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Alive and Well: R&D Spending at Instrument and Lab Product Companies

In fiscal 2017, combined R&D spending as a percentage of revenues in US dollars for 16 analytical instrument and laboratory product companies was 6.5%, or nearly \$3 billion, down two-tenths of a percentage point from the year before (see table below). The median ratio was 8.5% in FY17 compared to 8.6% in FY16.

Company	FY15			FY16			FY17			
	Rev. (\$M)	R&D (\$M)	% of Rev.	Rev. (\$M)	R&D (\$M)	% of Rev.	Rev. (\$M)	R&D (\$M)	% of Rev.	
Sales Over \$1B	Thermo Fisher Scientific	\$16,965	\$692	4.1%	\$18,274	\$755	4.1%	\$20,918	\$888	4.2%
	Merck KGaA (Life Science)	\$3,770	\$222	5.9%	\$6,357	\$292	4.6%	\$6,609	\$271	4.1%
	Agilent Technologies	\$4,038	\$330	8.2%	\$4,202	\$329	7.8%	\$4,472	\$339	7.6%
	Illumina	\$2,220	\$401	18.1%	\$2,398	\$504	21.0%	\$2,752	\$546	19.8%
	Waters	\$2,042	\$119	5.8%	\$2,167	\$125	5.8%	\$2,309	\$133	5.7%
	PerkinElmer	\$2,105	\$113	5.3%	\$2,116	\$124	5.9%	\$2,257	\$139	6.2%
	Bruker	\$1,624	\$146	9.0%	\$1,611	\$149	9.2%	\$1,766	\$163	9.2%
	QIAGEN	\$1,281	\$147	11.5%	\$1,338	\$150	11.2%	\$1,418	\$154	10.9%
	Total Larger Cos.	\$34,045	\$2,168	6.4%	\$38,464	\$2,428	6.3%	\$42,501	\$2,633	6.2%
Sales Under \$1B	Eppendorf	\$707	\$36	5.1%	\$732	\$39	5.3%	\$776	\$41	5.3%
	Oxford Instruments*	\$489	\$32	6.5%	\$406	\$33	8.1%	\$401	\$32	7.9%
	Bio-Techne	\$452	\$41	9.0%	\$499	\$45	9.1%	\$563	\$54	9.5%
	Tecan	\$449	\$41	9.1%	\$517	\$48	9.3%	\$560	\$52	9.3%
	NanoString Technologies	\$63	\$25	39.3%	\$86	\$35	40.1%	\$115	\$47	40.8%
	Fluidigm	\$115	\$39	34.2%	\$104	\$38	36.8%	\$102	\$31	30.2%
	Pacific Biosciences	\$93	\$60	65.1%	\$91	\$68	74.5%	\$93	\$65	69.9%
	Biotage	\$71	\$6	8.1%	\$78	\$6	7.4%	\$88	\$7	7.5%
	Total Smaller Cos	\$2,439	\$279	11.5%	\$2,513	\$312	12.4%	\$2,697	\$328	12.2%
Overall Total	\$36,483	\$2,448	6.7%	\$40,977	\$2,740	6.7%	\$45,198	\$2,960	6.5%	

[Click to enlarge](#)

In fact, the ratio of sales to R&D for companies in the table remained nearly the same in fiscal 2017 despite slower sales growth year over year. Revenue for all companies in the table increased 10.3% in FY17, down from 12.3% growth in FY16 (which included an over 65% increase in FY16 sales for Merck Life Science following the purchase of Sigma-Aldrich [see [IBO 9/30/14](#)]).

The review of annual R&D spending is based on fiscal 2017 sales (with the exception of Oxford Instruments) for 15 public and 1 private company (Eppendorf) as reported in company financial documents and presentations. The figures in the main table are based on final results converted into US dollars.

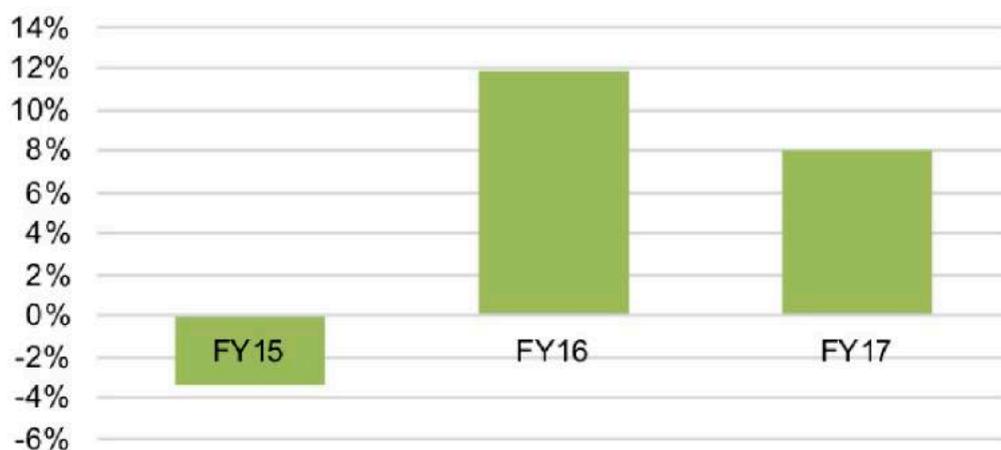
Spending Big: Double-Digit R&D Spending as a Percentage of Sales

Five of the 16 companies in the table spent a double-digit percentage of their annual revenues on R&D last fiscal year. The highest percentages belonged to long-read sequencer maker Pacific Biosciences (60.9%); NanoString Technologies (41.2%), which makes instruments and reagents for molecular profiling; and Fluidigm (30.2%), whose products include microfluidic-based PCR and mass cytometers for protein analysis in single cells.

Despite these companies' dedication to R&D, NanoString Technologies was the only one among these three firms to increase its R&D spending in FY17. Last fiscal year, the company's expenditures jumped 35.0% to make up 41% of revenues. This is in line with the company's broadening of its product line beyond its flagship digital barcoding technologies to develop and commercialize two new technologies: Digital Spatial Profiling for analysis of protein and gene expression, which is scheduled for full release in 2019; and the Hyb & Seq next generation gene sequencing platform, which is scheduled to be fully commercialized in 2020. This is reflected in the company's breakdown of its R&D costs that show a 61.4% increase in R&D spending for Platform Development to make up 22%, the largest percentage of R&D spending. The company attributed most of the increase to personnel costs.

Although Fluidigm and Pacific Biosciences both had ratios of R&D to sales in the double digits in FY17, they were also 2 of the 4 companies in the table to post declines in R&D spending last fiscal year. Respectively, the companies' R&D spending fell 19.8% and 3.4%. Both companies recorded improved revenues in 2017 but this was not the case in 2016, when sales declined. These declines may have been a contributing factor to their choice to reduce R&D expenditures in 2017. Consequently, both companies' R&D spending as a percentage of sales also declined in fiscal 2017. Fluidigm attributed the decrease to cost cuts and fewer projects. Pacific Biosciences noted a decline in chip development costs.

Change in R&D Spending for Companies in Table



Click to enlarge

Illumina and QIAGEN also spent a double-digit percentage of sales on R&D in FY17, and were the only companies with sales over \$1 billion to do so. The companies also happen to be the only exclusively life science-focused instrument and consumables companies among the firms in the table with over \$1 billion in sales. As shown in the table, both companies have maintained a steady ratio of R&D to revenues over the years, consistent with the pace and competitiveness in the development of software, consumables and instrumentation for life science and diagnostic applications.

Nonetheless, Illumina's increase in R&D spending last fiscal year was slower than the year before. In FY17, R&D spending jumped 8.3%, compared to a 25.7% boost in FY16. Even excluding Illumina's FY16 R&D investments in spinouts GRAIL and Helix, Illumina's core R&D spending rose 15% that year. Notably, Illumina introduced its new generation instrument platform for NGS, the NovaSeq, in January 2017, whose development might have contributed a substantial R&D increase FY16. In FY17, the company attributed its latest R&D spending increase specifically to a rise in headcount.

Dedicating Resources: Fastest Growing R&D Spending

Thirteen of the 16 companies in the table reported an increase in R&D spending last fiscal year. Out of these firms, 5 boosted their R&D expenditures double digits in FY17—NanoString (35.0%), Bio-Techne (18.4%), Thermo Fisher Scientific (17.6%), Biotage (13.8%) and PerkinElmer (12.1%). For 4 of these 5 companies, the boost was in line with double digits increases in sales: NanoString (32.9%), Bio-Techne (12.8%), Thermo Fisher Scientific (14.5%) and Biotage (12.0%).

