
Strategic Directions International, Inc.

INSTRUMENT BUSINESS OUTLOOK



Strategic Information for the Analytical & Life Science Instrument Industry

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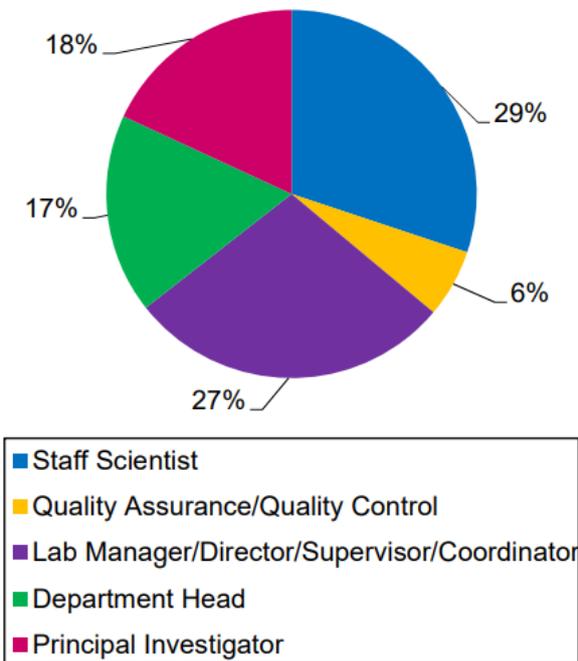
Planning for the Future: SAB Survey Gauges Scientists' Priorities in 2018 Lab Budgets

As this year draws to a close, many labs at private sector biopharmaceutical companies and service providers are preparing budgets for 2018 and prioritizing their labs' needs. According to a recent *IBO* survey, scientists indicated that lab materials, such as consumables and chemicals, are a purchasing priority in 2018, with the vast majority of respondents stating that they plan on upgrading their current instruments as opposed to purchasing brand new ones.

In a survey of 171 US-based scientists from contract research organizations and for-profit research institutions, conducted using BioInformatics LLC's [Scientific Advisory Board](#), respondents (see graphs below) shed light on what

2018 holds in regards to their lab budgets. The survey was conducted between December 19 and December 21, and has a +/- 7% margin of error at the 95% confidence interval.

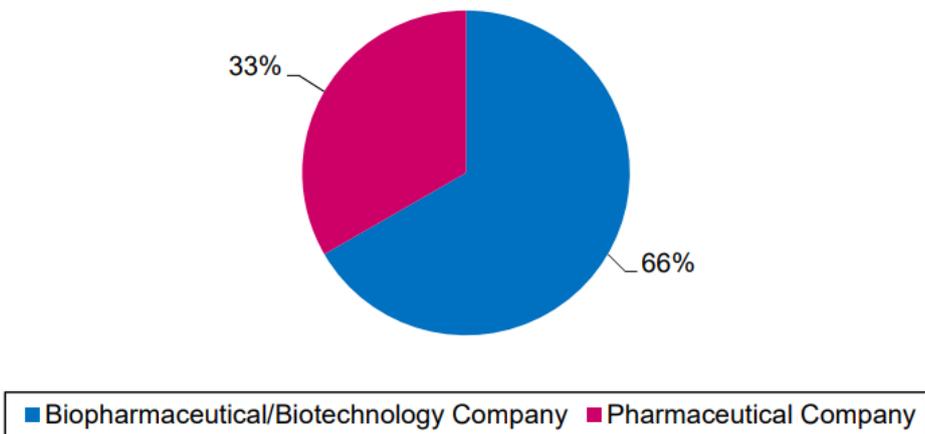
Respondent Job Positions



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As traditional pharmaceutical labs study small molecules and biotechnology labs usually focus on large molecule research, this survey concentrated on SAB members working in these fields to assess the budgeting priorities of both types of labs. Interestingly, almost 60% of respondents indicated that they work with both small and large molecules, while approximately 22% and 13% work solely with large molecules and small molecules, respectively.

Respondent Workplace



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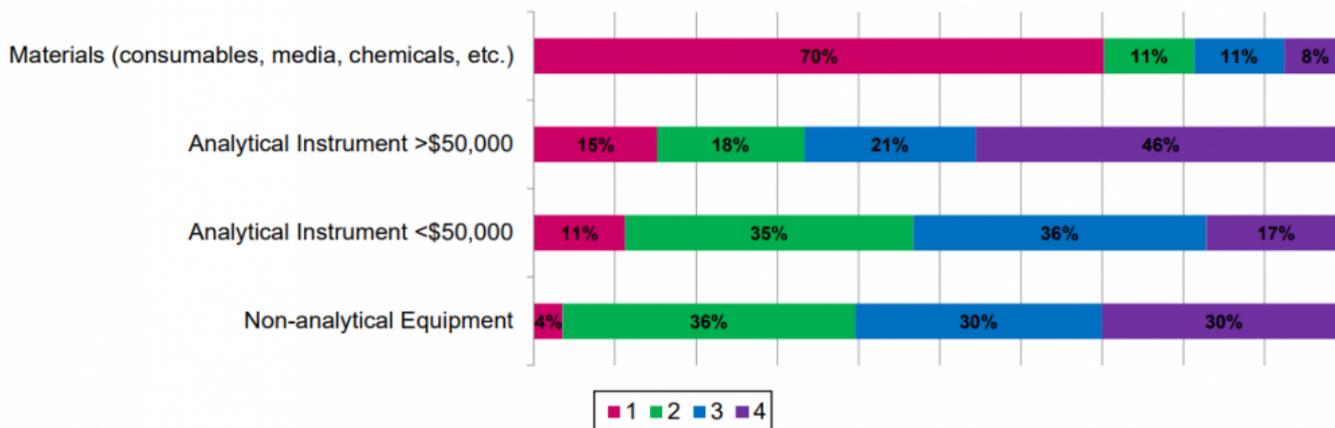
Consumables Cited as Top Priority

In 2018, the purchase of lab materials is a priority for most survey participants. Over half, or 56%, of respondents

plan on increasing their lab budgets for lab materials, such as consumables, reagents, media and other chemicals. The budget for non-analytical laboratory equipment, which is defined as instrumentation that does not measure a parameter, such as a centrifuge, is likely to remain the same for most participants, with 58% of respondents indicating no plans to increase or decrease their budgets for this category.

For analytical instruments that cost less than \$50,000, 49% of participants plan to keep their budgets the same as 2017, while 39% expect to increase their budgets. Only 8% of respondents indicated that their budget for instruments under \$50,000, such as a spectrophotometer, will decrease. Responses were similar in regards to the purchase of analytical instrumentation over \$50,000, such as LCs, with 37% indicating an increase in their 2018 budgets and 43% expecting it to remain flat. However, 13% of respondents indicated that the purchases of instruments over \$50,000 will decrease in 2018.

Purchasing Priorities for 2018 Lab Budgets
(1 = Highest Priority, 4 = Lowest Priority)



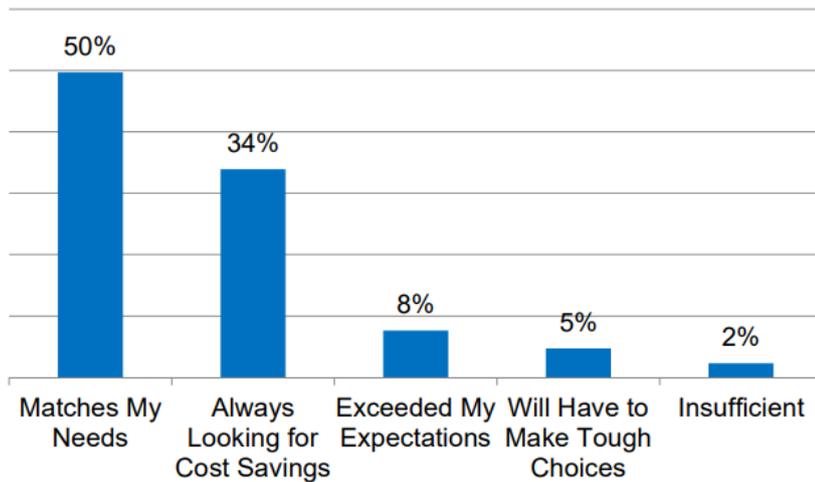
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Non-analytical Instrumentation Budgets Remain Flat

The results of the surveyed scientists' 2018 budget plans are further explained when analyzing their purchasing priorities (see graph above). Seventy percent of respondents indicated that lab materials, such as consumables, are a top priority in planning their 2018 lab budgets. Non-analytical lab equipment was ranked as a somewhat low priority or a low priority for 61% of survey participants, clarifying why the budget for this category is likely to remain flat in 2018. Responses for the purchase of analytical instruments under \$50,000 were mostly split between being a somewhat high priority and a somewhat low priority, with 35% and 37% of respondents indicating so, respectively. Almost half, or 46%, of all survey participants do not see analytical instrumentation costing over \$50,000 as a priority, indicating why the category's budget is expected to remain the same next year.

