IBO
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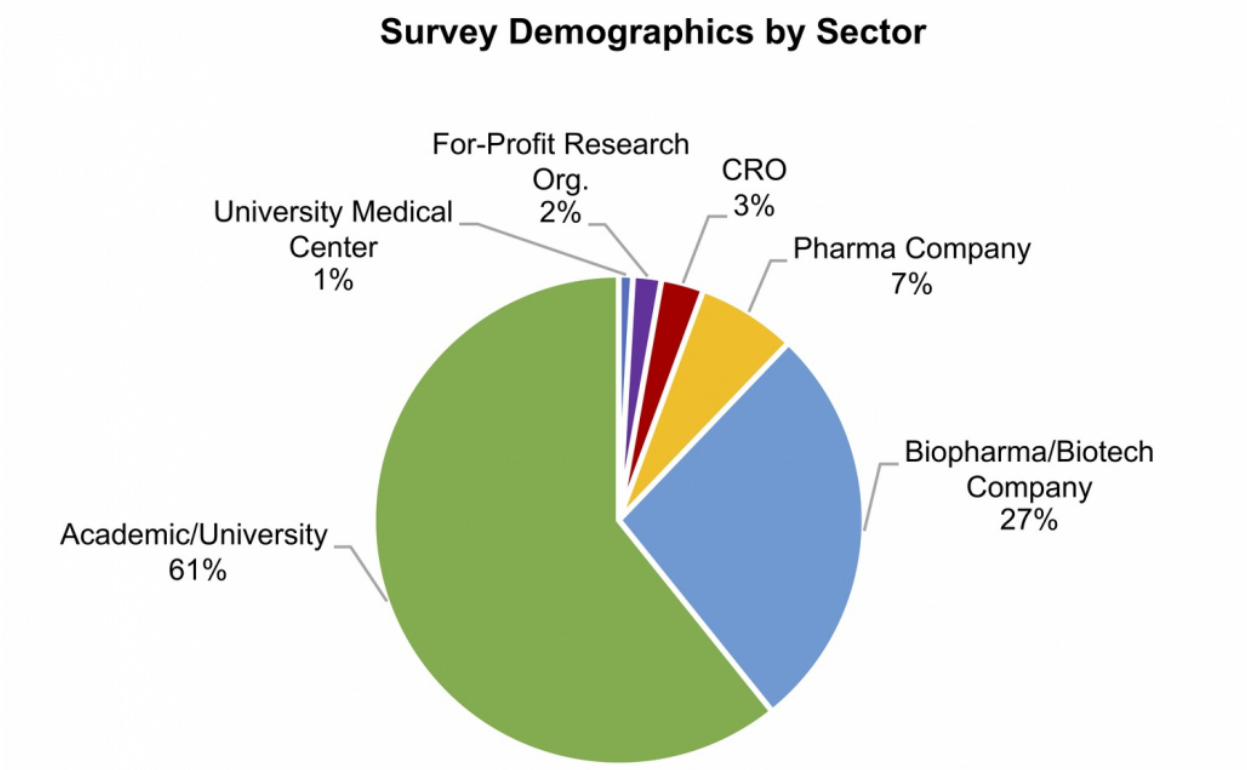
Foreign vs Domestic: IBO Surveys Chinese Scientists on Instrument Brand Preferences

As part of China's 13th Five Year Plan, China has been focusing on accelerating technological innovation in the nation. Chinese scientific output has been surging as the country increases its international scientific research collaborations and federal initiatives to foster research. These new advancements open diverse opportunities for analytical instrument and lab product companies, both foreign and domestic, in China.

To assess if and how these changes have influenced research scientists' views on foreign and domestic lab instrument brands in China, ***IBO*** asked Chinese scientists their views on the types of lab instruments they utilize most frequently and the attitudes they hold towards foreign versus domestic brands. ***IBO*** defines a lab instrument as an instrument that receives an electrical current and detects and/or measures a specified substance in a sample.

Between September 25 and October 5, ***IBO*** conducted a survey of 107 qualified Chinese respondents using BioInformatics Inc.'s Science Advisory Board, an online community of scientific experts. The respondents came from varied fields, with the majority coming from the academic and biopharmaceutical/biotechnology sectors.



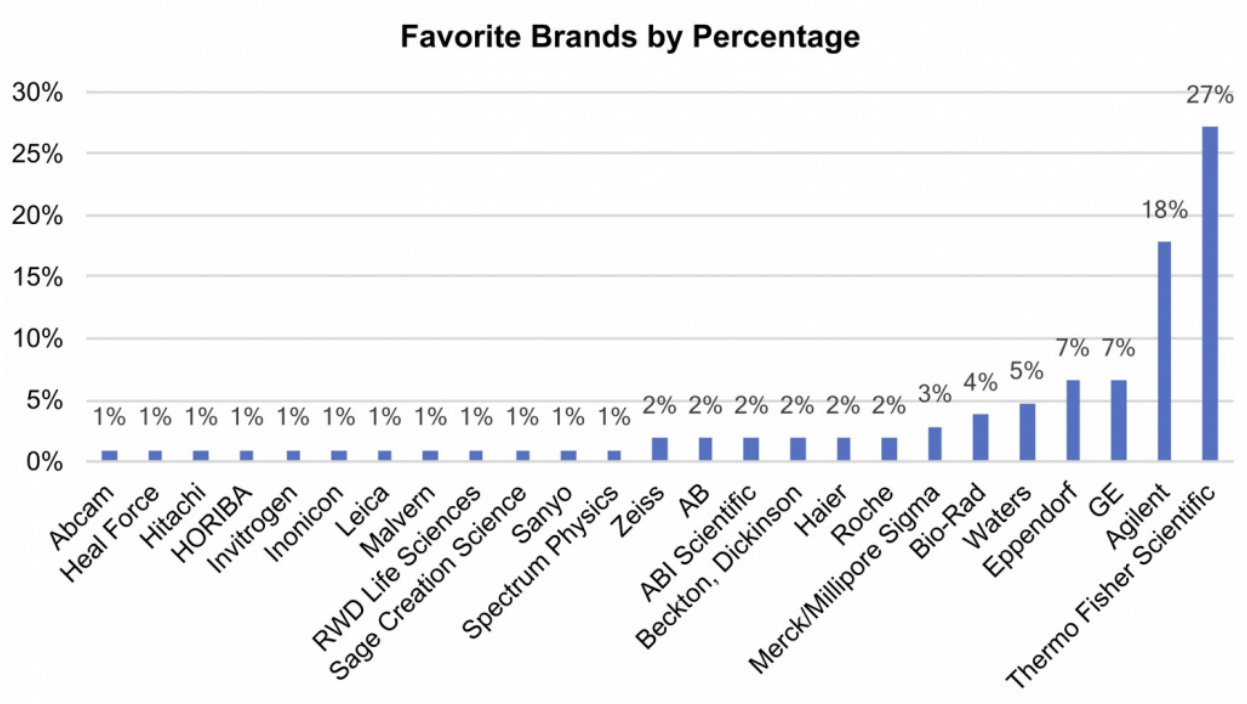
Respondents also had diverse employment backgrounds, with the majority, or 34%, working as educators (professors, assistant professors or teachers), and 21% managing, directing or supervising labs. Department heads and principal investigators also participated in the survey, accounting for 15% and 10% of respondents, respectively. The remaining 19% of survey participants was made up of graduate students, lab technicians, bioengineers, QA/QC workers and staff scientists.

Survey Results

In regards to domestic versus foreign brands, 35% of respondents indicated that at least half of the lab instruments they used were from domestic brands. Seventeen, or 16% of respondents, stated that exactly 50% of the instruments they used were domestic brands, with 2 respondents, 1 from the biopharma sector and 1 from academia, indicating that 100% of all instruments they used were domestic.

In contrast, 64% of respondents reported that most of the instruments they use were foreign brands. The largest subset was 30 respondents, or 28% of the total, who stated that 70% of the instruments they use are foreign. Similar to the two outliers who use 100% domestic Chinese instruments in their labs, one respondent from academia indicated that all instruments they used were foreign.