As with NanoString, Bio-Techne's increase suggests a major investment in new technology platforms, including Advanced Cell Diagnostics (see [IBO 7/15/16](#)), which develops RNA-ISH technology. The fastest increase in R&D spending for the company went to one business segment, Biotechnology, where it climbed 31.6% to make up 66% of total R&D spending. In contrast, R&D expenditures for the Protein Platform division declined 1.2% to make up 27%. Diagnostics division spending was flat.

Thermo Fisher Scientific also recorded a double-digit increase in R&D spending last year of 17.6%. The rise can likely be attributed in part to the company's purchase of Patheon (see [IBO 5/15/17](#)). Although overall R&D as a percentage of sales was 4.2% for the company, the percentage of R&D as manufacturing revenue was 6.6% (second quarter of 2017 through first quarter of 2018), up from 6.4% over the same period in 2016-17. As the company is a major distributor and service provider, the latter figure represents a more accurate estimated in terms of product development.

Swedish firm Biotage also reported a double-digit increase in R&D expenditures, growing 13.8%, slightly ahead of sales growth of 12.0%. This contrasts with flat R&D spending in FY16. Nonetheless, the company maintained its

R&D as a percentage of sales at around 7%.

PerkinElmer's R&D spending rose 12.1% last fiscal year. PerkinElmer indicated a sizable investment in a new technology, the Vanadis, using cell-free DNA for screening for aneuploidies (see [IBO 1/30/16](#)). The increase also includes the acquisition of EUROIMMUN, completed late last year (see [IBO 6/30/17](#)). Based on pro forma 2017 sales and R&D spending for the combined companies, R&D as a percentage of sales would have been 6.5% for PerkinElmer in 2017. PerkinElmer, like Bio-Techne and NanoString, posted double-digit percentage increases in R&D spending in both fiscal 2016 and 2017.

Declining Sales, Declining R&D?

Four companies in the table posted double-digit declines in R&D spending last fiscal year. Two of these companies, Pacific Biosciences and Fluidigm, had the second- and third-highest R&D spending as a percentage of sales, respectively, among companies in the table. Fluidigm attributed the decrease to cost cuts and fewer projects. Both companies recorded improved sales in 2017, but declines in 2016 sales may have contributed to R&D declines in 2017, as both companies' R&D spending as a percentage of sales declined year over year.

Merck KGaA Life Sciences and Oxford Instruments also both recorded declining R&D spending in fiscal 2017, falling 7.3% and 3.7%, respectively. However, each company's R&D as a percentage of sales remained steady. Merck Life Sciences' R&D spending was impacted by a sudden increase in 2016 due to the acquisition of Sigma-Aldrich. Oxford Instruments' R&D spending was impacted by the divestiture of its Industrial Analysis business (see [IBO 4/30/17](#)).

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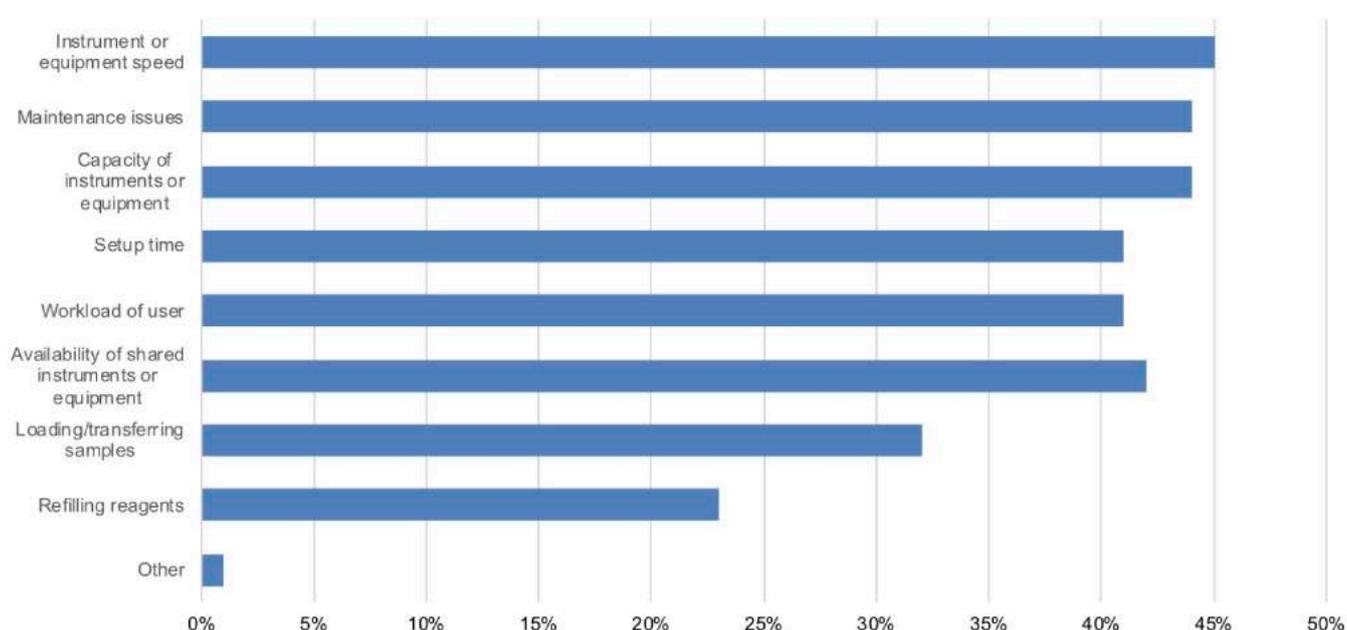
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Users' Top Automated Sample Prep Needs: More Automation and Speed

Sample preparation is a necessary part of virtually any laboratory activity. As analytical instruments have advanced, their throughput capabilities have greatly increased. This means that the volume of samples processed by many labs has also grown substantially in recent years. Unfortunately, for many users, sample prep is perceived as a repetitive and time consuming task that represents a significant bottleneck in their workflows, taking up time that could be spent on their analytical work.

In April, 456 users of nucleic acid preparation, prep chromatography and various extraction techniques were surveyed for a recently released [SDi report on sample preparation](#). Portions of the data presented here are exclusive to **IBO**.

Aspects of Sample Preparation that Represented Bottlenecks in Respondents' Workflow



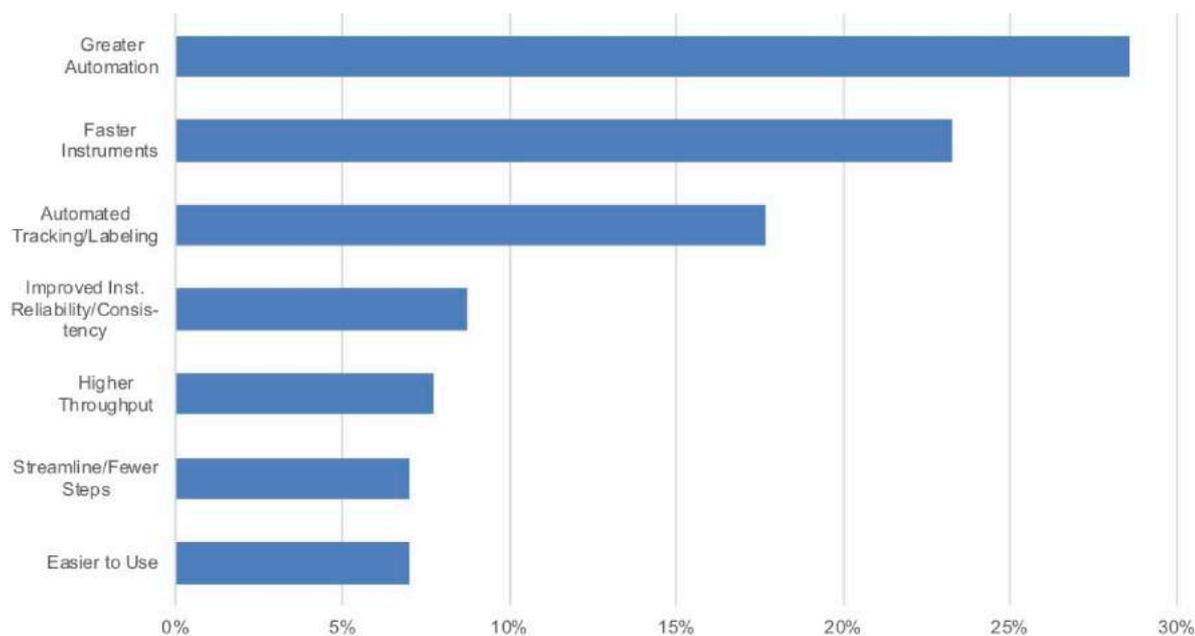
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Respondents were asked to select bottlenecks in their workflows that they have experienced from a list of technical and non-technical aspects of sample preparation that impede their workflows (see graph above). Most commonly identified were technical issues related to instrument design, namely sample prep instrument speed, and the sample capacity of instruments, which were each selected by nearly half of respondents.

