Strategic Directions International, Inc.

Instrument Business Outlook

Strategic Information for the Analytical & Life Science Instrument Industry

Instrument Business Outlook (ISSN 1061-2203) is published twice a month by Strategic Directions International, Inc.

Volume 26, Issue 2
April 30, 2017

Financial

FY2016 Executive Compensation Rises

Strong Gains for IBO Stock Indexes

Articles

New R&D Labs Established Worldwide

Executive Briefing

Oxford Instruments Exits Atomic Spectroscopy Market

AMETEK to Buy MOCON

Pfeiffer Vacuum Battles Takeover Bid

MTS Completes Chinese Investigation

Avantor Expands cGMP Chemicals Business

Australasia Consumables Supplier Acquired

Market Profile

Tabletop SEM

Industry Watch

Pharmaceuticals

Health Care

Chemicals

Region Watch

UK

South Africa

Brazil

News Items

Broad-based Companies

MS & LC/MS

Life Science Instruments

Surface Science

Bottom Line

Reported Financial Results

FY2016 Executive Compensation Rises

Total compensation for CEOs and named executive officers of publicly held laboratory instrument and product companies returned to growth in FY16 following a modest decline in in FY15. Given the steady climb in equity prices, adjusted EPS and free cash flows for many companies in the tables in FY16, it comes as little surprise that executive compensation reflected these gains. Accordingly, total compensation for all executives in the tables below who have served in their respective roles for more than one year advanced 12% on median basis and 16% on average.

IBO analyzed the summary compensation tables in the proxy statements of 17 CEOs and 21 named executives of dedicated business units from a total of 20 companies. As usual, compensation packages vary year over year due to achieved performance targets, timing of equity awards, promotions and discretionary measures, among other influences.

FY16 Executive Compensation for Presidents and CEOs of Lab Instrument and Product Companies

Executive	Title	Total Cash Compensation				Total Equity Comp.		Other Comp. ($000)	Total Comp.		Revenue	
		Salary ($000)	Annual Incentives ($000)	Total Ann. Cash Comp. ($000)	% Chg.	Stock & Option Grants ($000)	% Chg.		Total Comp. ($000)	% Chg.	FY16 ($M)	% Chg.
Agilent Technologies												
Michael R. McMullen	P/CEO	$1,042	$1,338	$2,380	22%	$6,341	28%	$193	**$8,914**	**24%**	$4,202	4%
Becton, Dickinson												
Vincent A. Forlenza	COB/P/CEO	$1,105	$2,000	$3,105	15%	$10,295	15%	$531	**$13,930**	**19%**	$12,483	21%
Bio-Rad Laboratories												
Norman Schwartz	P/CEO	$914	$720	$1,635	-25%	$3,220	4%	$22	**$4,876**	**-10%**	$2,068	2%
Bio-Techne												
Charles R. Kummeth	P/CEO	$800	$1,221	$2,021	56%	$5,409	286%	$38	**$7,468**	**173%**	$499	10%
Bruker												
Frank H. Laukien, PhD	COB/P/CEO	$652	$738	$1,390	-42%	$2,044	33%	$8	**$3,442**	**-13%**	$1,611	-1%
Danaher												
Thomas P. Joyce	P/CEO	$1,100	$3,500	$4,600	28%	$7,858	20%	$510	**$12,969**	**22%**	$16,882	17%
Harvard Bioscience												
Jeffrey A. Duchemin	P/CEO	$506	$0	$506	3%	$823	-18%	$24	**$1,352**	**-11%**	$105	-4%
Enzo Biochem												
Elazar Rabbani, PhD	COB/CEO	$555	$575	$1,130	21%	$88	52%	$189	**$1,408**	**20%**	$103	5%
Illumina												
Francis A. deSouza	P/CEO	$800	$0	$800	-39%	$7,500	87%	$109	**$8,409**	**56%**	$2,398	8%
Luminex												
Nachum Shamir	P/CEO	$636	$993	$1,629	9%	$1,990	19%	$12	**$3,631**	**12%**	$271	14%
Mettler-Toledo												
Olivier A. Filliol	P/CEO	$851	$961	$1,813	17%	$6,275	76%	-$759	**$7,329**	**11%**	$2,508	5%
Pacific Biosciences												
Michael Hunkapiller, PhD	COB/P/CEO	$0	$0	$0	0%	$1,985	37%	$0	**$1,985**	**37%**	$91	-2%
PerkinElmer												
Robert F. Friel	COB/CEO	$1,055	$3,887	$4,941	13%	$3,543	3%	$1,038	**$9,522**	**12%**	$2,116	1%
QIAGEN												
Peer M. Schatz	CEO	$1,146	$165	$1,311	6%	$0	NM	$12	**$1,323**	**6%**	$1,338	4%
Thermo Fisher Scientific												
Mark N. Casper	P/CEO	$1,407	$4,197	$5,604	29%	$11,677	1%	$520	**$17,801**	**9%**	$18,274	8%
VWR												
Manuel Brocke-Benz	D/P/CEO	$949	$767	$1,716	40%	$3,969	NM	$1,239	**$6,924**	**107%**	$4,514	5%
Waters												
Christopher J. O'Connell	P/CEO	$850	$1,300	$2,150	-2%	$5,340	-47%	$141	**$7,631**	**-38%**	$2,167	6%

Click to enlarge

Breakdown of CEOs Compensation

Total average compensation for the 17 CEOs in the table rose 16% to $7.0 million in FY16, with the largest distribution of salary allocated to long-term equity awards. The average value of combined stock and option awards grew 24% to $4.6 million to account for 66% of total compensation. Roughly half the CEOs recorded equity grants valued at more than $5 million, including more than $10 million for Mark N. Casper and Vincent A. Forlenza, presidents and CEOs of Thermo Fisher Scientific and Becton, Dickinson, respectively.

While the average split between stock- and option-based awards in FY16 trended towards the latter, the type of equity grants varied by company. For example, in FY16, Agilent Technologies included additional stock units in lieu of options to encourage retention. Equity awards for CEOs at Bio-Rad Laboratories, Illumina and Thermo Fisher were also predominantly weighted towards restricted stocks in FY16. Conversely, equity awards for executives at Enzo Biochem, Luminex and VWR were exclusively comprised of stock options.

Although stock awards provide greater financial security, options can offer huge rewards especially if granted during suppressed stock prices. In FY13, Mr. Casper received a special stock option grant of 600,000 shares at a strike price of $46.56. The estimated payout for these options listed in the 2009 SEC filing was $10.3 million. However, based on the sale of certain shares in FY13 and using the current share price for the remaining exercisable shares, his total potential estimated value for these options is over $55 million.

Accounting for 19% of total CEO compensation, average cash incentive awards also advanced at a steady pace for

CEOs in the table in FY16, expanding 11% to $1.3 million. This increase was driven by attained or exceeded financial results, as well as awards for discretionary achievements tied to acquisitions or strategic business developments.

Top 5 Total Compensation, 2016 Presidents and CEOs of Lab Instrument and Product Companies					
Company	**Executive**	**Cash Comp.**	**Equity Comp.**	**Other Comp.**	**Total Pay**
Thermo Fisher Scientific	Mark N. Casper	$5,604,096	$11,676,762	$519,803	**$17,800,661**
Becton, Dickinson	Vincent A. Forlenza	$3,105,000	$10,294,699	$530,762	**$13,930,461**
Danaher	Thomas P. Joyce	$4,600,000	$7,858,347	$510,454	**$12,968,801**
PerkinElmer	Robert F. Friel	$4,941,186	$3,543,209	$1,037,829	**$9,522,224**
Agilent Technologies	Michael R. McMullen	$2,379,850	$6,341,255	$193,310	**$8,914,415**

Click to enlarge

However, not all CEOs received cash incentives in FY16. Newly appointed Illumina CEO Francis A. deSouza (see ***IBO*** 3/15/16) and Harvard Bioscience President and CEO Jeffrey A. Duchemin failed to reach the minimum financial thresholds to be eligible for cash awards. Meanwhile, Pacific Biosciences President and CEO Michael Hunkapiller, PhD, waived all bonus incentives for the fourth consecutive year.

Base salaries grew for most CEOs in the table, climbing 5% on average to $845,189 to account for 12% of compensation. In his first full year as president and CEO of Agilent, Michael R. McMullen received an 11% pay raise, further adding to the list of five CEOs with salaries above $1 million. However, base salaries were unchanged for CEOs of Enzo Biochem and VWR, as well as for CEO of QIAGEN when excluding currency conversion. Mettler-Toledo President and CEO Olivier A. Filliol voluntarily reduced his base salary by 5% given the strengthening of the Swiss franc and company cost saving measures. Mr. Hunkapiller opted for an annual base salary of only $1. Also of note, Bruker President and CEO Frank H. Laukien, PhD, voluntarily took a 10% salary reduction beginning August 2016 through the remainder of the year.

Largest Compensation

Given Thermo Fisher's market capitalization and sales volume, it comes as little surprise that Mr. Casper recorded the largest total compensation package in FY16 among CEOs in the table, climbing 9% to $17.8 million. The pay increase was primarily driven by cash incentives, which jumped 40% to $4.2 million as the company exceeded most financial targets. However, Mr. Casper was also, along with other top Thermo Fisher executives, awarded a one-time supplemental bonus based on adjusted operating income to compensate for lower payments in the previous year due to extreme currency headwinds.

Compared to Mr. Casper, total compensation for CEOs of companies in the table within a comparable sales range were notably lower but expanded at a stronger rate. Mr. Forlenza's pay increased 19% to $13.9 million, including a 15% increase in long-term equity awards to $10.3 million. Mr. Forlenza was awarded a maximum $2.0 million cash incentive due to strong financial performance measures as well as other strategic accomplishments. Total compensation for Danaher President and CEO Thomas P. Joyce jumped 22% to $13.0 million. Mr. Joyce's cash incentive and long-term equity awards grew 35% and 20% to $3.5 million and $7.9 million, respectively, driven by incentives for the continued integration of Pall (see ***IBO*** 5/15/15) and acquisition of Cepheid (see ***IBO*** 9/15/16).

Inching closer to the $10 million compensation level was Mr. McMullen and PerkinElmer CEO Robert F. Friel, whose total pay advanced 24% and 12% to $8.9 million and $9.5 million, respectively. Mr. Friel's cash incentive expanded 16% to $3.9 million, representing the second largest cash incentive award among CEOs in the list, only behind Mr. Casper.