A majority of respondents are greatly satisfied with their lab budgets for next year, with 50% indicating that 2018 budgets match their needs (see graph below). Thirty-four percent of respondents prioritized cost savings in their budgets, while 2018 budgets exceeded the expectations for 8% of survey participants.

Thoughts on 2018 Lab Budget



Click to enlarge

Interestingly, a majority of respondents are more intent on upgrading existing analytical instruments than purchasing brand new instruments. Forty-five percent of survey participants plan to upgrade their analytical instruments, defined in the survey as acquiring a system that was already in their lab but has been improved to include greater capabilities and is consequently more expensive. Approximately 30% of respondents plan to purchase analytical instruments that have never been purchased by their labs before, and 25% expect to replace some of their analytical instruments with the latest or same model.

As lab budgets can give an indication on the priorities of researchers, survey results point to scientists making the most of their lab budgets in 2018, what with the majority of respondents planning to upgrade instruments and highlight consumables and media in their labs. Non-analytical lab equipment was indicated to be a low priority for many researchers, and with the substantial number of respondents prioritizing cost-savings in their budgets, the purchase of brand new or costly instrumentation also seems to be a lower priority for many of the scientists surveyed.

New Report: Advanced Microscopy

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- Single-molecule Localization (SMLM)
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Data included in the report:

- Segmented market size and demand
- Vendor share
- Technology usage
- Software solutions usage
- Brand awareness & satisfaction
- End-user product recommendations
- Lab budgets & spending



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IBO Stock Indexes Surge Through 2017

The **IBO Indexes** outperformed the three major US stock indexes in 2017, reflecting an overall strong performance by companies participating in the instrument and lab products market.

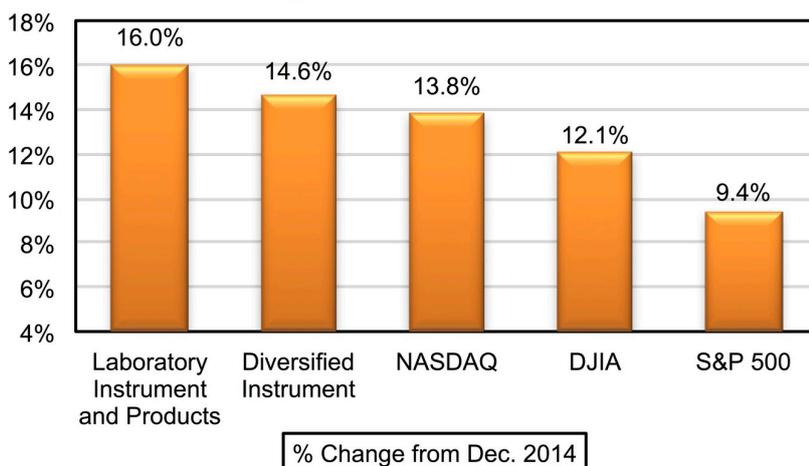
The US economy in 2017 remained robust as GDP growth remained above 3% for a second consecutive quarter. This most recent figure, an estimated 3.2%, was a sequential increase, surpassing the second quarter's 3.1% growth. However, third quarter GDP growth failed to reach its target, according to the BEA's estimate of 3.3%.

Overall, US GDP for the year accelerated due to higher consumer and government spending, as well as inventory investment. Compared to estimated GDP growth of 2.5% for all of 2017, for 2018, US GDP growth is expected decelerate 2.5%.

In December, the Fed raised the current interest rates to 1.5%, up a quarter of a percentage point. In 2018, rates are expected to hit 2.1%. And while the US inflation rate is estimated at 1.7% for 2017, lower than last year's 2.1%, it is expected to rise in 2018 to 1.9%.

US equity markets in the **IBO Stock Index** finished the year in strong fashion, as the NASDAQ composite advanced 28.2% to 6,903.39. Similarly, the Dow Jones Industrial Average similarly grew 25.1% to 24,719.2, while the S&P 500 increased 19.4% to 2,673.61. For December, however, the three markets performed just modestly, increasing 0.4%, 1.8% and 1.0%, respectively.

IBO and Major US Stock Indexes' Three-Year Avg. Annual Growth

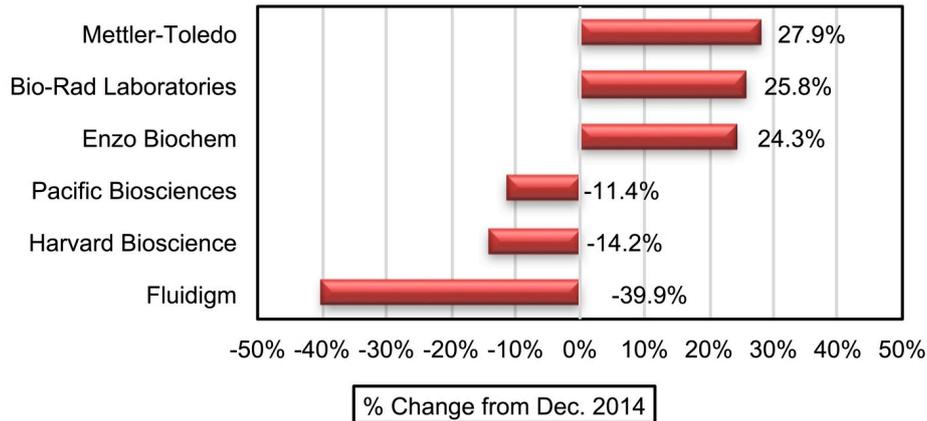


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The **IBO Laboratory Instrument and Products Index** delivered a strong performance in 2017, up an impressive 38.6%. On average, the *Index* has grown 16.0% since 2014. In particular, **Bruker** and **Illumina** have delivered significant growth in share prices, driven by strong revenue and earnings growth, along with reduced R&D expenses.

Similarly, the **IBO Diversified Instrument Index** has grown 14.6% over the same time frame, also driven by improved share prices in 2017. For the year, all shares in the *Index* ended in positive territory. **AMETEK** shares rose the most in terms of growth, up 49.1% to close at \$72.47 for the year. **Teledyne Technologies** share price grew at a similar pace, increasing 47.3% to end the year at \$181.15. **Xylem** and **Roper Technologies**' shares also experienced significant growth, up 37.7% and 41.5%, respectively. Overall, all stocks in the *Diversified Instrument Index* finished the year with double-digit growth.

IBO Lab. Instr. and Products Stock Index's Three-Year Avg. Annual Growth Top 3 Gainers and Losers



[Click to enlarge](#)

Laboratory Instruments and Products Stocks

In 2017, shares of most of the companies in the *IBO Laboratory Instruments and Products Index* delivered positive results. However, **NanoString Technologies**, **Pacific Biosciences** and **Fluidigm** all experienced double-digit decreases for the year, falling 66.5%, 30.5% and 19.1%, respectively. **MTS Systems** and **Luminex** shares both fell as well, however, decreasing just 5.3% and 2.6%, respectively. The *Index's* fastest grower for the year was **Illumina**, increasing 70.6% to close at \$218.49. **Bruker's** share price also delivered strong growth, increasing 62.0% to finish at \$34.32. In fact, **Harvard Bioscience** was the only company in the *Index* among the gainers to show a single-digit increase in share price, rather than a double-digit gain.

Despite the strong performances of Illumina and Bruker in 2017, on average, during the last three years, it has been **Mettler-Toledo** that has delivered the highest growth, increasing 27.9% since 2014 to finish the year at \$619.52. For the year, Mettler-Toledo share price rose 48.0%. The two other largest gainers over the three-year period have been Bio-Rad Laboratories and Enzo Biochem, both of which are companies serving the life science and diagnostics markets.