The next leading problems were related to the laboratory, and perhaps more specifically the communal circumstances of respondents. Regular maintenance and timely repair of sample prep-related instruments seemed to be a frequent concern, cited by almost half of respondents, as was the limited availability of shared pieces of sample prep equipment.

Issues related to sample prep in an individual user's workflow were also prominent. This was particularly true of time required for setup and the overall workload of the user. About a third of users identified the time spent loading or transferring samples in and out of instruments as a bottleneck.

Desired Improvements to Sample Preparation According to Survey Respondents



[Click to enlarge](#)

In an open-answer question, respondents were asked to identify how sample preparation could be improved to enhance their overall workflows. Of the 413 respondents who provided comprehensible answers, most took this opportunity as a chance to share a wish list of solutions (see graph above). Adoption of automation is rapidly proliferating, with 52% of respondents reporting that their lab currently uses some form of automation for sample prep. The most common automated instruments already in use by respondents are liquid handlers, automated pipettors and plate handlers.

Unsurprisingly, the majority of suggestions were related to making sample prep less time consuming for the user. By far, the most commonly identified feature desired by respondents was greater automation, as indicated by 29% of respondents. Users wish to reduce the hands-on work and attention required for sample prep.

With increasingly large sample volumes being generated, automation is becoming more necessary and relied upon. However, the desire for automation was not exclusive to high-throughput users. About a quarter of respondents who wanted greater automation lamented that suitable automation solutions were not available for users with lower-throughput workflows. Most automated instruments are not designed to prepare smaller numbers of samples. While automation saves users time and work, they are not completely perfect solutions. Nine percent of respondents cited the need for improved instrument reliability and consistency.

Sample tracking and labeling was also a common wish list item. Many users want greater integration of tracking features in their instruments. Some mentioned universal label reading and internet connectivity would be appreciated for tracking samples across the various instruments used in their workflows. Several desired RFID tagging of samples.

Nearly a quarter of respondents said that faster sample prep instruments would improve their workflows. This complaint was applicable to both instruments and slow running consumables. Along the same vein, 7% desired sample prep processes that were more streamlined or which involved fewer steps.

While sample prep remains a bottleneck, there is hope among some respondents. More than a third expect that their sample prep budgets will increase over the next two years. Of these fortunate respondents, most expect increases of more than 10%. The largest expected sample prep increase was reported among users of nucleic acid prep; 35% of the nucleic acid prep users who expect larger budgets anticipate substantial increases of 20% or more for sample prep.

Solid Start for First SLAS Europe Convention and Exhibition

The Society for Lab Automation and Screening (SLAS) inaugurated its first European Conference & Exhibition, held at the Brussels Square Meeting Centre in Belgium, June 27 to 29. SLAS has been developing its European program of events for many years, but this was the organization's first full exhibition. Nearly 100 exhibitors and 800 visitors attended the inaugural event.

Dr. Sabeth Verpoorte, president of SLAS, opened the conference with some remarks. With the greater global reach of the organization, SLAS has reorganized its councils. Rather than having separate North American and European Councils, new topic-focused councils have been created, with members drawn from both geographies.

Dr. Verpoorte took the opportunity to note the grant and support programs provided by SLAS, including a new program for visiting grad students to work for up to 6 months at a different university in another country. She also took the opportunity to highlight 2 upcoming conferences: the 2018 SLAS Advanced 3D Human Models and High-Content Analysis Conference, scheduled for October in Leiden, the Netherlands, and the 2018 SLAS Americas Sample Management Symposium, which will be held in November in Boston, Massachusetts.

The opening keynote speaker, Dr. Mathies Uhlén of the Royal Institute of Technology (KTH) in Sweden, gave an engaging talk with a discussion of the results of the Human Protein Atlas and related research stemming from that project. As the founding and current director of the Science for Life Laboratory, a collaboration of four Swedish universities, he has witnessed the growth of the organization to more than 1,200 researchers.

The Human Protein Atlas, begun in 2003, is an international effort to identify all proteins produced by the human body to further characterize which cells express them (the tissue atlas), and where they appear in subcellular structures (the cell atlas). The combination of this data with data from another long-term study that correlated protein data with more standard clinical chemistry data is now producing a new understanding of the effects of disease states on human proteins and the correlations between them.

Other keynotes at the conference discussed laboratory digitization and innovation in a changing world. Scientific talks were organized into several topic tracks, including discovery, technology, emerging investigative biology and career opportunities.

Dispendix introduced its prototype Calibri, an instrument designed to evaluate the accuracy of other liquid dispensing systems.

The exhibit hall also drew attention, and vendors were encouraged that the new event was off to a good start. A number of recently introduced or upcoming products were on display.

Dispendix introduced its prototype Calibri, an instrument designed to evaluate the accuracy of other liquid dispensing systems. Dispendix has developed unique droplet forming technology, which ensures a consistent size, for use in its own dispensing solutions. To dispense a desired quantity, a certain number of droplets must be generated, leading Dispendix to develop robust counting technology. The Calibri turns the calculation on its head; if a pipetted sample is turned into droplets, and the droplets counted, the total volume can be compared with the nominal volume of the aliquot to gauge the accuracy of the liquid handling system. It is hoped that the new system will be launched before the end of the year at a price under €7,500 (\$8,427 at €0.89 = \$1).

Photometrics develops cameras for the scientific world, in both customer-ready and OEM formats. Earlier this year, the company launched the Prime BSI Scientific CMOS Camera with 4.2 megapixels and 6.5 micron pixel dimension. These BSI and IRIS product lines, with prices ranging from about \$2,000 to \$20,000, are suited for many applications from live-cell imaging to super-resolution techniques.

Although the acquisition of Sierra Sensors had been announced only earlier this month (see [IBO 6/15/18](#)), the Bruker booth already had a "Bruker-ized" version of the system on display. Bruker expects the new system to be highly complementary with its MALDI MS systems for conducting binding assays after primary screening has been

accomplished .

Building on its electronics manufacturing technology, Yamaha Motor has created life science robotics solutions.

Cytosmart has continued to develop its OMNI brand of live cell imaging, and its newest version expands the product from a single imaging area to a large-format imager that can analyze entire incubator bottles. A confluency module exists already, but the company hopes to develop software with additional imaging applications a full-featured launch before the end of year.

Building on its electronics manufacturing technology, Yamaha Motor has created life science robotics solutions. The new business venture began in September 2017, and the Cell Handler is the first product developed. The system, which began shipping last year, performs colony/cell picking and digital imaging.

SLAS Europe's location in Belgium was in some ways fortuitous, as the event coincided with a meeting between Belgium and England in the World Cup. While the Belgian team triumphed, the many English partisans at the show were consoled not only that their team had already qualified for the knockout rounds, but the loss also allowed them to avoid mighty Brazil in the quarterfinal round. SLAS EUROPE 2019 will be held in Barcelona, Spain, June 26-28. The established US show will occur February 2-6, 2019, in Washington DC.

Bruker Expands AFM Capabilities

Billerica, MA 7/12/18—Scientific instrument firm Bruker has acquired JPK Instruments for an undisclosed amount. JPK Instruments' 2017 revenues totaled €10 million (\$11 million at €0.89 = \$1). JPK's systems are used for biomolecular and cellular imaging, and force measurements on single molecules, cells and tissues. "We have been making a substantial investment in advanced technologies for life science imaging, and have built up a portfolio of fluorescence microscopy products that enable biologists in research areas that require deep, fast imaging at high resolution and at low phototoxicity," said Bruker NANO President Dr. Mark R. Munch. Bruker stated that the acquisition adds to Bruker's existing fluorescence microscopy techniques, which include multiphoton microscopy, swept-field confocal microscopy, super-resolution microscopy and single-plane illumination microscopy. JPK makes biological AFM and optical tweezers for applications including life science imaging and force measurements.

This is Bruker's fifth acquisition this year (including [Bruker Buys Dairy Analysis Firm](#)) and the second AFM-focused firm it has purchased in addition to Anasys Instruments (see [IBO 4/15/18](#)). The purchase adds to Bruker's technology offering for cell biology and neuroscience, which are among the company's applications focus. JFK's instrumentation is used to study the effects of physical forces on cells and tissues.