Notable Pay Changes

With the largest percentage and nominal pay increase among executives in the table, total compensation for Bio-Techne President and CEO Charles R. Kummeth soared 173% to $7.5 million. Surprisingly, Mr. Kummeth's compensation level corresponded with payouts for CEOs of companies with four times the sales volume. However, Mr. Kummeth's disproportionate increase in compensation was attributed to a delayed timing of equity grants and other compensation in FY15 that were in turn included in FY16.

Other significant pay increases were recorded by VWR President and CEO Manuel Brocke-Benz and Mr. deSouza. Total compensation for Mr. Brocke-Benz more than doubled to $6.9 due to timing of a $4.0 million equity grant and higher cash incentives. Despite missing the threshold for a cash incentive award, total compensation for Mr. deSouza climbed 56% to $8.4 million because of a mid-year equity grant following his promotion.

Top 3 Total Compensation % Increases and Declines, 2016 Presidents and CEOs of Lab Instrument and Product Companies		
Top 3 % Increases		
Company	**Executive**	**% Chg.**
Bio-Techne	Charles R. Kummeth	173%
VWR	Manuel Brocke-Benz	107%
Illumina	Francis A. deSouza	56%
Top 3 % Declines		
Company	**Executive**	**% Chg.**
Waters	Christopher J. O'Connell	-38%
Bruker	Frank H. Laukien, PhD	-13%
Harvard Bioscience	Jeffrey A. Duchemin	-11%

Click to enlarge

Conversely, Waters President and CEO Christopher J. O'Connell dropped from the list of top five earners in FY15, as his total compensation fell 38% to $7.6 million in FY16. This was the sharpest compensation decline among executives in the tables in FY16. However, the loss in pay was primarily attributable to a $1.7 million bonus and higher equity awards granted in FY15 in connection with his hiring (see ***IBO*** 6/30/15).

In addition, total compensation for Bio-Rad Laboratories President and CEO Norman Schwartz, Mr. Laukien and Mr. Duchemin declined roughly 10% or more each due to missed financial targets.

Discretionary & Individual Performance Awards

Aside from financial performance, cash incentive awards were also based on discretionary measures. Luminex President and CEO Nachum Shamir, whose FY16 total compensation advanced 12% to $3.6 million, was rewarded for certain product developments, FDA approvals and the acquisition of Nanosphere, which ultimately resolved the company's strategic goal to either invest or acquire a new multiplex system.

Mettler-Toledo President and CEO Olivier A. Filliol was granted a one-time option award valued at $1.5 million, as the compensation committee concluded that cash compensation did not reflect the company's growth in market capitalization and was lower compared to peer companies. Consequently, Mr. Filliol's equity compensation jumped 76% to $6.3 million.

Executives of Dedicated Business Units

Total average compensation for active named executives in the table of dedicated business units at instrument and lab-related businesses accelerated 13% to $2.2 million in FY16. Similar to the list of CEOs, compensation for named executives varied by performance and size of dedicated business unit.

FY16 Executive Compensation for Head of Dedicated Lab Instrument and Product Businesses											
		Total Cash Compensation				Total Equity Comp.		Other Comp. ($000)	Total Comp.		Revenue	
Executive	Title	Salary ($000)	Annual Incentives ($000)	Total Ann. Cash Comp. ($000)	% Chg.	Stock & Option Grants ($000)	% Chg.		Total Comp. ($000)	% Chg.	FY16 ($M)	% Chg.
Agilent Technologies												
Mark Doak	SVP/P Cross-Labs	$471	$477	$948	12%	$1,638	53%	$54	**$2,640**	**34%**	$1,420	7%
Patrick Kaltenbach	SVP/P Life Sci. & Applied	$488	$418	$906	26%	$1,480	50%	$2,009	**$4,394**	**66%**	$2,073	1%
Jacob Thaysen	SVP/P Diag. & Genomics	$437	$511	$947	NM	$845	NM	$1,021	**$2,814**	**NM**	$709	7%
AMETEK												
John W. Hardin	P/Elec. Inst. Grp.	$470	$188	$658	-6%	$614	10%	$121	**$1,394**	**2%**	$2,360	-2%
Bio-Techne												
David Eansor	SVP Biotechnology	$400	$282	$682	66%	$451	-32%	$8	**$1,141**	**4%**	$317	3%
Robert Gavin	SVP Protein Platforms	$350	$136	$486	8%	$451	98%	$5	**$943**	**39%**	$77	17%
Bruker												
René Lenggenhager, PhD	P/Bruker BioSpin	$376	$143	$518	NM	$250	NM	$375	**$1,144**	**NM**	$563	3%
Mark R. Munch, PhD	EVP, P/Bruker Nano	$504	$195	$699	2%	$820	7%	$16	**$1,535**	**4%**	$455	-1%
Juergen Srega	P/Bruker CALID	$351	$84	$435	-23%	$550	0%	$89	**$1,074**	**-10%**	$475	-3%
Mettler-Toledo												
Thomas Caratsch	Head of Laboratory	$307	$248	$555	5%	$558	13%	-$3	**$1,110**	**-16%**	$1,224	6%
MTS Systems												
William Bachrach	Former P Test	$358	$197	$555	46%	$323	20%	$98	**$976**	**34%**	$512	11%
PerkinElmer												
James Corbett	EVP/P Disc. & Analy. Sol.	$461	$780	$1,240	23%	$1,183	102%	$22	**$2,445**	**52%**	$1,513	-1%
Jonathan P. DiVincenzo	Former SVP/P Env. Health	$353	$0	$353	-50%	$603	3%	$778	**$1,733**	**32%**	NA	0%
Prahlad R. Singh	SVP/P Diagnostics	$414	$419	$833	NM	$320	NM	$20	**$1,173**	**NM**	$603	5%
Thermo Fisher Scientific												
Thomas W. Loewald	SVP/P Ana. Inst.	$610	$808	$1,418	17%	$2,539	-3%	$105	**$4,062**	**4%**	$3,668	14%
Mark P. Stevenson	EVP/P Life Sci. Sol.	$850	$1,400	$2,250	-6%	$4,316	3%	$426	**$6,992**	**4%**	$4,978	12%
VWR												
Mark T. McLoughlin	SVP/P Americas	$451	$344	$794	22%	$814	NM	$56	**$1,664**	**136%**	$2,738	6%
Nils Clausnitzer	SVP/P EMEA-APAC	$371	$265	$637	NM	$930	NM	$7	**$1,574**	**NM**	$1,777	2%
Waters												
Ian S. King	SVP Instrument Tech.	$330	$266	$596	NM	$1,638	NM	$48	**$2,282**	**NM**	NA	NA
Rohit Khanna	SVP Applied Tech.	$341	$274	$616	NM	$1,568	NM	$63	**$2,247**	**NM**	NA	NA
Xylem												
Colin R. Sabol	SVP/P Analy. & Treat.	$420	$253	$673	9%	$789	13%	$88	**$1,550**	**10%**	NA	NA

Click to enlarge

Average equity compensation for executives of dedicated business units advanced the fastest among compensation categories, rising 13% to $1.1 million, representing 51% of total compensation. Average base salary and cash incentives increased 1% and 6% to $438,044 and $384,380 to make up 20% and 18% of total compensation, respectively. Accounting for the remaining 11% of total compensation, Other pay rose sharply, but this was primarily due to the $1.5 million and $1.0 million relocation payments for Patrick Kaltenbach and Jacob Thaysen, SVP and president of Agilent's Life Sciences & Applied Markets and Diagnostics & Genomics Groups, respectively. Both Mr. Kaltenbach and Mr. Thaysen relocated to the company's headquarters in Santa Clara, California, from their home countries of Germany and Denmark, respectively.

All three named executives at Agilent, including SVP and President of Cross-Labs Mark Doak, received strong cash bonus awards based on overall end-market performance, such as sales growth in China and biopharmaceutical sales. Other business measures that exceeded planned financial targets included online order growth for Mr. Doak's Group and SureSelect target enrichment sales for Mr. Thaysen's Group. However, several business metrics fell below the target plan, such as a customer satisfaction survey, sales growth for an unspecified project and regulatory compliance measures.

The largest compensation package for executives of dedicated business units in FY16 went to Thermo Fisher EVP and President of Life Sciences Solutions Mark P. Stevenson, whose total pay advanced 4% to $7.0 million.

Top 5 Total Compensation, 2016 Head of Dedicated Lab Instrument and Product Businesses					
Company	**Executive**	**Cash Comp.**	**Equity Comp.**	**Other Comp.**	**Total Pay**
Thermo Fisher Scientific	Mark P. Stevenson	$2,249,951	$4,316,051	$425,627	**$6,991,629**
Agilent Technologies	Patrick Kaltenbach	$906,061	$1,479,571	$2,008,639	**$4,394,271**
Thermo Fisher Scientific	Thomas W. Loewald	$1,418,006	$2,538,810	$104,993	**$4,061,809**
Agilent Technologies	Jacob Thaysen	$947,420	$845,472	$1,020,749	**$2,813,641**
Agilent Technologies	Mark Doak	$947,700	$1,638,114	$54,394	**$2,640,208**

Click to enlarge

The most notable change in compensation among named executives of dedicated business units was for Mark T. McLoughlin, SVP and President of VWR's Americas Lab and Distribution Services, whose compensation skyrocketed 136% to $1.7 million. This increase stemmed from option awards granted under the company's equity incentive plan initiated in 2014.

In contrast, total compensation for Juergen Srega, president of Bruker CALID, declined 10% to $1.1 million as his business segment missed all five performance targets.

Aside from Mr. Thaysen, there were a number of newly announced executive officers in the table of dedicated business units. Ian S. King and Rohit Khanna were named SVP of Instrument Technology and SVP of Applied Technology for Waters effective January 25, 2016 (see ***IBO*** 2/15/16). VWR appointed Nils Clausnitzer as SVP and president of its EMEA-APAC Lab business (see ***IBO*** 2/29/16). President of Bruker BioSpin Bruker René Lenggenhager, PhD, was added to the list of named executives following his appointment on November 1, 2015 (see ***IBO*** 11/15/15). Finally, Prahlad R. Singh retained his title of SVP and President of PerkinElmer Diagnostics but was elevated to executive officer status on October 3, 2016 (see ***IBO*** 9/30/16).

PerkinElmer made additional changes to its named executive officers to align with its new organizational structure (see ***IBO*** 9/30/16). Accordingly, James Corbett was promoted from SVP and President of Human Health to EVP and President of Discovery and Analytical Solutions, effective October 3, 2016 (see ***IBO*** 9/30/16). Given the promotion, Mr. Corbett received a higher base salary and an additional restricted stock grant award valued at $0.5 million. As such, total compensation for Mr. Corbett jumped 52% to $2.4 million.

