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Instrument Business Outlook

Strategic Information for the Analytical & Life Science Instrument Industry

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Sales per Employee Dip in Fiscal 2016

Although 17 instrument and laboratory product businesses recorded impressive total sales growth in fiscal 2016, their overall average productivity gains were minimal, according to an analysis of fiscal 2016 sales per employee for these businesses (see table below). In many cases, slower sales growth for businesses coupled with steady hiring patterns resulted in a year-over-year decline in productivity growth.

Changes in productivity provide insight into a business's strategy and development, and can also indicate broader trends across the industry in terms of market growth and product demand. The figures in the table are based on

FY16 employment figures and FY16 currency neutral sales in US dollars. For companies that do not report in US dollars, constant exchange rates were used.

Company	Sales per Employee FY16	Number of Employees FY16	Employee Change FY 16	Currency Neutral Revenue Change FY16	Currency Neutral Productivity Change FY16
Agilent Technologies	$336,160	12,500	5.9%	5.8%	-0.1%
Biotage	$253,330	308	5.1%	6.2%	1.0%
Bio-Techne	$319,887	1,560	15.0%	12.6%	-2.1%
Bruker	$268,552	6,000	0.0%	-0.3%	-0.3%
Eppendorf	$239,002	3,029	2.0%	4.8%	2.7%
Fluidigm	$177,328	589	0.9%	-8.9%	-9.7%
Harvard Bioscience	$240,278	435	-0.5%	-1.8%	-1.4%
Illumina	$436,068	5,500	19.6%	8.0%	-9.6%
NanoString Technologies	$212,504	407	32.6%	38.0%	4.1%
Pacific Biosciences	$207,110	438	11.2%	-2.2%	-12.1%
PerkinElmer	$264,440	8,000	0.0%	-5.3%	-5.3%
QIAGEN	$285,651	4,684	2.7%	6.3%	3.4%
Sartorius (Lab Prod. & Ser.)	$155,308	2,327	8.0%	7.9%	-0.1%
Tecan	$361,864	1,413	3.3%	13.5%	9.9%
Thermo Fisher Scientific	$332,256	55,000	5.8%	8.6%	2.7%
VWR	$442,569	10,200	5.7%	5.6%	-3.7%
Waters	$314,165	6,899	4.6%	6.8%	2.1%

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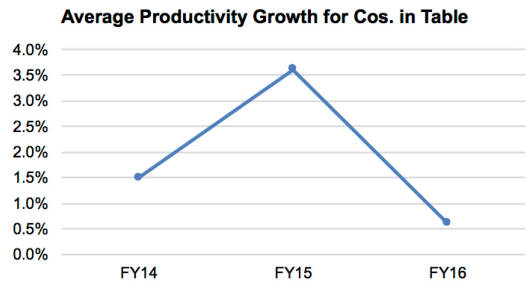
Total Productivity

Excluding currency, the companies in the table recorded a 0.6% increase in productivity in fiscal 2016 to average sales per employee of $328,453. For these companies, FY16 currency neutral sales growth averaged 6.5%; however, the growth rate of total number of employees was less than a percentage point behind at 5.8%.

Consequently, overall productivity growth for the 17 businesses decelerated from the 3.6% increase in fiscal 2015. In FY15, not only did currency neutral sales grow faster, at 7.2%, but the percentage increase in the number employee numbers was slower, at 3.5%. In fact, in FY15, none of the 17 companies reported a decline in currency neutral sales growth, compared to 5 that did in FY16.



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Sales Declines vs. Productivity

Although annual sales, excluding currency, declined for 5 companies in the table, only 1 company, Harvard Bioscience, reported a decrease in the number of employees. Of the 4 other companies, the number of new hires was moderate to flat in 3 cases, Bruker, Fluidigm and PerkinElmer, as each company was engaged in different stages of efficiency programs.

PerkinElmer reported restructuring plans in both the second and third quarters of 2016, which decreased its workforce by 94 employees, according to its SEC 10-K filing. The changes were part of a broader multiyear effort aimed at company processes and organizational structure, which included realignment of the company's divisions

(see ***IBO*** 9/30/16).

Bruker reported in its 10-K filing that 125 employees were affected by the restructurings of its Bruker CALID and Bruker Nano Group businesses last year. For all of Bruker, the filing shows a reduction in number of general and administrative, and R&D employees, but increases in the number of production and distribution, and selling and marketing staff.

Following revenue declines, Fluidigm initiated a cost savings and efficiency plan in the first quarter of FY16, which included workforce reductions. Regulatory filings show a reduction in the company's general and administrative, and manufacturing workforce. But the company increased the number of R&D, sales, technical support and marketing personnel.

According to Pacific Biosciences' SEC filings, its workforce increased in all areas in FY16, perhaps in anticipation of Roche's introduction of a clinical NGS system based on Pacific Biosciences technology. Roche terminated the agreement late the year (see ***IBO*** 12/31/16), which will likely affect fiscal 2017 staffing levels.

Employee Growth vs. Productivity

In fiscal 2016, four companies recorded double-digit employee growth: Bio-Techne, lllumina, NanoString Technologies and Pacific Biosciences. Two of them, Bio-Techne and NanoString, also recorded double-digit jumps in productivity, as employee growth was accompanied by strong sales.

Although Bio-Techne completed two acquisitions in fiscal 2016 (the largest of which was Cliniqa, with 75 employees at the time of purchase [see ***IBO*** 6/15/15]), the firm added 204 employees altogether. Company sales growth also benefited from the first full year of sales of the 2014 acquisitions of CyVek (see ***IBO*** 11/15/14) and PrimeGene (see ***IBO*** 4/15/14). Investments in fiscal 2016 related to employees included sales and marketing, and geographic expansion, according to company conference calls, related to the company's growth plans. The company aims to reach over $800 million in sales by FY21.

Tecan recorded the fastest increase in productivity in FY16

Like Bio-Techne, Nanostring is a company in growth mode. But, unlike Bio-Techne, it has not made any acquisitions in recent years. Nonetheless, it recorded the highest percentage growth in employees among companies in the table. Nanostring's 10-K filing shows that the company's employees grew by double-digit percentages in all work areas in FY16, including a 48.6% increase in its R&D workforce to 107 people. The company introduced several new assays during the year, increased its penetration of the clinical diagnostics market, advanced its companion diagnostics agreements, and announced future R&D projects, namely, single-molecule sequencing chemistry and multiplex digital immunohistochemistry.

Fastest Productivity Growth

Tecan was the company in the table with the fastest productivity growth last fiscal year at 9.9%. Including the 2015 acquisition of Sias (see ***IBO*** 10/31/15), which had around 80 employees at the time of purchase, total employment grew only 3.3%, or by 44 people. This excludes approximately 60 employees added by the 2016 acquisition of SPEware (see ***IBO*** 8/31/16), according to the company's annual report. This was a relatively minor increase in a year when currency neutral sales increased double digits. Sales growth was driven by new products introduced in the current and previous years. The productivity growth is also a considerable increase from fiscal 2015, when Tecan's productivity rose 4.2%. Also adding to FY16 productivity growth were past acquisitions, as the company's 13.5% growth in currency neutral revenues included 5.3% growth from acquisitions. In some ways, the company reaped the benefit of past investment, as the company's total number of employees rose 8.5% in FY15 as the company rolled out major product lines.

Highest Productivity

Although Tecan recorded the fastest increase in productivity in FY16, VWR recorded the highest sales per employee at $442,569. The company benefits from being primarily a distributor of other companies' products, and thus has a lower manufacturing and R&D footprint than other businesses in the table. It has also been one of the most acquisitive firms in the table, buying five businesses in fiscal 2016 alone. Despite the highest sales per employee, productivity declined 3.7% in FY15 (see ***IBO*** 6/30/16).

Illumina, which recorded the highest productivity among these 17 companies in FY15, was number two last year with sales of $436,068 per employee. The company's dominant market position, portfolio of high-priced consumables and product pricing enabled it to maintain high productivity despite a decline in FY16 sales. Illumina continued its double-digit increase in employees, rising 22.5% and 25.2% in fiscal 2015 and fiscal 2014, respectively (see ***IBO*** 6/30/15).