Bruker Buys Dairy Analysis Firm

Drachten, Netherlands 7/3/18—Scientific instrumentation firm Bruker has acquired Lactotronic, which develops and manufactures instruments for the dairy industry. Financial details were not disclosed. Lactotronics' products include the MIRA milk analyzer for QC and verification. The companies have previously collaborated on a high-end dairy analyzer based on FT-NIR. "As we expand in the food analysis markets, the acquisition of Lactotronic accelerates our development of solutions for milk and dairy analysis, and expands our dairy market presence," stated Bruker Optics President Urban Faeh. "The Lactotronic technologies expand our food analysis offerings, and we welcome the talented Lactotronic team with their valuable expertise and long experience in milk analysis."

Bruker's offerings for the food market include FT-NIR and NMR systems tailored to particular food testing and safety applications. Other companies that provide molecular spectroscopy systems specifically for dairy QC include FOSS and Perten Instruments (PerkinElmer).

BioIVT Expands Research Offerings

Westbury, NY 7/9/18—BioIVT, which provides research models and services, has acquired Optivia Biotechnology for an undisclosed amount. Optivia Biotechnology specializes in transport protein assays and services for drug research. “We are delighted that Optivia is joining BioIVT as we position to become the world leader in transporter sciences,” stated BioIVT CEO Jeffrey Gatz. “Optivia will be an important addition to BioIVT’s leading ADME-Toxicology model systems franchise, complementing the capabilities of our recent acquisitions of Qualyst Transporter Solutions and Ascendance Biotechnology.” Optivia will become part of BioIVT’s PHASEZERO Research Services business.

Including Optiva Biotechnology, BioIVT has steadily expanded from a supplier of biological specimens to products such as cell culture media and stem cells, as well as services, having acquired three firms since March 2017 (TransCell Science, Ascendance Biotechnology, Qualyst Transporter Solutions). Optiva Biotechnology’s commercial products include the TransFlex transporter plates.

First Quarter Results: Biotage, Fluidigm, Horizon Discovery, NanoString Technologies, Oxford Instruments

Biotage Organic Sales Up Close to 10%

Biotage Q1 FY18		
	Rev. (\$M)	Chg.
Total Company	SEK 208.0	12.3%
Systems	SEK 97.7	12.4%
Consumables and Spare Parts	SEK 88.6	13.1%
Service Contracts and Other Services	SEK 3.8	154.7%

On an organic basis, first quarter sales for Biotage rose 9.8%. (See [IBO 4/30/18](#).) System and Aftermarket sales constituted 48% and 52% of sales, respectively. On a reported basis, including the acquisition of Horizon Technology (see [IBO 12/15/17](#)), Analytical Chemistry sales increased 30.0%, including a substantial rise in evaporation product sales. Industrial Products revenue also grew double digits, climbing 30.2%, with particularly strong growth in Europe. In contrast, Organic Chemistry sales grew a scant 1.3%, as sales declined in Europe, Japan and India.

Biotage Q1 FY18		
	% of Rev. (SEK M)	Chg.
North and South America	43%	14.2%
Europe	24%	-1.3%
Japan	13%	-2.8%
China	10%	22.0%
EMEA and APAC	7%	68.8%
South Korea	4%	155.5%
India	1%	-49.0%

Fluidigm Mass Cytometry Sales Decline

Fluidigm Q1 FY18			
	Rev. (\$M)	% Rev. Growth	% of Rev.
Total Company	\$25.2	-1.1%	
Instruments	\$7.5	-30.0%	30%
Consumables	\$13.0	22.6%	51%
Services	\$4.8	14.5%	19%
Licence and Grant	\$0.0	-100.0%	0%

In the first quarter, organic sales for Fluidigm fell around 4% due to slower demand for mass cytometers. (See [IBO 5/15/18](#).) Mass cytometry revenue declined 23.1% to \$9.0 million. This included a 34.0% drop in product sales, as instrument sales declined offset by double-digit consumables sales. The company attributed the decline in instrument demand to delayed orders for mass cytometers, as well as the impact of early-adopter sales a year ago.

Fluidigm Q1 2018			
Adj. Op. Profit (\$M)	Chg.	Adj. Op. Margin	Chg. (pps)
-\$12.3	-29.7%	-48.8%	19.8%

In contrast, genomics revenue jumped 181% to \$16.3 million, led by applied markets. Genomics product sales increased 22.1% to \$13.8 million. Although sales of high-throughput genomics products rose, single-cell genomics product revenue declined.

Fluidigm Q1 FY18		
	Chg.	% of Rev.
US	-14.5%	40%
Europe	11.0%	34%
Asia Pacific	19.1%	24%
Other	-33.5%	3%

By region, highlights included over 50% increase in organic revenue growth for China, which accounted for 13% of sales. Similarly, Japanese revenue grew 45%. On an organic basis, European sales were up 3%. Fluidigm forecasts second quarter sales of \$25-\$28 million, up 2.5% at the midpoint.

Horizon Discovery Rides High on Acquisition

Horizon Discovery FY17			
	Rev. (\$M)	Chg.	% of Rev.
Total Company	£36.5	51.7%	
Products	£22.8	101.4%	62%
Services	£13.7	7.4%	38%

In constant currency, Horizon Discovery's fiscal 2017 sales rose 50%, as Product sales grew 101% and Services revenue was up 4%. (See [IBO 5/15/18](#).) Organically, revenues rose 14%, with Product sales up 22.8% and Sales revenue increasing 4%. EBITDA declined from a loss of £4.0 million (\$5.1 million at £0.78 = \$1) to a £1.1 million (\$1.4 million) loss. E-commerce sales increased 67%.

Horizon Discovery FY17

	Chg.	% of Rev.
Americas	45.0%	59%
Europe, Middle East and Africa	43.8%	28%
Asia Pacific	131.5%	12%

The Products business consists of Research Products and Applied Products. Sales of Research Products jumped 223.1% to £12.6 million (\$16.2 million) due to the Dharmacon acquisition (see [IBO 7/31/17](#)), to make up approximately half of Products revenue. On an organic basis, Research Products revenue declined 7.7% attributed to a nonrecurring large cell-line agreement. Applied Products sales rose 37.8% to £10.2 million (\$13.1 million). The Bioproduction business represented 51% of sales. For the Molecular Reference Standards business, Off-the-Shelf sales remained strong, while OEM revenues fell.

Growth in Services revenue was led by Custom Cell Line Engineering and, within contract testing, molecular screening for target identification and validation.

Consumables Growth Leads NanoString Revenues

NanoString Technologies Q1 FY18

	Rev. (\$M)	Chg.	% of Rev.
Total Company	\$23.1	27.8%	28%
Instruments	\$4.7	4.6%	20%
Consumables	\$9.4	8.9%	41%
In Vitro Diagnostics	\$2.2	50.5%	9%
Service	\$1.8	46.2%	8%
Collaborations	\$5.0	119.3%	22%

In the second quarter, NanoString Technologies revenues showed a healthy increase. (See [IBO 5/15/18](#).) Sales of nCount SPRINT systems represented nearly 40% of unit sales. Also showing good growth were sales of the high-throughput dual-use nCounter FLEX systems. By application areas, oncology applications made up 75% of new instrument placements, with immunology and neuroscience representing the remainder.

Total consumables sales rose 14.9% to \$11.5 million. In particular, oncology panel sales increased 50%, fueled by immune-oncology applications. Overall, panel revenue was up more than 30% to account for over 70% of sales of life science consumables, which totaled \$9.4 million.

NanoString Technologies Q1 FY18

	% of Rev.	Chg.
Americas	69%	29.6%
Europe & Middle East	25%	30.4%
Asia Pacific	6%	4.3%

Geographically, within the Americas, US revenues increased 25.4% to \$14.8 million. The Americas, Europe and Middle East, and Asia Pacific accounted for 57%, 32% and 11% of instrument revenues, respectively.

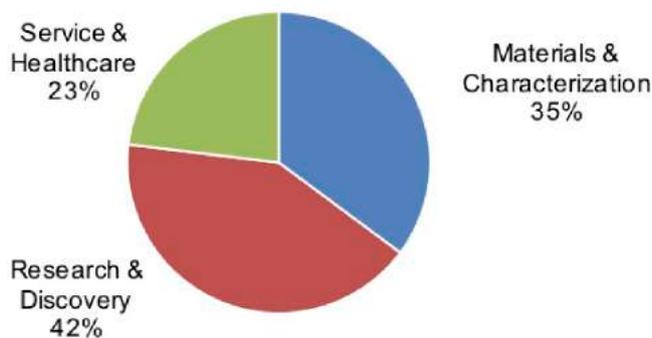
Second quarter revenues are expected to decline 26%–29% to \$24.5–\$25.5 million due to a drop in collaboration revenue. Product and service revenue is forecast to be \$18.5–\$19.5 million, compared to \$18.3 million a year ago. Collaboration revenue is expected to be around \$6 million.