Top 5 Realized Comp. (Salary, Incentives, Exercised Options & Vested Stock), 2016 Presidents and CEOs of Lab Instrument and Product Companies		
Company	**Executive**	**Total Realized Comp.**
Thermo Fisher Scientific	Mark N. Casper	**$46,313,506**
Becton, Dickinson	Vincent A. Forlenza	**$21,919,347**
PerkinElmer	Robert F. Friel	**$21,054,090**
Mettler-Toledo	Olivier A. Filliol	**$20,478,894**
Danaher	Thomas P. Joyce	**$13,767,353**

Click to enlarge

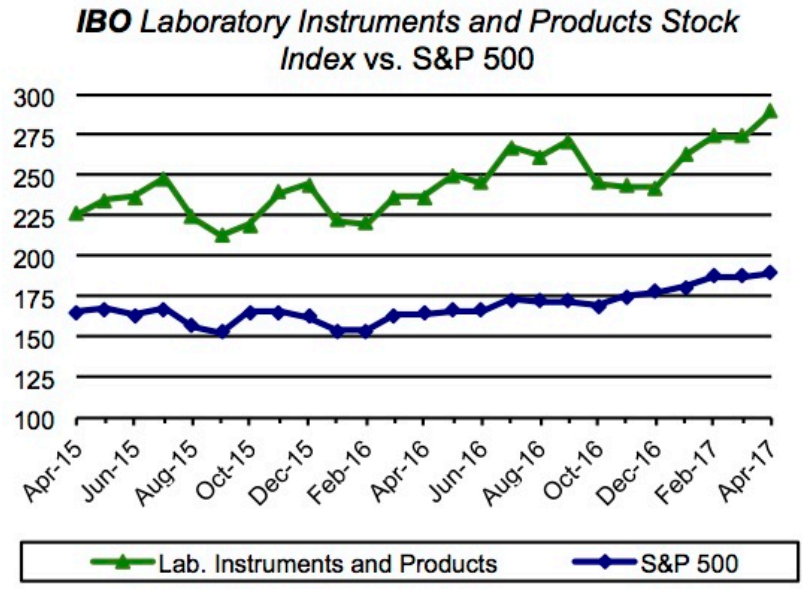
Realized Pay

Realized pay is an alternative calculation of executive compensation, which consists of base salary, cash incentives, vested restricted stock and gains from stock options exercised. This methodology is considered by some to be a more accurate portrayal of payments received during the fiscal year, as it reflects the impact of stock price fluctuations when equities actually vest rather than estimated at prior grant periods. In FY16, Mr. Casper recorded the largest realized pay among executives in the tables, valued at $46.3 million. Three other CEOs recorded realized compensation of more than $20 million in FY16: Mr. Forlenza, Mr. Friel and Mr. Filliol.

Strong Gains for IBO Stock Indexes

Global equity markets soared in April following France's preliminary presidential elections, which favored the more euro and business friendly candidate, Emmanuel Macron. Major US Indexes reached historic highs further fueled by corporate earnings and President Trump's one page double-spaced tax reform plan aimed at lowering corporate and capital gains taxes, as well as repealing the alternative minimum tax and estate tax. Despite the strong market vitality, the overall economic environment continued to struggle. First quarter US GDP growth was revised lower by 40 basis points to 0.7% due to a significant deceleration in consumer spending and lower inventory investments.

For the month, the Dow Jones Industrial Average, S&P 500 and NASDAQ advanced 1.3%, 0.9% and 2.3%, respectively. Year to date, the Dow, S&P 500 and NASDAQ are up a bullish 6.0%, 6.5% and 12.3%, respectively.



Click to enlarge

Laboratory Instruments and Products Stock Index

The *Index* climbed 5.6% for the month and is up an impressive 19.2% year to date to 289.69. Most companies ended the month in positive territory, led by **Bio-Rad Laboratories**, which advanced 9.5%.

Thermo Fisher Scientific and **Waters** also posted healthy gains in April, climbing 7.6% and 8.7%, respectively, due to strong first quarter adjusted EPS results on April 26 and April 25, respectively. Earnings for these companies were driven by moderated currency headwinds, as well as continued strength in the biopharmaceutical markets and growth in China. In addition, industrial markets improved for **Thermo Fisher** and were strong for **Waters**. In spite of the strong operational performances, the companies' increased earnings outlooks were primarily attributed to currency, as well as lower tax expenses for **Waters** and acquisition contributions for **Thermo Fisher**. **Waters** raised its 2017 adjusted EPS from $6.85–$7.10 to $7.20–$7.40. **Thermo Fisher** boosted its 2017 adjusted EPS range from $9.06–$9.24 to $9.12–$9.28.

Illumina expanded 8.4% for the month despite mixed quarterly financial results on April 25. The company reported an adjusted EPS decline of 10% to $0.64 for the first quarter, but results were in line with consensus. Sales for the company slightly exceeded analysts' expectations (see Bottom Line), but margins were pressured by new product introductions. The company maintained its 2017 adjusted EPS outlook of $3.60–$3.70, and projected second quarter adjusted EPS of $0.65–$0.70.

Despite the strong *Index* growth, several companies declined in double digits for the month. **Pacific Biosciences**, which reported a wider-than-expected first quarter adjusted EPS loss of $0.26 on April 26, fell 23.8% in April, leading all decliners. The company provided a cautious outlook due to uncertainty in US government funding, and lowered its 2017 product and services sales projection from 40%–60% to 35%–45%. On a sequential basis, second

quarter sales are expected to decline.

On April 27, **Harvard Bioscience** posted first quarter adjusted EPS just above analysts' estimates due to improved operational efficiency. Despite reaffirming its 2017 adjusted EPS outlook of $0.05–$0.07, shares contracted 7.7% for the month.

In other news, on April 23, Moody's Investors Service placed **Becton, Dickinson'**s (**BD**) "Baa2" senior unsecured and "Prime-2" debt under review for a downgrade following the $24 billion, including debt, proposed acquisition for **C.R Bard**. The projected transaction, while significantly expanding BD's debt, presents compelling adjusted operating margins. **BD** shares were pressured following the announcement but ended the month up 1.9%

There were a number of ratings changes this month. On April 19, Cantor Fitzgerald downgraded **PerkinElmer** from "Overweight" to "Neutral." **NanoString Technologies** was downgraded by Morgan Stanley on April 20 from "Overweight" to "Equal Weight."

Diversified Instrumentation Stock Index

The *Index* climbed 3.7% for the month and is up 12.9% for the year to 232.09. All companies traded higher except for **Danaher**, which fell 2.6%. However, the company reported first quarter results on April 20 mostly in line with expectations. The company maintained its 2017 adjusted EPS guidance of $3.85–$3.95, and projected second quarter adjusted EPS to be $0.95–$0.98.

Corning recorded the strongest gain among *Index* companies in April, rising 6.9%. The company topped first quarter adjusted EPS expectations on April 25, driven by strength in its Optical Communications and Specialty Materials segments.

Similarly, **Honeywell**, **Illinois Tool Works (ITW**) and **Roper Technologies** all exceeded first quarter adjusted EPS estimates due to improved organic sales growth and operational efficiency, and raised full-year EPS outlooks.

On April 21, **Honeywell** raised the bottom range of its 2017 EPS outlook by $0.05 to $6.90–$7.10. On April 24, **ITW** advanced its 2017 adjusted EPS from $6.00–$6.20 to $6.20–$6.40. Second quarter adjusted EPS are expected to be $1.55−$1.65. **Roper** increased its 2017 adjusted EPS on April 28 from $8.82–$9.22 to $8.98–$9.28. Second quarter adjusted EPS is projected to be $2.16–$2.24.

Company	Date Rep.	Fiscal Quarter	20167 Adj. EPS	Analyst Consensus	Vs. Estimate	YOY Growth	2016 Adj. EPS
Laboratory Instruments and Products Stock Index							
HBIO	27-Apr	1Q	$0.00	($0.01)	$0.01	-100%	$0.02
PBIO	26-Apr	1Q	($0.26)	($0.23)	-$0.03	-13%	($0.23)
ILMN	25-Apr	1Q	$0.64	$0.64	$0.00	-10%	$0.71
TMO	26-Apr	1Q	$2.08	$2.02	$0.06	16%	$1.80
WAT	25-Apr	1Q	$1.46	$1.33	$0.13	16%	$1.26
Diversified Laboratory Stock Index							
DHR	20-Apr	1Q	$0.85	$0.84	$0.01	-21%	$1.08
GLW	25-Apr	1Q	$0.39	$0.35	$0.04	39%	$0.28
HON	21-Apr	1Q	$1.66	$1.62	$0.04	8%	$1.53
ITW	24-Apr	1Q	$1.54	$1.45	$0.09	19%	$1.29
ROP	28-Apr	1Q	$2.11	$2.00	$0.11	41%	$1.50

Click to enlarge

International

Asia Pacific equity markets traded mostly higher in April, led by Hong Kong's Hang Seng and South Korea's Kospi, which improved 2.1% each. Japan's Nikkei 225 advanced 1.5%. However, China's Shanghai Composite and Thailand's SET slipped 2.1% and 0.6%, respectively.

Prices for Pacific Rim companies in the ***IBO*** Stock Table were mixed. **HORIBA** recorded the largest gain among these companies, climbing 9.2%, while **JEOL** fell 6.3%.

Hitachi High-Technologies also contracted for the month, sliding 5.3%. This decline was primarily due to the announced purchase of **Oxford Instruments'** Industrial Analysis business on April 26 (see **Executive Briefing**).

On April 26, the company reported that fiscal year EPS ending March 31 climbed 12% to ¥292.08 ($2.57), which was ahead of the company's previous forecast due to improved operational performance. However, the company projected fiscal 2017 EPS to decline 13% to ¥254.49 ($2.31) despite stronger revenue growth.

All major European Indexes advanced in April except for the UK's FTSE 100, which declined 1.6%. Meanwhile, France's CAC and Sweden's OMX 30 climbed 2.8% and 2.5%, respectively.

Prices for all European companies in the ***IBO*** Stock Table advanced in April.

Oxford Instruments produced the largest gain, leaping 20.7%. Shares jumped 11.8% on April 26 after reporting the sale of its Industrial Analysis business to **Hitachi**. On April 27, **Oxford** was upgraded by Numis Securities from "Hold" to "Buy."

Biotage, **Horizon Discovery** and **Spectris** similarly recorded double-digit price increases in April, as shares advanced 19.1%, 15.3% and 10.5%, respectively. On April 27, **Biotage** reported that first quarter EPS climbed 57% to SEK 0.55 ($0.06) driven by strong demand for peptide products and an expanded direct sales network.