Year over year, however, sales per employee declined, dropping 9.6%, as hiring outpaced sales growth. The company's investments are related not only to company growth but market growth. As Illumina President and CEO Francis deSouza told analysts on the company's first quarter 2016 conference call, "I've highlighted over the past year or 18 months that much of the market development that has to happen now in sequencing falls on Illumina; that we don't have a lot of other large companies who are spending marketing dollars developing markets and, so, that is key for us to do, more than it ever has been." Such markets include NIPT testing and clinical oncology, and their associated reimbursement and regulatory issues.

Productivity Declines

Productivity declined for 10 of the 17 companies in the table. For 5 businesses, productivity fell despite an increase in fiscal 2016 sales: Agilent Technologies, Bio-Techne, Illumina, Sartorius Lab Products and Services, and VWR. This reflects an investment period for these businesses. As discussed above, Bio-Techne and Illumina's investments are related to future growth prospects.

In fiscal 2016, Agilent added 700 employees. The increase comes after a 200-employee decline last year following the divestment of product lines, organizational changes and streamlining efforts. During FY16, Agilent acquired iLab Solutions, which had 70 employees at the time of purchase (see ***IBO*** 6/30/16), and closed its purchase of Seahorse Biosciences (see ***IBO*** 9/15/15), stating that most of that company's 200-person workforce were now with Agilent. The company has stated its commitment to growing its informatics, diagnostics and services businesses. It also signed a product development agreement with LaserGen (see ***IBO*** 3/15/16), which includes new Agilent R&D efforts. Thus it appears after a period of reorganization, new investments are flowing.

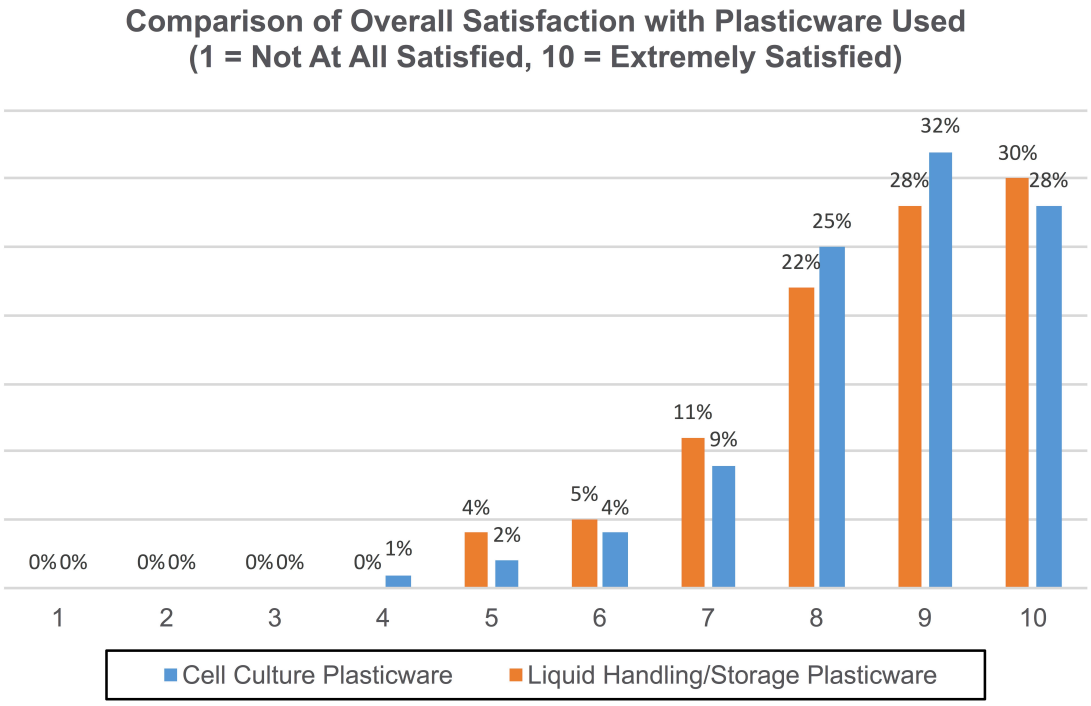
Like Agilent, VWR's productivity fell last year. In addition to acquisition activity discussed above, VWR continues to increase its portfolio of self-manufactured products and its services business. Of the 900 employees the company added in FY18, 700 were based in North America, and Europe accounted for 200, according to the company's 10-K. These are also the two regions in which acquisitions were made.

Likewise, Sartorius Lab Products & Services grew its employee base due to acquisitions. The business added 172 people in fiscal 2016, stating in its annual report that most of the new positions were due to the purchase of IntelliCyt, with 55 employees at the time of sale (see ***IBO*** 6/30/16), and ViroCyt (see ***IBO*** 7/15/16). The acquisitions boosted annual division revenues by about 3%. In its annual report, the company also noted increased investments in the division's sales structure. The acquisitions represent new technologies and markets for the company, so the company can be expected to invest in them in coming years.

Lab Plasticware Budgets on Moderate Rise, According to Global Survey Results

Due to the increase in R&D expenditures in the pharmaceutical and biotechnology industries, as well as the rise in analytical research infrastructure development in Asia Pacific, global lab budgets for cell culture and liquid handling plasticware are forecast to rise. Scientists choose particular plasticware brands due to factors such as brand reputation, customer service and durability, and allocate a significant part of lab budgets to specific plasticware based on market segment and research applications.

BioInformatics LLC's 2017 Market for Laboratory Plasticware: Cell Culture and Liquid Handling/Storage is a 44-question online survey completed by 1,148 scientists around the world between April 4 and April 14, 2017. The purpose of the report is to help inform manufacturers and distributors of plasticware about the market size and growth prospects, average plasticware lab budgets, brand awareness and customer loyalty to a brand. The survey also examines the specific channels through which plasticware is frequently purchased, as well as the rise of 3D cell culture techniques within labs using cell culture plasticware. The information in this article is taken from the 81-page report of survey results.



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Cell Culture

The market for cell culture plasticware in 2016 was robust and its forecast is optimistic, with flasks and multi-well plates making up a significant portion of the market. The Corning,Eppendorf, Falcon,Nalgene and NEST Scientific brands are some of the main players in the cell culture plasticware market, with VWR and Sigma-Aldrich major distributors of branded products. In terms of brand awareness, Corning, Falcon and VWR were among the group of companies most customers thought of for cell culture plasticware, with over 50% of respondents listing two or more brands.

Certain cell culture plasticware are more commonly used than others in labs, with multi-well plates used by virtually all scientists. These plates come in a variety of sizes and provide various surface chemistries, making them a staple in analytical research. The types of cell culture plasticware used in a lab also depends on market segment, as survey results indicated that some cell culture plasticware are used more often in industrial labs as opposed to academic labs.

Due to foreign pharmaceutical and biotechnology R&D investments made in Asia Pacific, the demand for cell culture plasticware is growing in the region. With global R&D spending for the pharmaceutical industry growing at an estimated CAGR of 6.5% from 2016 to 2022 and the dominance of biologics in the drug market (see Industry Watch), the demand for cell culture plasticware in this sector is on an upswing. The use of 3D cell culture in these labs also contributes to the increased demand, especially in Asia Pacific, where 3D cell culture has been gaining traction due to the rise in the number of pharmaceutical/biotechnology labs across the region. However, as the survey results indicate, the use of 3D cell culture in labs is still quite dependent on lab budgets.

Since certain cell culture plasticware are used more commonly in labs, the vast majority of lab budgets for cell culture plasticware are allocated towards those particular plasticware, such as multi-well plates, which make up a significant portion of cell culture plasticware lab budgets. The usage of specific plasticware is determined by the market segment, as industrial labs' budgets for plasticware are geared more towards 2 out of 5 cell culture plasticware (i.e., multi-well plates, flasks, filter bottles, cell factories and roller bottles) in contrast to academic labs.

North American and European researchers expect their lab budgets to increase at a comparable rate, and results indicated a moderate discrepancy between the increase of lab budgets between academic and industrial labs. Generally speaking, due to higher budgets because of private investments, industrial labs purchase cell culture plasticware more frequently than academic labs, with certain types of plasticware bought more frequently than others.

Liquid Handling

The market for liquid handling/storage plasticware in 2016 was similarly as healthy as the market for cell culture plasticware. This market is dominated by pipette tips and centrifuge tubes, both which are also driving growth. As in the cell culture plasticware market, Corning, Falcon, Sigma-Aldrich and VWR are major providers in the liquid handling/storage plasticware market, with Eppendorf emerging as the leader in both vendor share and brand awareness among customers.