Oxford Instruments Posts Profit

Oxford Instruments FY18		
	Rev. (\$M)	Chg.
Total Company	£296.9	-1.1%
Materials & Characterization	£118.1	11.7%
Research & Discovery	£112.1	-10.5%
Service & Healthcare	£66.8	-3.6%

In constant currency, Oxford Instruments’ fiscal 2018 sales ending March 31, were flat. (See [IBO 6/15/18](#).) Orders rose 5.0%, to £134.0 million (\$181.1 million at £0.74 = \$1) or 5.8% in constant currency.

Oxford Instruments FY18



Materials & Characterization (Asylum Research, NanoAnalysis, Plasma Technology) revenue increased 11.7%, and was up 13.2% in constant currency. Semiconductor & Communications accounted for 46% of segment revenue, with Advanced Materials, Environment, Energy, Healthcare & Life Science and Quantum Technologies representing 30%, 10%, 7%, 6% and 1%, of segment sales, respectively. Product sales strength included imaging and analysis products for electron microscopy, as well as SPMs and semiconductor processing systems.

Research & Discovery (Andor Technology, NanoScience & Magnet Resonance, X-ray Technology, minority share in ScientaOmicron) sales fell 10.5% and declined 9.7% on a constant currency basis. Orders were flat. Forty percent of segment sales were for Healthcare & Life Science applications and 20% were for Quantum Technologies applications. Semiconductor & Communications, Advanced Materials, and Research & Fundamental Science respectively accounted for 20%, 13% and 4% of sales. Environment and Energy applications each accounted for 3%. Growth was offset by softer sales growth for Andor optical microscopy systems, NanoScience sales and x-ray tube revenue. Areas of revenue strength included desktop NMR, products for quantum technology applications, and x-ray sources for medical and research markets.

Service & Healthcare revenue declined 3.6% and was down 2.9% in constant currency. Sales growth was led by demand for services. However, sales declined for OI Healthcare’s US business.

Oxford Instruments FY18

	% of Rev.	Chg.
US	30%	0.9%
Rest of Europe	12%	2.9%
Rest of Asia	12%	3.4%
UK	6%	7.7%
Japan	12%	3.0%
China	17%	1.7%
Germany	8%	4.4%
Rest of World	3%	11.2%

Ambient Ionization MS

One of the most basic components of a typical MS systems is its ion source—a chamber where the sample becomes negatively or positively charged, a necessary step that allows the sample to be properly separated, manipulated and analyzed by the mass analyzer. Among the most common ionization methods are chemical ionization, electron ionization and MALDI, all of which function within the vacuum chamber of the instrument and require various modes of sample preparation.

Although such ionization methods form the basis of classical MS, there continues to emerge an alternative strategy of ionizing samples, one that seeks to eliminate sample preparation completely and permit samples to be analyzed in their native states at atmospheric pressure. In fact, over the past couple decades this strategy has yielded not one, but dozens of methods collectively belonging to a family of techniques known as ambient ionization.

Ambient ionization methods for MS can generally be placed into two categories. The first category encompasses methods related to atmospheric pressure chemical ionization (APCI). In APCI, analyte flowing into the ion source is exposed to heat and high-pressure gas (usually nitrogen). This forms a gas stream that sweeps past high voltage from a corona discharge pin, creating a plasma where both positive solvent ions and electrons ionize the analyte. These sample ions are then directed through a narrow ion path with a vacuum where they are sent to the mass analyzer.

The most common form of APCI-based technique is known as Direct Analysis in Real Time (DART). DART typically uses helium gas to flow through the corona discharge, where it either ionizes or forms excited atoms. When the excited atoms are directed onto the sample to form positive sample ions, a competing process that ionizes oxygen leads to the creation of negative sample ions. The heat from the helium flow, along with the like-charge repulsion of the ionized sample, evaporates the analyte ions, allowing them to enter the mass analyzer through a skimmer cone. DART technology is primarily offered through JEOL, having developed it in 2005. It is also sold by IonSense, which often collaborates with Waters to integrate the company's MS systems with a DART ionization source.

The second category of ambient ionization methods encompasses those that are related to electrospray ionization (ESI). In ESI, analytes flowing into the ion source are subjected to a high voltage that removes ions with the opposite polarity. A solution with only one charge type remains and is directed through a narrow steel tube. When exposed to nitrogen, the solution is nebulized into a spray of charged droplets, which are quickly dried with a secondary flow of heated nitrogen gas. As the ions are released into the vapor phase, they form progressively smaller droplets that distort and develop an extension with a concave surface (a Taylor cone) from which the ions are released. Influenced by a voltage gradient and vacuum source, the ions are then directed through an ion path toward the mass analyzer.

By far the most conventional form of ambient ionization technique related to ESI is desorption electrospray ionization (DESI). Developed in 2004 by Graham Cook, PhD, at Purdue University, DESI is very similar to ESI except it lacks a secondary flow of heated nitrogen to dry the charged droplets. Instead, a mixture of methanol and water is subjected to a high voltage and nebulized with nitrogen. This stream of charged droplets is directed at the surface of solid samples, from which the analyte is ejected as ions. These ions are then directed through a collection tube to

enter the mass analyzer. DESI is commonly used in cancer research, with the first instrument of its kind launched commercially in 2008 by Prosolia, which currently owns the technology. Prosolia also offers PaperSpray ionization, another variant of ESI.

Ambient ionization techniques are useful for a wide variety of applications, including forensics, food safety, petroleum analysis, environmental studies, pharmaceuticals and clinical research. The appeal of these techniques is that they require no sample pretreatment, are able to perform rapid analysis on-site and are relatively low-cost. The technique also allows for the development of miniaturized instruments.

However, their main drawbacks are that they cannot ionize all of the sample types they comes across, and the techniques are usually not validated. Also, there is also more susceptibility to increased noise within the spectrum. Despite its limitations, the market for the technology is expected to post high single digit growth over the next few years, driven by applications in drug analysis and point-of-care testing.

Ambient Ionization MS at a Glance:

Leading Vendors

- JEOL
- Prosolia
- IonSense

Largest Markets

- Forensics
- Pharmaceuticals
- Agriculture and Food

Instrument Cost:

- \$40,000-\$90,000

R&D

Since 2000, global R&D expenditures have increased 170% in current dollars to \$1.821 trillion. US R&D expenditure peaked in the latter half of the 21st century, representing almost 70% of global R&D funding in 1960. However, by 2016, the share of US global R&D expenditures had dropped to represent approximately 28%, not necessarily due to lessened US R&D investments, but because of increased R&D investments in other countries.

In 2016, the US funded the most R&D worldwide, investing \$511.1 billion. China followed closely with \$451.2 billion in R&D funding, while Japan, Germany and South Korea rounded out the top 5, spending \$168.6 billion, \$4118.5 billion and \$79.4 billion, respectively. The 10 leading countries to invest in R&D, which also included France, the UK, Russia, Taiwan and Italy, respectively, accounted for 85% of the world's total R&D expenditures in 2016.

Although countries like China, France, Germany, Italy, Japan, the UK and the US contributed the most to R&D funding, their share of global R&D expenditures have fallen. In contrast, China, Russia, South Korea and Taiwan's shares of global R&D expenditures have increased. In 2000, China, Japan, South Korea and the US represented approximately 5% of global R&D. By 2016, China's share of global R&D had spiked from 5% to 25%. During the same period, the US' share of global R&D dropped from 40% to 28%, and Japan's share declined from 15% to 9%.

Source: [Congressional Research Service](#)

Environment

Climate change scientists around the world are working on new methods and technologies to increase the quantity and quality of environmental data. Key data that are missing include biogeochemistry information explaining how chemicals and nutrients traverse through the earth's physical systems, ecosystems and atmospheric systems. Many climate change scientists are utilizing machine learning methods to teach their models how to better analyze the data.

The US leads the world in earth and environmental sciences research, but due to the current administration's threats of environmental policy changes, as well as a 2011 Congress rule that prohibits NASA scientists from directly collaborating with their contemporaries in China, this leading status is precarious. NASA is a significant funder of environmental sciences research in the US.

Although, in absolute terms, the US is the leader in earth and environmental science research publication output according to the *Nature* Index, China has the greatest growth in publications among the 10 leading countries. In order, the remaining leaders in publication output are the UK, Germany, France, Canada, Australia, Japan, Switzerland and the Netherlands. Australia has the highest proportion of earth and environmental sciences publications relative to total natural sciences output at 23%, while Japan has the lowest at 7%. The US' proportion is around 13%, while China's is 10%. Over the past 10 years, China has spent \$100 billion on reforestation efforts and has collaborated with the US to develop software that can identify where a reforestation effort would yield the most benefits.