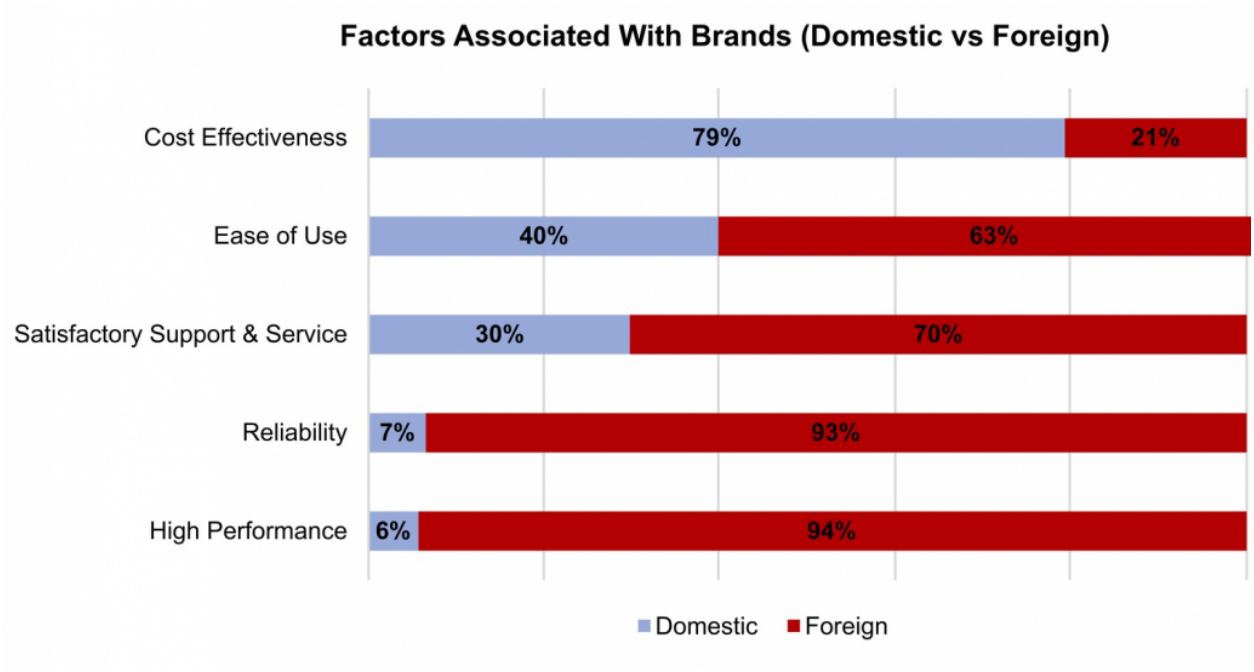
These figures may be explained by examining data regarding the number of domestic and foreign brands available in the respondents' labs. Generally, the share of domestic brands within the surveyed labs has not increased, with only 38 participants, or 36%, stating that they had seen increased use of Chinese brands in their labs in the past three years. Sixty-four percent indicated that they had not seen the percentage of domestic brands in their labs grow. This may explain why over 60% of respondents specified that the majority of instruments in their labs are foreign brands.



Respondents were also asked to indicate their favorite brand of lab instrumentation, regardless of whether the company was foreign or domestic. Companies such as Agilent Technologies, Eppendorf, GE and Waters were stated by multiple respondents, while Thermo Fisher Scientific emerged as the clear preference, with over a quarter of total participants citing the broad-based company as their favorite (see chart above).

Survey participants associated certain capabilities with either domestic or foreign brands. Interestingly, despite the considerable number of researchers that indicated they use domestically branded instruments, an overwhelming majority of respondents stated that they associate high performance and reliability of lab instruments with foreign companies' instruments (see chart below).

Satisfactory company support and service, and instrument ease of use were factors that showed slightly less of a discrepancy amongst respondents, with 67 respondents associating foreign companies' instruments with ease of use and 75 stating that foreign companies provide better support and service. The major advantage that Chinese instruments have, according to survey results, is their cost effectiveness, with 79% of respondents indicating that domestic companies' instruments are more reasonably priced.



Although these basic factors are more associated with foreign brands, the vendor landscape in China is changing and may influence attitudes towards domestic brands in the future. According to 81 respondents, or 76%, there has been a rise in the establishment of Chinese lab instrument companies. Therefore, as more and more Chinese analytical instrument companies set up shop in the country, it will be noteworthy to assess if the Chinese researchers' responses change in any way, as opportunities to purchase from and work alongside domestic instrument companies will increase.

Federal US FY19 Appropriations Boost NIH Budget

The US Senate Appropriations Committee has announced agreements on three FY2019 omnibus appropriations packages for the federal budget. The second package consists of appropriations bills for the Departments of Defense and Labor, HHS, Education and related agencies.

The package was signed into law on September 28, avoiding a partial government shutdown. The information below has been extracted from various federal documents, including explanatory reports and appropriations bills. (For information on the DoE's budget, see ***IBO*** 9/30/18.)

NIH

Within the DHHS, the NIH budget received $2 billion, a 5.4% increase, to $39.1 billion. A budget increase was provided by the Senate to every NIH Institute and Center for fiscal 2019.

This rise included $711 million for the 21st Century Cure Act, a 43.3% increase. As per the 21st Century Cures Act, $400 million was allocated to the NCI for cancer research; $57.5 million was provided for the National Institute of Neurological Disorders and Stroke; $57.5 million was budgeted for the National Institute on Mental Health for the BRAIN initiative; and $196 million was allocated from the NIH Innovation Fund for the Precision Medicine initiative, which received $186 million of the figure, and regenerative medicine research, which got the remaining $10 million.

Many other programs in the NIH's various institutes received boosts to their budgets, including funding for research on Alzheimer's disease, which jumped 28.0% to $2.3 billion. Although final figures were not provided, funding for the All of US precision medicine initiative grew by $86 million, while funding for the BRAIN initiative jumped $29 million. The budget for the Cancer Moonshot grew by $100 million. The Office of Director's Common Fund received $606.6 million, plus an extra $12.6 million for pediatric research per the Gabriella Miller Kids First Research Act.

Other areas of research were also favored. For opioids research, $500 million was provided for research driving the development of alternatives to opioids, pain management and addiction treatment. To fight antibiotic resistant bacteria, $550 million was allocated, an increase of $37 million. Congress also encouraged the NIH to develop and broaden the scope of clinical infrastructures and networks for the research of genetic and sporadic frontotemporal degeneration (FTD). The purpose of this directive is to increase knowledge of the disease, while establishing an infrastructure for biomarker discovery and clinical trials.

Key to this are advancements in informatics in order to create a solid infrastructure for FTD research, which includes the collection and recording of data and samples, incorporation of data reported by patients, and the use of new technologies that promote IoT. Also cited as important to the directive is the development of a "data biosphere" generated with multi-omic platforms that will provide a network for researchers, including younger scientists from various fields, to share datasets.

Agilent and Waters: New Suit and New Settlement

IBO's second installment of its annual review of selected new patent infringement lawsuits involving lab instrument and product companies details new and settled litigation, and provides an update on a suit reported on earlier this year.

New Suits

A recent acquisition has led Agilent Technologies into a new patent infringement suit. In August, Agilent purchased ProZyme (see ***IBO*** *6/30/18*), the maker of the GlyX and GlykoPrep products for glycan analysis. Agilent now offers the Instant PC glycan reagents based on the same glycan anlaysis technology. Last month, Waters filed suit in US District Court in Delaware (Wilmington) against Agilent for infringement of US Patent No. 9,658,234 (Method for Analysis of Compounds with Amino Group and Analytical Reagent Therefor), stating that the Instant PC glycan reagents infringe the IP used in its GlycoWorks RapiFluor-MS N-Glycan Kit. Waters initially licensed rights to the patented technology from Ajinomoto and acquired the IP this year. Waters claims willful infringement, and requests preliminary and permanent injunctions as well as royalties on product sales.

According to the complaint, "The claims of the '234 Patent cover specific carbamate compounds to label primary and secondary amines within another compound. The label assists with the subsequent detection and characterization of the labeled compound. The claims of the '234 Patent also cover methods of labeling and methods of analyzing the labeled compound including by way of mass spectrometry."

Dismissals

In another chapter of the companies' litigation history, Agilent and Waters have settled a previous suit. In March, the companies stipulated to dismiss Waters' 2011 patent infringement suit against Aurora SFC Systems and Agilent (see ***IBO*** *10/31/11*) involving SFC technology. The case was dismissed with prejudice.