Sartorius, which advanced 2.4% for the month, reported on April 24 that adjusted first quarter EPS climbed 18% to €0.50 ($0.53). The company raised its full-year 2017 currency-neutral sales growth outlook from 8%–12% to 12%–16%, primarily due to recent acquisitions.

In ratings news, on April 7, HSBC Holdings downgraded **Merck KGaA** from "Hold" to "Reduce." On April 6, HSBC Holdings upgraded **Spectris** from "Reduce" to "Hold," and raised its price target from nearly 50% to GBX 2,500 ($31.21).\

Company: Exchange	Market Value (US M)	52 Week Range Low ($)	High ($)	Price 1/31/17	Change 1 Month	Change YTD	P/E (ttm)	EPS (ttm)
Laboratory Instruments and Products								
Agilent Technologies: n	$17,946	40.26	55.51	$55.05	4.1%	20.8%	35	1.56
Becton, Dickinson and Company: n	$40,711	157.60	186.40	$186.97	1.9%	12.9%	31	6.01
Bio-Rad Laboratories: n	$6,450	135.94	219.34	$218.26	9.5%	19.7%	230	0.95
Bio-Techne: o	$4,013	91.45	117.42	$107.08	5.3%	4.1%	51	2.10
Bruker: o	$3,919	19.59	28.79	$24.39	4.5%	15.2%	26	0.95
Enzo Biochem: n	$407	4.76	8.98	$8.80	5.1%	26.8%	13	0.68
Fluidigm: o	$144	4.31	11.05	$4.94	-13.2%	-32.1%	NM	-2.62
Harvard Bioscience: o	$83	2.25	3.90	$2.40	-7.7%	-21.3%	NM	-0.14
Illumina: o	$27,174	119.37	186.88	$184.86	8.3%	44.4%	37	4.99
Kewaunee Scientific: o	$64	16.20	27.60	$23.25	1.1%	-4.9%	14	1.65
Luminex: o	$805	17.64	23.75	$18.83	2.5%	-6.9%	59	0.32
Mettler-Toledo: n	$13,673	343.61	518.32	$513.42	7.2%	22.7%	36	14.22
MTS Systems: o	$886	41.53	59.00	$46.45	-15.6%	-18.1%	46	1.01
NanoString Technologies: o	$369	11.89	23.45	$17.48	-12.0%	-21.6%	NM	-2.34
Pacific Biosciences: o	$366	3.75	10.57	$3.94	-23.8%	3.7%	NM	-0.86
PerkinElmer: n	$6,543	45.35	60.35	$59.41	2.3%	13.9%	28	2.12
QIAGEN: o	$7,211	20.73	30.31	$30.09	3.9%	7.4%	89	0.34
Thermo Fisher Scientific: n	$65,157	139.07	168.76	$165.33	7.6%	17.2%	30	5.49
VWR: o	$3,727	24.42	31.75	$28.26	0.2%	12.9%	25	1.12
Waters: n	$13,722	128.90	174.68	$169.89	8.7%	26.4%	26	6.57
Diversified Laboratory								
AMETEK: n	$13,168	43.28	57.56	$57.20	5.8%	17.7%	26	2.19
Corning:	$27,004	18.21	29.08	$28.85	6.9%	18.9%	8	3.66
Danaher: n	$58,806	72.34	88.01	$83.33	-2.6%	7.1%	25	3.28
Honeywell	$100,073	105.25	131.34	$131.14	5.0%	13.2%	21	6.35
Illinois Tool Works: n	$48,193	98.32	142.82	$138.09	4.2%	12.8%	24	5.80
Roper Technologies: n	$22,543	159.28	217.88	$218.70	5.9%	19.5%	34	6.48
Teledyne Technologies: n	$4,840	91.08	135.89	$134.83	6.6%	9.6%	25	5.37
Xylem: n	$9,254	40.95	54.99	$51.41	2.4%	3.8%	35	1.45
Laboratory Instruments and Products				**289.69**	**5.6%**	**19.2%**	**48**	
Diversified Laboratory				**232.09**	**3.7%**	**12.9%**	**25**	
Dow Jones Industrial Average				20,940.51	1.3%	6.0%		
S&P 500				2,384.20	0.9%	6.5%		
NASDAQ Composite				6,047.61	2.3%	12.3%		
Region Company	Market Value (Local M)	52 Week Range Low (L)	High (L)	Price 1/31/17	Change 1 Month	Change YTD	P/E (ttm)	EPS (ttm)
Pacific Shares								
GL Sciences: t	¥11,932	560	1,381	¥1,170	6.9%	32.2%	10	¥117.63
Hitachi High-Technologies: t	¥645,018	2,654	5,040	¥4,295	-5.3%	-8.9%	15	¥292.08
HORIBA: t	¥263,086	3,960	6,550	¥6,520	9.2%	20.5%	21	¥306.38
JEOL: t	¥49,959	350	610	¥555	-6.3%	8.8%	NM	-¥3.17
Precision System Science: os	¥8,303	290	573	¥377	-1.3%	-7.4%	NM	-¥71.88
Shimadzu: t	¥540,441	1,344	1,961	¥1,888	6.7%	1.4%	23	¥81.10
Techcomp: hk	HKD 342	1.07	1.95	HKD 1.33	4.7%	3.1%	46	$0.00
European Shares (London)								
Abcam: l	£1,740	5.87	9.48	£8.57	3.8%	11.7%	43	£0.20
Halma: l	£3,646	8.54	11.31	£10.53	2.8%	17.3%	36	£0.29
Horizon Discovery: l	£162	1.04	2.14	£2.07	15.3%	43.8%	NM	-£0.10
Oxford Instruments: l	£454	6.10	9.61	£9.90	20.7%	35.2%	102	£0.10
Scientific Digital Imaging: l	£19	0.09	0.34	£0.26	9.4%	41.9%	15	£0.02
Spectris: l	£2,864	16.04	27.45	£27.60	10.5%	19.3%	321	£0.09
European Shares (Other)								
Biotage: st	SEK 3,268	25.90	52.00	SEK 50.50	19.1%	10.0%	31	SEK 1.63
Datacolor: s	CHF 116	510.00	745.50	CHF 700.00	7.7%	7.7%	19	CHF 36.36
Merck KGaA: g	€ 13,932	78.28	108.70	€ 107.80	0.9%	8.7%	29	€ 3.75
Sartorius: g	€ 6,133	58.83	82.00	€ 81.90	2.4%	12.5%	52	€ 1.58
Tecan: s	CHF 1,912	132.10	174.90	CHF 169.80	6.1%	6.9%	36	CHF 4.66

Click to enlarge

New R&D Labs Established Worldwide

The 2017 spring edition of ***IBO***'s report on new laboratories details the construction and groundbreaking of labs in numerous end-markets, such as pharmaceuticals, food testing and chemicals. The table below highlights new labs in the chemical, CRO and food industries, while new labs in the academic, government and pharmaceuticals sectors are detailed in the article.

Selected New Labs

	Organization	Location	Details	Timeline
Chemicals				
Technolgy and R&D center	Hexion	Kamp-Linfort, Germany	The new center will consolidate R&D from numerous other facilities located in the nearby city of Duisburg. An additional 1,600 m² (17,200 ft²) will be added on to an existing 1,400 m² (15,000 ft²) office/warehouse building. It will expand the company's capacity for R&D in technology, coatings, civil engineering, aerospace composites and electric casting applications.	Construction for the center is expected to be completed by mid-2018.
Application technology lab	BYK; HOMA	Shchyolkovo, Russia	Along with HOMA, a Russia-based dispersions and emulsions manufacturer, BYK opened a new application technology lab near Moscow. At over 125 m² (1,345 ft²), the facility will allow for BYK and HOMA to collaborate on accelerating innovative additive solutions for their customers in Russian-language regions, along with providing technical and customer support.	The lab opened its doors in December 2016.
R&D center	Sumimoto	Sao Paulo, Brazil	Sumimoto opened its first Latin America Research Center (LARC) for R&D of crop protection products, as well as to conduct field crop and efficacy trials. At BRL 12 million ($3 million), LARC covers 48 ha (5,166,677 ft²), including experimental fields, a greenhouse and various lab facilities. The company hopes the Center will provide new growth opportunities in Latin America, as the Brazilian region is the global leader for agrochemicals.	LARC opened its doors in November 2016.
CROs				
Preclinical medical device research lab	NAMSA	Shanghai, China	This marks NAMSA's third Asian Pacific facility, expanding the service company's investment in Chinese-based lab services. At 80,000 ft² (7,432 m²), the facility will contain numerous analytical tools for medical device quality and safety assurance, as well as performance evaluations for early-stage R&D. NAMSA also intends for the new facility to enable global partners to enter the Chinese market, as well as enabling Asian Pacific medical device customers to introduce products outside of China.	The Shanghai research lab opened in November 2016.
Expansion of food and water testing services	Eurofins	Wolverhampton, England	The £1.5 million ($1.9 million) project adds 1,000 m² (10,764 ft²) to Eurofins' Food and Water Testing UK & Ireland headquarters. Major developments include the expansion of food microbiology labs on the main floor, with water hygeine testing expanding into a new section on the first floor, complementing the current food chemistry and contaminants labs.	Construction is expected to be completed by fall 2017.
GLP-compliant bioanalysis lab	Recipharm	Uppsala, Sweden	Contract development and manufacturing organization Recipharm opened a 500 m² (5,382 ft²) purpose-built bioanalysis lab that is compliant with GLP. The $550,000 building is the largest GLP bianalysis lab in the Nordic region, and provides medicinal chemistry, synthesis and analytical preclinical development services to drug development companies working in clinical trials. The new lab will allow the company to increase its processing capabilities to analyzing 10,000 plasma samples per week.	The facility opened in November 2016.
Food				
R&D center	Cargill	Plymouth, MN	Cargill's new R&D center covers 100,000 ft² (9,290 m²) and is dedicated to research for improving food safety as well as the development of new, nutritious food ingredients. The $25 million center features numerous labs in molecular biology, and advanced analytical and materials research, as well as test kitchens and a pilot production plant.	The R&D center opened in November 2016.
Food testing R&D lab	Merieux NutriSciences	Gainesville, FL	At 22,700 ft² (2,109 m²), Merieux NutriSciences' new lab in Florida will expand food testing capabilities for safety, nutrition and QA. The new lab will also house panels and a sensory lab to evaluate how various foods are perceived by consumers, as well as a space for microbial research for food producers to help them understand the changes food undergoes when it is processed.	Construction is scheduled for completion in summer 2017.
Food testing and agricultural services	SGS	Uiwang City, South Korea	SGS opened a new agriculture and food testing lab near Seoul. The facility covers 2,340 m² (25,188 ft²) and offers comprehensive testing facilities, including food chemical and contaminant testing, and microbiological and DNA testing. Tests are conducted on products in various food categories, such as beverages, grains, meat, seafood, dairy, herbs and spices, tea and coffee, processed and canned goods, oils, fats, bottled water and confectionary.	The new lab opened in November 2016.