Source: [Nature](#)

Pharmaceuticals

Gene therapy has been on the rise the first human gene therapy trial was conducted three decades ago. Over the past five years, gene therapy has garnered over \$600 million in venture capital funds. Many countries are focusing on projects in the field, particularly the UK, which predicts that by 2035 the region may have a 15% stake in global cell and gene therapy activities, \$10 billion in revenue and 18,000 jobs. As of June last year, 59 cell and gene therapy trials were active in the UK, with 10 trials for in vivo gene therapies.

Since gene therapy involves long-term therapeutic effects, regulatory issues may pose a challenge, for regulators will have to make long-term decisions based on limited data. Also, once approved by federal agencies, gene therapy products will always be costly to produce and supply, which will require creative payment models for insurers and patients. However, experts in the industry hope that the cost of gene therapies will eventually reduced to an annual costs comparable to a regime of a monoclonal antibody.

Globally, there is a lack of capacity for clinical-grade vectors, resulting in small- and medium-sized businesses having to compete to get their products manufactured. But experts predict that there may be an oversupply of gene therapy products in the market within the next few years that will bring the prices down, providing greater opportunities for smaller businesses to produce their therapeutics.

A critical component to progressing gene therapy is technology advancements. Currently, a batch of viral vector that is large enough to treat up to six patients can cost up to \$2 million from a contract manufacturer, which means that for a clinical trial, millions of dollars may have to be spent just to source the viral vector. Similar to the evolution of monoclonal antibodies, scalable platform processes are extremely important to the advancement of gene therapies, such as large bioreactors for adherent cells or a customized process that allows cells to be cultured in suspension.

Source: [Chemistry World](#)

EU

The EU is in its second water health monitoring and reporting cycle, which lasts from 2015 to 2021, as part of the EU Water Framework Directive, which includes 89,000 rivers, 18,000 lakes, 13,000 groundwater sites, and 3,600 coastal and estuary waters. According to the latest data, member states in the EU have made significant progress in improving water quality around the continent by enhancing wastewater treatment, decreasing pollutant runoff from farmland and establishing efforts to restore marine ecosystems. However, only 40% of monitored water bodies such as lakes, rivers, estuaries and coastal waters were classified as being in “good” or “high” standing during 2010 and 2015. Pollution from agriculture, industry and houses is still affecting 60% of water bodies.

Generally, groundwater sources are in good standing, with 74% of groundwater area achieving good chemical status and 89% achieving good quantitative status. A low chemical status refers to water contaminated with chemicals such as mercury and cadmium, which are commonly found in water samples. Estonia, northern Scandinavia, Scotland, Slovakia, Romania and many river basin districts in the Mediterranean have a higher proportion of surface water bodies that are in good or high standing, while European areas with central river basin districts, higher populations and agriculture generally failed to achieve a good or high standing. Thirty-eight percent of monitored lakes, rivers and other surface water bodies are in good chemical status.

Key goals for improving EU water health include dispersing source pollution, such as pollutant runoff from farms, and point source pollution, such as sewage wastewater discharge.

Source: [European Environment Agency](#)

India

The Indian government is providing \$29 million between 2018 and 2020 to the country’s drug industry to encourage competitiveness, provide easy access to testing and facilities, decrease the cost of bulk drugs by up to 25%, and assist small- and medium-sized pharmaceutical companies in upgrading their technology. By bolstering infrastructure facilities and lowering the cost of bulk drug production, the government hopes to transform India into a global leader for bulk drug exports.

The initiative will be implemented as one-off grants meant to provide financial support for developing facilities that are backed by state governments or state corporations. The maximum grant will be \$14.64 million per “bulk-drug park,” which are clusters of bulk-drug facilities. Pharmaceutical companies can also apply to develop Common Facility Centers for bulk-drug production, at a maximum limit of \$2.93 million per cluster of Centers. These projects will be part of the Pharmaceutical Technology Upgradation Assistance Scheme (PTUAS), which will be allocated \$21 million.

For small- and medium sized enterprises (SMEs), PTUAS will provide interest subvention if they have GMP-compliant production facilities for bulk-drug and pharmaceutical formulations. Usually, SMEs that look to upgrade their production infrastructures and technologies in order to meet WHO-GMP standards must obtain loans from financial institutions, but under PTUAS, eligible SMEs can apply for grants to upgrade their facilities. Currently, approximately 75% of pharmaceutical SMEs are strictly production companies with proprietary facilities, while 13% are active in both manufacturing and trading. Of that 13%, about 11% of companies are conducting R&D, including clinical tests and contract research, and 50% of these SMEs export to countries worldwide.

New markets for more affordable pharmaceuticals that the Indian government is focusing on include Africa and Latin America. In 2017–2018, the US represented 31% of India’s pharmaceutical exports, which totaled \$17.27 billion. India also has the highest number of US FDA-approved pharmaceutical plants outside the US. Along with expanding into new regions, India is additionally looking to reduce its dependence on China for API sourcing, and is in the process of developing a roadmap to increase API production in India.

Source: [The Pharma Letter](#)

South Korea

Science in South Korea is thriving, with R&D accounting for 4% of GDP in 2016. Among the projects in which the country has invested are research networks and facilities, such as the Institute for Basic Science, and a x-ray free-electron laser facility in Pohang, to name a few. However, the R&D system in South Korea is due for major revamping as data indicates that the more the country invests, the less it gets back.

A major reason for this is the method in which the federal government distributes R&D funds. For example, in 2017, 94% of the South Korean R&D budget went to large, federally directed projects revolving around strategic research areas such as biotechnology, information technology, materials and robotics, while small research groups were allocated only the remaining 6%. This issue was one of much contention, and was a highly debated scientific issue in last year's presidential election.

There are three key issues in South Korea's R&D system. Firstly, basic research is extremely underfunded, with only \$1.2 billion, or 7%, of the country's 2017 research budget of \$18 billion going towards individual investigators and small groups working on basic research projects. Also, very few funds from the country's R&D budget are allocated to research infrastructure at academic institutions and researchers looking for startup grants. Secondly, R&D produces many patents in South Korea, but these patents do not necessarily result in actual innovation. Government-devised projects are partly to blame for this, as they are usually not well-designed and lack strategic roadmaps and long-term goals.

Lastly, scientific R&D in the country is not necessarily geared towards pressing public concerns. For example, South Korea has the highest global proportional rate of people aged 65 and above, with Alzheimer's and other diseases becoming more prevalent; however, there are no government R&D strategies to tackle these issues. The South Korean government is beginning to take steps to address these issues through policy changes.

Source: [Nature](#)

Life Science Instruments

Company Announcements

Thermo Fisher Scientific disclosed in a financial filing that it paid \$65 million to purchase **IntegenX** (see [IBO 3/30/18](#)).

In June, **ANDE** announced that its ANDE Rapid DNA Identification System has received National DNA Index System (NDIS) approval from the **FBI**. The approval allows accredited NDIS laboratories to process DNA samples using the system and search the resulting ANDE DNA IDs against the FBI's Combined DNA Index System program, without manual interpretation or technical review. The company called it the first rapid DNA system to receive an approval.

NanoString Technologies announced in June a collaboration with the **Cancer Therapy Evaluation Program of the NCI**, which will use the company's PanCancer IO 3060 panel to characterize immune activity and development of potentially predictive gene therapies in NCI-sponsored clinical trials.

In June, **NanoString Technologies** named the **Netherlands Cancer Institute** as its first Center for Excellence (COE) for Digital Spatial Profiling. The goal of the COE program is to establish a global network of centers with expertise in distinct research areas to expand the utility of the DSP platform.

Science Exchange, a marketplace for outsourced R&D, entered into a collaboration with **LI-COR Biosciences** to offer a suite of molecular imaging services based on LI-COR's NIR fluorescence detection method.

Product Introductions

In June, **Molecular Devices** launched the new SpectraMax ABS and ABS Plus Microplate Readers, which cover a wide range of absorbance-based applications and can be easily integrated into full robotic systems. The SpectraMax ABS Plus Microplate Reader can run both cuvette-based and microplate reader applications on the same instrument. Both readers have filterless monochromator flexibility that allows for selecting the exact wavelength for every assay.

Gene-based Analysis

Company Announcements

In May, **LexaGene**, which develops instrumentation for pathogen detection, entered into an agreement with the **Stanford University School of Medicine** involving the use of a targeted sequencing technology developed in the laboratory of Dr. Hanlee Ji, a Stanford associate professor of medicine, in combination with LexaGene's microfluidic instrument.