Another case involving Agilent has also settled. Agilent was named a defendant in a case brought in May in US District Court in Delaware by Thermo Fisher Scientific. The plaintiff alleged infringement by Agilent's 8800 ICP-QQQ MS and subsequent related systems of U.S. Patent Nos.: RE45,386 (reissue of 7,202,470) (Means for Removing Unwanted Ions from an Ion Transport System and Mass Spectrometer); 7,230,232 (Means for Removing Unwanted Ions from an Ion Transport System

and Mass Spectrometer); and RE45,553 (reissue of 7,211,788) (Mass Spectrometer and Mass Filters Therefor). The case was dismissed in October following a stipulation for dismissal with prejudice by the parties.

Also settled quickly was a suit filed in July by Alfano Optical Tomography against Bruker in the Northern District of California. Alfano Optical Tomography, which is managed by patent firm General Patent, claimed infringement of US Patent No. 6,208,886 (Non-Linear Optical Tomography of Turbid Media) by Bruker microscopes designed to generate 3D tomographic maps, such as the Ultima multiphoton microscopes. Last month, the court dismissed the action without prejudice following a request by the plaintiff.

Resolving a suit filed in 2016 in the US District Court Northern District of California, the Regents of the University of California have settled with Genia Technologies and its cofounder Roger Jinteh Arrigo Chen. The suit involved four patent applications: US Patent Nos. 14/056,636, 14/300,453, 14/919,315, 15/087,734 and 15/162,225 (all entitled Compositions, Devices, Systems and Methods for Using a Nanopore), as well as several abandoned patent applications. Genia Technologies was acquired by Roche in 2014 (see ***IBO*** *6/30/14*). Dr. Chen worked at the University of California Santa Cruz, where the patented technology was developed. The allegations included breach of contract. In July, the court dismissed the suit with prejudice upon the request of both parties, citing a settlement agreement.

In another NGS-related suit, in July, NuGEN Technologies settled its suit filed in January in Northern California District Court against KeyGene Technologies. NuGEN's suit requested a declaratory judgment of non-infringement of three patents to protect it from future litigation. The suit involved US Patent Nos. 9,702,004 (Method for High-throughput AFLP-based Polymorphism Detection); 9,745,627 (High Throughput Screening of Populations Carrying Naturally Occurring Mutations); and 9,896,721 (Strategies for High Throughput Identification and Detection of Polymorphisms). According to NuGen's complaint, KeyGene had approached the company alleging infringement of KeyGene's patent portfolio by NuGEN's Ovation Target Enrichment System and Allegro Targeted Genotyping products, among others. The parties jointly stipulated to dismiss the case with prejudice.

Also settled was Scripps Research Institute's 2016 patent infringement suit against Illumina (see ***IBO*** *5/15/16*). In May, the court granted Illumina's joint motion and stipulation for a final judgment that Illumina was entitled to a judgment of non-infringement as a matter of law. Scripps has filed an appeal with the US Court of Appeals for the Federal Circuit.

Updates

In a patent infringement suit brought by the Regents of the University of California and Becton, Dickinson filed last year (see ***IBO****5/31/18),* the US District Court of the Southern District of California has granted defendants Affymetrix and Life Technologies' (Thermo Fisher Scientific) summary motion for non-infringement of 1 of the 3 patents under dispute. The court dismissed the claims concerning US Patent No. 9,085,799 (Methods and Compositions for Detection and Analysis of Polynaucleotides Using Light Harvesting Multichromophores).

Twist Bioscience to Go Public

Washington, DC 10/2/18—Synthetic DNA supplier Twist Bioscience has filed with the US SEC to publicly offer its common stock on the Nasdaq Global Market. Pricing information is not yet available. For the first nine months of fiscal year 2018, company revenues jumped 133.1% to $17.0 million (see Bottom Line), with gene shipments up 101.6% to 176,292 genes. Gingko Bioworks accounted for 32% of sales. The company has cash, cash equivalents and short-term investments of $92.5 million as of June 30. Its accumulated deficit stands at $191.1 million.

Twist Bioscience provides synthetic genes (70% of revenues), oligo pools (13%), DNA libraries (7%) and target enrichment kits for NGS (10%). Industrial chemicals (73% of revenues) and academic research (25%) account for the majority of customers. The company's plans include establishment of a manufacturing site in China, and further development of antibody libraries and library screening services. The company has 221 employees.

According to the filing, Twist Bioscience's silicon chip-based synthesis platform provides advantages in throughput, scalability and cost. The company stated that it charges $0.09 for a 300–1,800 bps-length genes versus competitors' pricing of $0.15–$2.00 for an order of 150 base pairs. Company shareholders include Illumina, which holds an 8% stake.

US ITC Rules Against 10x Genomics

Washington, DC 9/20/18—In response to a complaint brought by Bio-Rad Laboratories and Lawrence Livermore National Security (see ***IBO*** *8/31/17*), the US International Trade Commission (ITC) has ruled that 10x Genomics violated subsection (b) of Section 337 of the Tariff Act for importation for sale of certain microfluidic devices. The ITC has ruled that 10x Genomic infringed complainants' US Patent Nos. 9,500,664 (Droplet Generation for Droplet-based Assays); 9,636,682 (System for

Generating Droplets—Instruments and Cassette) and 9,649,635 (System for Generating Droplets with Push-back to Remove Oil). However, it was found that 10x Genomics did not infringe US Patent No. 9,126,160 (System for Generating Droplets with Push-back to Remove Oil). A recommendation for the remedy will be issued shortly.

The patents are also the subject of an infringement case filled last year by Bio-Rad against 10x Genomics in US District Court (see **IBO** *11/15/17). Although ITC cases cannot result in damage awards, they can lead to a restriction on imports of the infringing product.*

Brooks Automation Expands to Include Genomic Testing Services

Chelmsford, MA 9/26/18—Brooks Automation, which supplies automation and cryogenic solutions, has agreed to acquire GENEWIZ for $450 million in cash. GENEWIZ provides gene sequencing and synthesis services serving over four thousand customers. Brooks Automation expects GENEWIZ annual revenues of more than $140 million. The acquisition is estimated to be immediately accretive to Brooks Automation's non-GAAP earnings.

"This is an exciting day for Brooks as we announce the pending acquisition of GENEWIZ, which will be our largest acquisition to date in Life Sciences," stated Brooks Automation President and CEO Dr. Steve Schwartz. "This transaction is more than just an addition to our Life Sciences business as GENEWIZ will add a new and innovative platform which we expect to leverage, along with our core capabilities, to add even more value to samples under our care." GENEWIZ Co-founder and CEO Dr. Amy Liao will remain as the head of the business. The transaction is expected to close by year end.

GENEWIZ's revenues rose 31.9% last year, with non-GAAP gross margins of around 50%. Thee company serves over 100,000 users with 1,100 employees at 14 sites. Brooks Life Sciences, which is estimated to generate $198 million in fiscal 2018 revenues, specializes in biological sample management, including automated stores, and cold chain sample management and services. GENEWIZ increases the business' more value-added services, according the company's conference call regarding the acquisitions. The company noted that the combination of sample management and testing services is unique among GENEWIZ's competitors. The company also cited geographical benefits, as Brooks Life Science is strong in Europe and GENEWIZ is strong in China.

The purchase is the latest in a series of acquisitions for Brooks Automation as it transitions to more high-growth markets, including life sciences, and away from its traditional cyclical semiconductor products. Last month, the company announced plans to sell its semiconductor cryogenics business for $675 million.

Second Quarter Results: Abcam, Biotage, Fluidigm, HORIBA and Pacific Biosciences

Abcam Reports Double-Digit Growth in China

Abcam FY18			
	Rev. (M)	**Chg.**	**% of Rev.**
Catalogue Revenue	£202.4	7.1%	93%
Custom Product & Licensing	£0.0	11.6%	7%

Abcam revenues for the fiscal year ending June 30 amounted to £233.2 million ($319.5 million at £0.73 = $1). (See ***IBO***9/15/18.) The rise in operating profits and margin was thanks to the company's depreciation and amortization falling 16.2%.