Click to enlarge

Academic

Along with the selected new labs mentioned in the above table, a new facility at Lawrence Berkeley National Laboratory (Berkeley Lab) in California is in the works. The Integrative Genomics Building (IGB) will unite

researchers from the DoE Joint Genome Institute with scientists from the Systems Biology Knowledgebase to create a biosciences presence at Berkeley Lab. Expected to cost $91.5 million, the four-story IGB will house approximately 300 staff and researchers, and cover an estimated 77,000 ft^2 (7,153 m^2). The facility will serve as a hub for R&D related to microbials, biofuels, renewable chemicals and genomics. The building is expected to be completed in 2019, with the groundbreaking having taken place at the end of January 2017.

Also focusing on biology and the life sciences is a new lab currently under construction at the University of California, San Diego (UCSD). The Biological and Physical Sciences Building broke ground October 2016 and is expected to open in June 2018. With a $111 million price tag, the seven-story, 128,000 ft^2 (11,892 m^2) building will be used for research in a variety of fields, including neurobiology and biochemistry. The basement will house state-of-the-art equipment, including an NMR resource from the NIH.

Another life sciences research center is opening at Yale, expected to be completed in 2019 at the University's Gibbs Laboratory site in New Haven, Connecticut. The new Science Building will house the Molecular, Cellular and Developmental Biology department, which is part of the larger Molecular Biophysics and Biochemistry department of the University. Administrative, teaching and research will take place in the 238,000 ft^2 (22,111 m^2) building, and there will be specialized areas for research in plant biology and quantitative biology, as well as chemistry labs for organic synthesis and a cryo-electron microscopy facility in the basement for the study of biomolecules. The new center is estimated to cost $200 million, according to *Yale News*.

Government

The US government is also putting an emphasis on chemistry research with the construction of three new centers, including a new chemistry lab, at the Pacific Northwest National Laboratory in Richland, Washington. The *Tri-City Herald* reports that, collectively, the new office, collaboration center and chemistry lab buildings will total 566,500 ft^2 (52,630 m^2) and will cost close to $30 million. The new chemistry lab is planned to cover 16,468 ft^2 (1,530 m^2) and will provide researchers with ample space for wet chemistry work, including radiation detection. At 24,000 ft^2 (2,230 m^2), the $9.8 million collaboration center will serve as a meeting hub for scientists and thought leaders. Construction began October 2016 and is estimated to finish by 2018.

The National Cancer Institute (NCI) is building a new epidemiology and genetic research lab at the John Hopkins Montgomery County Campus in Maryland. At 70,000 ft^2 (6,503 m^2), the new building will bring together scientists and researchers currently working at separate research centers 25 miles apart. The labs in the new building will provide space for genomics research in cancer, translational genomics, genomic susceptibility and genetic epidemiology. NCI plans to begin operations in the building in mid-2019. John Hopkins is the largest recipient of extramural NIH funding.

The British government is also making strides in cancer research, with the London Borough of Sutton making a £14 million ($17.4 million) investment in creating a new, world leading cancer research institute. Over 22,000 m^2 (236,806 ft^2) of land was purchased by the Sutton Council, and is backed by the Royal Marsden NHS Foundation Trust and the Greater London Authority. Creating a London Cancer Hub is expected to be a £1 billion ($1.2 billion) endeavor and is forecast to cover 265,000 m^2 (2,852,436 ft^2), with the new cancer institute serving as the crucial first step in undertaking the project. Eventually, the Cancer Hub will serve as a central facility for scientists, doctors, researchers and life science companies focused on innovations in cancer research.

The Jackson Laboratory's new Center for Biometric Analysis in Maine will focus on the research of cancer and other diseases, as well. The *Bangor Daily News* states that the 21,000 ft^2 (1,951 m^2) building is forecast to create between 150 and 200 new jobs, and is scheduled for completion in January 2018. Construction costs are approximately $14 million, with an additional $7 million budget for the purchase of analytical instruments and high-end imaging devices, totaling $21 million. Research in the new Center will include cancer, Alzheimer's disease and addiction, with a "hospital for mice" in which researchers will conduct possible treatments and diagnose illnesses.

Pharmaceuticals

Disease research is an important topic of research in the pharmaceutical industry as well, as exemplified by Pfizer expanding its Missouri operations through the construction of a $200 million R&D building in Chesterfield. Expected to create 80 jobs, the new facility will zero in on R&D pertaining to biologic therapies, as well as developing vaccines for clinical trials. Covering 32 acres (129,499 m^2), the new R&D site will be completed in 2020.

Researching and developing new medications is also a priority for Janssen Pharmaceutica, which received a €42.8 million ($46.1 million at €0.92= $1) investment from Johnson & Johnson to create a new lab on Janssen's Beerse campus in Belgium. Forecast to be operational by 2020, the 10,400 m^2 (111,945 ft^2) new lab is entitled Project LION (Labs-In-One-Network) and is part of the Small Molecule Analytical Development and Pharmaceutical Sciences departments, which conduct QA and stability tests on new medications, as well as develop optimal methods of drug administration.

Canadian-owned Apotex is constructing an R&D and manufacturing center expected to be completed in early 2019 to expand operations in the US. The new $50 million center will also serve as the base for packaging operations for Aveve Drug Delivery Systems. Covering 302,000 ft^2 (28,057 m^2), the new facility is the largest US investment Apotex has made, and will be one of the largest manufacturing sites in South Florida. The establishment of the site is expected to result in 150 new jobs.

Oxford Instruments Exits Atomic Spectroscopy Market

London, UK 4/26/17; Tokyo, Japan 4/26/17—Oxford Instruments (OI) a provider of high-technology solutions, has agreed to sell its Industrial Analysis business to Hitachi High-Technologies (HHT) for £80 million ($116 million at £0.69 = $1) excluding cash and debt. The Industrial Analysis business, comprised of XRF, LIBS and OES technologies, recorded £49.5 million ($75.0 million at £0.66 = $1) in sales in fiscal 2016 and an adjusted operating profit of £3.3 million ($5.0 million). "The sale of the Industrial Analysis business follows the continued strategic review of our portfolio and is a key element in the ongoing transformation of Oxford Instruments," stated OI Chief Executive Ian Barkshire. "This transaction creates a more focused NanoTechnology Tools and Service business with some improvement to operating margin, and will bring net debt to EBITDA leverage after completion to below one times on a pro-forma basis for the year ended 31 March 2017." HHT commented that the acquisition adds handheld atomic spectroscopy systems to its Scientific Systems Business portfolio and broadens its sales network. According to HHT, revenues for the acquired business declined 7.1% in fiscal 2016 to ¥6,790 million ($48.5 million at ¥140 = $1). The Industrial Analysis management team will join Hitachi High-Technologies. The transaction is expected to close in July.

*Oxford Instruments cited challenging end-markets, notably metals, for slower growth for its Industrial Technology business in fiscal 2016. Under Mr. Barkshire, who took over as CEO a year ago (see **IBO** 4/30/16), OI has also divested its Superconducting Wire business (see **IBO** 11/30/16). In 2015, the company sold its Austin Instruments cryopump business (see **IBO** 12/31/15). In the atomic spectroscopy market, HHT currently offers benchtop XRF, atomic absorption spectrometers, ICP, ICP-MS systems as well as inorganic analyzers. HHT and OI compete in the benchtop XRF market.*

AMETEK to Buy MOCON

Berwyn, PA and Minneapolis, MN 4/17/17—AMETEK, a manufacturer of electronic instruments and electro-mechanical devices, has signed a definitive merger agreement with MOCON. AMETEK will acquire all outstanding shares of MOCON for $30 per share, or an aggregate value of $182 million. The price represents a 39% premium over MOCON's April 13 closing share price. MOCON provides lab and field gas analysis instruments, recording 2016 sales of $63 million (see Bottom Line). "They are the global leader in gas analysis instrumentation for package and permeation testing. Its products and technologies nicely complement our existing gas analysis instrumentation business, and provides us with opportunities to expand into the growing food and pharmaceutical package testing market," stated AMETEK CEO David A. Zapico. The acquisition is expected to close in the late second quarter or in the third quarter.

MOCON's business is comprised of four divisions: Packaging Testing Products and Services, consisting of headspace analyzers, leak detection equipment and gas mixers; Permeation Products and Services; Microbial Detection Products; and Industrial Analyzer Products and Services, made up of gas analysis and monitoring instruments, including online GCs and total hydrocarbon analyzers. The Industrial Analyzer Products and Services solutions will

add to AMETEK Process Instruments' online analytical instrument products, which include online gas analysis systems.

Pfeiffer Vacuum Battles Takeover Bid

Asslar, Germany 2/15/17; 2/27/17; 3/15/17; 3/31/17; 4/24/17; Maulburg, Germany 1/24/17; 3/17/17; 3/29/17; 4/25/17; 4/27/17—Publicly held Pfeiffer Vacuum, a manufacturer of vacuum solutions, is urging shareholders to reject a public tender offer from vacuum pump company Busch, concluding that the unsolicited proposal does not offer a premium for majority ownership and is below the current share price.

The March offer price of €110.00 ($122.22 at €0.90 = $1) per share is a 14.3% increase from Busch's initial offer, made in January, of €96.20 ($106.89) per share. At the time of the original offer, Busch held just under a 30% stake in the company. Regarding the initial offer, Pfeiffer Vacuum told shareholders that it did not offer a "customary premium for acquiring such a controlling interest," the premium was below comparable transactions, and "the Busch Group may actively interfere with Pfeiffer Vacuum's strategic setup." When making the second offer, Busch stated that it plans to operate Pfeiffer Vacuum as a listed company, separate from its own business, with no change to business operations.

Shareholders are expected to vote on the offer at Pfeiffer Vacuum's annual general meeting on May 23, at which the company is urging a strong shareholder turnout. "In order to reaffirm our interest in a trustful relationship, we proposed a number of binding and forward-looking guarantees to the Management of Pfeiffer Vacuum outlined in a Business Combination Letter, on condition that the Management constructively supports the offer, at least the strategic impetus of it," said Sami Busch, a managing partners of Busch. As part of the offer, Busch would chair Pfeiffer Vacuum's Supervisory Board. Pfeiffer Vacuum stated on April 24 that is has not ruled out cooperation with Busch. But the company wrote, "To this day, the Busch Group has not even begun to outline a suitable scheme as to what form a possible concrete cooperation between the two companies would take."