Two out of 4 liquid handling/storage plasticware products (centrifuge tubes, cryogenic vials, serological plastic pipettes and pipette tips) are most commonly used, with researchers generally choosing the same brand for both product types. Customers using Eppendorf's centrifuge tubes, for example, are also likely to use Eppendorf's pipette tips. According to survey results, the motivation behind using a particular brand's products is dependent on a number of factors, such as product performance, ease of use and ordering, price, material quality, product design and brand reputation, with certain factors weighted more heavily than others for customers. Academic labs and industrial labs cite different motivations for brand switching in the survey, with factors such as better technical support and customer service, better performance, and product availability playing a varying role in each product segment.

Asia Pacific emerges as the region driving growth in the liquid handling/storage plasticware market due to the establishment of new research infrastructures and labs. As R&D expenditures in the pharmaceutical and biotechnology sectors continue to rise, liquid handling/storage plasticware demand is expected to rapidly grow for these industries. Due to the high volume of sampling in these labs, automation techniques such as liquid handling are also more likely to be used, contributing to the growth in demand for its plasticware.

Since pipette tips and centrifuge tubes are standard in liquid handling and automation techniques, these products account for the vast majority of plasticware lab budgets. Out of 22 company options, Eppendorf and Falcon emerged as the brand leaders of liquid handling/storage plasticware products purchased in labs, but results indicated brand choice also depends on product types and the customer's market segment. Most of the survey respondents suggested that their lab budgets for liquid handling/storage plasticware would likely stay the same or modestly increase within the next two years, with certain segments and regions more poised for growth than others.

PerkinElmer Buys Autoimmune Testing Firm for $1.3 Billion

Waltham, MA 6/19/17; Lübeck, Germany 6/19/17—PerkinElmer has signed a definitive agreement to acquire EUROIMMUN Medical Laboratory Diagnostics for $1.3 billion in cash. EUROIMMUN is provider of autoimmune testing, infectious disease and allergy testing products. Based in Germany with 2,400 employees, the company is expected to post revenues of $310 million this year, with China accounting for 45% of sales. "With the acquisition of EUROIMMUN and its talented team of professionals, we are able to leverage our combined advanced detection, imaging and assay development capabilities, along with our strong collective market positions and synergistic commercial activities, to deliver better and more complete solutions to our customers around the world," commented PerkinElmer Chairman and CEO Robert Friel. The purchase is expected to be accretive to PerkinElmer's 2018 non-GAAP EPS by $0.28–$0.30.

*The acquisition in expected to close in the fourth quarter, according to an analyst call discussing the deal. As Mr. Friel highlighted in the call, specialty diagnostics testing, especially in emerging markets, has been a focus and source of growth for PerkinElmer in recent years. Acquisitions in this area included Tulip Diagnostics (see **IBO** 1/15/17) and Shanghai Haoyuan Biotech (see **IBO** 11/15/12). EUROIMMUNE expands PerkinElmer's test menu and technology offerings for a number of markets. Going forward, PerkinElmer continues to expect its diagnostics business to account for 50% of revenues, according to the call.*

Regarding the companies' commercial synergies, Mr. Friel stated on the call, "For example, EUROIMMUNE enables expansion into the nearby adjacencies within reproductive health, including sexually transmitted diseases, HPV and

infectious disease, while increasing PerkinElmer's ability to offer an extensive menu and more complete solutions to our customers." Two-thirds of EUROIMMUNE revenues are from autoimmune sales, and 20%–25% are from infectious disease testing, according to the call. The acquisition will be funded by cash and incremental debt. PerkinElmer expects ROIC from the purchase of more than 10% by year five. This year, EUROIMMUNE is expected to record EBITDA of $70 million.

Shimadzu Acquires CRO

Tokyo, Japan 6/21/17—Analytical instrumentation provider Shimadzu has purchased CRO AlsaChim. Based in France, AlsaChim is focused on stable isotope–labelled compounds, metabolites and pharmaceutical-related substances. No financial details were provided. "With AlsaChim, we have a strong partner in our organization who is able to finalize and validate new application kits and utilize the developments done by EUIC [Shimadzu's European Innovation Center], and transfer them into ready-to-use products," said Bjoern-Thoralf Erxleben, senior manager, Analytic Shimadzu Europa. Shimadzu stated that with the addition of stable isotopes and reference methods, the purchase allows it to provide complete kits for its clinical systems, including its LC/MS systems and CLAM-2000 automated sample preparation platform for MS.

The purchase expands Shimadzu's consumables offerings, especially for MS, in line with the company's current strategy. AlsaChim has 20 employees, according to a spokesperson for Shimadzu Europe. Shimadzu plans to distribute AlsaChim's products worldwide.

Analytik Jena Sells LIMS Business

Jena and Cologne, Germany 6/30/17—Analytical instrument firm Analytik Jena has sold its AJ Blomesystem business, which supplies LIMS, to GUS, an ERP solutions provider. Financial details were not disclosed. "By taking over the LIMS business, the GUS Group is expanding its offering of solutions both for the process industry as well as for analyzing and controlling institutes, and is thus expanding its position as a process expert," stated Dirk Bingler, managing director of GUS Deutschland. As of July 1, the acquired firm will be known as Blomesystem. All employees and locations will be retained.

AJ Blomesystems has 37 employees, according to Analytik Jena CEO Ulrich Krauss. Asked if Analytik Jena plans to divest other businesses, he told **IBO**, *"Analytik Jena will continue to focus on its core business and has made the necessary adjustments to its business portfolio." The company also recently divested its Optics business (see* **IBO** *6/15/16).*

Unchained Labs Makes Fifth Acquisition

Pleasanton, CA 6/29/17—Biological tools firm Unchained Labs has purchased Trinean for an undisclosed amount. Trinean provides the DropSense systems for measuring protein, DNA and RNA concentrations. "Concentration measurement is central to everything our customers do, and DropSense96 is the only product in the world that does it for biologics at high concentration with high throughput," commented Unchained Labs Founder and CEO Tim Harkness. Unchained Labs raised $13 million in Series C funding in connection with the deal. Unchained Labs generates annual revenues of more than $35 million with eight product lines.

Trinean has 23 employees, which will expand Unchained Lab's total staff to over 130 people, according to an Unchained Labs spokesperson. Asked about how Trinean's systems fits with Unchained Labs' other product lines, he told **IBO**, *"Every researcher working on biologics needs to know how much protein is in their sample, before and after sample prep, purification, characterization and every other step of the development process." He added, "We will also continue to sell the DropSense96 and DropSense16 to genomics customers measuring DNA and RNA*

*concentrations." Since its establishment in 2015, Unchained Labs has acquired Optim technology (see **IBO** 2/28/15), AVIA Biosystems, Avid Nano (see **IBO** 10/31/15) and Freeslate (see **IBO** 2/29/16).*

Repligen Merges with Filtration Firm

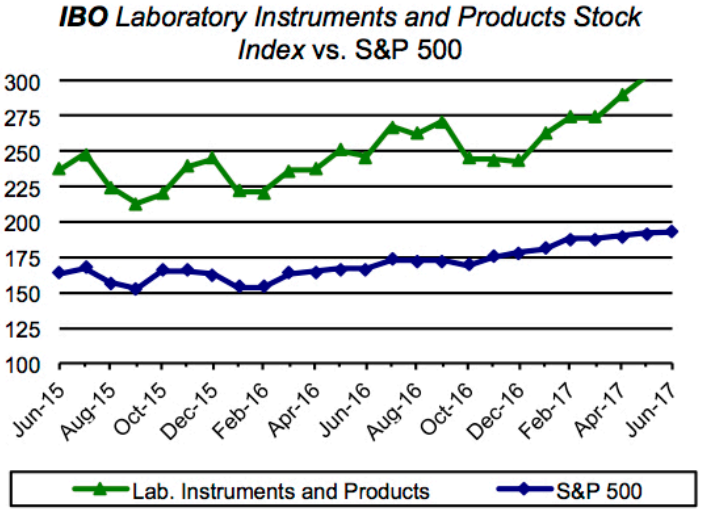
Waltham, MA 6/23/17—Bioprocessing technology firm Repligen has definitively agreed to acquire Spectrum, a diversified filtration company, for $359 million, consisting of $120 million in cash and 6,154,000 shares. Spectrum products include hollow fiber cartridges, benchtop commercial-scale filtration and perfusion systems, and single-use solutions. In 2016, it generated revenues of $40.2 million. "This is a pivotal transaction for Repligen that meets all of our acquisition criteria and is a major step forward in building Repligen as a global leader in bioprocessing and achieving our long-term financial goals," stated Repligen President and CEO Tony J. Hunt. Spectrum is anticipated to contribute $17–$18 million to Repligen's 2017 sales, and to add $47–$50 million to 2018 sales. The purchase is expected to be breakeven to adjusted EPS in 2017 and accretive in 2018. Over three years, synergies are estimated to total $20–$25 million, including $15–$20 million in revenue synergies. The transaction is scheduled to close in the third quarter.