Conversely, **Fluidigm** has fallen the most, dropping 39.9% to \$5.89, on a three-year average, as it has faced new competition in the single-cell analysis market. NGS firm Pacific Biosciences has also posted a three-year average decline as the company has faced strong competition.

International Stocks

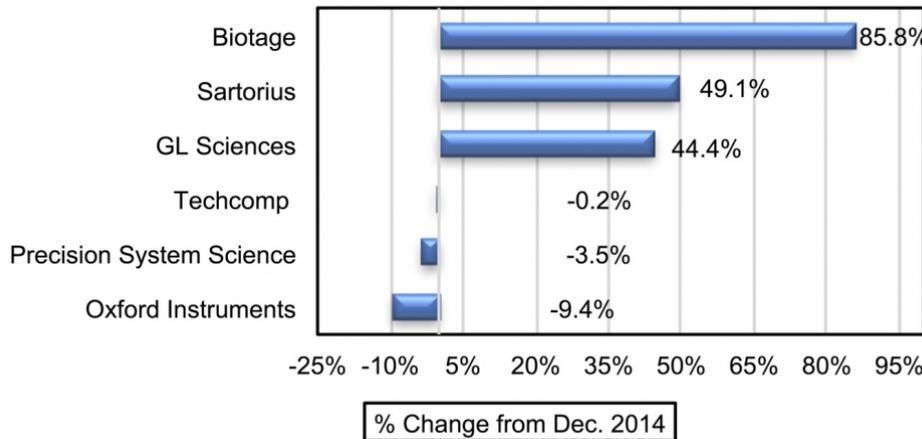
For the year, Asia Pacific indexes all finished with positive growth. Hong Kong's Hang Seng grew the fastest, increasing 25.2% to 29,919.15. Philippines' PSEi also experienced significant growth, advancing 19.5% for the year. South Korea's Kospi and India's Sensex 30 both reached double-digit growth, finishing 2017 up 18.2% and 17.5%, respectively. However, Australia's All Ordinaries increased just 0.5%.

For the year, Asia Pacific shares in the *IBO Stock Table* all finished in positive territory. **GL Sciences** finished the year with impressive returns as share price leaped 142.3% to close at ¥2,144.0 (\$19.10 at ¥112 = \$1). This performance helped the company place among the top 3 international performers in the *IBO Stock Table* over a 3-year period.

Conversely, **Hitachi High-Technologies'** share price experienced the slowest amount of growth, climbing just

0.7%. As for the remaining Asia Pacific shares in the **IBO** Stock Index, growth was in double-digits. **Precision System Science** shares delivered 62.4% growth, finishing the year at ¥661.0 (\$5.88).

IBO International Companies Three-Year Avg. Annual Growth Top 3 Gainers and Losers



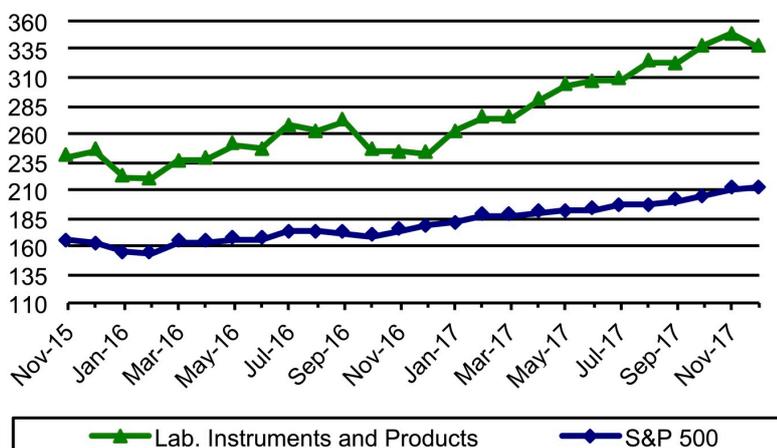
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As for European indexes in 2017, Italy's FTSE MIB delivered the fastest growth, advancing 18.0% for the year. Germany's XETRA DAX, Spain's IBEX 35, and Switzerland's SMI all grew in double-digits, increasing 11.7%, 11.0% and 11.4%, respectively. The UK's FTSE 100, however, experienced just modest growth, advancing 3.2% during 2017.

European shares in the **IBO** Stock Table experienced similar results to the Asia Pacific shares in the Stock Table, with just one company down for the year. **Merck KGaA**, which finished at €89.75 (\$108.0 at €0.83 = \$1), fell 9.5% in 2017. Conversely, **Biotage** experienced significant growth, advancing 83.0% to close at SEK 84.00 (\$10.27 at SEK 8.2 = \$1). In fact, Biotage is also the best performing international share in the **IBO** Stock Table over a three-year average. Among other European shares, **Spectris** and **Sartorius** share prices both delivered single-digit growth, advancing 7.5% and 3.6%. For the remaining European shares in the **IBO** Stock Table, share prices grew double digits.

In turn, the three international share prices that delivered the most negative growth on a three-year average were **Oxford Instruments**, **Precision System Science** and **Techcomp**. Compared to last year's three-year average growth figures, Oxford Instruments, Precision System Science and Techcomp remained the bottom three again.

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



Laboratory Instrument and Products Stocks

For the month, the **IBO Laboratory Instruments and Products Index** stocks fell 3.5% to 336.94, snapping a two-month increase. The Index's largest gainer was **Kewaunee Scientific**, up 5.3% to \$29.00, driven by a positive earnings report on December 5. The company reported an EPS of \$0.62, a \$0.08 or 14.8% increase. The rest of the shares in the *Index* finished the month in negative territory with **Pacific Biosciences** falling the most, down 17.2% to close at \$2.64.

Enzo Biochem shares fell in similar fashion, dropping 16.9% to finish the month at \$8.15. On December 7, Enzo Biochem reported its fiscal first quarter earnings, delivering an adjusted EPS of -\$0.01, an increase of \$0.02. **Bio-Rad Laboratories'** share price also decreased double digits, down 12.0% to finish the month at \$238.67.

Becton, Dickinson and **Illumina** both fell mid-single digits, dropping 6.2% and 5.0%, respectively, in December. Both share prices finished the month similarly at \$214.06 and \$218.49, respectively. **PerkinElmer** and **Fluidigm** both declined less, falling only 0.8% and 1.0%, respectively. PerkinElmer's share price closed the month at \$73.12, while Fluidigm shares finished at \$5.89. **Harvard Bioscience** share price remained flat, unchanged at \$3.30.

Company	Date Rep.	Fiscal Quarter	2017 Adj. EPS	Analyst Consensus	Vs. Estimate	YOY Growth	2016 Adj. EPS
Laboratory Instruments and Products Stock Index							
ENZ	7-Dec	Q1	(\$0.01)	(\$0.02)	↑	\$0.01 56.0%	(\$0.02)
KEQU	5-Dec	Q2	\$0.62	NA	NA	14.8%	\$0.54

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Diversified Laboratory Stocks

In December, all of the companies in the **IBO Diversified Laboratory Index** ended in the negative. **AMETEK** shares fell the least, declining only 0.3% at \$72.47. Conversely, **Roper Technologies'** share price decreased the most, ending the month at \$259.00, a 3.1% drop. For the remaining share prices in the **IBO Diversified Laboratory Index**, the average loss rate was around 1%-2%, whereas the overall *Diversified Laboratory Index* decreased 1.6%. **Corning**, **Danaher** and **Honeywell** fell 1.2%, 1.6% and 1.7%, respectively.

International Stocks

For the Asia Pacific, most of the **IBO** market indexes grew positively, with Thailand's SET increasing the fastest, up 14.5% to close the month at 1,753.71. Indonesia's Jakarta Composite and Malaysia's KLCI also experienced solid growth, rising 6.8% and 4.6% to 6,355.65 and 1,796.81, respectively. The market indexes that fell during the month were South Korea's Kospi, China's Shanghai Composite and Singapore's STI, down 0.4%, 0.9% and 0.3%, respectively.