Abcam FY18			
	Rev. (M)	**Chg.**	**% of Catalogue Rev.**
Primary and Secondary Antibodies	£174.5	5.4%	75%
Recombiant antibodies	£48.0	18.8%	
Other Products	£42.3	14.6%	18%
Immunoassay Products	£15.0	21.0%	

Geographically, China was the only region that recorded double-digit growth in catalog revenue, at 25.0% to £33.0 million ($45.2 million). The Americas region was the most profitable in catalog revenue at £88.5 million ($116.3). For fiscal year 2019, Abcam forecasts 11% revenue growth.

Abcam FY18			
	Rev. (M)	Chg.	% of Rev.
US	£97.4	6.1%	42%
China	£33.1	24.0%	14%
Japan	£16.4	-9.4%	7%
UK	£13.6	7.1%	6%
Germany	£13.4	8.1%	6%
Other Countries	£59.3	7.0%	25%

Biotage's Analytical and Organic Chemistry Product Sales Leads Revenue Growth

Biotage Q2 FY18		
	Chg.	% of Rev.
North and South America	11.6%	40%
Europe	10.3%	25%
Japan	-5.5%	10%
China	20.0%	8%
EMEA and APAC	149.4%	9%
South Korea	48.9%	4%
India	360.0%	2%

Despite a relatively weak SEK currency rate, Biotage's second quarter organic sales rose 9.0% to SEK 236.1 million ($27.2 million at SEK 8.67 = $1). (See ***IBO*** 7/31//18.) On a reported basis, Systems and Aftermarket product sales accounted for 51% and 49% respectively, including a 50% increase in quarterly sales for the Isolera purification system in the US.

Biotage Q2 2018			
Op. Profit (M)	**Chg.**	**Op. Margin**	**Chg. (bps)**
SEK 50.0	34.4%	21.2%	224

Analytical Chemistry sales increased 47% to SEK 85.9 million ($9.9 million) due to the inclusion of Horizon Technology (see ***IBO***12/15/17). Organic Chemistry sales rose 14% to SEK 136.6 million ($15.8 million), with strong sales in India, EMEA and APAC. In contrast, Industrial product sales declined 24.7% as sales fell in Europe.

Biotage Q2 FY18		
	Rev. (M)	**Chg.**
Total Company	SEK 236.1	20.3%
Systems	SEK 120.2	24.3%
Consumables and Spare Parts	SEK 94.1	19.9%
Service Contracts and Other Services	SEK 19.9	1.1%

Maxpar Human Immune Panel Sales Rise for Fluidigm

Fluidigm Q2 FY18			
	Rev. (M)	**Chg.**	**% of Rev.**
Total Company	$26.4	10.5%	
Instruments	$10.4	5.0%	39%
Consumables	$11.4	18.6%	43%
Services	$4.7	7.7%	18%
License and Grant	$0.0	-100.0%	0%

In the second quarter, organic sales for Fluidigm increased 11% to $26.4 million due to an increase in both product and service revenues, partially offset by a decrease in license revenue. (See ***IBO*** 8/15/18.) It should be noted that foreign currency appreciation rates contributed 2

percentage points to the 11% increase in total revenue. Mass cytometry revenue increased 32% to $13.7 million, which included a 19% increase in consumables sales. The company attributed the rise of mass cytometry sales to instrument placements in pharmaceutical, translational research and cancer centers. Most notably, Fluidigm highlighted a milestone of instrument placements in 50% of the US's comprehensive cancer centers. Regarding mass cytometry consumables, the increased revenue was due to high sales of the Maxpar Human Immune Monitoring Panel, which was launched in the second quarter.

Fluidigm Q2 FY18		
	Chg.	% of Rev.
US	3.2%	46%
Europe	17.6%	34%
Asia Pacific	24.1%	18%
Other	-23.4%	2%

In contrast, genomics revenue decreased 5% to $12.8 million. Specifically, genomic products sales fell 3% to $10.5 million. The decrease in genomic product sales was due to lower sales of high-throughput genomics instrument and single-cell genomics product sales. In contrast, high-throughput genomic consumables sales increased.

Fluidigm Q2 2018			
Adj. Op. Profit (M)	Chg.	Adj. Op. Margin	Chg. (bps)
-$6.6	29.4%	-24.9%	1408

By region, highlights included China, which fell 21% due to timing of customer orders, accounted for 48% of the Asia-Pacific regional sales and 9% of global sales. UK revenue accounted for 29% of Europe regional sales and 10% of global sales. Both the UK and China were the only regions that had sales exceed 9% of total revenues during the quarter. Fluidigm forecasted that its third-quarter sales would be $29 million, a 9.73% increase.

HORIBA'S Americas Sales Benefit from Operation Investment

HORIBA's combined revenues for its Scientific Instruments and Systems (SI), and Process and Environmental Instruments and Systems (P&E) businesses rose 7.7% in the second quarter to ¥10,289 million ($93.7 million at ¥109.8 = $1) to make up 22% of total company sales. (See ***IBO*** 8/15/18.)

HORIBA Q2 FY18			
	Rev. (M)	Chg.	% of Rev.
Process & Environmental Instruments & Systems	¥4,307.0	10.9%	7%
Scientific Instruments & Systems	¥5,984.0	5.6%	9%

As was the case last quarter, SI sales were driven by the Americas and Japan. In the case of Japan and Europe, the increase in sales was thanks to high R&D spending. Despite the Americas being the second most profitable region for SI sales, the region did experience an operating loss of ¥545 million ($5.0 million) due to HORIBA investing in a stronger presence in the region. SI orders fell 1.4% to ¥5,938 million ($54.1 million). SI second half revenue is forecasted to rise 5.9% to ¥15,464 million ($140.8 million).

HORIBA Q2 FY18				
	SI		PE	
	Rev. (M)	Chg.	Rev. (M)	Chg.
Japan	¥1,385	24.1%	¥2,066	-8.5%
Asia	¥1,562	-15.9%	¥960	29.9%
Americas	¥1,610	0.9%	¥754	70.6%
Europe	¥1,426	29.5%	¥445	18.2%

Second quarter P&E revenue rose due to increased sales of water quality analyzers and air pollution analyzers in Asia. P&E orders grew 6.0% to ¥4,775 million ($43.5 million). P&E second half revenue is forecast to rise 4.3% to ¥9,751 million ($88.8 million).

NanoString's Overall Revenue Falls Despite Strong System Sales

In the second quarter, NanoString Technologies revenues significantly decreased despite product and service revenues of $20.4 million. (See ***IBO*** 8/15/18.) One cause of the revenue decrease was the increased sales of the lower-priced nCount SPRINT system and the decreased sales of higher-priced FLEX and MAX instruments. Oncology clinics continued to be the largest clients for new instrument placements, accounting for 60%.

NanoString Technologies Q2 FY18			
	Rev. (M)	**Chg.**	**% of Rev.**
Total Company	$25.0	-27.7%	
Instruments	$5.5	-9.1%	22%
Consumables	$10.3	11.8%	41%
In Vitro Diagnostics	$2.5	37.4%	10%
Service	$2.1	68.1%	8%
Collaborations	$4.6	-71.7%	18%

Total consumables sales rose 16% to $12.8 million due to a 30% rise in sales of panel products and a 37% increase Prosigna IVD kits. Oncology panel sales of PanCancer immune profiling panel and PanCancer IO 360 panels increased 40%.

NanoString Technologies Q2 FY18		
	Chg.	**% of Rev.**
Americas	-37.8%	68%
Europe & Middle East	22.1%	26%
Asia Pacific	-20.5%	6%

Geographically, within the Americas, US revenue decreased 40.7% to $15.9 million. The Americas, Europe and Middle East, and Asia Pacific accounted for 57%, 28% and 14% of instrument revenue, respectively.

NanoString Technologies Q2 FY18			
Op. Profit (M)	Chg.	Op. Margin	Chg. (bps)
-18.8	-467%	-75.2%	-65.6%

Third quarter revenues are forecast to increase 15%–21% to $19.5–$20.5 million due to an anticipated sales increase of consumables and service, driven by the company's Digital Spatial Profiling technology access program. Product and service revenue are forecast to be $79–$81 million, a 10%–13% increase. Collaboration revenue is expected to be around $6 million.

Pacific Biosciences' Quarterly Goals Not Met Despite Strong Instrument Sales

Second quarter revenues for Pacific Biosciences rose 7% to $21.6 million due to strong Sequel instrument sales. (See ***IBO***8/15/18.) In total, Sequel instrument installations surpassed expectations with 275 instruments installed, a slight increase from the 250 instruments prediction. Roughly 30% of the Sequel instruments were installed in China.