*Repligen's core business is Protein A affinity ligands, which are sold to GE Heatlhcare and MilliporeSigma. In recent years, the company has expanded its bioprocess chromatography and filtration business. In 2016, 41% of revenue (assuming the full-year revenues of TangenX [see **IBO** 12/31/17] and Spectrum] came from filtration, with chromatography representing 20% and proteins the remainder. The acquisition doubles Repligen's filtration product offerings and adds filtration consumables, according to a company analyst call. Repligen stated that the acquisition increases its addressable markets from mABs to vaccines, recombinant protein and gene therapy. It also adds to the company's commercial organization and infrastructure, including a direct sales presence in Asia. Spectrum products address both upstream and downstream applications.*

IBO Stock Indexes Benefit from Markets' First-Half Strength

US equity markets showed mixed results in June. Estimates for first quarter GDP were revised upwards on June 29 two-tenths of a percentage point to 1.4%. On June 14, the US Federal Reserve raised the benchmark interest rate a quarter percentage point to 1%–1.25%, the third consecutive quarterly increase and a vote of confidence in the economy. But weak growth in consumer spending and a late month decline in tech stocks curtailed overall equity growth.

In June, the S&P 500 and Dow Jones Industrial Average grew 0.5% and 1.6%, respectively, while the NASDAQ slumped 0.9%. Nonetheless, each Index has enjoyed a strong first half, up 8.2%, 8% and 14.1%, respectively. Both the S&P 500 and Dow Jones have posted their strongest first-half performances since 2013.



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Laboratory Instruments and Products Stock Index

In line with the main market indexes, the *Index* rose 1.2% for the month, with 13 of the 20 companies posting gains, led by **Enzo Biochem**. For the year, the *Index* has increased a strong 26.3%, with **Enzo Biochem** again posting the largest gain. **Fluidigm** has recorded the largest decline, falling 44.5%.

On June 8, **Enzo Biochem** reported roughly flat adjusted EPS for the fiscal third quarter ending April 30, which was ahead of analysts' consensus. Despite weak Life Sciences sales due to timing of orders and slower demand from industrial and academic customers, top line growth benefited from strength in the Clinical Labs segments. The company also highlighted specific molecular diagnostic product developments and a new in-network partnership with a major insurance provider.

On June 20, **Kewaunee Scientific** reported an increase in fiscal fourth quarter and fiscal year adjusted EPS. Fiscal year-end adjusted EPS gained double digits due to strong domestic sales growth (see Bottom Line).

Looking to boost depleting cash reserves and help manage working capital, both **NanoString Technologies** and **Pacific Biosciences** announced new public common stock offerings this month. **NanoString** tumbled 9.2% on June 1 after pricing its 3.0 million common share offering at $16.75, including an underwriter option to purchase up to an additional 450,000 shares. The offering closed on June 6 with a full exercise of additional shares, resulting in net proceeds of roughly $56.5 million.

Pacific Biosciences priced a 15.4 million common stock offering at $3.10 on June 14, yet shares declined a modest 1.2%. The offering included an underwriter option to purchase up to an additional 2.3 million shares.

In the news, **PerkinElmer** jumped 4.6% on June 19 following the announcement of the acquisition of **EUROIMMUN** (see Executive Briefing). Shares ended the month up 8.1%.

Company	Date Rep.	Fiscal Quarter	2017 Adj. EPS	Analyst Consensus	Vs. Estimate	YOY Growth	2016 Adj. EPS
Laboratory Instruments and Products Stock Index							
ENZ	8-Jun	3Q	($0.04)	($0.06)	⇧ $0.02	0%	($0.04)
KEQU	20-Jun	4Q	$0.51	NA	NA	2%	$0.50
KEQU	20-Jun	FYE	$1.66	NA	NA	17%	$1.42

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Diversified Instrumentation Stock Index

The *Index* inched up 0.9% in June and is up 16.2% for the year. During the month, 5 of the 8 shares recorded gains,

led by **Xylem**.

On June 20, **Danaher** announced €250 million ($281million at €0.89 = $1) and €600 million ($674 million) offerings of Euro-denominated senior notes due 2022 and 2027, respectively. Net proceeds are expected to total €845 million ($949 million), and will be used to repay outstanding debt and for corporate purposes.

On June 1, Goldman Sachs upgraded **Illinois Tool Works** from "Sell" to "Buy," and raised its price target from $131 to $155 per share. On June 7, Janney Montgomery Scott downgraded **Danaher** from "Buy" to "Neutral."

International

Most major Asian indexes posted gains in June, with Taiwan's TAIEX up 3.5% and the Shanghai Composite rising 2.4%. Two indexes declined, as India's Sensex 30 dropped 0.7% and the Philippines Stock Exchange PSEi Index declined 0.1%.

Four Asian stocks in the ***IBO*** Stock Table declined, led by **GL Sciences**, which fell 11.5%. **Precision System Science** led all gainers, rising 80.1%.

Major European indexes declined this month. Spain's IBEX 35 was down 4.0%, while France's CAC Index declined 3.1%. However, year to date, both indexes are up.

All five European shares in the ***IBO*** Stock Table also declined this month, with **Sartorius** plunging 6.8%. UK shares fared only slightly better, with 1 of the 6 companies in the ***IBO*** Stock Table, **Horizon Discovery**, gaining in price.

On June 2, **Horizon Discovery** reported that for the year ending December 31, 2016, EPS loss widened 8% to 12.1 pence ($0.16). Despite strong sales and gross margin growth, earnings were negatively impacted by increased operation investments, higher taxation and exceptional cost items. For 2017, the company projected sales to grow 11%–29% to £30–£35 million ($38–$44 million) and positive EBITDA.

Based on continuing operations and favorable currency impact on revenues, **Oxford Instruments** reported on June 13 that adjusted EPS for the fiscal year ending March 31 advanced 6% to 47.7 pence ($0.62). Organic sales growth for the company were again hampered by industrial demand.

On June 13, **Halma** reported that fiscal 2017 adjusted EPS ending April 1 climbed 17% to 40.2 pence ($0.52) due to favorable currency impacts and previous restructuring activity. The company's yearly dividend expanded 7% to 13.7 pence ($0.18). HSBC Holding downgraded the company on June 14 from "Buy" to "Hold," but raised its price target from GBX 1,150 ($14.55) to GBX 1,200 ($15.18).