*The tender offer runs April 12 through June 1. According to Busch, the latest offer is a 28% premium over the volume-weighted three-month average price prior to the January offer. On April 24, Pfeiffer Vacuum stated the offer is an 8.3% discount of its share price as of April 11, the last day prior to the second offer. Busch has held an over 25% stake in the company since fall 2015. Busch's latest offer is valued at €1.1 billion ($1.2 billion). Pfeiffer Vacuum's 2016 revenues increased 5.0% to €474.2 million ($526.9 million) (see **IBO** 3/31/17). The company's product portfolio primarily consists of high-vacuum pumps, including turbo pumps used in analytical instruments. It also offers the PrimaPlus quadrupole MS and MS-based gas analysis systems.*

MTS Completes Chinese Investigation

Eden Prairie, MN 4/10/17; Washington, DC 4/10/17—Announcing its delayed 2016 financial results and its first quarter results (see **IBO** 4/15/17, MTS Systems disclosed that it has completed the internal investigation of the possible violation of the company's Code of Conduct by employees in China (see **IBO** 11/30/16). "The investigation, overseen by the Audit Committee of our Board of Directors, and conducted using external legal counsel and forensic experts, confirmed that certain employees involved with our China Test business violated our Code of Conduct by starting a company that competes with MTS in the low end of the materials test market within China. Importantly, the investigation did not find any evidence of intellectual property theft," said MTS Systems President and CEO Dr. Jeffrey A. Graves. He stated that as a result of the investigation the company will make changes to its processes and controls related to Code of Conduct and compliance policies and procedures, adding "with particular focus on those related to third-party sales of our products and local sourcing activities." Among the actions being taken to address the deficiencies is the creation of a Chief Risk and Compliance Officer position. According to an SEC filing, the former China Test leader and other senior management were identified as having violated the conflict of interest provisions of the Code of Conduct.

In its annual SEC filing, MTS Systems wrote, "[W]e have identified opportunities to enhance our processes and

*controls to further address the challenges presented by the China operating environment." In addition, the filing stated, "To address the challenges presented by the findings of the investigation of our China operations, we are exploring multiple business alternatives to address the low-end materials market." In 2016, the company made changes to its processes and controls in response to a finding of material weaknesses in its internal control over financial reporting in 2015 (see **IBO** 4/15/16).*

Avantor Expands cGMP Chemicals Business

Center Valley, PA 4/20/17—Avantor, a supplier of ultra-high-purity materials, has acquired Puritan Products for an undisclosed amount. Puritan Products provides cGMP buffers and solutions for biopharmaceutical customers, as well as high-purity chemicals for research and electronic materials customers. "The addition of Puritan is a key next step in our growth plans, as it provides access to new customers in the US and Europe, a broader portfolio of high-purity products for the Biopharma, Research and Electronic Materials industries and access to additional capabilities, including new cGMP operations and talented new colleagues," commented Avantor CEO Michael Stubblefield.

Puritan Products manufactures and supplies a variety of chemicals, including acids, bases, solvents and salts, and chemical blends. Avantor's laboratory chemical brands are J.T. Baker and Macron Fine Chemicals. Puritan was previously owned by Zabel Capital.

Australasia Consumables Supplier Acquired

London, UK 4/20/17—Technical products firm Diploma has acquired Abacus for £13.6 million ($19.4 million at £0.70 = $1), including net debt, and deferred consideration of up to £2.1 million ($3.0 million). With 44 employees at locations in Australia and New Zealand, Abacus supplies clinical diagnostics instruments and consumables to the pathology and life sciences markets. For the year ending June 30, 2016, Abacus generated revenues of £13.6 million ($20 million). Abacus will join Diploma's Life Sciences business.

For the life sciences, Abacus is a distributor for a number of companies, including Baker Company, Bio-Rad and Merck Millipore. Part of Diploma's Life Sciences division, Diploma Healthcare distributes specialty surgical and diagnostic products for health care and clinical laboratory customers.

Tabletop SEM

In contrast to light microscopy, which employs visible light, electron microscopy uses accelerated electron beams to illuminate and examine objects. Given that the wavelength of an electron could be 100,000 times shorter than that of visible light, the resolving power of electron microscopes is as low as 50 pm, whereas for light microscopes it is about 100 nm.

There are two major types of electron microscopes: Transmission Electron Microscopes (TEMs) and Scanning Electron Microscopes (SEMs). TEMs, which are used more in the life sciences, focus a beam of electrons through a finely cut sample. SEMs scan a beam of electrons across a rectangular area (so-called raster scanning) of a sample, which can range from microchips to living cells.

Upon electron bombardment of a specimen, the incoming electrons interact with atoms in the sample and lose energy. This energy is released in various forms, including secondary electrons, backscattered electrons, x-ray emission and heat. To construct an image, SEMs mainly rely on secondary electrons and backscattered electrons.

Since their inception in the 1930s and 1940s, electron microscopes have been designed to target high-end research applications. However, in response to growing number of customers seeking higher-resolution microscopy, tabletop

SEMs entered the market in April 2005, led by Hitachi High-Technologies. With single-digit nanometer resolution, these instruments are less powerful than their full-size counterparts but more powerful than even the best light microscopes. Furthermore, they are cheaper, smaller and much easier to operate than traditional SEMs and TEMs.

Numerous industries deploy tabletop SEMs, including semiconductor and electronics, materials and metallurgy, life sciences, minerals and mining, industrial manufacturing, forensics, environmental testing and academia. In many cases, these devices are involved in the QA and QC processes for which an inspection, rather than a meticulous analysis, of the sample or product is required.

The total market for tabletop SEMs was close to $100 million in 2016. Although this segment comprises less than 5% of the total electron microscopy market, it grew 9.0% last year. The growth is driven by ever-tightening regulatory requirements across industries, increasing standards in developing countries, in particular, China, and the popularity of nanotechnologies.

The top supplier of tabletop SEMs is Hitachi High-Technologies, offering two lines of products, the TM3030 and TM3030Plus. The second leading competitor, Phenom, provides a more diversified product portfolio, addressing different market niches with each. The company sells the Phenom Pure model for entry-level customers, the Phenome Pro and Phenome XL as the standard models, the Phenome ProX model for x-ray analysis, the Phenome GSR model for forensics applications, and the Delphi, which combines fluorescence and electron microscopy. JEOL released the third generation of its desktop SEM product, the JCM-6000Plus NeoScope, in August 2015. The big three, Hitachi High-Technologies, JEOL and Phenom, together control over 50% of the market. Other major suppliers are Keysight Technologies, Nikon and Seron Technologies.

Tabletop SEM at a Glance:

- ***Leading Suppliers:***
    - Hitachi High-Technologies
    - Phenom
    - JEOL
- ***Largest Markets:***
    - Electronics
    - Materials
    - Academia
- ***Instrument Cost***
    - $35,000–$125,000

Pharmaceuticals

Pharmaceuticals: Companies are accelerating innovation in the vaccine technology sector, an estimated $35 billion market that is growing by about 8% annually. Four companies dominate the vaccine market: GSK, Merck, Pfizer and Sanofi, which collectively comprise approximately 80% of global vaccine revenues. According to the "Access to Vaccines Index," the previously mentioned four companies, along with Johnson & Johnson, Daiichi Sankyo, Takeda and India's Serum Institute, are conducting R&D for 89 vaccines pertaining to 35 diseases. About 50% of R&D in the field is for optimizing existing vaccines, while the remainder is dedicated to innovating new vaccine technologies and products. Diseases that are key drivers of vaccine R&D include meningococcal and pneumococcal disease, influenza, respiratory syncytial virus and human papillomavirus. Currently, vaccines are commercially available for an estimated 30 diseases. Companies are working to develop vaccines for diseases such as HIV and AIDS, and elder people whose immune systems may be weaker than those of children and teenagers, as well as RNA- and DNA-based

vaccines.
Source: *Financial Times*

Health Care

Despite a 14% decline in overall private equity deal value, investments into the health care industry reached a 10-year high in 2016, with health care private equity deals reaching $36.4 billion, almost a 60% increase from 2015. The MultiPlan (a national-managed health care preferred provider organization) and TeamHealth (an American hospital staffing firm) deals accounted for almost 33% of total investments, with deal values of $7.5 billion and $6.1 billion, respectively. The majority of investments were focused on public-to-private deals, with three out of the four largest deals in 2016 being public-to-private, as well as outsourced contract services, IT and retail-based clinics. By sector, provider and related services deals totaled $14.9 billion, payer and related services deals reached $10.5 billion, deals for biopharma and related services were $8.1 billion, medtech and related services deals totaled $2.8 billion, and health care IT activity topped $15.5 billion.

North America was a hotspot for private equity activity in 2016, with nine of the top ten deals involving US companies. In total, North American deal value jumped to $28.4 billion in 2016, over three times what it was in 2015, even though the number of deals decreased 13% to 101. Along with the MultiPlan and TeamHealth deals, five other deals were valued at $1 billion or more, which largely drove the increase in deal value. In Europe, deal value fell drastically to $4.6 billion in 2016, a 42% decrease. The number of deals also decreased 12.2% to 49.

In contrast, Asia Pacific private equity deals in health care were healthy in 2016, with total deal value of $3.2 billion. Although this is a 35.0% decrease from 2015, this is largely due to the fact that there was no significant “megadeal” in 2016 like there was the year before (i.e., the $3.3 billion buyout of WuXi PharmaTech). Ten deals in Asia Pacific were valued at over $100 million, and $700 million was utilized for private investments in public equities. The majority of Asia Pacific deals were made in the health care provider sector, with 113 deals made in 2016, a 21.5% increase.

The International Monetary Fund (IMF) predicts that global expenditures in health care will increase 6% each year to $10 trillion in 2020. The US is the largest health care market in the world, with spending comprising 18% of GDP and IMF predicts the US market itself will be over $4 trillion in 2020.

Source: *Bain & Company*

Chemicals

According to *Chemical & Engineering News*’ (*C&EN*) 2017 capital and R&D spending survey, chemical companies cut R&D expenditure costs last year. Comprised of data from 19 leading chemical companies in the UK and Europe, the firms collectively decreased R&D spending by 5.2% to $9.7 billion, which includes cutbacks on construction, infrastructure and equipment spending. Specifically, spending for new plants and equipment fell 15.3% to $18.6 billion. *C&EN* data for 18 of the 19 companies spans a 10-year period, and according to their estimates, R&D spending for the 18 companies has increased marginally more than 1% over the last decade, while R&D budgets increased by 21% without taking inflation into account. R&D as a percentage of sales, however, increased to 3.5% in 2016, the highest figure it has been at in the past decade.