For the month, shares in **IBO's** Asia Pacific region shares in the **IBO** Stock Table were mostly down, with **GL Sciences** and **Hitachi High-Technologies** being the only companies to have shown growth, rising 1.3% and 2.3%, respectively. Conversely, **Shimadzu** and **HORIBA** fell the most, down 4.3% and 3.0% for the month. Shimadzu closed at ¥2,562.0 (\$22.8 at ¥112 = \$1), while HORIBA finished the month at ¥6,790.0 (\$60.4). Hong Kong's **Techcomp** ended the month with no change at HKD 1.79 (\$0.23 at HKD 7.82 = \$1).

However, in Europe, most of the indexes declined, with Italy's FTSE MIB down 2.3%. Sweden's OMX Stockholm 30 similarly fell 2.1%, finishing the month at 1,576.94. The only gainers in the region were the UK's FTSE 100, which grew a substantial 4.9%, and Switzerland's SMI, which rose modestly, up 0.7%.

European shares within the **IBO** Stock Table delivered mixed results for the month, with **Biotage**'s share price growing the fastest at 9.4%. Biotage's share price closed the month at SEK 84.00 (\$14.30 at SEK = \$1). **Abcam**'s shares also generated healthy growth, up 7.3% to finish the month at £10.55 (\$ at £0.74 = \$1). Conversely, **Datacolor** and **Oxford Instruments** fell the most, down 5.6% and 3.6%, respectively. **Tecan** and **Horizon Discovery**'s share prices both remain unchanged, closing December at CHF 202.7 (\$208.37 at CHF 0.97 = \$1) and £2.40 (\$3.25).

Company: Exchange	Market Value (US M)	52 Week Range		Price 11/30/17	Change 1 Month	Change YTD	P/E (ttm)	EPS (ttm)
		Low (\$)	High (\$)					
Laboratory Instruments and Products								
Agilent Technologies: n	\$20,865	42.92	61.84	\$66.97	-3.3%	47.0%	35	1.94
Becton, Dickinson and Company: n	\$42,691	161.29	206.63	\$214.06	-6.2%	29.3%	47	4.60
Bio-Rad Laboratories: n	\$6,647	143.39	239.91	\$238.67	-12.0%	30.9%	302	0.79
Bio-Techne: o	\$4,533	95.68	117.42	\$129.55	-3.9%	26.0%	66	1.95
Bruker: o	\$4,775	19.59	27.85	\$34.32	-2.4%	62.0%	37	0.94
Enzo Biochem: n	\$485	4.88	9.68	\$8.15	-16.9%	17.4%	NM	-0.05
Fluidigm: o	\$147	4.31	11.05	\$5.89	-1.0%	-19.1%	NM	-2.22
Harvard Bioscience: o	\$130	2.25	3.90	\$3.30	0.0%	8.2%	NM	-0.09
Illumina: o	\$29,282	119.37	189.48	\$218.49	-5.0%	70.6%	42	5.25
Kewaunee Scientific: o	\$81	16.38	27.60	\$29.00	5.3%	18.6%	18	1.60
Luminex: o	\$874	17.64	23.75	\$19.70	-7.8%	-2.6%	30	0.66
Mettler-Toledo: n	\$16,651	343.61	582.20	\$619.52	-1.5%	48.0%	38	16.45
MTS Systems: o	\$1,021	41.53	59.00	\$53.70	-3.9%	-5.3%	42	1.27
NanoString Technologies: o	\$349	11.89	23.45	\$7.47	-2.4%	-66.5%	NM	-2.05
Pacific Biosciences: o	\$488	3.46	10.40	\$2.64	-17.2%	-30.5%	NM	-0.90
PerkinElmer: n	\$7,602	45.35	63.03	\$73.12	-0.8%	40.2%	20	3.60
QIAGEN: o	\$7,399	20.73	33.06	\$30.93	-3.0%	10.4%	97	0.32
Thermo Fisher Scientific: n	\$74,564	139.07	173.64	\$189.88	-1.5%	34.6%	32	5.88
VWR: o	\$4,371	24.42	37.25	\$33.25	0.4%	32.8%	31	1.08
Waters: n	\$14,496	131.35	179.07	\$193.19	-2.0%	43.8%	28	6.78
Diversified Laboratory				\$0.00				
AMETEK: n	\$15,253	43.28	61.37	\$72.47	-0.3%	49.1%	30	2.38
Corning: o	\$27,996	18.88	29.72	\$31.99	-1.2%	31.8%	14	2.31
Danaher: n	\$60,528	73.42	88.01	\$92.82	-1.6%	19.2%	27	3.38
Honeywell	\$108,185	105.25	135.00	\$153.36	-1.7%	32.4%	23	6.60
Illinois Tool Works: n	\$51,642	98.32	142.82	\$166.85	-1.4%	36.2%	26	6.52
Roper Technologies: n	\$25,097	159.28	228.21	\$259.00	-3.1%	41.5%	38	6.89
Teledyne Technologies: n	\$5,747	92.52	137.00	\$181.15	-2.7%	47.3%	31	5.88
Xylem: n	\$11,317	42.52	54.99	\$68.20	-1.6%	37.7%	40	1.72
Laboratory Instruments and Products				336.94	-3.5%	38.6%	58	
Diversified Laboratory				271.90	-1.6%	32.3%	29	
Dow Jones Industrial Average				24,719.22	1.8%	25.1%		
S&P 500				2,673.61	1.0%	19.4%		
NASDAQ Composite				6,903.39	0.4%	28.2%		
Region	Market Value	52 Week Range		Price	Change	Change	P/E	EPS
Company	(Local M)	Low (L)	High (L)	11/30/17	1 Month	YTD	(ttm)	(ttm)
Pacific Shares								
GL Sciences: t	¥17,076	557	1,494	¥2,144	1.3%	142.3%	15	¥144.19
Hitachi High-Technologies: t	¥540,625	3,360	5,040	¥4,750	2.3%	0.7%	19	¥245.97
HORIBA: t	¥286,671	4,305	7,440	¥6,790	-3.0%	25.5%	18	¥375.69
JEOL: t	¥50,714	356	648	¥639	-2.6%	25.3%	89	¥7.21
Precision System Science: os	¥13,077	334	1,011	¥661	-1.5%	62.4%	NA	¥71.44
Shimadzu: t	¥598,358	1,394	2,254	¥2,562	-4.3%	37.6%	29	¥87.56
Techcomp: hk	HKD 521	1.07	3.21	HKD 1.79	0.0%	38.8%	23	¥0.01
European Shares (London)								
Abcam: l	£2,168	7.14	10.34	£10.55	7.3%	37.5%	51	£0.21
Halma: l	£4,144	8.79	11.82	£12.60	-1.6%	40.4%	37	£0.34
Horizon Discovery: l	£231	1.05	2.71	£2.40	0.0%	66.7%	NA	£0.12
Oxford Instruments: l	£601	6.10	11.39	£8.51	-3.6%	16.3%	NA	£0.44
Scientific Digital Imaging: l	£22	0.13	0.31	£0.25	2.6%	33.1%	21	£0.01
Spectris: l	£2,757	18.40	28.69	£24.87	-0.7%	7.5%	93	£0.27
European Shares (Other)								
Biotage: st	SEK 3,818	33.90	67.50	SEK 84.00	9.4%	83.0%	46	SEK 1.83
Datacolor: s	CHF 124	538.00	800.00	CHF 840.00	-5.6%	29.2%	20	CHF 41.39
Merck KGaA: g	€ 11,946	88.20	115.20	€ 89.75	0.1%	-9.5%	24	€ 3.68
Sartorius: g	€ 6,028	65.01	90.12	€ 75.42	-1.6%	3.6%	44	€ 1.70
Tecan: s	CHF 2,159	148.80	187.30	CHF 202.70	0.0%	27.6%	42	CHF 4.84

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

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Thermo Fisher Scientific Buys Second Electron Microscopy Provider

Waltham, MA 12/29/17—Thermo Fisher Scientific, a provider of scientific solutions, has acquired Phenom-World for an undisclosed amount. Phenom-World provides desktop SEMs and solutions for research and industrial markets. Thermo Fisher stated that the purchase adds to its products for entry-level SEM. The company joins Thermo Fisher's Analytical Instruments segment.