Company: Exchange	Market Value (US M)	52 Week Range Low ($)	High ($)	Price 6/30/17	Change 1 Month	Change YTD	P/E (ttm)	EPS (ttm)
Laboratory Instruments and Products								
Agilent Technologies: n	$19,276	41.98	60.48	$59.31	-1.7%	30.2%	33	1.78
Becton, Dickinson and Company: n	$42,508	161.29	188.48	$195.11	3.1%	17.9%	32	6.02
Bio-Rad Laboratories: n	$6,769	135.94	224.24	$226.31	1.3%	24.2%	241	0.94
Bio-Techne: o	$4,406	95.68	117.42	$117.50	4.8%	14.3%	63	1.86
Bruker: o	$4,629	19.59	27.85	$28.84	6.0%	36.2%	31	0.94
Enzo Biochem: n	$512	4.88	9.68	$11.04	22.7%	59.1%	16	0.71
Fluidigm: o	$118	4.31	11.05	$4.04	-10.8%	-44.5%	NM	-2.52
Harvard Bioscience: o	$88	2.25	3.90	$2.55	10.9%	-16.4%	NM	-0.14
Illumina: o	$25,507	119.37	189.48	$173.52	-2.2%	35.5%	35	4.99
Kewaunee Scientific: o	$68	16.38	27.60	$24.95	8.7%	2.0%	18	1.42
Luminex: o	$908	17.64	23.75	$21.12	4.2%	4.4%	66	0.32
Mettler-Toledo: n	$15,647	343.61	582.20	$588.54	1.0%	40.6%	38	15.30
MTS Systems: o	$990	41.53	59.00	$51.80	-0.1%	-8.6%	44	1.18
NanoString Technologies: o	$357	11.89	23.45	$16.54	-9.8%	-25.8%	NM	-2.47
Pacific Biosciences: o	$331	3.46	10.40	$3.56	7.9%	-6.3%	NM	-0.86
PerkinElmer: n	$7,509	45.35	63.03	$68.14	8.1%	30.7%	33	2.04
QIAGEN: o	$7,876	20.73	33.06	$33.53	-0.1%	19.7%	96	0.35
Thermo Fisher Scientific: n	$68,759	139.07	173.64	$174.47	1.0%	23.6%	32	5.49
VWR: o	$4,357	24.42	37.25	$33.01	-0.2%	31.9%	29	1.12
Waters: n	$14,849	131.35	179.07	$183.84	2.3%	36.8%	28	6.57
Diversified Laboratory								
AMETEK: n	$13,992	43.28	61.37	$60.57	-0.7%	24.6%	27	2.22
Corning:	$28,127	18.88	29.72	$30.05	3.3%	23.8%	8	3.66
Danaher: n	$59,554	73.42	88.01	$84.39	-0.6%	8.4%	26	3.28
Honeywell	$101,714	105.25	135.00	$133.29	0.2%	15.1%	21	6.35
Illinois Tool Works: n	$49,994	98.32	142.82	$143.25	1.4%	17.0%	25	5.80
Roper Technologies: n	$23,866	159.28	228.21	$231.53	1.9%	26.5%	36	6.48
Teledyne Technologies: n	$4,608	92.52	137.00	$127.65	-2.9%	3.8%	25	5.10
Xylem: n	$10,016	42.52	54.99	$55.43	6.3%	11.9%	40	1.39
Laboratory Instruments and Products				**307.08**	**1.2%**	**26.3%**	**52**	
Diversified Laboratory				**238.81**	**0.9%**	**16.2%**	**26**	
Dow Jones Industrial Average				21,349.63	1.6%	8.0%		
S&P 500				2,423.41	0.5%	8.2%		
NASDAQ Composite				6,140.42	-0.9%	14.1%		
Region Company	Market Value (Local M)	52 Week Range Low (L)	High (L)	Price 6/30/17	Change 1 Month	Change YTD	P/E (ttm)	EPS (ttm)
Pacific Shares								
GL Sciences: t	¥14,435	557	1,494	¥1,290	-11.5%	45.8%	18	¥72.92
Hitachi High-Technologies: t	¥600,541	2,654	5,040	¥4,360	-0.9%	-7.5%	15	¥292.08
HORIBA: t	¥290,499	4,280	7,080	¥6,830	0.7%	26.2%	21	¥320.44
JEOL: t	¥57,359	350	610	¥587	6.0%	15.1%	95	¥6.17
Precision System Science: os	¥20,113	290	638	¥969	80.1%	138.1%	NM	-¥71.44
Shimadzu: t	¥632,998	1,344	2,191	¥2,138	-0.2%	14.8%	24	¥89.79
Techcomp: hk	HKD 526	1.07	3.21	HKD 1.90	-5.5%	47.3%	66	$0.00
European Shares (London)								
Abcam: l	£1,985	6.19	9.89	£9.74	-0.5%	27.0%	49	£0.20
Halma: l	£4,171	8.54	11.58	£11.00	-4.0%	22.6%	32	£0.34
Horizon Discovery: l	£197	1.04	2.22	£2.08	3.0%	44.4%	NM	-£0.12
Oxford Instruments: l	£601	6.10	11.39	£10.48	-5.0%	43.2%	NM	-£0.36
Scientific Digital Imaging: l	£21	0.09	0.34	£0.24	-6.8%	29.7%	14	£0.02
Spectris: l	£3,007	16.04	28.69	£25.23	-3.4%	9.1%	293	£0.09
European Shares (Other)								
Biotage: st	SEK 3,689	27.40	60.00	SEK 57.00	-3.8%	24.2%	35	SEK 1.63
Datacolor: s	CHF 124	538.00	775.00	CHF 750.00	-3.2%	15.4%	18	CHF 41.39
Merck KGaA: g	€ 13,623	78.28	108.70	€ 105.41	-1.9%	6.3%	29	€ 3.59
Sartorius: g	€ 6,048	59.00	86.93	€ 80.77	-6.8%	10.9%	51	€ 1.58
Tecan: s	CHF 2,031	135.50	183.90	CHF 180.30	-1.5%	13.5%	39	CHF 4.66

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Compact Image-Based Cell Analyzers

Broadly, cytometers refer to instruments that can measure various characteristics of cell populations in suspension. Depending on which and how many characteristics or parameters they address, these systems can be classified differently.

At one end of this spectrum are minimally configured cell counters, equipped with only one brightfield detection channel for cell counting and viability measurements. At the other end are flow cytometers, which can be loaded with an arsenal of modules, including a minimum of a dozen fluorescent detection channels, as well as cell sorting devices and concurrent microscopy capabilities.

Compact image-based cytometers or cell analyzers lie in the first category, with typically 1 to 3 fluorescent detection channels, in addition to a brightfield channel. Such cell analyzers can conduct fluorescent-based cellular assays to measure cell-cycle progression, signaling pathways and apoptosis, to name a few applications.

The systems' small size, ease of use and affordability make them ideal for laboratories that want to measure more parameters than just the number of cells in their samples or make a more quantitative measurement, yet do not want to buy high-end cell analyzers or flow cytometers.

As mentioned earlier, the brightfield channel of these instruments acts as an automated image-based cell counter. The sample is first treated with a reagent like trypan blue to stain dead cells, but not live cells. Images taken using a CCD camera are analyzed to determine cell count and viability.

For other types of cell analysis, the cells first need to be labeled with fluorescent dyes or antibodies, binding only to specific components of interest, like caspases for apoptosis studies or EGFR for cell signaling studies. The labeled sample is then exposed to a specific fluorescent channel, and the emitted light is collected and analyzed. The presence of multiple fluorescent channels enables the instrument to measure different wavelengths, and therefore different parameters, at the same time.

In 2016, the total market for compact image-based cell analyzers amounted to approximately $50 million, and is forecasted to grow annually at around 5% this year. The growth is mainly driven by the cost and space saving potential of these systems, particularly in academia where laboratories have tight budgets, and the overall market strength of biomedical research in biotechnology and pharmaceutical industries.

Thermo Fisher Scientific is the top supplier in the space, offering the Countess II FL product line. The Countess II FL has 1 brightfield and 2 user-definable fluorescent channels, and a 7 in. capacitive touchscreen. It only requires 10 µL of sample, and in order to analyze fluorescently labeled cells, needs to be supplemented with the EVOS light cube. In contrast to other image-based products, the Muse Cell Analyzer from MilliporeSigma utilizes a microcapillary flow-based technology for three-parameter analysis of cell populations in an 8 in. x 10 in. machine. Other notable products in this market are NucleoCounter product series from ChemoMetec, the Cellometer Auto 2000 and Cellometer Vision CBA from Nexcelom, and Arthur from NanoEnTek.

Personal Image-Based Cell Analyzers at a Glance:

Largest Suppliers

- Thermo Fisher Scientific
- MilliporeSigma
- ChemoMetec

Largest Markets

- Academia
- Biotech
- Government

Instrument Cost

- $3,000–$15,000

Government

On June 22, the EPA released its first regulatory strategy, along with guidance and strategies known as “scoping documents”, detailing the evaluation of chemicals in commerce. These new rules and supporting documents are expected to affect manufacturers in various sectors, such as chemical, automobile, airplane, electronic parts and paint, as well as their suppliers and customers.

