **Chemspace** and **LabNetwork**, a **WuXi AppTec** company, which are both online marketplaces for chemical compounds used in drug discovery, entered into a collaboration agreement. LabNetwork's products will be available on www.chemspace.com, with distribution and technical support provided by Chemspace for European customers. Use of the Chemspace database is free of charge for customers.

Product Introductions

In December 2018, **Eppendorf** introduced the CryoCube F740h, advanced F740Hi and water-cooled F740hiw ultra-low-temperature freezer models, featuring future-proof green cooling liquids.

VELP Scientifica released in January the VELP Hermes web platform enabling a connected ecosystem of devices, people and data.

In January, **Asynt** launched the affordable, five-module Reactor flow chemistry platform. It allows both single and multiphasic reactions to be carried out across a range of residence times. Total operating volume is 10 mL.

VIAFLO introduced in January 2 new 24-channel pipetting heads, extending the capabilities of its VIAFLO 96/384 pipettes for cell biology workflows. The new heads are a 10- 300 µL option for cell or reagent addition, and a 50 -1,250 µL version for media and buffer transfers.

Across International, a manufacturer of heat treatment, material processing, and laboratory equipment, released in February a new magnetic stirrer with a 7 in. heated plate, a maximum speed of 2,000 rpm and a maximum temperature of 350°C.

Caron announced in February that its Wally family of CO₂ incubators now carries the CE mark and is available in the EU.

In February, **Uniqsis** announced that its PhotoSyn photoreactor light module for continuous flow chemistry is now available with alternative LED array configurations, which makes it compatible with a broader range of photochemical reactions.

Porvair Sciences released a 96-well, round bottom, 1 mL deep-well microplate manufactured in the US in February. The microplates are certified RNase/DNase free.

Lab Automation

Company Announcements

In November 2018, **Techcomp** signed an exclusive distribution agreement with liquid handler supplier **Eprep** for China, Hong Kong SAR and Macau SAR.

The [Boston Business Journal](#) reported in December 2018 that **HighRes Biosolutions** promoted President Ira Hoffman to CEO, effective February 1. The company has \$50 million in sales and 150 employees.

Andrew Alliance announced a collaboration agreement in February that will integrate its OneLab cloud-based software solution and connected devices into biotech firm **Valitacell**'s cell line development applications.

Andrew Alliance announced in February a co-marketing agreement to integrate **Ziath**'s DataPaq Mirage 2D barcode rack scanner and other devices with its OneLab software platform and associated hardware, bringing sample tracking capability to a large number of applications.

Sales for **Brooks Life Science** sales rose 40.5%, including 8% organic growth, for the fiscal first quarter ending in December 2018 to \$66.7 million (see [IBO 2/15/19](#)). On an organic basis, Sample Management sales increased 8% and sales for recently acquired GENEWIZ (see [IBO 10/15/18](#)) grew 20%. The company added 60 new customers to its Sample Management business. Fiscal second quarter Life Science revenue is expected to be \$81-\$86 million, including Sample Management sales of \$50-\$52 million.

Product Introductions

In January, **Hamilton Storage** launched the LabElite DeCapper SL. The model is 20% smaller than the LabElite DeCapper. It is compatible with labware in 96-, 48- and 24-format tube racks, with internal or external threads, such as microtubes, cryovials and specialty tubes, from all major labware manufacturers.

In January, **Gilson** launched a cost effective benchtop instrumentation product line, comprised initially of the the CENTRY 101 Plate Centrifuge, the CENTRY 117 Microcentrifuge, the Digital Mini Incubator, the Digital Drybath series, the Mini Vortex, the Vortex Mixer, the Digital Hotplate Stirrer and the Roto-Mini Plus.

INFORS HT released in January a new Multitron incubator shaker, featuring a temperature-control concept that allows users to achieve optimum, gradient-free temperature uniformity, guaranteeing comparable growth conditions across all batches. Other new features include an improved hygienic design and an Ethernet interface.

In February, **Andrew Alliance** and **Sartorius** introduced the co-developed Andrew Alliance Pipette+ system. The Andrew Alliance Pipette+ system comprises several components that communicate with one another: Sartorius' electronic single and multichannel pipette hardware, an intelligent stand and Andrew Alliances' cloud-based OneLab software.

INTEGRA introduced in February the cost effective ASSIST PLUS pipetting robot. ASSIST PLUS can be programmed either directly on the pipette or remotely from a PC, and has three deck positions.

Reported Financial Results

\$ in Millions USD	Period	Ended	Sales	Chg.	Op. Prof.	Chg.	Net Prof.	Chg.
Agilent Technologies*	Q1	31-Jan	\$1,284.0	6.0%	\$250.0	9.2%	\$504.0	NM
Agilent Technologies (LSAG)*	Q1	31-Jan	\$607.0	1.8%	\$159.0	3.2%	NA	NA
Agilent Technologies (ACG)*	Q1	31-Jan	\$442.0	8.3%	\$105.0	20.7%	NA	NA
Agilent Technologies (DGG)*	Q1	31-Jan	\$235.0	13.5%	\$33.0	37.5%	NA	NA
Kewaunee Scientific**	Q3	31-Jan	\$32.4	-15.2%	-\$0.1	NM	\$0.02	-98.4%
Repligen	Q4	31-Dec	\$51.8	24.7%	\$7.9	140.8%	\$5.6	-53.7%
Repligen	FYE	31-Dec	\$193.9	37.4%	\$26.0	85.6%	\$16.6	-41.4%
Other Currencies (in Millions)								
Bio-Works	Q4	31-Dec	SEK 2.35	112.6%	-SEK 0.22	5.1%	-SEK 13.87	-49.3%
Bio-Works	FYE	31-Dec	SEK 6.56	32.7%	-SEK 38.07	-61.5%	-SEK 37.96	-60.4%
Precision System Science***	Q2	31-Dec	¥1,721.20	-15.7%	¥229.11	-5027.8%	¥235.65	-996.0%
Shimadzu**	9 mo.	31-Dec	¥278.22	5.7%	¥27.57	8.4%	¥19.48	8.0%
Shimadzu (Analytical & Measuring Instr.)**	9 mo.	31-Dec	¥169.3	5.2%	¥24.532	6.9%	NA	NA
Spectris	FYE	31-Dec	£1,604.20	5.2%	£248.30	3.8%	£185.20	-21.1%
Spectris (Materials Analysis)	FYE	31-Dec	£541.10	16.4%	£72.10	5.1%	NA	NA
Takara Bio (Bioindustry Business)	9 mo.	31-Dec	¥21.98	7.7%	¥4.14	12.0%	NA	NA

*For fiscal year ending October 31, 2019

**For fiscal year ending March 31, 2019

***For fiscal year ending June 30, 2019

NA = not available, NM = not material