The acquisition adds to Thermo Fisher's SEM business that was acquired through last year's purchase of FEI (see [IBO 5/31/16](#)). The acquisition reunites two businesses that were separated when FEI sold Phenom-World in 2009 (see [IBO 11/15/09](#)). With the purchase, Thermo Fisher now participates in the fast growing tabletop SEM market, which has been responsible for wider adoption of the technology at a lower price point. Earlier this year, Phenom-World introduced its fifth generation systems.

JSR Acquires CRO and Product Provider

Tokyo, Japan 12/20/17—JSR has entered into an agreement to purchase publicly held Crown Bioscience for TWD 12 billion (\$400 million = TWD \$30.0 = \$1), or TWD 75 (\$2.50) per share JSR's Life Sciences Business Division provides specialized materials, products and services. Crown Biosciences offers drug development and testing services, as well as models and tools. The combined company is forecast to have fiscal 2017 sales of ¥410,000 million (\$3,637 million = ¥112.73 = \$1), a 5.5% increase. Crown Bioscience generated fiscal 2016 revenues of TWD 1,976 million (\$65.9 million), a 30.9% increase. JSR stated, "Upon completion of the transaction, JSR's capabilities in its Life Science business will extend from pure and strategic research, drug discovery and diagnostics development, to cell line development, process development and manufacturing." The deal is expected to close in June 2018.

JSR provides petrochemical products, fine chemicals and semiconductor materials, and has designated its Life Sciences business as a strategic priority. For the fiscal year ending in March, JSR Life Sciences Business revenue rose 32.2% to ¥40,200 million (\$371 million = ¥108.36 = \$1).

This acquisition expands JSR's breadth of products and services for biopharmaceutical companies from research through manufacturing. In addition to Crown Bioscience's CRO services, the purchase adds Crown Bioscience's drug research product lines, which primarily consists of cell lines and primary antibodies.

JSR Life Sciences' offerings include the KBI Biopharma contract development and manufacturing organization, bioprocess materials such as the Amsphere A3 protein-A chromatography resin product line, and research and IVD reagents. In addition to holding a 51% stake in publicly held Medical & Biological Laboratories, JSR Life Sciences' research and IVD reagent companies also include J&W Beijing Biotech, JSR Micro and others. According to Medical & Biological Laboratories' website, basic research reagents accounted for 23% of its fiscal 2017 sales of \$7,348 million (\$67.8 million). In 2016, JSR acquired a 51% stake in the Medical & Biological Laboratories' US business, MBL International (see [IBO 4/30/16](#)), which had 2015 sales of \$7.3 million.

Microarray Provider Sold

Piscataway, NJ 12/27/17—Gene synthesis service provider GenScript Biotech has agreed to purchase CustomArray for an undisclosed amount. CustomArray supplies customized oligonucleotide pools and microarrays. "The acquisition of CustomArray further strengthens our synthetic biology product portfolio with a unique technology that we believe will enhance our customers' ability to accelerate innovation in drug discovery and development, genome

editing, protein engineering and synthetic biology,” stated GenScript CEO Frank Zhang, PhD.

With the acquisition, GenScript Biotech adds a proprietary technology for in situ synthesis of oligonucleotide microarrays. GenScript also sells life science research products. CustomArray’s two array products allow the production of either 12,000 or 90,000 oligonucleotides on an array and are available at a cost effective price, according to the company’s website.

Thomas Scientific Makes Acquisition

Swedesboro, NJ 12/20/17—In a blog posting, lab distributor Thomas Scientific has announced the acquisition of Phenix Research Products. “Phenix Research Products is a well-regarded brand with a track record of customer-centric innovation and expansion in four key areas: cryostorage, PCR, robotics/automation and TC [tissue culture],” stated Thomas Scientific President and CEO Charles Simmons. “Their shared set of core values, customer-centric consultative approach, and complementary products and brand solidifies our commitment to offering our customers value and quality of product.”

Based in North Carolina and founded in 1990, Phenix Research emphasizes technical support and service, strategic sourcing and low pricing, according to its website. Thomas Scientific was recently acquired by private equity firm Carlyle Group (see [IBO 9/30/17](#)), and thus can be expected to continue to expand with acquisitions.

Liquid Scintillation

A radionuclide is an atom with an unstable nucleus that can spontaneously transform into another nucleus or energy level. When this occurs, the energetic particles or waves given off by these radionuclides are collectively known as radiation. There are generally three types of radiation, which have been given the names alpha, beta and gamma. An alpha particle is a helium nucleus, a beta particle is an electron and a gamma ray is a photon. As all three types of radiation can be ejected from a nucleus with great energy, the damage they can cause to biological cells continues to be a serious safety concern due to the risk of human or animal contact with natural or manmade radioactive materials. There are several techniques that can detect radiation, but one of the most common devices used by scientists is a liquid scintillation counter.

A liquid scintillation counter measures the activity of radionuclides in a sample by analyzing photons emitted. The measurement process begins by dissolving a sample in a unique scintillation solution, also known as a cocktail, which consists of a compatible solvent and a fluor solute that emits photons upon excitation by light. The kinetic energy of the particles spontaneously emitted from the sample’s radionuclides is absorbed by solvent molecules, making them excited. The energy of the excited solvent molecules is then emitted as UV light, allowing the solvent molecules to return to ground state.

When an excited solvent molecule transfers its energy to a solute molecule, the solute molecule in turn becomes excited. As these excited solute molecules return to ground state, photons are emitted in the form of blue light flashes. This reaction takes place inside the dark enclosure of a liquid scintillation counter, where these blue light flashes are captured by a photomultiplier tube and converted into electrical impulses. These impulses are then analyzed to both identify and quantify the radioactive elements that are present in the sample.

Outside of basic research, liquid scintillation counting is often used for testing radiation content in drug discovery applications. The technique works best with isotopes that are low-energy beta emitters, including tritium and carbon-14, which are commonly used to tag pharmaceutical compounds and other life science molecules. The technique is also frequently used within energy production facilities or to test environmental samples for radioactive contamination.

PerkinElmer is the clear market leader, having introduced in 2015 its Tri-Carb and Quantulus GCT families of liquid scintillation counters. The company is also the leading supplier of radiochemicals. Other significant suppliers include Hidex and MP Biomedicals.

The total market for liquid scintillation in 2016 was about \$100 million, which includes sales from cocktails as well as the instruments themselves. Due to the mature nature of the technique, as well as a general trend toward avoiding technologies and infrastructure that use nuclear energy, the market for radiation detection is expected to remain flat, if not decline moderately.

Liquid Scintillation at a Glance

Leading Vendors:

- PerkinElmer
- Hidex
- MP Biomedicals

Largest Markets:

- Pharmaceuticals
- Government
- Biotechnology

Instrument Cost:

- \$15,000–\$80,000

Pharmaceuticals

R&D returns, the balance between research investment and cash inflows from drug sales, in the pharmaceutical industry have continued their decline since 2010, dropping to 3.2% in 2017, a 0.5 percentage point decrease from 2016 and 6.0 percentage point decline from 2010. This decrease in R&D returns averages to an approximately one percentage point drop each year, a point of concern for the industry. In contrast, the cost of bringing an asset to the market has doubled since 2013, jumping over 110% to \$2.173 billion in 2017.

Projected peak sales per asset, which have declined by over 50% between 2010 and 2016, grew 18.5% from 2013, reaching a blockbuster level of \$1.128 billion. Smaller, mid-tier pharmaceutical companies continued to outperform larger companies in 2017, with a 9.9% increase in projected returns to 11.9% in 2017.

The development of cancer therapies have been on a steady rise over the last 8 years, with late-stage pipeline revenue for oncology for the top 12 pharmaceutical companies jumping from 18% in 2010 to 37% in 2017. However, the growing development of cancer therapies is not without its challenges; there is a lack of eligible and accessible patients to participate in and complete the large number of clinical trials required within the given timeline. Also, many immunotherapies are effective only for a specific set of cancers and in a subpopulation of people who have those cancers.

Recommendations for remedying R&D productivity include incorporating artificial intelligence for improving study designs, wearables and connected devices for refining the method in which patients participate in clinical trials, and utilizing crowdsourced input in clinical trials to encourage patient retention.