The three final rules will establish what chemicals in commerce have been most used in the past decade; classify chemicals as high- or low-risk priorities for the purpose of risk evaluation; and determine the way in which the EPA will evaluate high-priority chemicals. The establishment of the Lautenberg Chemical Safety Act last year required the EPA to examine the risks of chemicals in commerce and consider their risks to exposed population on a deadline basis.

The first regulation is called the inventory update or reset rule, and requires manufacturers and importers of chemicals to notify the EPA of all the chemicals they have developed, imported or processed over the past decade. If the manufacturer is unaware of the exact chemical that they have purchased, both the processor and the supplier of the chemical would inform the EPA of its specifics.

The prioritization rule, the second regulation, requires chemicals to undergo a screening process by the EPA to assess risk levels. The third and final rule, the risk evaluation rule, entails the Agency evaluating risks of high-priority chemicals through scientific analysis. This gives the EPA room to determine the risks, or lack thereof, any time during the risk evaluation process. If the EPA finds a chemical to have a high risk, the Agency must find a way to ensure the chemical meets safety standards for use.

So far, the 10 chemicals being evaluated as per the risk scoping documents are asbestos, pigment violet 29, 1,4-dioxane, HBCD flame retardants, carbon tetrachloride, 1-bromopropane, methylene chloride, n-methylpyrrolidone, trichloroethylene and tetrachloroethylene.

Source: *Bloomberg*

Food

Last year, the National Academies of Science, Engineering and Medicine created a committee of 8 staff members and 13 scientists from across the US to tackle challenges and identify opportunities for growth within the food and agriculture sector. The committee members, with backgrounds in various fields, such as nutrition, climate science and nanotechnology, are currently working on a “strategic vision” to be released in March 2018 for how to increase quantities and improve qualities of food products. The premier meeting of the committee’s Science Breakthroughs 2030 project was held earlier this month, and the consensus was that food and agriculture is in need of a “moonshot” project to address innovations in the sector.

The USDA’s R&D budget for agriculture has not increased in 10 years, and while irrigation was seen as a plus for agriculture, the drying up of water sources has pressured farmers and scientists to find alternative methods of growing crops with less water. Pathogens also present a serious challenge to global food supplies. Future diseases are a concern, but even diseases that are threatening fruits and vegetables currently do not have cures. In using genomic data, drones and sensor monitoring for precision agriculture, experts hope to have “data behind every seed” planted, as Susan Wessler, co-chair of the Foundation for Food and Agriculture Research, stated. Although new technologies are of key importance in revolutionizing the agriculture sector, they must be adaptable by famers and their businesses, as well. The agriculture workforce is also in need of a revamp, as the top agricultural labs are mostly filled with international researchers, from countries like China in which agriculture is considered an

esteemed career path. The committee is working on creating a “magnet” to attract young and diverse researchers to the US.

The Science Breakthroughs 2030 report is expected to be completed before the current farm bill expires. The committee will meet five times in 2017. The filmed first session is available online.

Source: *Washington Post*

Pharmaceuticals

In *EvaluatePharma*’s World Preview 2017 report, the long-term outlook for the pharmaceutical industry indicates that the sector is on an upswing, despite the uncertainties brought about by recent political and economic challenges around the world; however, the report also describes the first decrease in long-term sales forecasts in 10 years, citing pressures on drug pricing as a key factor. The report forecasts prescription drug sales to grow at a CAGR of 6.5% to reach $1.06 trillion by 2022 from the period of 2016 to 2022, with new cancer immunotherapies and higher-risk assets contributing to much of the growth. Notably, orphan drugs will account for 32% of this spike in sales. Global pharmaceutical R&D spending is expected to grow at a CAGR of 2.4% to $181 billion in 2022. On average, R&D expenditures on New Molecular Entities (NMEs) was $4 billion over the past decade. As of May 2017, 17 NMEs have already been approved.

By 2022, biologics are forecast to account for 52% of the Top 100 drug sales, with Roche leading the market. Roche also leads the forecast for having the greatest pharmaceutical R&D expenditures by 2022. Oncology remains the largest sales generator and is estimated to grow at a CAGR of 12.7% between 2016 and 2022. Roche, Celgene and Johnson & Johnson are the top respective companies in this sector. By drug type, in 2017, biotechnology accounts for 26% of sales of worldwide prescription drug and OTC sales, with conventional/unclassified technology accounting for the remainder—these figures are set to change to 30% and 70%, respectively, by 2022.

The top three companies in prescription drug sales are forecast to be Novartis with $49.8 billion in sales by 2022, Pfizer at $49.7 billion and Roche with $49.6 billion.

Source: *EvaluatePharma*

China

Due to the Chinese government loosening its grip on regulations, as well a rise in investments and foreign-trained researchers and workers, China is transforming into a burgeoning biotechnology hub. Drugmakers in China are receiving capital for R&D and innovation from US colleagues, with Merck, Eli Lilly, Tesaro and Incyte among the US-based companies that have signed multimillion dollar deals with Chinese drug companies. Other US companies have focused more on biotechnology R&D, investing in research at academic institutions in China.

Chinese biotechnology has worked long and hard to get to this point, with Chinese drug makers spending years providing contract services to companies such as Merck and Pfizer, while selling generic drugs instead of the innovations they were contributing to in the West. With more citizens returning to China with foreign training, the talent pool is rapidly growing and a new sector of biotechnology startups is becoming established. Initiatives such as the Thousand Talents program, which offers tax breaks, grants and other incentives to foreign-trained citizens to return home, have helped contribute to the boom in local talent. Moreover, the Chinese FDA has made the process of moving investigational therapies from research labs to doctor clinics much quicker as part of one of its many recent regulatory reforms.

There are still certain challenges that Chinese drugmakers must deal with, such as frequently failed US FDA inspections. Also, biotech startups must become profitable before going public and raising capital on the stock market. However, the surge in talent, startups, investments and collaboration with Western companies is ensuring China’s continued rapid rise to becoming a leader in biotechnology within the coming decades.

Source: STAT

Thailand

In a bid to revitalize technology and R&D strategies in the country, the Thai government has approved an additional THB 2.5 billion ($74.1 million) for 27 universities as part of the Thaliand 4.0 plan, an economic model dedicated to driving Thailand's economy through innovation. Over the past 30 years, the country has poured billions of baht into R&D, but as of yet, no products have been commercialized, or the innovations end up under foreign ownership. The government is revamping the state of R&D in the country, going so far as to debate the "usefulness" of state R&D organizations, such as the National Science and Technology Agency and the Thaliand Research Fund, as well as "wasteful research" done by universities and local R&D authorities.

Organizations such as Tusco (Thailand-US Cooperation) have been serving as a remedy in the meantime, with Tusco suggesting the launch of a US-Thailand research program in the US, consisting of US researchers training Thai students, researchers and educators in specific sectors without Thailand spending too much on lab infrastructure. Tusco could also potentially set up a fund for Thai researchers and companies to buy startup companies in the US, jumpstarting the process of developing and commercializing products.

Currently, the government plans to increase spending on R&D by two percentage points to represent 0.7% of GDP, or THB 120 billion ($3.6 billion). By 2020, the government plans for R&D to represent 1.5% of GDP and 2% by 2032. Currently, public spending on R&D accounts for approximately 30%, and more incentives are needed to increase private sector R&D spending.

Source: *The Nation*

Bulgaria

Due to recent quality concerns, the Bulgarian government has announced plans to conduct quality checks on food products from multinational companies sold in the country. The food products will be compared to food products in Western European countries to ensure that they are the same. Eastern European countries are hoping to lobby the EU to stop global food companies from selling identical products that have differing ingredient lists based on what European country they are being sold in. Consumer groups have voiced concerns regarding the use of poorer-standard ingredients being used in food products in Central and Eastern Europe compared to Western European countries. The EU only requires that food packaging clearly list ingredients, not the quality of the ingredients. Rumen Porozhanov, Minister of Agriculture, Food and Foestry, stated that food products such as chocolate, dairy, meat, non-alcoholic drinks, juices and baby foods from Germany and Austria have already been purchased for the purpose of conducting quality checks by comparing them with to Bulgarian products. Mr. Porozhanov indicated that the quality checks will be conducted alongside the Visegrad Four, a consortium made up of Poland, Slovekia, Hungary and the Czech Republic, which has also already been vocal in its criticism of the same issue.
Source: *Reuters*

MS & LC/MS

Company Announcements

In May, **Thermo Fisher Scientific** announced a licensing program for its Thermo Scientific Tandem Mass Tag protein identification and quantitation technology. **Cell Signaling Technology** is a customer.