Pacific Biosciences Q2 FY18			
	Rev. (M)	Chg.	% of Rev.
Total Company	$21.6	7.5%	
Product	$18.5	11.7%	86%
Instrument	$8.5	19.7%	
Consumables	$10.0	5.6%	
Service and Other	$3.1	-12.3%	14%

Despite strong instrument sales, Pacific Biosciences' quarterly revenue predictions were not met, thanks to the sales of lower-priced Sequel consumables increasing and the decline of higher-priced RS II consumables sales. Specifically, Sequel consumables usage increased 90% by the company's

customers, while RS II consumables usage declined 50%. Also, the company did not have any large multi-unit orders for the quarter.

Click to enlarge

Geographically, Pacific Biosciences once again emphasized the demand in China, thanks to the country utilizing its instruments and consumables in plant and animal sequencing projects. The overall Asia Pacific market made up 25% of total revenues. Due to the impending launch of Pacific Biosciences' 8M SMRT Cell, the company is anticipating that its customers may postpone buying current products. With that in mind, the company decided not to provide a revenue forecast for the next quarter or the year.

Pacific Biosciences Q2 2018			
Op. Profit (M)	Chg.	Op. Margin	Chg. (bps)
-$21.7	10.8%	-100.8%	2072

MALDI IMS

MALDI MS is a powerful technique primarily used for the analysis of biomolecules, often for studies involving drug metabolism, proteomics, lipidomics and genomics. Samples are first mixed with a matrix solution containing solvents and a matrix compound that has strong optical absorption in the UV or IR range. The samples are then dried and recrystallized on a specialized MALDI plate.

Desorption or ionization of the matrix is done by irradiating the sample with a laser beam in a high-vacuum environment. The resulting ionized particles in the vapor phase are injected into a mass analyzer, most commonly a TOF analyzer, in order to profile the molecular constituents of the sample. When this technique is performed on tissue samples on a series of adjacent x- and y-grid coordinates, the individual features of each spectrum can be interpreted with software to generate color-coded spatial maps of proteins. The combination and integration of hundreds or thousands of these maps allows scientists to visualize the structure of tissue sections, a practice known as MALDI imaging MS (MALDI IMS).

MALDI-IMS is primarily used for applications in histology and pathology. In preclinical drug discovery applications, the technique is useful for analyzing the distribution of specific drug compounds and

their metabolites. It is also routinely used in cancer research and other clinical research studies to uncover biomarkers for diseases, identify the distribution of proteins, or monitor the metabolism of pharmaceuticals and other chemicals.

Most current instruments dedicated to MALDI-IMS applications were released a few years ago. The current leading supplier for the technology is Bruker, which offers the FLEX series of MALDI-TOF and TOF/TOF systems, the most recent of which is the rapifleX, introduced in June 2015. In June, the company introduced the scimaX magnetic resonance MS, a high-end system capable of switching to a MALDI source for imaging. In fact, Bruker's control of the market was further established through its recent acquisition of SCiLS (see ***IBO*** 1/15/18), a leading provider of MALDI imaging software tools.

Other major vendors are Shimadzu and Waters, which both introduced their MALDI imaging instruments in mid-2013. Shimadzu offers the MALDI-7090 TOF/TOF, while Waters supplies the SYNAPT G2-Si HDMS. JEOL, a moderate-size player in the market, introduced its MALDI SpiralTOF MS in 2010.

The market for MALDI-IMS applications was about $50 million in 2018. Mid-to-high single digit growth is expected over the next several years, driven by demand from pharmaceuticals and CROs.

MS-IMS at a Glance:

Largest Markets:

- Pharmaceuticals
- Academia
- CROs

Leading Vendors:

- Bruker
- Shimadzu
- Waters

Instrument Cost:

- $300,000–$700,000

Energy

Natural gas is being touted as a key energy source in the future, with numerous oil companies announcing projects in the field. While natural gas projects have traditionally yielded lower returns in

comparison to oil projects, oil companies have slim choices when it comes to strategizing for the future.

The average weighed internal rate of return for liquefied natural gas projects that are presently in the pipeline is approximately 13%, compared to 20% and 51% for deep water projects and unconventional oil developments, respectively. However, oil companies have discovered fewer new oil sources than natural gas opportunities within the past 10 years, and along with governments around the globe focusing on pollution reduction and clean energy, the demand for natural gas is on the rise.

Oil consumption is forecast to grow 0.5% each year until 2040, which is a significantly slow down compared to previous decades, while other forecasts indicate oil demand could come reverse within the next 10 years. Consumption for natural gas, however, is predicted to grow to represent 24% of global energy by 2040, rising two percentage points from 2016, according to the International Energy Agency. By 2025, companies such as Shell and BP are forecast produce more gas than oil.

Source: *The Wall Street Journal*

Pharmaceuticals

Many advances have been made in the biopharmaceutical industry, such as immunotherapy for cancer treatment, gene editing and cell-based therapies. A major factor driving the biopharma industry is healthy investments in biopharma companies, which have spiked within recent years, including the contributions that established biopharma companies are making through corporate venture capital (CVC) affiliates, which support biotech startups. According to Pharmaceutical Research and Manufacturers of America (PhRMA), CVCs are investments that are "made by an external entity established by a corporation specifically to invest in promising startup companies, usually related to the company's own industry." Along with financial investment, a CVC can also support a startup with management, technical development and strategy.

Venture investments in deals that involved CVCs of 15 PhRMA member companies have surged over 660%, from $414 million 2000 to $3.2 billion in 2017. The value of all CVCs investments have increased 90% over 17 years from $12.8 billion in 2000 to $24.3 billion last year. Approximately 20% of total biopharma investments are supported by PhRMA members' CVCs, which also contributed to 30% of the increase in biopharma VC investments in 2016–17. The number of health care startups, such as companies specializing in health technology and digital health, have also risen thanks in part to the support of PhRMA-member CVCs.

PhRMA-member CVCs that fund new startups helps to address issues with biopharma innovation and R&D, as much of the money is used to fund R&D that concentrates on newly emerging technologies. Much of the support for the biomedical R&D ecosystem is provided by PhRMA companies through CVC funds, which not only provide financial support but also non-financial resources to ensure that these biotech startups can flourish.

Source: *PhRMA*

Government

A new report released by the OECD this month examines the governance of public research policies in 35 OECD member countries from 2005 to 2017. According to the data, there is an increased use of funding for projects, as well as performance contracts and evaluations, for Higher Education Institutions (HEI) and Public Research Institutes (PRI).

In 32% of the countries, only one ministry is responsible for determining research and innovation agendas, while 18% of countries have separate ministries for research and innovation. Agencies, defined as "public entities in charge of policy implementation regarding public research, or research and innovation councils, i.e. public institutions outside ministries with the mandate to support the governance of public research," set policy priorities in 32% of OECD nations. Most countries have ministries that provide institutional funding for both HEIs and PRIs, while in 89% of OECD countries national agencies decide how project funding is allocated. In 12 of 31 countries, a single agency provides project funding.

The report found that 89% of countries have councils for research and innovation. HEIs and PRIs are generally autonomous in regards to their relationships with industry, budget allocations and recruitment of researchers. In 85% of OECD countries, HEIs are able to freely create legal entities such as technology offices, and they are also free to determine how they choose to allocate their funding within the institution.

Source: *OECD*

UK

England's National Health Service (NHS) is launching a new program under which it will conduct a standard set of genomic tests for certain cancers and rare diseases. For patients who consent, the NHS will store the test data at a national research center along with the patients' health records.

The NHS is establishing this new genomics data program because most rare diseases lack adequate treatment methods. Approximately 7% of people in Britain will, at some point in their lives, have a rare disease (a disease that affects less than 1 in 2,000 people). Generally occurring in childhood, these diseases are usually due to a single genetic mutation. Since the NHS covers 55 million people, the hope of the program is that researchers will be able to identify many patients with rare diseases within the stored datasets, compare the progress of the disease in the patients, and determine any lifestyle, diet or other factors that may contribute to forecasting the disease's progress.

Cancer is also linked to genetic changes. The NHS' new program is designed to enable researchers to use the national datasets to identify an important mutation and match the cancer to drugs that can treat it, as the data will be able to help indicate which treatment works best with which genetic profile.