BASF, 3M, DuPont, Dow Chemical and Evonik Industries were the top 5 companies with the highest R&D spending, with expenditures of $2.06 billion, $1.74 billion, $1.64 billion, $1.58 billion and $485 million, respectively. Celanese, W.R. Grace, Albemarle, DuPont and Eastman Chemical had the largest decreases in R&D spending from 2015, with expenditures dropping 34.5%, 29.6%, 22.3%, 13.5% and 12.7%, respectively. Solvay was a distinct anomaly in the group of companies surveyed, as the company’s R&D spending jumped 10.1% in 2016.

Source: *C&EN*

UK

In 2015, R&D expenditure in the UK increased 3.9% to £31.6 billion ($38.5 billion), with the majority of the growth driven by spending in the business sector, for which it grew 5.6% to £20.9 billion. Total R&D expenditure, which includes investments from the business, higher education, government and private nonprofit sectors, as a percentage of GDP increased marginally to 1.68%, but exceeded 2014 R&D expenditure by £1.0 billion in constant prices excluding inflation.

The business sector accounted for 66% of total R&D expenditure, with pharmaceuticals R&D comprising £4.2 billion, and machinery and equipment comprising £1.0 billion. Higher education had expenditures totaling £8.0 billion, accounting for 25% of total R&D expenditure, a 2.6% increase. Although private nonprofit organizations make up the smallest portion of R&D performance in the UK, comprising 2% of total R&D expenditure, the sector itself had the greatest increase in R&D expenditure in 2015. Total R&D expenditure in this sector was £0.6 billion, a 15% increase from 2014. Government spending, the only sector to decrease R&D expenditure in 2015, fell 4.5% to £2.1 billion, accounting for 7% of total R&D expenditure. Overseas funding represented £5.4 billion.

Source: *Office for National Statistics*

South Africa

In 2014/2015, Gross Expenditure on R&D (GERD) in South Africa increased 8.1% to ZAR 29.345 billion ($2.24 billion), or ZAR 23.257 billion in constant prices, with the greatest R&D investment coming from the business enterprise sector. As an indicator of R&D intensity ("the total intramural expenditures on R&D performed in the country in a given year relative to GDP"), GERD was 0.77%, up four percentage points from 2013/2014, although R&D expenditure as a percentage of GDP decreased from 2.2% to 1.5% in 2014/2015.

R&D expenditure increased across all sectors (business enterprise, nonprofit, government, science councils and higher education), with the largest increase coming from the business sector, which increased 24.4% to ZAR 1.508 billion in 2015. The manufacturing industry within the business sector represented the second largest R&D expenditure with 33.9% of Business Expenditure on R&D (BERD) totaling ZAR 4.501 billion, an 18.7% increase. Mining followed, with a BERD of 10.1%, down four percentage points from the year before, totaling ZAR 1.340.

The largest source of funding was the government, including higher education and science councils, which accounted for 43.9% of total GERD, or ZAR 12.873 billion. Business represented 41% of GERD, with spending of ZAR 11.981. R&D personnel increased 5.2% to 72,400, with the higher education sector comprising the vast majority of researchers at 44,457.

Biotechnology and nanotechnology R&D represented 5% and 3% of GERD, respectively. The highest R&D spending was for engineering at 19%, with medical and health sciences following closely, representing close to 19% of GERD. Basic research accounted for 7% or ZAR 845.2 million, a 12.7% decrease, while applied research represented 57% or ZAR 7.541 billion, a 23.9% increase.

Source: *The Centre for Science, Technology and Innovation Indicators*

Brazil

The Brazilian federal agency for higher education funding announced recently the formation of the "More Science, More Development" (MSMD) program to replace the previous "Science Without Borders" initiative. The MSMD program will generate structural changes to the way academic institutions receive and allocate funding by giving universities more autonomy. Previously, government funds for higher education were allocated to specific people or individual departments, but with the onset of MSMD, universities will have more control over where the funding goes. The new program is expected to stimulate greater collaborations with foreign researchers and research institutions, as well as a stronger relationship amongst Brazilian universities. MSMD requires individual academic institutions to collaborate on "internationalization" strategies with foreign partners to secure mobility funding. Universities are obliged to submit proposals by October, with funding figures for MSMD expected to be released with the publication of Brazil's 2018 budget.

Source: *The PIE News*

Broad-based Companies

Company Announcements

In a January **SEC** filing, **Thermo Fisher Scientific** announced the transfer of its plastics for cell culture and vaccines/biologics; sample preparation and analysis; and production chemicals product lines from its Laboratory Products and Services segment (LPS) to its Life Sciences Solutions segment (LSS). The biochemical product line was transferred from LSS to LPS.

For the fiscal third quarter ending December 31, 2016, sales for **Hitachi High-Technologies**' Science and Medical Systems improved 0.7% to ¥42.2 billion ($385.5 million) to account for 27% of company revenues (see ***IBO*** 1/31/17). Excluding currency, sales grew roughly 9%, driven by acquisitions and strong demand for clinical analyzers in China. Scientific Instruments sales grew in the low single digits organically, while Electron Microscopes sales contracted in the upper single digits due to weakness in Europe.

Fourth quarter 2016 sales for **Sartorius' Lab Products & Services Division** (LPS) grew 9.2%, 7% organically, to €86.9 million ($93.4 million) (see ***IBO*** 2/28/17). For the year, LPS sales advanced 6.5%, 5% organically, to €325.3 million ($361.4 million) to account for 25% of revenues. Growth was driven by strong demand for lab filters and microbiological test consumables. Currency-neutral LPS sales in the Americas, EMEA and Asia Pacific expanded 17.3%, 5.9% and 4.7%, to account for 22%, 50% and 28% of LPS revenues, respectively. LPS orders climbed 9.9% excluding currency. The company projected 2017 LPS sales to grow 3%–7% organically.

In March, **Antec Leyden**, a provider of electrochemical detectors for LC and MS, announced a name change to **Antec Scientific**.

Judges Scientific's 2016 revenues grew 2.0% to £57.3 million ($77.4 million), including 2% organic growth (see

IBO 3/31/17). Organically, orders rose 2.9%. Materials Sciences revenues were flat to make up 49% of revenues. Vacuum revenue grew 4.5%. Adjusted operating profit declined 2.4% to £28.2 million ($38.1 million).

Halma announced in April that Finance Director Kevin Thompson will retire next year.

In April, **Xylem** announced that beginning in the second quarter it will combine its Analytics, **Sensus** and **Visenti** businesses, and report the results as such.

Luminex announced in April that Jay B. Johnston will retire from the Board in May.

Danaher announced in April that its Pall Water division will now operate in affiliation with the companies that form Danaher's Water Quality Platform.

Hach, a **Danaher** company**,** announced in April a collaboration with **Royal HaskoningDHV**, under which its analytical instrumentation is certified to test the quality of water treated with **Royal HaskoningDHV'**s Nereda technology. The companies will also collaborate.

In April, **BD** named Tom Polen as president. He currently serves as executive vice president and president of **BD Medical**.

GE Healthcare reported in its first quarter conference call that Life Sciences orders grew 15%, with Bioprocess orders up 15%, driven by an order for the Kubio flexible facility product.

MS & LC/MS

Company Announcements

In March, **908 Devices** closed $20 million in a growth equity funding round. New investors include **Tao Capital Partners**.

In 2016, **Microsaic** revenues increased 8.7% to £0.8 million ($1.1 million) as unit volumes increased 17%. However, the results were below expectations. Operating loss declined 13.3% to £3.3 million ($4.5 million). The company announced that it is now focused on the pharmaceutical market, including bioprocessing and diagnostics.

Microsaic announced in April a collaboration with software firm **SCPA** (**Software für Chromatographie aunder Prozess-Analytik**), integrating its 4000 MiD compact MS with SCPA's PrepCon 5 preparative data and control software.

SCIEX announced in March that **the Children's Medical Research Institute** opened **ProCan, the Australian Cancer Research Foundation International Centre for the Proteome of Human Cancer**. The Center, set up through an alliance with SCIEX, will help industrialize the process of analyzing tissue samples and identifying cancer biomarkers.

In March, **Proteome Sciences** announced that 2016 sales for Tandem Mass Tags (TMTs), which enable identification and quantitation of proteins in different samples using tandem MS, grew 57% to £1.4 million ($1.9 million). TMTs are sold by **Thermo Fisher Scientific**. Proteome Sciences is currently working on a new tag structure for 16-plex reagents, as well as 10-plex reagents for use with lower-resolution MS.

In April, **Syft Technologies** announced the listing of its shares on New Zealand's **Unlisted** trading facility. For the year ending March 31, 2016, company revenues rose 15.7% to NZD 6.4 million ($4.4 million).

In April, **Becton, Dickinson** announced it will globally distribute MBT Biotargets, disposable plates, and the MBT Sepsityper sepsis management kit, as well as standard reagents and other products, for use with **Bruker**'s MALDI Biotyper systems. The products are part of a complete portfolio for addressing antimicrobial resistance.

Product Introductions

In March, **Waters** launched Proteolabels software, an extension for Progenesis QI for proteomics, which supports studies involving stable isotope labels. It is available through an exclusive agreement with **Omic Analytics**.

Waters in March released the METLIN MS/MS Library for Progenesis QI for implementation of a METLIN library, a metabolomics database, directly within the Progenesis QI software.

In March, **SCIEX** introduced the Routine Biotransform Solution, comprised of the ExionLC AD system, X500 QTOF System and Metabolite Software 2.0 software. It also released the Advanced Biotransform Solution, based on SWATH Acquisition using the TripleTOF 6600 and MetabolitePilot Software 2.0. The company called the MetabolitePilot Software 2.0 the first commercial software to automate protein catabolite identification.

In April, **Advion** released the iASAP (inert Atmospheric Solids Analysis Probe) for easy sampling and fast analysis of air-sensitive compounds such as metal catalysts and organometallics.

Biognosys introduced in April SpectroDive 8.0, which supports library generation from DDA (Data Dependent Acquisition) and subsequent panel generation for data acquisition with MRM and PRM workflows.

Biognosys relaunched in April its blood proteomics portfolio. Its PlasmaDive and PlasmaDeepDive Assay Panels are now offered in 3 sizes: 20, 48 and 96 samples, and come with a license for SpectroDive software. Stable isotope labeled standard reference peptides are now available separately as PlasmaDive Reference Peptides and PlasmaDeepDive Reference Peptides kits.