In May, **Astrotech** engaged **Chardan** to advise on strategic alternatives for its **1st Detect** subsidiary, which

provides MS technology.

In June, **Labkey** announced that the **NCI Clinical Proteomic Tumor Analysis Consortium** has joined the **Panorama Partners Program**, a collaboration of proteomics-focused organizations established by Labkey and the **MacCoss Lab at the University of Washington**. The program is designed to help fund and direct the development of the Panorama open source proteomic data management tool.

Waters announced in June the approval by **Brazil's National Health Surveillance Agency** of the Waters ACQUITY UPLC, ACQUITY UPLC I-Class System, as well as the Xevo TQD, Xevo TQ-S micro and Xevo TQ-S[1] for IVD use.

Waters named Dr. Flemming Ornskov, CEO of **Shire**, to its Board in June.

SCIEX Diagnostics' AB SCIEX TRIPLE QUAD 4500MD LC-MS/MS system gained regulatory approval from the **China Food and Drug Administration** in June.

Product Introductions

In May, **Cerno Bioscience** introduced MassWorks 5.0. New features include extended mixture analysis of 10 components or more, and NIST GC/MS library search integration.

Biotage released in May the Isolera Dalton 2000 mass detector for flash purification. It features a wider detection range of ion masses, up to m/z 2000, than the previous model.

SCIEX unveiled in June the Vitamin D 200M Assay, calling it the first and only FDA-cleared LC/MS-based Vitamin D assay kit. It is designed exclusively for the SCIEX Topaz System (see ***IBO*** 6/15/17).

In June, **Thermo Fisher Scientific** released the Thermo Scientific ProSightPC 4.0 software for top-down and middle-down proteomics. It features five search modes to help determine the exact proteoform.

Thermo Fisher Scientific released in June the Thermo Scientific ISQ EC single quadruopole MS for use with IC and HPLC systems. The Chromeleon CDS platform is embedded in the system's instrument control for time savings.

In June, **PREMIER Biosoft** released SimLipid 6.0 to advance biological lipidomics research. It offers an automated lipidomic data analysis solution for use with the **Waters** ACQUITY UPLC and Xevo G2-XS QTof MS system and SONAR data independent acquisition.

Genedata debuted in June Genedata Expressionist 11.0 for the characterization of biopharmaceutical molecules based on MS. New features include a project management extension, which enables consolidation and dissemination of product knowledge across different functions, and an open plugin infrastructure.

Biognosys launched in June Spectronaut Pulsar, a Data Independent Acquisition (DIA) software with an integrated database search engine. It supports a spectral library–free workflow as well as target analysis of DIA data using spectral libraries.

In June, **Prosolia** introduced a new DESI (Desorption ElectroSpray Ionization) 2D model compatible with **Agilent Technologies'** TOF, Q-TOF and IM-Q-TOF LC/MS systems. DESI enables imaging without matrix by MS.

PerkinElmer launched in June the NeoLSC MSMS kit, calling it the first CE-marked commercial IVD kit to utilize MS for the six most commonly screened lysosomal storage disorders, all from single dried blood samples.

In June, **908 Devices** debuted the MX908, its second-generation handheld chemical detection and identification device. New features include increased sensitivity and an upgraded hazards target list.

In June, **Shimadzu** introduced an LC/MS/MS Method Package for D/L amino acids, enabling the simultaneous analysis of chiral amino acids in 10 min without derivatization using CROWNPAK CR-I(+) and CR-I(-) columns.

In June, **Agena Bioscience** announced the European launch of its MassARRAY System with CHIP Prep Module, marketed as a CE-IVD product, for targeted genetic testing.

Orders/Sales of Note

In June, **Agena Bioscience** announced that **Assurex Health**, a subsidiary of **Myriad Genetics**, selected its MassARRAY System for streamlined lab set-up and sample processing of Assurex's GeneSight Psychotropic LDT. Assurex has run over 150,000 GeneSight tests using the system, and the new system will increase the number of samples run on the platform.

Broad-Based Companies

Company Announcements

Hamilton opened a customer service center in Badalona, Spain, in February, to support customers in Spain and Portugal. The product lines covered by the center are automated liquid handling and process analytical measurements.

In June, **Hitachi High-Technologies** opened the $4.5 million Hitachi High Tech Science Park in Chatsworth, California, to support partners of its Scientific Systems Business, and its Biotechnology and Medical Products Business. It is also the headquarters of Hitachi High-Technologies Science America.

Fluidigm announced in a May regulatory filing that Evan Jones will retire from its Board.

In June, **Cal-I Enterprises**, a supplier of refurbished lab equipment, opened its fourth refurbishing center in Los Angeles, California. The approximately 20,000 ft^2 (1,858 m^2) center will refurbish analytical, medical and optical lab equipment.

In June, **Tecan** named Erik Norström as head of Corporate Development. Since August 2015, he served as corporate vice president, Business Development, at bioscience firm **Chr. Hansen Holding**.

AMETEK announced in June the retirement of Chairman Frank S. Hermance, effective July 7. AMETEK CEO David A. Zapico will be named chairman.

In June, Thailand's The Nation reported that **QIAGEN** has opened an office in Bangkok and established the QIAGEN-TropMed Centre for Molecular Techniques at **Mahidol University**. The company also partnered with the Medical Genomic Centre at **Ramathibodi Hospital** for use of NGS.

GE Healthcare announced in June the appointment of Kieran Murphy, CEO of GE Healthcare Life Sciences, as CEO of GE Healthcare. He replaces John Flannery, who was named CEO and chairman elect of GE.

Oxford Instruments named Stephen Blair to its Board, effective July 1. Most recently, he served as chief executive of **e2v**.

For fiscal 2017 ending April 1, **Halma**'s Environmental & Analysis sector revenue grew 16.0%, 3.5% organically, to £219.1 million ($284.4 million) to make up 23% of company revenues (see ***IBO*** 6/15/17). Adjusted segment operating margin expanded 170 basis points to 19.0%. Photonics, Water and Environmental Monitoring sales rose 20.9%, 5.7% and 13.4% to make up 62%, 25% and 12% of sector revenues, respectively. US sales grew 6% organically to make up 43% of sector revenue. Asia Pacific revenue rose 13% organically to make up 21%. While UK sales grew 2% on an organic basis, European sales declined 4% organically.

Merck KGaA announced in June the establishment of the **Merck Foundation**, which combines its corporate responsibility activities, and expands its scope to address health, social and economic challenges in the 21st century.

Bruker announced in June that Chris van Ingen plans to retire from its Board this month.

Product Introduction

Shimadzu announced in June the introduction of the free Shimadzu Multi-omics Data Analysis Pack for metabolic engineering, designed for faster analysis and visualization of proteomics, metabolomics and flux analysis data sets from Shimadzu GC/MS and LC/MS systems in order to create a metabolic map. It is available on the Garuda Platform. The product is the result of a collaboration with the **Systems Biology Institute** and **Osaka University**.

Molecular Spectroscopy

Company Announcements

NMR provider **Nanalysis** named **LabroTek** as a distributor in April for the Nordic countries and the Baltics.

In April, **JEOL Resonance** and **Mestrelab Research** announced a technology partnership for the use of qNMR for routine QC. The companies developed signal acquisition and qNMR analysis software for use in a highly automated environment. The product is scheduled for release in July.

In May, **CID Bio-Science** and its sister company, **Felix Instruments – Applied Food Science**, acquired the CP Pigment Analyzer from **CP**.

Endress+Hauser announced in May the expansion of **Kaiser Optical Systems**' Raman analyzer manufacturing plant in Ann Arbor, Michigan. The $9 million expansion doubles the floor space to 87,000 ft^2 (8,100 m^2). Kaiser Optical Systems has around 100 employees.

In June, **Thorlabs** established **PolySense**, an industry-university research lab in the physics department of the **Technical University** in Bari, Italy. It will focus on development of optical gas sensing systems using quartz-enhanced photoacoustic spectroscopy.

In June, **CAMO Software** and **Metrohm** announced a partnership under which CAMO's multivariate analysis software will be integrated with Metrohm's Vision Air 2.0 spectroscopy software for supporting the Lab Vis-NIR workflow.