The national data center in which all NHS records will be kept is already running, with patient files from another project run by Genomics England serving as the pilot project for the program. The data center already has a collection of 82,000 genomes of patients with rare diseases and cancers, which is being mined by approximately 3,000 researchers from over 20 countries.

A major priority for the program is testing for genetic variations that may cause unfavorable reactions to certain drugs. For some diagnoses that require the sequencing of the entire genome, the analyses will be accomplished using a single-gene test. Testing for combinations of gene variants is also important, in order to target prevention for chronic ailments—by some estimates, 40–70% of drug prescriptions may be of no use for these types of illnesses.

Source: *The Economist*

Persian Gulf

Countries in the Gulf Cooperation Council (GCC) are focusing on investments into research infrastructure, but according to data from The Ideation Center, they need to concentrate on creating

an environment conducive to high-quality research and collaboration to optimize their research ecosystems.

While GCC governments are funding infrastructure, including investing in state-of-the-art facilities and labs at universities and schools. However, the countries do not allocate much funding towards research. R&D spending in these Persian Gulf countries range from 0.1% of GDP in Bahrain to 0.9% in the UAE, compared to the OECD average of 2.5%. Because of this, GCC countries have a trade deficit in regards to knowledge-based services, such as R&D, professional and technology-based services. In 2015, for example, the deficit hit 4.0% of GDP in Oman, 1.3% in Kuwait and 0.8% in Saudi Arabia.

Probems limiting R&D and innovation in the GCC include administrative issues within academia, such as insufficient time for professors to research and a limited number of PhD programs in the region, as well as funding challenges. Additionally, the report cited a lack of research collaborations amongst domestic and international researchers and not enough partnerships between academia and the private sector. Insufficient IP regulations and limited academic contribution to policy formulations also contribute to stifling research output and productivity.

The report concludes that by prioritizing research in the GCC public sector agenda, GCC countries would be able to better develop a mutually beneficial relationship between research organizations and government institutions. Moreover, in fostering local researchers' communities, GCC countries can improve research productivity through increased funding, exchange programs and administrative support. Establishing a link between academia and industry would also aid in commercialization of innovations. This could be achieved through collaborative contracts, R&D agreements and reformed research policies. In addition, improvements in the judicial systems of GCC countries would improve IP frameworks in the region.

Source: *Strategy&*

Africa

As part of a new plan agreed upon by Chinese and African leaders at the third Summit of the Forum on China-Africa Cooperation in Beijing in September, China has pledged to help improve science research in Africa in fields such as agriculture, climate change, quantum physics and AI. Chinese President Xi Jinping will provide $50 billion in loans and grants not only for research projects, but also for infrastructure, medical programs and clean energy initiatives. Chinese firms have pledged $10 billion in funding.

A key part of the new plan is providing training through the availability of 50,000 scholarships for citizens of African countries, including scientists, to study in China. Scholarships for postgraduate training will also be offered for Chinese and African institutions, such as the Sino-Africa Joint Research Center at the Jomo Kenyatta University of Agriculture and Technology in Juja, Kenya. China will also help expand the University of Health and Allied Sciences in Ho, Ghana. Additionally, another 50,000 people will be offered travel opportunities to participate in seminars and workshops.

The plan highlights China's commitment to work with African countries to improve agricultural science and practices, as well as environmental protection, areas that China has been involved in for decades. The plan also recommends the establishment of new joint research centers in environmental studies and geostudies, with locations to be determined. Programs on biodiversity, combating climate change and desertification will also be developed, with 500 senior agriculture experts from China scheduled to travel to African nations to help remodel current agricultural practices.

Analysts and experts note the lack of transparency amongst the over 20 Chinese-government-funded agricultural technology development centers that have been established throughout Africa since 2006, stating that the institutes mostly represent Chinese commercial interests and have realized little, if any, significant breakthroughs in agriculture R&D.

Source: *Nature*

Broad-based Companies

Company Announcements

In August, **Hercuvan** named **Intralab Ekatama** as a distributor for Indonesia.

In September, **Bio-Techne** announced a corporate initiative to advance cell and gene therapy research and ex vivo cell processing.

For the fiscal year ending March 31, **JEOL Scientific and Metrology Instruments** sales grew 3.0% to ¥ 68,480 millions ($687.0 million) (see Bottom Line) to make up 66% of company revenues.

In September, **MilliporeSigma** opened a new 40,903 ft^2 (3,800 m^2), $20 million BioReliance lab in Singapore, calling it the first GMP BioReliance biosafety testing lab in Asia Pacific. It offers a range

of upstream and downstream bioprocessing solutions through an M Lab Collaboration Center, Media Development Services Lab and imMEDIAte Advantage Lab.

In September, **PerkinElmer** announced a collaboration with India's **Institute of Chemical Technology** to open "explorer G3 Project," an advanced high-throughput screening facility at **DBT-ICT Centre for Energy Biosciences**, Mumbai. The facility will house a fully automated robotic system integrated with different instruments, like PerkinElmer's JANUS G3 liquid handler, colony picker, thermal cycler, multimode reader and automated incubators for microbial screening and characterization applications.

In October, **Konica Minolta** launched **Konica Minolta Precision Medicine Japan** (KMPMJ) for marketing high-end precision medicine tools and diagnostic services in Japan. Based in Tokyo, with 23 employees, the business will be led by Ken Masuo. KMPMJ will provide tools to identify and track disease-linked biomarkers and related services to accelerate the development of targeted therapies. It will also offer diagnostic and prognostic testing services using genes, proteins and other molecules.

GE named Board member H. Lawrence Culp, Jr., former CEO of **Danaher**, as chairman and CEO in October.

In October, **Becton, Dickinson** promoted Tom Polen to COO, in addition to his current role as president. The company has not had a COO since 2016.

Liquid Chromatography

Company Announcements

In July, **Pall**, a **Danaher** company, extended its consumables distribution agreement with **KANEKA** to include the next generation KANEKA KanCapA 3G sorbent for the primary capture of monoclonal antibodies from clarified cell culture. Pall currently distributes KANEKA's KanCapA Protein A chromatography sorbents.

Metrohm announced in July that its ICs can now be controlled by **Waters**' Empower CDS. Empower Software has over 475,000 users worldwide.

In August, **MilliporeSigma** announced that it will open in the first quarter of 2019 its first Mobius Single-use Manufacturing Facility in China, located in Wuxi.

In September, **BIA Separations** opened of a new upstream processing laboratory to support integrated optimization of upstream and downstream process development.

Purolite Life Sciences officially opened in September a 25,833 ft^2 (2,400 m^2) agarose resin manufacturing facility in South Wales, capable of producing 100,000 L annually.

In October, **PharmaFluidics** entered into a partnership agreement under which it will offer **Thermo Fisher Scientific**'s custom-made EASY-Spray transfer lines, in combo sets with its µPAC chromatography micro-Chips, to constitute an ultra-high-resolution front-end source platform for Thermo Fisher MS instruments.

In October, the **Carlyle Group** and **GIC** announced that **Nouryon** is the new name of the former **AkzoNobel Specialty Chemicals**business that it acquired earlier this year (see ***IBO*** *4/30/18*).

Product Introductions

In July, **Phenomenex**, a **Danaher** company, introduced Luna Omega SUGAR, a new Luna Omega phase for sugar analysis by HILIC. The phase is specifically engineered for carbohydrate separation and analysis from food, beverage and pharmaceutical matrices, such as milk, animal feed, wine, soda, fruit and tablets.

DataApex released in July Clarity Chromatography Software 8.0, featuring a graphically enhanced user interface and an expanded portfolio of controlled instruments.

In August, **Teledyne ISCO**, a **Teledyne Technologies** company, introduced the Combi*Flash* NextGen flash chromatography system, consisting of three models: the Combi*Flash* NextGen 100, which is a basic system; the Combi*Flash* NextGen 300, which is customizable; and the Combi*Flash* NextGen 300+, with RFID technology. Depending on the model, the systems support flow rates from 1 to 300 mL/min and operation pressures up to 300 psi.

Agilent Technologies released in August a new version of its CDS, the OpenLab CDS ChemStation Edition, enabling labs to export files in the Allotrope Data Format (ADF), which is designed to

standardize the collection, exchange and storage of analytical data. The **Allotrope Foundation** announced that this is the first release of commercial software that supports the ADF.