In June, **Fluidigm** entered into a co-marketing agreement with **Genomenon**, the creator of the Mastermind genomic search database and automated machine learning algorithms, to offer evidence-based genomic panel design services for translational and clinical disease research.

In June, **Fluidigm** debuted the Advanta Sample ID Genotyping Panel for use with the Biomark HD system for the identification and quality assessment of human samples and cell lines in disease research. It enables laboratories to accurately detect a unique genetic fingerprint to assist in maintaining a chain-of-custody from sample acquisition to data analysis.

In July, DNA synthesis company **SGI-DNA**, a spin-out of **Synthetic Genomics**, named Todd R. Nelson, PhD, MBA, as CEO. He was most recently with **DiscoverX**.

Product Introductions

EnviroLogix launched in July the QuickScan II, a next generation scanner for quantifying GMOs and mycotoxins for the grain, processing and feed industries. New features include improved operational efficiency and the ability to scan 22 tests simultaneously.

Bio-Techne added new capabilities and options in June to its **ACD**-branded RNAscope and BaseScope ISH portfolio. The company expanded its prevalidated tissue bank with new tissues and disease types and created precollected immuno-oncology datasets, profiling key targets and immune checkpoint markers.

Cell-based Analysis

Company Announcements

In February, **Becton, Dickinson** filed suit in **US District Court** alleging that **Cytek Biosciences** and several former BD employees who are current or former Cytek staff of misappropriation of property, including confidential, proprietary and trade secret information; specifically, secret technical specifications, source code and designs related to the field of flow cytometry. The infringing product is alleged to be the Athena flow cytometer.

Nikon and its subsidiary, **Nikon Instech**, announced in February a strategic business cooperation contract for cell-related fields with **Berkeley Lights** (BLI). As part of the contract, Nikon plans to invest \$30 million in the company. Nikon also entered into an exclusive sales agency contract with BLI for sales in Japan. Nikon Instech began exclusive domestic distribution in Japan from January.

In May, **Berkeley Lights**, digital cell biology technology company, announced a program with **TPG Biologicals**, a leading cell line development company in Asia, to accelerate TPG's cell line development workflow.

In June, **Berkeley Lights** entered into a collaboration with **ChemPartner** focused on accelerating ChemPartner's

mAb discovery workflow.

In June, **Berkeley Lights** announced that **Catalent Pharma Solutions** will adopt its platform to accelerate Catalent Biologics' cell line development workow.

In May, **Stratedigm** and **Shero Diagnostics** announced a partnership. Leveraging Stratedigm's flow cytometry technology. Shero Diagnostics will utilize its reagent library to create single-click diagnostics tests.

Akoya Biosciences announced in May the launch of the CODEX Early Access Program, with 10 sites having purchased the system. CODEX technology (CO-Detection by indEXing) affordably converts existing fuorescence microscopes into high-dimensional imaging systems capable of single-cell resolution to provide a comprehensive solution for spatially resolved, highly multiplexed biomarker analysis.

In June, **Namocell** signed a distribution agreement with **Tomy Digital Biology** to distribute its Namocell Single Cell Dispenser in Japan.

Ovizio Imaging Systems appointed Dr. Emilie Viey as CEO in June. Most recently, she was director of Commercialization at **ACEA Biosciences**.

In June, **NanoCollect Biomedical**, which develops and manufactures tools for cell analysis and sorting, named Chris Neary as CEO. Most recently, he was with **Water Street Healthcare Partners**.

IsoPlexis, a developer of single-cell analytics technology, announced in June a collaboration with **Nektar Therapeutics**. The collaboration is focused on further defining the functional impact of NKTR-214 in the clinic, at the single-cell level, with the goal of revealing how both mechanism and potential immune correlates with outcome.

In July, **SCIENION**-affiliate **Cellenion** and **Miltenyi Biotec** signed a comarketing agreement to improve and accelerate the development of monoclonal cell lines by combining the use of their respective MACSQuant Tyto Cell Sorter and cellenONE X1 single-cell deposition unit.

Product Introductions

In March, **BMG Labtech** announced the availability of its Atmospheric Control Unit on its Omega series microplate readers.

MR Solutions launched in May four CT models idesigned to operate alone or with its clip-on PET and SPECT imaging systems for its range of MRI scanners. The MR Solutions family now includes 6 cryogen-free MRI scanners with a range between 3 T to 9.4 T, 5 PET systems that include clip-on and within the bore and 2 SPECT systems. The company has over two thousand installations worldwide

In May, **BioTek** introduced the Synergy LX MultiMode Microplate Reader to automate the most common microplate-based assays. The 200-999 nm range encompasses a broad range of UV-Vis absorbance assays, including 2 µL measurements when used with the Take3 MicroVolume Plate.

MI Labs debuted in June the E-Class line of economical, entry-level PET, SPECT and CT systems.

Protein-based Analysis

Product Introductions

In June, **miniPCR** launched the second generation blueGel integrated electrophoresis and visualization system. New features include secure electrode contacts for reliable, interruption-free runs.

In June, **Bruker** introduced the new Sierra SPR32 system with higher sensitivity and new instrument control software.

Surface Science

Company Announcements

SPECS Surface Nano Analysis changed its name to **SPECSTII** in March.

In May, **Nikon** announced the transition of its Brazilian research business to **Biolab Brasil**. The local, Brazilian-owned company will maintain full line distribution, factory authorized service and warranty support for Nikon's full line of microscopes, including confocal and super-resolution systems. **Spectrun, Hoven, PMH** and **BioLab Brasil**, which are all current Nikon Instruments Brazilian dealers, will continue to sell and support Nikon's products to the educational and clinical market.

Enviro Analytical Instruments, a provider of environmental XPS solution and a **SPECS** company, named **Scanwell** as its UK distributor of the EviroESCA x-ray photoelectron spectroscopy system.

ZEISS Research & Quality Technology's half-year revenue for the the period ending March 31 declined 0.8%, but were up 4% in constant currency, to €737 million (\$893 million) to represent 27% of company revenues. Driving sales was demand from the automobile industry.

In May, the **University of North Florida Materials Science and Engineering Research Facility (MSERF)** announced its partnership with **TESCAN** to install a TESCANA Q-Phase microscope, an instrument for quantitative phase imaging based on holographic microscopy that is capable of imaging live cells for up to 5 days. The demonstration period will last 90 days.

In June, AFM firm **Park Systems** named **CN Technical Services** as its sales representative for the UK and Ireland. Other European distributors include **ST Instruments** for Benelux, **Milexia** for France, **Gambetti Kenologia** for Italy, **Biometa Tecnologia y Sistemas** for Spain, **Schaefer SouthEast** for Romania and South-East Europe, **Promenergolab** for Russia and **Tekno Tip** for Turkey

In June, **Park Systems** appointed **AVBA Hi-Tech Services** as a sales representative for Israel.

In July, **Park Systems** opened the Park Nanoscience Lab at the **Indian Institute of Science** in Bangalore, India, which has been upgraded to the status of Institute of Eminence. The Nanoscience Lab at the **Centre for Nano Science and Engineering** will be equipped with a Park NX20 AFM.

In June, the **California Nanosystems Institute** at the **University of California, Los Angeles (UCLA)** and **Leica Microsystems** officially established the Leica Microsystems Center of Excellence at UCLA. The Center of Excellence features confocal microscopy technology from Leica, including 3D STED, digital light sheet, super-resolution and multiphoton imaging systems.

JEOL announced in June the grand opening of the **UC Irvine Materials Research Institute** and **JEOL Center for NanoScale Solutions**. The Center includes the first US installation of the JEOL GRAND ARM TEM. The facility also houses the company's JEM2800 high-throughput, nano-analysis TEM/STEM, and the JEM2100F cryogenic and atomic-level structural analysis TEM.

Cytosurge announced in June a premium partnership with **Bruker** to combine the femtoliters-scale fluid control and cell treatment precision of its FluidFM with the force control, resolution and speed of Bruker's PeakForce Tapping AFM technology. The partnership opens up a broad range of FluidFM applications for BioScope Resolve BioAFM users, from single-cell adhesion and injection into single cells, through colloidal studies to nanolithography. This partnership is the third between Cytosurge and leading AFM manufacturers.

Product Introductions

In May, **JEOL** and **Digital Surf** partnered to introduce SMILE VIEW Map software for users of JEOL's SEMs.

Leica Microsystems released in June PAULA (Personal AUtomed Lab Assistant) for cell labs. PAULA is designed

to automate time consuming, routine manual tasks, such as confluence checks. PAULA is based on a unique optical layout combining multichannel LED fluorescence and phase illumination.