Source: [Deloitte](#)

Government

Earlier this month, the US FDA issued a [draft guidance](#) outlining plans to increase the enforcement of homeopathic medicines that pose serious safety risks, such as medicines marketed with claims of treating cancer, heart disease, and opioid and alcohol addictions. US law dictates that homeopathic medications meet the same approval

requirements as other drugs, but since 1988, the FDA used “enforcement discretion” to permit the manufacturing and distribution of homeopathic medicines without the need for FDA approval. Although the new proposal will not require homeopathic medicines to receive FDA approval, it outlines a greater level of scrutiny of homeopathic products for medicines considered health threats. Under the new proposal, the majority of homeopathic medications will not be deemed high risk and will still be easily accessible to consumers.

The draft guidance will be open for comment for 90 days.

Source: [Washington Post](#)

Nanotechnology

With the rise of nanotechnological innovations used in various industries, such as energy, consumer goods, water purification, apparel, agriculture and food safety, worldwide nanotechnology revenues are forecast to reach \$3.7 trillion in 2018. Nanotechnology is especially a major growth driver in the High-Tech (HT) manufacturing industries, which added \$511 billion to the US GDP in 2014. Although it accounts for approximately 3% of the GDP, HT manufacturing industries fund nearly 50% of all business R&D in the US. This includes incorporating nanoscale devices in semiconductor manufacturing, sensor and communications equipment, pharmaceuticals and precision medicine, and the automobile and aerospace industries.

The US fiscal 2018 budget includes \$1.2 billion for the National Nanotechnology Initiative (NNI) for a total of \$25 billion invested in nanotechnology since the Initiative’s inception in 2001. Nanoscale science, engineering and technology at 12 agencies is supported by the federal government, with the largest investments allocated to the NSF, DHHS/NIH, DOE, DOD and DOC/NIST.

By area, 39% of this nanotechnology R&D in the 2018 fiscal budget is for foundational research and 24% for applications, devices and systems. Signature initiatives and grand challenges represent 16% of total NNI funding, while infrastructure and instrumentation make up 15% and environment, health and safety account for the remaining 6%.

Strategies for reaching the goals set out in the NNI include establishing a nanotechnology R&D program, commercializing products for social benefit, and developing leading education, employment and infrastructure for nanotechnology advancement.

Source: [National Nanotechnology Initiative](#)

China

China’s biotechnology industry is estimated to have an output totaling ¥10 trillion (\$1.2 trillion—\$1.51 trillion) by 2020, according to a report released by the social development department of the Ministry of Science and Technology and the China National Center for Biotechnology Development. The value of the burgeoning Chinese biotech industry as a whole is forecast to account for more than 4% of the nation’s GDP by 2020.

In comparison to other countries, the report indicates that China is either the world leader in biotech or on par with developed countries in specific biotech fields, such as super hybrid rice breeding technology and application, transgenic plant research and animal somatic cell cloning. China is also a leader in the development of biofermented products, with the report stating that biofuels are replacing the equivalent of more than 33 million tons of coal each year. The country’s biotech products are in high demand overseas, resulting in high production volumes. Also, the report indicated that China’s pharmaceutical exports are changing from APIs to preparations.

Source: [XinhuaNet](#)

Japan

Japan's national research institute, Riken, is pushing back against government control so that it can choose its own research initiatives and fund them by commercializing findings. Forty-one years after its establishment, Riken became a governmental research institute in 1958 under what is now known as the Ministry of Education, Culture, Sports, Science and Technology. This change in ownership made it difficult for Riken researchers to pursue projects that were not in accordance with or approved by federal policies. In relinquishing control to the government, Riken transferred its research focus to projects that would "yield reasonable outcomes" in approximately five years. Quality control checks on experimental data began to falter, leading to slapdash research findings that ultimately damaged the institute's reputation, such as the "discovery" of STAP (Stimulus-Triggered Acquisition of Pluripotency) cell studies, which was later withdrawn by Riken on grounds of "fraudulent" research.

In 2016, Riken was granted more autonomy through its new designation as a national R&D agency, tasked with conducting international research collaborations to accelerate scientific innovation. However, Japan's science budget has remained flat for several years, resulting in a lack of increase in grants to Riken and the resurrection of federal interference.

Riken is now searching for methods to establish its own source of revenue, asking government ministries to cut down on restrictions and requirements so that the institute can make its own investments and increase revenues from patent royalties.

Source: [Nikkei Asian Review](#)

EU

According to the European University Association's latest report on public funding, out of 21 higher education systems, 15 boosted public investments over 1% in 2017, with Hungary and Iceland recording the fastest increases at 29.6% and 11.1%, respectively.

In real terms, the largest investments in universities were made in Turkey, Austria, Luxembourg, Croatia and Iceland, jumping 18%, 8%, 8%, 7% and 7%, respectively. Alternatively, the most significant cuts in investments to higher education institutes took place in Greece, Slovenia and the Czech Republic, where funding decreased 16%, 9% and 6%, respectively. In Northern and Central European countries, such as Finland and Hungary, there were certain signs of recovering public investment in universities, in accordance with the European Commission's *Winter 2017 Forecast*, which expects the economies of EU Member States to continue growing in 2018.

Countries that had years of nominal, negative or flat growth, such as Scandinavia, Belgium, the Netherlands and France, are making amends to get public university funding back on track, while countries such as Austria, Germany and Switzerland are continuing to prioritize university investments.

Long-term research funding is forecast to grow in countries such as Spain, Hungary, the Netherlands, Poland and Slovakia, with research infrastructure funding projected to increase in Cyprus, Spain and Hungary.

Source: [European University Association](#)

Sequencing

Company Announcements

In November, **Scipio Bioscience** completed an initial fundraising round, resulting in €1.2 million (\$1.3 million). The company is developing a novel sample preparation solution for single-cell studies based on barcoding in a test tube

format.

NRGene announced in November a partnership with Israel's **Tel Aviv Sourasky Medical Center** to perform genetic analysis of Parkinson's disease using its GenoMAGIC cloud-based genomic analysis system.

In December, **NRGene** announced a partnership with **Wageningen University & Research** in the Netherlands as well as commercial partners to create multi-genomic mapping of commercial food potatoes.

In December, **NeoGenomics**, which operates CLIA-certified labs, joined **Thermo Fisher Scientific's** Next Generation Sequencing Companion Dx Center of Excellence Program.

In December, the US **Centers for Medicare & Medicaid Services** proposed coverage for **Thermo Fisher Scientific's** Oncomine Dx Target Test as part of a national coverage determination for NGS IVD tests. Once implemented, this would provide Medicare beneficiaries with reimbursable testing, including for clinical trials that meet a specific set of criteria.

BGI announced in December a memorandum of understanding with Germany's **Hummingbird Diagnostics** to establish a broad collection in miRNA-based molecular diagnostic applications built on NGS technology. The relationship is currently centered on neurodegenerative disorders.

In December, **BGI Genomics** entered into a partnership with **Sanguine BioSciences**, a builder of data-integrated patient communities, to develop a database of combined genomic and clinical data to increase the speed and efficiency of precision clinical trial recruitment. The first project will focus on rheumatoid arthritis.

DNAnexus announced in December the availability of the DeepVariant bioinformatics tool on the DNAnexus Platform.

Oxford Nanopore announced in December the first sequencing of an over one million base sequence using its nanopore technology.

In December, public benefit corporation **Luna DNA** announced \$2 million in seed funding. Calling its product the first genomic platform powered by the blockchain, Luna DNA's community-owned database gives Luna Coins for contributing genomic and medical information. Investors and leadership include former **Illumina** executives.

Bluebee announced in December a partnership to provide a secure, convenient data processing solution for **Agendia's** NGS-based MammaPrint BluePrint Breast Cancer Recurrence and Molecular Subtyping Kit.

BC Platforms announced in December a cooperation with the €59 million (\$70 million) **FinnGen** program, which plans to study 500,000 unique blood samples collected by Finnish biobanks. BC Platforms has developed a data availability query, meta-analytics and analysis-result browsing platform for the program.

Product Introductions

In November, **Edico Genome** unveiled the DRAGEN Complete Suite on **Amazon's** AWS Marketplace.

Edico Genome announced in December the availability of its DRAGEN pipeline with **Seven Bridges'** cloud-based data ecosystem.

In December, **Google** announced the open source release of DeepVariant, a deep learning technology to reconstruct the true genome sequencing from high-throughput sequencing data with greater accuracy. The variant calling platform was developed by **Google Brain** and **Verily Life Sciences**.