In September, **Showa Denko** launched the Shodex IC SI–36 4D column, which analyzes anions and is compatible with hydroxide eluents. The combination of the new column and hydroxide eluent does not require two different eluents (gradient system), and can perform separation with a single eluent (isocratic system) within 30 minutes.

3M introduced in September the 3M Emphaze AEX Hybrid Purifier, featuring 2 new laboratory capsules and 1 scale-up capsule that allows evaluations at lab and scale-up volumes. The new Emphaze capsules are sterilization/sanitization compatible and can be used across various aqueous-based biopharmaceutical processes, including vaccine purification.

YMC America released in September the YMC-Triart Bio C4, developed specifically for HPLC and UHPLC separations of intact antibodies and other large proteins. The hybrid silica–based butyl phase is ideal for high-sensitivity analysis using MS friendly mobile phases. It features a 300 Å pore size and is available in 1.9 µm, 3 µm and 5 µm particle sizes.

In October, **YMC** launched the YMC-SEC MAB column, featuring 3 µm silica base particles with a pore size of 250Å.

In September, **Genovis** introduced the FabRICATOR-HPLC column for automated antibody analysis. The FabRICATOR HPLC column is an enzyme reactor that allows the transfer of existing methods using the company's enzymes onto fully automated instruments.

In September, **JASCO** released new LC and SFC control drivers for **SCIEX**'s SCIEX Analyst MS software.

In October, **Biotage** debuted the compact Biotage Selekt flash purification system, and Biotage Sfär family of flash purification columns with various media and sizes ranging from 5 g to 350 g. The new columns can be opened and used in conjunction with Biotage Samplet cartridges.

Trace Elemental Instruments introduced in October the XPREP C-IC, calling it the world's first automated combustion–IC sample preparation system. The system samples the combustion gas as well as automatically transfers the condensed samples to the IC.

In October, **Bio-Works** released WorkBeads affimAb, an optimized alkaline-stable resin designed for purification of monoclonal- and polyclonal antibodies in laboratory to process scale.

Life Science Consumables

Company Announcements

TriLink BioTechnologies, a **Maravai LifeSciences** company, announced in September that it plans to relocate and expand its operations, consolidating its San Diego facilities into a new 95,000 ft^2 (8,826 m^2) facility. The new facility will house the company's current local staff of more than 150, and can accommodate growth to more than 350 R&D, commercial and manufacturing employees.

Product Introductions

In August, **Empirical Bioscience** introduced the EB Pure Agarose Gel Extraction Kit. The set is designed to quickly isolate small DNA fragments (70 bp–20 kb) from agarose gel in 15 min.

In September, **Stream Bio** and distributor **2B Scientific** released Conjugated Polymer Nanoparticle molecular bioimaging probes, available in four emission wavelengths.

Gene-based Consumables

Company Announcements

In August, synthetic biology firm **Oxford Genetics** secured a multimillion pound contract with a global e-commerce provider of reagents and tools. As part of the agreement, Oxford Genetics will leverage its high-throughput automated genomic engineering platform for CRISPR modification of mammalian cell lines.

China-based genome editing technologies company **EdiGene** announced in August the completion of a $15 million series pre-B financing, led by new investor **Lilly Asia Ventures**.

In August, **Diagenode**, which provides complete solutions for epigenetics research and sample preparation, acquired **NXTDx**, a Belgium-based epigenetics service provider. NXTDx offers a broad variety of start-to-finish epigenetics services including a number of targeted DNA methylation assays for the screening of DNA methylation biomarkers.

Horizon Discovery announced in August that it has entered into a collaboration with a global pharmaceutical partner to codevelop and apply a novel research tool for target identification and validation using single-cell RNAseq-linked pooled CRISPR screening.

For the half year, **Horizon Discovery** revenues rose 107.5%, 126% on a constant currency basis, to £25.1 million ($34.4 million) (see ***IBO*** *9/30/17*). On a pro forma basis, sales grew 5.4% to £14.0 million ($19.2 million). Research products sales, which include Dharmacon, grew 665.0% to £15.3 million ($21.0 million). Applied products revenue increased 39.4% to £4.6 million ($6.3 million), with bioproduction revenue up 22.2% to £1.1 million ($1.5 million) and sales of molecular reference standards rising 45.8% to £3.5 million ($4.8 million). Services revenue declined 23.5% to £5.2 million ($7.1 million), as the company transitions away from its traditional screening services. Asia Pacific sales grew 175.0% to £3.3 million ($4.5 million).

In September, **Agilent Technologies** announced that is has filed a second amended complaint against **Twist Bioscience** and CEO Emily Leproust in its suit alleging breach of contract, breach of the duty of loyalty and misappropriation of trade secrets (see ***IBO*** 2/15/16). According to Agilent, the new complaint adds two additional defendants, Twist employee Siyuan Chen and former Twist employee Solange Glaize, and adds new facts. The complaint states, "Leproust and several other former Agilent employees who joined her at Twist . . . stole Agilent's most sensitive documents. Using thumb drives, cloud accounts, and personal emails, Leproust, Chen, Glaize and other former Agilent employees stole hundreds of Agilent documents clearly marked 'Confidential.'" Secondly, the complaint alleges that Dr. Leproust secretly accepted a position as CEO of Twist, yet remained an Agilent employee for 17 months. In response to Agilent's latest statement, Twist Bioscience responded, "Agilent's wholesale shift in its allegations, two-and-a-half years into its suit, reveals only the weakness of its claims. Agilent's most recent allegations are gamesmanship, not substance. They omit that more than four months before it sought to change its complaint, Twist informed–and provided to Agilent–the irrelevant, passively retained documents referenced by Agilent in its proposed amendment. Discovery also afforded Agilent access to thousands of Twist's technical documents, yet they have been unable to tie any Agilent document or information to Twist's game-changing silicon technology."

In September, **Arbor Biosciences** partnered with **TATAA Biocenter**, which will distribute and support of Arbor's NGS and synthetic biology products in Sweden, Denmark, Norway, Slovakia, and the Czech Republic. TATAA will also incorporate Arbor's NGS products into its NGS training courses.

Thermo Fisher Scientific licensed in September CRISPR technologies from the **Broad Institute** and **ERS Genomics** (foundational **University of California** IP). Under the terms of the licenses, Thermo Fisher is granted global nonexclusive rights to products, tools and services for research.

Japan-based **GenAhead Bio**, a genome editing services business, licensed in September **ERS Genomics**' CRISPR/Cas9 genome editing technology patents.

Meridian Bioscience Chairman John (Jack) A. Kraeutler retired, effective September 30. He was replaced by David C. Phillips.

In September, **Cancer Genetics** signed a supply agreement with **Agilent Technologies** under which Agilent will manufacture its proprietary FISH probe reagents. Agilent will supply Cancer Genetics with the custom probe for use in its FISH-based HPV-Associated Cancer Test (FHACT). Cancer Genetics also plans to out-license the probes through distribution channels.

In October, gene synthesis company **EVONETIX** announced a collaboration with **LioniX**, a provider of customized microsystem solutions in scalable production volumes, to scale up production of MEMs for DNA synthesis.

Product Introductions

In September, **BIOTECON Diagnostics** introduced two new real-time PCR tests, the **food**proof Spoilage Yeast Detection 1 + 2 LyoKits for the detection of spoilage yeasts in beer, alcoholic mixed beverages and soft drinks.

Thermo Fisher Scientific announced in September that its portfolio of Invitrogen GeneArt products and services are now available in China.

In September, **Horizon Discovery** launched its Myeloid DNA Reference Standard for cost effective assay validation. It contains 22 mutations across 19 genes that are commonly associated with myeloid cancer. The company's portfolio includes over one hundred reference standards.

In October, **Cellecta** introduced the CloneTracker XP Expressed Lentiviral Barcode Library and CloneTracker XP Barcoded CRISPR Library product lines for tracking clonal variations in large cell populations. The Libraries are designed to express an RNA transcript in the cells and thus can be detected by either DNA or RNA sequencing.

Sales and Orders of Note

In September, bioengineering company **ATUM** announced it extended its 2014 agreement with **Archer Daniels Midland** to apply its bioengineering technology and gene engineering platform to ADM's process technologies.