Product Introductions

In April, **Axalta Coating Systems** introduced its fifth generation spectrophotometer, the Acquire Quantum EFX, for reading metallic, pearl and effect colors. It is designed for use by collision repair shops.

Rudolph Research launched in May the Rudolph Research J457 digital benchtop refractometer, which features automated sample load monitoring and sample calibration inspection. The system is available in various configurations.

In May, **Magritek** introduced the 80 MHz Spinsolve 80, calling it the only 80 MHz benchtop using 5 mm NMR tubes. It is the latest addition to the Spinsolve product line, which includes 43 MHz and 60 MHz instruments.

Ocean Optics launched in May two new Education Packs built around its STS microspectrometer and Spark spectral sensors. The EDU-STS-VIS-PACK measures wavelengths of 350–800 nm. The EDU-SPARK-PACK measures wavelengths of 380–700 nm.

In June, **Bruker** unveiled the IR Biotyper system for microbial strain typing, and IR Biotyper Kit for 30 individual samples per run. Based on FTIR spectroscopy, the system simultaneously characterizes a microbial sample by strain-specific absorbance patterns in the IR spectrum. Applications include routine hospital hygiene and infection control.

Bruker launched in June the B.I.QUANT-UR module for its Avance IVDr 600 MHz NMR. It provides automated and reproducible quantification of up to 150 metabolites in urine in 80–100 samples per day.

In June, **Oxford Instruments** launched the MQC+ benchtop NMR analyzer for the measurement of oil, water, fluorine and solid fat in a variety of samples. Available in three models, it also measures physical properties including crystallinity and density of polymers.

In June, **Micromem Applied Sensor Technologies** released the RT-Lube Analyzers for real-time, on-site detection of wear elements in lubricating fluids. The initial sales focus will be on wind turbine gear boxes.

Sequencing

Company Announcements

In May, **Bluebee** and **MediSapiens** entered into a strategic partnership with a tailored end-to-end analytical solution for NGS data by integrating their respective Bluebee and Explorer platforms.

BGI announced in May that the **Broad Institute's** GATK Best Practices pipeline will be freely available to worldwide users of BGI Online in China. This includes support of Workflow Definition Language and the Cromwell workflow execution engine in future BGI Online versions.

Xinhua reported in May that **BGI** and Australia's **Queenland Institute of Medical Research** opened a new laboratory, which will use the BGISEQ-500 sequencer.

In May, **Golden Helix** entered into a multiyear partnership with **Sentieon**, integrating Sentieon's secondary analysis tool with Golden Helix software. This allows clinical users to go from a FASTQ to a clinical report.

MolecularMD was named an **ArcherDX** Certified service provider for ArcherDX's NGS panels.

In June, **Bristol-Myers Squibb** and **QIAGEN** agreed to explore the use of NGS to develop gene expression profiles as a predictive or prognostic tool with Bristol-Myers Squibb's immune-oncology therapies. The companies, which have worked together since 2009, plan to enter into other agreements to develop diagnostic products.

QIAGEN received in June a license from the **Johns Hopkins University** for biomarkers that identify patients suitable for immuno-oncology therapies. The agreement involves rights to genetic biomarkers to assess microsatellite instability and mismatch repair in all sample and cell types. By exercising certain option rights, QIAGEN will be able to commercialize tests using NGS for the biomarkers.

In June, **ReadCoor**, developer of Fluorescence In-Situ Sequencing (FISSEQ), announced a research collaboration with **WAVE Life Sciences** to create a registry of brain cell network maps and advance WAVE's nucleic acid chemistry for targeted delivery to the brain. The companies will develop a cell map of the mouse brain.

Diagenode licensed in June a technology specifically for ChIP sequencing using low-input samples, ChiPmentation, from the **Austrian Academy of Sciences' CeMM Research Center of Molecular Medicine**.

The **University of Debrecen, Hungary** and **BGI** signed a memo of understanding to establish a local NGS sequencing hub for population cohort studies and diagnostic testing, as well as R&D.

Under a partnership agreement, **Takara Bio** and **Formulatrix** developed a series of SOPs for miniaturizing reaction volumes in reverse transcription steps of single-cell sequencing workflows. The workflow uses Takara Bio's SMART-Seq v4 cDNA libraries and Formulatrix's MANTIS Liquid Handler.

Thermo Fisher Scientific announced in June the **FDA** premarket approval of the Oncomine Dx Target Test, calling it the first NGS-based test that simultaneously screens tumor samples for biomarkers associated with three FDA-approved therapies for non–small cell lung cancer. The Test evaluates 23 genes simultaneously. **LabCorp Diagnostics** and **Covance Businesses**, **NeoGenomics Laboratories** and **Cancer Genetics** are among the first labs to offer the Test. Developed in collaboration with **Novartis** and **Pfizer**, the Test runs on Thermo Fisher's Ion PGM Dx System.

In June, **Illumina Ventures**, with participation from **Merck** and other investors, awarded **SerImmune** an $8

million round of financing. SerImmune is developing an immune mapping technology platform and antibody repertoire database.

In June, **Cornell University** joined the **Consortium for Sequencing the Food Supply Chain**, whose members include **IBM Research**, **Mars** and **Bio-Rad Laboratories**, which is conducting a metagenomics study to categorize and understand micro-organisms. Cornell University will help the Consortium create new tools that can help monitor raw milk to detect anomalies that represent food safety hazards and possible fraud.

Swift Biosciences completed a Series D funding in June led by **Arboretum Ventures**, raising $12.2 million.

Product Introductions

TOMA Biosciences launched in March the COMPASS Tumor Profiling System, a workflow pathway from tumor, library preparation, sequencing, data analysis, clinical annotation and reporting. It includes the TOMA OS-Seq, an oligo selective sequencing capture technology.

In May, **Sophia Genetics** released its Whole Exome Solution and Clinical Exome Solution, both of which are accessible through Sophia DDM.

In June, **Oxford Nanopore** released the Direct RNA Sequencing Kit, providing new insights including base modifications, and the PCR cDNA Sequencing Kit for a high-throughput workflow that can generate full-length cDNA for isoform quantification and identification. The new Direct cDNA Sequencing Kit provides a simple workflow.

In June, **SeraCare Life Science** released the iQ NGS QC Management software v2, which supports whole-workflow data capture. New features include integration with **Illumina**'s Basespace and LIMS.

In June, **Illumina** announced that its Extended RAS Panel will beginning shipping in the third quarter. The **FDA**-approved NGS kit helps clinicians identify which patients are eligible for treatment of metastatic colorectal cancer with Vectibix, and meets several medical societies' guidelines. The kit, which was developed with **Amgen** and runs on Illumina's MiSeqDx System, simultaneously interrogates 56 variants across and KRAS and NRAS genes in order to establish mutant status in a single test.

Sales/Orders of Note

In June, **Congenica** announced that its Sapientia platform will be used by **UniteGene** to carry out NGS as part of China's **"100K Wellness Pioneer Project."** This is part of a strategic commercial agreement with Congenica to support UniteGen's operations in China.

Illumina announced in June that **Genomics England** selected it as the primary variant interpretation and reporting software venture for tumor and matched normal samples characterized as part of the **100,000 Genomes Project**. Genomic England will expand its use of BaseSpace Variant Interpreter for cancer at all NHS Genomic Medicine Centers. A public release of the software will take place this summer.

Reported Financial Results

$US	Period	Ended	Sales	Chg.	Op. Prof.	Chg.	Net Prof.	Chg.
Kewaunee Scientific	Q4	30-Apr	$34.6	1.4%	$1.8	-12.4%	$1.4	2.6%
Kewaunee Scientific	FYE	30-Apr	$138.6	7.7%	$6.5	14.8%	$4.6	19.2%
Other Currencies								
DKK-TOA	FYE	31-Mar	¥14,445	0.8%	¥1,365	-0.1%	¥1,226	31.7%
Porvair	6 Mo.	31-May	£55.5	-87.7%	£5.2	9.4%	£3.7	10.9%
Porvair (Microfiltration)	6 Mo.	31-May	£36.4	3.1%	£5.2	5.9%	NA	NA
ReproCELL	FYE	31-Mar	¥1,258	18.0%	-¥944	7.8%	¥912	-53.5%

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