Thermo Fisher Scientific released the Ion Torrent Oncomine Myeloid Research Assay, which interrogates DNA mutations, RNA fusion transcripts and gene expression levels associated with myeloid cancers in a single run, yielding results in 2-3 days. It analyzes 74 genes in a single panel.

In December, **Lexogen** launched new Globin Block Modules for its QuantSeq kits, extending the functionality of QuantSeq 3' mRNA-Seq Library Prep for gene expression profiling of whole blood. The kits enable globin reduction

during library preparation.

Sales/Orders of Note

In December, **Skyline Medical**, which supplies an FDA-cleared water fluid disposal system, announced an expansion of its use of NGS through a license to **Illumina**'s MiSeqDx platform for use in development of its D-CHIP service platform venture with **Helomics** for identifying correlations between patient demographic data, tumor gene sequence and drug responses.

Life Science Consumables

General Life Science Consumables

Company Announcements

In September, **Vector Laboratories**, a **Maravai LifeSciences** company, named **NeoBioscience** as an exclusive distributor for China.

Applied StemCell announced a new division, **AccuRef Diagnostics**, focused on advancing molecular diagnostics through reference standards.

In December, **ProMab Biotechnologies**, a manufacturer of monoclonal antibodies and immunotherapy-related products and services, acquired the **One World Lab** (OWL) transparency-based marketplace for antibodies. OWL will not be operational, but it will be used to expand ProMab Biotechnologies' products and services.

Products Introductions

In November, **3dbiosurfaces** and **STRATEC Consumables** debuted the 3D NS-NC slide microarray substrate for both DNA and RNA, as well as protein microarrays at attractive prices.

Vector Laboratories released in November the TrueVIEW Autofluorescence Quenching Kit for removing unwanted fluorescence for FFPE tissue samples, blood cells and structural elements such as collagen and elastin. It requires five minutes for incubation, and does not require ethanol steps and dilution.

Gene-based Consumables

Company Announcements

In November, **Synbio Technologies** and **GSL Biotech** entered into an agreement, allowing users of GSL Biotech's "SnapGene" software to order constructs directly from Synbio Technologies after having designed them in "SnapGene."

Twist Bioscience announced in November that it has licensed **Oxford Genetics**' SnapFast technology platform to provide a broad range of application-specific expression vectors that Twist Bioscience will use to clone synthesized DNA for its customer base.

In November, **New England Biolabs** (NEB) and **CasZyme** entered into a multiyear collaboration to identify and commercialize CRISPR-Cas nucleases. NEB will manufacture and sell the nucleases.

In December, **Canon BioMedical** named **BIOZOL Diagnostica Vertrieb** as a distributor for Austria, Germany and Switzerland.

Horizon Discovery announced in December an extension of its pre-existing license to **ERS Genomics**' CRISPR

gene editing technology, allowing it to expand its license coverage. The ERS Genomics' patent for this technology was granted on December 1.

In December, **Copenhagen Center for Glycomics** (CCG) and **Desktop Genetics** announced a collaboration to develop the next generation of CRISPR analysis. The product is designed to provide a deeper understanding of a novel method of identifying nuclease-generated mutations, Indel Detection by Amplicon Analysis (IDAA), developed by the lab of Dr. Eric Paul Bennett. The method is currently used by CCG and its spin-out company, **Glycodisplay**. IDAA reduces the workload of cell line editing by facilitating the initial screening of newly generated nuclease reagents, as well as the subsequent generation of edited cell pools or clonal cell lines.

Contrast manufacturer **Aleveron** announced in December a license agreement to manufacture and distribute a GMP version of **Integrated DNA Technologies'** *S. pyogenes* Cas 9 variant, which is patented by Integrated DNA Technologies. The agreement expands the companies' partnership. The research grade of the product is available this month, with the clinical grade to become available in the fourth quarter of 2018.

Merck Life Sciences announced in December that Singapore has granted its patent application for CRISPR technology, the fourth such patent allowance. The technology covers successful integration of an external DNA sequence into the chromosome of eukaryotic cells using CRISPR.

Product Introductions

Synthego launched in October the CRISPRevolution Gene Knockout Kit, calling it the first guaranteed CRISPR gene editing solution by offering a money-backed guarantee on success with high editing efficiencies in any human cell type.

In November, **TwistDx** introduced the TwistAmp range of liquid-format Recombinase Polymerase Amplification (RPA) kits. An alternative to PCR, the RPA isothermal DNA/RNA amplification technology produces results typically within 3-10 minutes.

Desktop Genetics released in November the DESKGEN Series CRISPR Libraries consisting of six CRISPR library products, each of which can be tailored to an investigator's list of genomic targets using any delivery method. Each product addresses a particular experimental application of the genome editing technology. The company designs and manufactures kits based on a specific customer's list of targets.

In November, **Canopy Biosciences** debuted the CRISPR Complete Gene Editing Kits, containing everything a researcher needs to conduct a CRISPR experiment in a single kit. Pricing starts at \$900 for a gene knockout kit.

Horizon Discovery, through its acquisition of **Dharmacon** (see [IBO 7/31/17](#)), introduced in November the latest addition to its Edit-R portfolio for CRISPR activation. The company calls the new offering the first-to-market reagents enabling native gene overexpression for meaningful gain-of-function studies. The two-component system is available in lentiviral and synthetic formats, and is amenable to arrayed studies.

In November, **Canon BioMedical** released PCR-based Novallele assays to accurately determine SMN1 and SMN2 copy number.

Thermo Fisher Scientific expanded in November its Invitrogen TrueEdit tool kit, introducing the Invitrogen TrueCut Cas9 Protein v2, a recombinant *Streptococcus pyogenes* Cas9 protein for genome editing with CRISPR technology. The company also released the ready-to-transfect Invitrogen TrueGuide Synthetic gRNAs.

In December, **ATCC** and the **Association of Biomolecular Research Facilities Metagenomics Research Group** launched three new microbiome reference standards comprising genomic DNA prepared from microorganisms prevalent in extreme environments.

INSCRIPTA (formerly **Muse Biotechnology**) introduced in December the MAD7 CRISPR enzyme, available free of charge for researchers. For other uses, the charge is a low, single-digit royalty. INSCRIPTA is developing a broad family of CRISPR enzymes and gene editing technologies.

In December, **ArcticZymes** released the IsoPol SD+ and IsoPol BST+ low-temperature isothermal polymerases, which each feature stronger strand displacement.

Sales/Orders of Note

In December, **Juno Therapeutics** entered into a seven-year agreement with **Thermo Fisher Scientific** to use Thermo Fisher's Cell Therapy Systems (CTS) activation reagents in the manufacturing of its CAR T therapies. Juno Therapeutics will use Thermo Fisher's CTS Dynabeads CD3/CD28 magnetic beads.

Cell-based Consumables

Company Announcements

CellSystems and **ATERA** announced in September an expansion of their collaboration to comarket ATERA's "on-demand" 3D-tissue model R&D and specialized contract research services.

In October, **InSphero** and **Charles River Laboratories** announced a partnership through which Charles River Laboratories will license its collection of Patient-Derived Xenograph (PDX) tumors to InSphero, as well as use InSphero's 3D cell culture technology as part of its preclinical services.

Cellesce announced in November the launch of the company. The firm provides colorectal organoids, ethically derived from colorectal cancer patients. The initial offering is 10 colorectal cancer organoid lines.

In November, **Organovo** announced a collaboration with **Viscient Biosciences** to develop a custom research platform for studying liver disease.

In December, **StemBioSys** entered into an agreement with **Caltag Medsystems** to distribute and market StemBioSys products in the EU. Initially, the agreement covers StemBioSys' cell expansion products.

MilliporeSigma has entered into an exclusive distribution agreement for **Avanti Polar Lipids'** research lipid portfolio outside the US. Avanti Polar Lipids offers approximately two thousand products.

Product Introductions

InVitria, a provider of animal-free cell cultural media supplements and reagents launched a media-formulation service in November.

In November, **Lonza Walkersville** introduced pooled human liver microsomes for in vitro ChYtochrom P450 (CYP) phenotyping, which are a new Silensomes Human Liver Microsomes offering. The products are the result of Lonza's recent agreement with **Biopredic**.