Horizon Discovery announced in September that **AstraZeneca** has adopted its Edit-R crRNA libraries as part of AstraZeneca's drive to establish a functional genomics discovery platform. AstraZeneca also joined the Genomics Discovery Initiative, a collaborative functional genomics screening community facilitated by Horizon.

Cell-based Consumables

Company Announcements

In August, **CELLINK** debuted a new Bioink containing **BIOLAMINA**'s BIOLAMININS laminin protein-based reagents for culturing cells in a 3D enviroment. Bioink can be mixed with living cells to print functional human tissues in so-called 3D-bioprinters.

In September, **Hesperos** received a $4 million, three-year Phase IIb Small Business Innovation grant from the **NIH National Center for Advancing Translational Sciences** to increase capacity for its human-on-a-chip technology, and to prepare its systems for regulatory approval utilizing advanced PKPD modeling capabilities.

Bioprinting firm **Aspect Biosystems** and **JSR** entered into a collaboration to develop human liver tissue. The companies will develop vascularized human liver lobules.

In September, **Reaction Biology** and **Promega** announced a new cell-based profiling service for drug discovery based on Promega's NanoBRET technology. RBC is the first provider to create an entire NanoBRET panel as a service.

STEMCELL Technologies announced in September an exclusive license agreement with **Brigham and Women's Hospital** for rights to commercialize technologies for the generation of hPSC-derived kidney organoids.

Product Introductions

In August, **Greiner Bio-One North America** launched a new line of Erlenmeyer shaker flasks. The shaker flasks feature a patented 2-in-1 DuoCAP, which allows for flexibility between vented and nonvented applications. The new product line's volumes range from 125 mL to 3,000 mL capacity and are available with flat or baffled bottoms.

In October, **Canopy Biosciences**, a provider of gene editing and personalized medicine technologies, introduced a new catalog of over 2,000 sequence-verified knockout cell line clones in a variety of commonly used cell line backgrounds. They are provided as either live cells or cell lysates.

Ibidi introduced in October the µ-Plate 384 Well Clear, a microtiter plate that combines automated cell cultivation with high-resolution microscopy. Featuring a 50 µL volume per well, it is suitable for high-throughput applications.

Protein-based Consumables

Company Introductions

In September, **Antibodies.com** named Dr. Claire Button as CEO. She most recently served as a strategic advisor through **Fusion Biomed**.

In October, **Avacta** entered into a commercial license with **New England Biolabs** to commercialize a product using its Affimer technology for use in both life science research and diagnostics assays.

Product Introductions

In September, **Olink Proteomics** introduced the Olink NEURO EXPLORATORY biomarker panel, designed for discovery-scale application to 1,072 different protein biomarkers. The panel enables simultaneous measurement of 92 proteins using 1 µL of primarily plasma, serum or cerebrospinal fluid, as well as other types of human sample.

Rockland Immunochemicals launched in September the BioQuantiPro CHO-HCP ELISA Kit for the detection and screening of host cell protein contaminants in bioprocessing, stating that it provides the transparency into the data necessary to develop accurate bioprocessing standards with confidence

In October, **Abcam** debuted new phosphate buffered saline (PBS)-only recombinant antibodies, which are free from preservatives and stabilizing agents.

Laboratory Products

Laboratory Equipment

Company Announcements

Organomation announced in June that its N-EVAP nitrogen evaporators, solvent evaporators and solvent extraction instruments are now available online through **Thomas Scientific**.

Eppendorf announced that in July the **US District Court** has announced a final default judgment in Eppendorf's 2015 suit against **Topscien Instrument** (**Ningbo China**). The judgment permanently enjoins Topscien from using Eppendorf's MiniSpin centrifuge trademark or product design trade dress (visual product appearance) in the US. Eppendorf was awarded liquidated damages. In September, Eppendorf was also awarded two separate judgments of the **Landgericht Duesseldorf** in its suit against **Ritter** for infringement of European Patent Nos. 2575402B1 and 2279791B1 by its Ritips pro and Ritips professional dispenser tips. Ritter recently dropped its appeals. Ritter is permanently enjoined from using Eppendorf's patents in Germany, and Eppendorf was awarded damages.

In August, **Uniqsis** named **Sentinel Process System** as its exclusive working partner and distributor for the US.

In September, **Telstar** announced that local subsidiaries will now cover distribution in North America, Mexico and Central America, and parts of Europe.

Product Introductions

In August, **Boekel Scientific** introduced the GEN2 CO2 Incubator, designed and manufactured in the US. The system can accurately control temperatures from +50°C above ambient to 600°C, and has an automated cleaning cycle for decontaminating the unit.

In September, **BINDER** released the V ultra-low-temperature freezers, featuring low energy consumption, available in sizes of 500 L and 700 L.

Heathrow Scientific released in September the Magnetic Induction Stirrer (3 L plus). The product is motorless, with no moving parts.

In September, **Heathrow Scientific** introduced the MagFuge, calling it a first-of-its-kind high-speed centrifuge and magnetic stirrer in one unit. Switching is completed by changing out the tool-free rotor. Three rotors are included—2 for centrifugation (12 places for 1.5/2.0 mL tubes and 6 places for 5 mL tubes with adapters for additional tube sizes) and 1 for stirring.

Alliance Scale released in September four models of the new Alliance Ohaus Mini Vortex Mixers, available in fixed- and variable-speed models and feature reduced heat generation.

Eppendorf released in September the Eppendorf SmartExtender, an incubation tool that can easily be used as an add-on to existing mixers and related SmartBlocks in the lab. Up to 12 x 1.5 mL vessels can be incubated in parallel, and the temperature control for heating is independent from the SmartBlock in use.

In September, **Thermo Fisher Scientific** introduced the Thermo Scientific Savant SpeedVac systems, calling them the first line of vacuum concentrators offering a library of pre-programmed protocols while also allowing users to create custom programs. The Savant SpeedVac line of products consists of eight vacuum concentrators.

Laboratory Automation

Company Announcements

NanoScreen announced in August a strategic partnership with **SCBIO**, the official state affiliate of **BIO**, the **US Biotechnology Innovation Organization**.

In September, **Brooks Automation** named Michael Rosenblatt, MD, chief medical officer of **Flagship Pioneering**, to its Board, increasing the number of Board members from 10 to 11.

In October **Arzeda**, the **Protein Design Company**, **Twist Bioscience**, **TeselaGen Biotechnology** and **Labcyte** partnered to build a DNA assembly platform to significantly reduce the time and cost required to build genes encoding Arzeda's designed proteins.

Product Introductions

In September, **Tecan** announced that its Fluent and Freedom EVO liquid handing platforms are available with its Introspect and Common Notification System (Tecan CNS) software tools. Introspect is a new, cloud-based service that provides a comprehensive overview of when and how laboratory automation systems are used.

ARTEL debuted in September a new version of its Multichannel Verification System for volume verification for nearly all automated liquid handlers and multichannel pipettes. Multiple features have been added to the system to streamline processes and increase ease-of-use for more intuitive operation.

Reported Financial Results

$USD in Millions	Period	Ended	Sales	Chg.	Op. Prof.	Chg.	Net Prof.	Chg.
Twist Bioscience	9 Mo.	30-Jun	$17.0	133.2%	$50.9	21.5%	$51.4	21.6%
Other Currencies in Millions								
Bio-Works	H1	30-Jun	SEK 3.55	24%	(SEK 16.26)	-61%	NA	NA
EuroTech	H1	30-Jun	€ 37.30	€ 0.70	€ 2.70	NM	€ 1.90	NM
GL Sciences	Q1	30-Jun	¥5,610.1	10%	¥578.2	40%	¥370.0	37.3%
JEOL	FYE	31-Mar	¥104,571.0	5%	¥3,929.0	89%	¥4,532.0	660.4%
JEOL (Scientific & Measurement Instruments)	FYE	31-Mar	¥68,480.0	3%	¥1,067.0	-16%	NA	NA
Microsaic	H1	30-Jun	£0.3	96.2%	£1.5	0.4%	NA	NA
Parks Systems	Q2	30-Jun	KRW 13,120.0	150%	KRW 3,618.0	NM	KRW 4,012.0	2549%
Precision System Science	FYE	30-Jun	¥3,641.0	-5%	¥385.0	-13%	¥457.0	-17.7%
XRF Scientific	FYE	30-Jun	AUD 24.3	13%	AUD 1.0	6%	AUD 1.3	69%

NA = not available, NM = not meaningful

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