Leica Microsystems debuted in July a new version of its Cleanliness Expert software. New features include analysis of more than one filter per batch. The software is a result of a collaboration with Pall.

In June, **EDAX**, an **AMETEK** company, launched the Velocity EBSD camera, which offers high-speed EBSD mapping with what it calls the highest indexing performance on real-world materials.

Sales and Orders of Note

Thermo Fisher Scientific announced in May the installation of its Thermo Scientific Glacios Cryo-TEM at **Astex Pharmaceuticals'** R&D headquarters in Cambridge, UK, to aid in drug discovery and development.

In July, **Thermo Fisher Scientific** announced that the **Brazilian Center for Research in Energy and Materials** (CNPEM) is the first center in Latin America to install a Thermo Scientific Krios G3i Cryo-TEM. Installation is expected to begin the third quarter at the **Brazilian Nanotechnology National Laboratory**, one of four National Laboratories managed by CNPEM.

The **Institut Pasteur** officially unveiled in July its new **Thermo Fisher Scientific** Thermo Scientific Krios Cryo-TEM for use in research in areas such as immunology, bacteriology, virology, parasitology and neuroscience.

Informatics and Software

Company Announcements

ACD/Labs announced in March the filing of a copyright infringement suit against **Mestrelab Research** in Barcelona, Spain. The lawsuit asserts that ACD/Labs' proprietary software source code was directly incorporated into Mestrelab's MNova IUPAC Name software. According to ACD/Labs, Mestrelab Research's management was notified repeatedly about the concern but refused to acknowledge the possible infringement prior to the court filing.

In May, **CAMO Software** named Raman Bhatnagar as CEO, replacing Shirley Henshall. Most recently he was director of Strategic Projects at **Intrum/Lindorff**, a credit management services company.

Genedata announced in May that the Genedata Screener platform has become the first invitro screening data analysis platform for a new biotech infrastructure initiative from Amazon Web Services (AWS), the cloud-based Biotech Quick Start program. AWS Biotech Quick Start is designed to provide an enterprise-grade research environment in the cloud, based on best practices and integrated with leading life science solutions.

In May, **Lab7 Systems** changed its name to **L7 Informatics** and named Vasudev Rangadass, PhD, as CEO. Prior to Lab7 Systems, Dr. Rangadass was chief strategy officer at **NantHealth**. L7 Informatics's Enterprise Science Platform is a scientific process and data management system.

L7 Informatics announced in May a connector to the **Microsoft Genomics** service on the Azure cloud for L7's Enterprise Science Platform.

In May, **Schrödinger** established a collaboration with Canada's **National Centre for Drug Research and Development** to develop novel immuno-oncology monoclonal antibodies and other cancer biologics. Schrödinger will support hit triage, prioritization through prediction of physico-chemical liabilities and antibody humanization. The initial project will involve an immune checkpoint target that is present on cancer stem cells.

In June, **Benchling**, the data management and collaboration platform for life sciences research, closed a \$14.5 million Series B funding round, led by **Benchmark**. More than 100,000 scientists across enterprises and academia use Benchling. Customers that have standardized on its platform include **Regeneron Pharmaceuticals, Incyte, Editas Medicine, Agenus, Zymergen** and **Obsidian Therapeutics**.

Elucidata announced in June that it raised \$1.7 million in seed funding. The financing round was led by **Hyperplane Venture Capital**. Elucidata's drug discovery platform for -omics data is at the intersection of computational biology, software engineering, modeling, machine learning, statistics, and design.

In June, **Labstep**, a platform for researchers that captures real-time scientific data and connects lab groups enabling information sharing and reproducibility, announced that it raised £1 million (\$758,000) in funding. The company plans to double its staff to 12. Labstep has users at over 600 universities including, **Stanford, Harvard, MIT, Oxford, University College London, Imperial College, King's College** and **the Crick Institute**.

Product Introductions

In May, **Amazon Web Service** introduced Amazon Neptune, a fully managed graph database service. Applications include drug discovery. Amazon Neptune is available in North Virginia, Ohio, Oregon and Ireland regions, and will expand to additional regions in the coming year.

In June, **Genedata** released the Genedata Expressionist 12.0 enterprise software solution offering integrated data management, processing, analysis, and reporting for MS-based characterization of biotherapeutics and related applications in proteomics and metabolomics. New features include the applications of metadata that can directly apply specific parameters to individual MS data sets and optional cloud deployment.

Schrödinger introduced in June a 2D coordinate generation tool to the RDKit open source cheminformatics toolkit. In addition, Schrödinger utilized the RDKit to develop an open source GPU-enabled similarity search tool.

In June, **Simulations Plus** released version 9 of its ADMET Predictor AI modeling program. New features include additional pharmacokinetic endpoint predictions as part of the high-throughput pharmacokinetics simulations module.

Sales and Orders of Note

In May, **Biomax Informatics'** client **Royal DSM** signed a multi-year license for the Biomax to implement a new enterprise knowledge platform.

In June, Germany's **Friedrich-Schiller-Universität Jena** selected **ACD/Labs'** ACD/Spectrus Processor, ACD/NMR Workbook Suite, and ACD/MS Workbook Suite to advance its analytical data management strategy in the Faculty of Chemistry and Earth Science.

LabArchives announced in new enterprise partnership in June with the **University of Oxford** for its ELN and also obtained a site license.

Liquid Chromatography

Company Announcements

In May, **Postnova Analytics** announced the publication of the results of a collaboration with the **Department of Biosciences at the University of Helsinki** in Finland using its Asymmetrical Flow FieldFlow Fractionation (AF4) system for the purification of halophilic (extreme) viruses.

In June, **Repligen** and **Navigo Proteins** agreed to codevelop a portfolio of next generation ligands utilizing Navigo's Precision Capturing technology platform. Repligen will receive intellectual property rights and exclusivity on all affinity ligands developed with Navigo, and Navigo will receive a series of milestone and royalty payments. The agreement expands a two-year agreement between the companies that resulted in the development of a next-generation Protein A affinity ligand.

Repligen agreed in June to supply its next generation Protein A ligand, NGL-Impact A, to **Purolite Life Sciences**, which will commercialize the ligand using its Praesto agarose jetting base-bead technology (see below). NGL-Impact A was developed as part of Repligen's collaboration with Navigo Proteins. Purolite Life Sciences's jetting technology is a new method that produces agarose beads with a uniform particle size distribution to drive higher capacity and increase pressure flow properties.

Product Introductions

In May, **YMC** introduced YMC BioPro HIC BF, a new hydrophilic polymer stationary phase bonded with C4 (butyl), available in 4 µm non-porous particle size.

In June, **YMC America** debuted YMC Chiral ART Amylose-C Neo, a new and improved version of its iscoated Chiral ART Amylose-C chiral phase, offering increased resolution.

Biotage released in May a new UV Monitor Kit, a plug-and-play kit which can be easily added to its Biotage Flash 150 and Biotage Flash 400 systems in pharmaceutical development or manufacturing environments.

In June, **Novasep** introduced the modular BioSC Pilot, which combines batch and continuous chromatography with intermediate purification steps in downstream processing for use, from early pilot phase to small commercial production.

Purolite Life Sciences launched in June the Praesto Jetted A50 Protein A resin.

Sales and Orders of Note

In May, API manufacturer **Cambrex** completed a 400 ft² (37 m²) pilot plant expansion in High Point, North Carolina. The expansion included an upgrade of its **Waters'** Empower 3 chromatography data system.

In June, **Nanologica** announced an agreement to deliver columns worth at least \$333,333 per year over the next three years to Chinese **SinoUnison**, which focuses on analytical services in food production SinoUnison will also develop new methods based on Nanologica's products.

Reported Financial Results

\$ USD in Millions	Period	Ended	Sales	Chg.	Op. Prof.	Chg.	Net Prof.	Chg.
Euro Tech	FYE	31-Dec	\$17.4	-22.8%	(\$0.6)	14.3%	\$0.4	132.3%
Other Currencies in Millions								
Park Systems	Q1	31-Mar	KRW 6,361.0	119.5%	-KRW 323.3	83.8%	-KRW 149.2	94.5%
Photon Control	Q1	31-Mar	CAD 13.85	16.6%	CAD 4.70	90.0%	CAD 2.88	69.7%
Syft Technologies	FYE	31-Mar	NZD 12.4	50.0%	NZD 1.1	44.1%	NZD 3.6	209.9%
Takara Bio (Bioindustry)	FYE	31-Mar	¥29,568	11.3%	¥6,683	7.5%	NA	NA
XRF Scientific	H1	31-Dec	AUD 12.1	15.2%	AUD 0.5	43.4%	AUD 0.7	122.9%

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