ATCC released in November a new in vitro model system for a key mechanism of invasion and metastasis in lung cancer. This product is the first in the launch of a series of novel in vitro systems that employ gene-edited epithelial-mesenchymal transition reporter cell lines to address specific disease and resistance mechanisms in cancer.

ibidi introduced the μ -Dish^{35mm} Quad, a four-compartment cell culture dish that can be used for simultaneous assays.

Protein-based Consumables

Company Announcements

In November, **Genovis** signed an agreement with Chinese distributor **Shanghai Titan Scientific**. Shanghai Titan Scientific has sales of over CNY 600 million (\$90 million).

In December, **Genovis** named **Allianz Bioinnovation** as a distributor for India.

Sygnis' Innova Biosciences brand partnered in November with **Abingdon Health** to provide full lateral flow assay development services. The agreement also established Innova Biosciences as the preferred colloidal gold supplier to Abingdon.

In November, **Sygnis** signed a supply agreement with **US Biological** for its Innova Lightning-Link technology for

antibody labelling.

In November, **Base Pair Biotechnologies** completed a \$3.2 million Series A-3 financing and the opening of its new 5,000 ft² (464.5 m²) lab and office in Pearland, Texas. Base Pair Biotechnologies provides custom aptamer discovery and development services, as well as a small line of catalog aptamers.

Product Introductions

In October, **Sygnis** launched its Innova Biosciences Universal Lateral Flow Assay kit for simplified and accelerated assay development.

Mercodia and **Quansys Biosciences** released in October the AKURIO Islet Hormones multiplex assay, which measures four hormones in pancreatic research.

In November, **Promega** announced the launch of the NanoBRET Target Engagement Intracellular Kinase Assay, calling it the first assay to quantify inhibitor drug binding to kinase proteins inside live human cells.

Olink Proteomics introduced in December the Olink Mouse Exploratory panel for simultaneous analysis of 92 protein biomarkers, using 1 µL of biological sample. The assays are based on the company's Proximity Extension Assay.

Surface Science

Company Announcements

In November, **Leica Microsystems** and Germany's **Center for Structural Systems Biology** established a partnership for the development of new integrated cryo-imaging solutions, and the establishment of the Advanced Light and Fluorescence Microscopy facility.

In December, **JPK Instruments** partnered with **Cytosurge**, making Cytosurge's FluidFM technology available on the JPK NanoWizard AFM platform. FluidFM technology unites the best features of microfluidics and force microscopy by introducing closed microscopic channels into force sensitive probes. As a result, micro- and nanopipettes can be controlled with utmost precision and without damaging cells.

ZEISS announced in December the addition of two positions to its four-member Executive Board, effective January 1, 2018. Dr. Jochen Peter will join the Board representing the Research & Quality Technology segment. He is currently head of the Industrial Metrology business group. Dr. Karl Lamprecht will join the Board representing the Semiconductor Manufacturing Technology segment. He currently heads the segment. CFO and CIO Thomas Spitzenfeil will leave the company, effective September 2018.

ZEISS announced that revenue for the year ending September 30 for the Research & Quality Technology segment (the Industrial Metrology and Microscopy business groups), sales rose 4.9% to €1,538 million (\$1,709 million), or 29% of total company sales.

Product Introductions

Thermo Fisher Scientific launched in September the new Thermo Scientific Nexsa surface analysis system, which easily integrates X-ray Photoelectron Spectroscopy (XPS) with additional techniques for correlative analysis in materials research. It combines the Thermo Scientific K-Alpha⁺ XPS system with the Thermo Scientific ESCALAB Xi⁺ microprobe. Among the complimentary techniques that can be added are Raman spectroscopy, ion scattering spectroscopy, reflected electron energy loss spectroscopy and UV photoelectron spectroscopy. New features include a small spot x-ray source and the ability to transfer air-sensitive materials into the instrument.

Thermo Fisher Scientific released TopoMAPS software for SEM image analysis, powered by **Digital Surf's** Mountains software platform. Features includes SEM image enhancement, 3D reconstruction and metrology.

In November, **Olympus Life Science** introduced two new upright models of its FLUOVIEW FV3000 confocal laser scanning microscopes designed for in vitro and in vivo experiments. One model is optimized for fixed-tissue experiments and the other is optimized for electrophysiology.

ZEISS, in collaboration with the **National Center for Microscopy and Imaging Research at the University of California, San Diego**, debuted in November a new Focal Charge Compensation module for block face imaging with the ZEISS GeminiSEM and 3View from **Gatan**. It is designed for imaging biological sample features with faster acquisition rates and minimal sample damage.

In November, **ZEISS** released a new imaging mode for its ZEISS LSM 8 family with Airyscan for live-cell imaging. The new mode creates an optical section of 0.2 Airy units and resolves structures down to 120 nm laterally in a single image.

In December, **ZEISS** debuted the ZEISS GeminiSEM 450 for analytics and ultrahigh resolution, calling it a new FE-SEM flagship. It enables researchers to switch seamlessly between imaging and analytical modes at the touch of a button, and caters to a broad variety of sample types.

ZEISS released in December the ZEISS ZEN Intelleis, a new machine learning capability for segmentation of correlative microscopy datasets. The software is available for the company's full range of optical, confocal, x-ray, electron and ion microscopes. It allows multiple spatially registered datasets to be used in parallel during classification. It also works with 6D datasets.

In December, **Leica Microsystems** introduced the DM6 LIBS microscope for materials analysis. It allows researchers to analyze microstructure and composition in one work step. It features an integrated LIBS function, and eliminates the need for sample transfer, as well as the time for sample preparation and set up for electron microscopy.

Materials Characterization

Company Announcements

Elektron Technology announced in October the sale of its **Sheen Instruments** subsidiary to **Industrial Physics** for total gross consideration of £1.2 million (\$1.6 million). Sheen Instruments manufactures and supplies inspection and testing instruments used in the paint, coating, automotive and other industries. In fiscal 2017, Sheen Instruments's revenues totaled £2.6 million (\$3.5 million).

Moritz Netzsch will join **NETZSCH**'s Executive Board, effective January 1, 2018. In fiscal 2017, NETZSCH recorded revenues of around €480 million (\$533 million).

For the year ending September 30, **MTS Systems**' Test sales declined 1.6% to \$504.1 million (see [IBO 11/30/17](#)). Excluding currency effects, Test sales declined 0.8%. Materials sales accounted for 22% of Test revenues.

In December, **Ametek Brookfield** named Joseph Plante as division vice president and business unit manager. Most recently, he was president of **Diba Industries**.

Product Introductions

In November, **Shimadzu** launched the HITS-TX high-speed impact testing machine, which can perform tensile tests of plastics and resin-based composite materials at a maximum speed of 20 m/s (72 km/h).

In December, **Spectro Scientific** launched version 7 of its LaserNet 200 Comprehensive Particle Analyzer Series for analysis of particles in lubricating and hydraulic fluids. It features an increased particle counting range of up to 10 million particles/mL without dilution. The Series now consists of four models with the new LaserNet 215 system that includes particle count and ferrous monitor features.

Sales/Orders of Note

In December, **Spectradyne** announced it doubled the installed base of its nCS1 nanoparticle analyzer this year.

Reported Financial Results

\$ in Millions USD	Period	Ended	Sales	Chg.	Op. Prof.	Chg.	Net Prof.	Chg.
Enzo Biochem	Q1	31-Oct	\$27.7	5.3%	(\$0.6)	-56.6%	(\$0.6)	-56.6%
Enzo Biochem (Life Science)	Q1	31-Oct	\$7.3	-5.0%	\$0.8	-3.6%	NA	NA
Kewaunee Scientific	Q2	31-Oct	\$41.5	14.2%	\$2.7	16.0%	\$1.8	14.8%
Other Currencies (in Millions)								
Borosil Glassworks (Scientificware)	Q2	30-Sep	INR 319.1	0.3%	INR 67.7	1.8%	NA	NA
Borosil Glassworks (Scientificware)	H1	30-Sep	INR 555.1	0.0%	INR 101.6	7.2%	NA	NA
DKK-TOA	H1	30-Sep	¥6,779.0	6.3%	¥577.0	40.7%	¥358.0	53.0%
EuroTech	Q3	30-Sep	€16.2	14.6%	€0.4	NM	-€0.1	88.6%

NA = not available, NM = not meaningful

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