In April, **Bruker** launched CE-IVD MBT STAR Carba IVD kits for its MALDI Biotyper for functional testing of high-risk Carbapenemase Antibiotic Resistance, calling it the first validated diagnostic assay MS-based resistance testing on the market. The company also released the CE-IVD MBT Mycobacterial IVD Library and Software module, which make mycobacteria identification available for clinical diagnostic purposes. In addition, the application portfolio of the MBT Subtyping Module was increased.

Life Science Instruments

Nucleic Acid–based

Company News

JN Medsys named in January **Research Biolabs** as the distributor for its Clarity digital PCR system in Singapore and Malaysia.

Circulomics announced in February a $1.5 million Small Business Innovation Research Phase II grant from the **NIH/National Institute of General Medical Sciences** to develop a single-molecule platform for DNA/RNA sample-quality analysis based on its PicoSep technology. Sizing occurs through a hydrodynamic mechanism based on the flow behavior of DNA in small buffer-filled microcapillaries. The first products to be developed will be kits for RNA/DNA integrity analysis and high–molecular weight DNA sizing. The products are an alternative to CE.

In February, PCR firm **InstantLabs Medical** announced that **Angeon Group** has taken a controlling interest in the company and that Angeon CEO Joseph E. Gargan was named CEO. In connection with the changes, the company's name was changed to **InstantLabs**.

Product Introductions

Thermo Fisher Scientific launched in March the Applied Biosystems QuantStudio 5 Real-Time PCR System for Human Identification, designed to deliver efficient performance with a smaller footprint and lower annual maintenance costs.

In March, **NanoString Technologies** introduced the nCounter Low RNA Input Kit for sample inputs from 1–10 ng, utilizing Multiplexed Target Enrichment; the nCounter Vantage 3D RNA MAPK-P13K Pathways Panel, a curated gene set measuring transcriptional activity of the MAPK and PI13K pathways; and the nCounter Myeloid Innate Immunity Panels for gene expression profiling of human or mouse RNA.

In April, **Bionano Genomics** released for its Saphyr systems the Bionano Access 1.0, which includes Bionano Solve 3.0, software tool, as a free download. Bionano Access centralizes all software tools required to generate, edit, analyze and visualize Bionano maps, and comes with a variant annotation pipeline. Bionano Solve 3.0 assembly pipeline allows users to do structural variaion analysis or hybrid scaffolding.

Cell-based

Company News

AcouSort, a Swedish developer of acoustophoresis technology for separating, enriching and cleaning cells and other particles for bioanalysis, listed its shares on Sweden's **AktieTorget** trading platform in January.

In January, flow cytometry firm **Cytek Biosciences** completed a $12 million Series B financing round. It previously completed a $12.3 million Series A financing round.

In February, **MIMETAS** and **Molecular Devices** announced a combined marketing effort for their respective OrganoPlate organ-on-a-chip platform and ImageXpress Micro Confocal high-content imaging system.

Berkeley Lights in March named Eric D. Hobbs, PhD, senior vice president of Operations and Consumables, as CEO and a Board member. Former CEO Igor Khandros, PhD, remains on the Board.

BIOKÉ, a business unit of **Cell Signaling Technology Europe**, announced in March it will exclusively distribute **ACEA Biosciences**' xCELLigence Cell Analyzer in Benelux countries.

In April, *Globes* reported that MRI company **Aspect Imaging** closed a $30 million funding round. In total, the company has raised $150 million.

Product Introductions

MR Solutions launched in March the 9.4 T cryogen-free preclinical scanners for the cardiovascular sector. It can incorporate PET and SPECT capabilities.

NanoString Technologies introduced in March the Intracellular Compatible Universal Cell Capture Kit, which enables the nCounter Vantage 3D RNA:Protein Immune Cell Signaling Assay with as few as 25,000 cells for expression analysis of 770 RNA and 26 key intracellular proteins.

In March, **Cytek Biosciences** launched the compact DxP Athena flow cytometry system, designed to make the benefits of flow cytometry more readily available to a larger number of researchers. It features multiple configurations of up to 3 lasers and 13 colors, as well as a 96-well plate loader option.

IntelliCyt, a **Sartorius** company, released in March the Cy-Clone Plus assay system for ranking and selection of clones for cell line development using its iQue Screener PLUS platform.

In April, **GE Healthcare Life Sciences** launched the IN Cell Analyzer 6500*HS*, its third generation laser-based confocal imaging system for high-content assays, featuring increased throughput. The company also introduced the IN Cell Analyzer 2500*HS*, a wide-field high-content imaging system, equipped with deconvolution. Also released was the Carta image analysis software for the IN Cell Analyzer systems, incorporating advanced segmentation algorithms designed to reliably extract information needed for downstream phenotypic analysis without the need for complex pre- and post-image processing operations.

Solentim introduced in April the VIPS (Validated In-situ Plate Seeding) single-cell dispensing system for

microplates, designed for use in generating clonally derived cell lines. Its SMART LD technology images a well immediately after a cell dispensing event and automatically confirms whether a single cell was dispensed.

Protein-based

Company News

In April, **InDevR** announced an exclusives sales, marketing and customer support agreement with **I&L Biosystems** for Western Europe.

Gyros Protein Technologies announced in April it will exclusively distribute **Luxembourg Bio Technologies**' PyOxim and K-Oxyma coupling agents in North America and nonexclusively globally, and on a nonexclusive basis in all regions, HDMA. The reagents will be sold as part of Gyros's PurePep brand.

Product Introductions

In February, **Creoptix Sensors** announced the Creoptix Wavedelta system for label-free kinetics analysis, featuring four parallel flow channels and an increased temperature range.

In April, **Gyros Protein Technologies** launched the Gyrolab Generic PK Kit for use with its Gyrolab xP and XPlore systems. The multi-species kit is designed for pharmacokinetic studies. Results are generated in one hour.

Pall ForteBio introduced in April the Octen RED96e instrument for label-free biomolecular interaction analysis. Compared to previous models, it features enhanced unattended throughput, assay and sample versatility. The 8-channel platform performance quantification of 96 samples in 32 minutes and kinetic screening of 64 samples in 1.5 hours.

Surface Science

Company Announcements

PrimeNano named in February AFM supplier **CSInstruments** as a distributor for its ScanWave module in Europe. Scanwave enables high-resolution imaging of the permittivity and conductivity of materials at the nanoscale.

In March, **Olympus** opened the Olympus Discovery Center at the **Douglas Mental Health University Institute of McGill University** in Montreal, Canada, to advance neuroimaging.

The Core Facilities at **Carl R. Woese Institute for Genomic Biology at the University of Illinois at Urbana-Champaign** announced in March a partnership with the **ZEISSlabs@location** program, making the Institute the **ZEISSlabs@location**'s first North American location. The program allows access to technologies immediately following or sometimes before their broad release. Training and classes by ZEISS personnel are also available.

In April, **ZEISS** opened its new ZEISS Microscopy Customer Center Europe at its Oberkochen, Germany, site. With an area of 14,000 ft^2 (1,200 m^2), the two-floor Center includes space for biosafety level 1 work. The Customer Center formerly located in Munich was transferred to this site.

Cornell University announced in March that it has licensed Electron Microscope Pixel Array Detector (EMPAD) technology for scanning TEM to **FEI**. The EMPAD extracts local strains, tilts, rotations, polarity, and electric and magnetic fields quickly, with high sensitivity, and at a wide range of intensities. FEI plans to offer the detector starting later this year.

In March, **Echo** completed a $7.5 million Series A funding, co-led by **Dolby Family Ventures** and **Tech Coast Angeles**. Echo's Revolve microscope transforms between upright and inverted configurations.

In April, **Leica Microsystems** named **NCI** as an exclusive distributor for its EM sample preparation solutions in the Midwest and Western regions of the US.

Park Systems opened its European headquarters in Heidelberg, Germany, in April.

Product Introductions

ZEISS launched the Celldiscoverer7 microscope in November 2016 for high-throughput live-cell imaging. It features a new optical design and hardware-based autofocus.

In March, **ZEISS** released the ZEISS Crossbeam 550 FIB-SEM, featuring an increase in resolution for imaging and materials characterization, and a speed gain in sample preparation. It replaces the Crossbeam 540.

In March, **Hitachi High-Technologies** introduced the SEM CR6300 for detecting defects during semiconductor manufacturing. Features include faster speed compared to conventional models, and the ability to provide a characteristics index for process optimization and yield enhancement by comparing the captured defect images with pattern-design data.

In April, **Hitachi High-Technologies** and **Digital Surf** released Hitachi map 3D software for SEM systems, featuring ultrafast 3D reconstruction of surface topography.

Leica Microsystems launched in April the SP8 DIVE (Deep In Vivo Explorer) confocal microscopy system, calling it the first spectrally tunable solution for multi-color, multiphoton deep tissue imaging. It can capture up to four fluorophores simultaneously and an unlimited number of fluorophores simultaneously. It features the new 4Tune detection technology.

In April, **Olympus** introduced the CX43 and CX33 microscopes, designed for high-throughput, regular use. They feature ergonomic design to reduce user fatigue and a new LED light source.

JEOL US launched in April the JSM-IT300HR SEM, featuring a larger chamber that can accommodate multiple detectors as well as an intuitive software interface.

In April, camera designer **Photometrics** and microscope firm **Confocal.nl** partnered to create the Confocal.nl Re-scan Confocal Microscope (RCM) combined with the Photometrics Prime 95B for super-resolution imaging. The RCM can be connected to any microscope to transform it into confocal system capable of sub-diffraction-limited imaging.

Thermo Fisher Scientific launched in April the Thermo Scientific Explorer 4 Analyzer with MQA software, its fourth generation SEM/x-ray spectroscopy system for metals quality analysis during production. Compared to previous models, it is faster, allowing for characterization of thousands of inclusions per hour.

Sale/Order of Note

In March, **TESCAN** announced the installation of its first TESCAN FIB-SEM LYRA3 system in India at **Jawaharlal Nehru University**.

Reported Financial Results

$US	Period	Ended	Sales	Chg.	Op. Prof.	Chg.	Net Prof.	Chg.
Corning (Life Sciences)	Q1	31-Mar	$210.0	2.9%	NA	NA	$17.0	41.7%
Danaher	Q1	31-Mar	$4,205.7	7.2%	$623.9	1.8%	$506.1	-33.3%
Danaher (Life Sciences)	Q1	31-Mar	$1,308.1	4.0%	$211.6	19.4%	NA	NA
Danaher (Environmental & Applied Solutions)	Q1	31-Mar	$914.8	4.7%	$208.0	4.8%	NA	NA
Harvard Bioscience	Q1	31-Mar	$24.2	-10.4%	($0.6)	-189.1%	($1.1)	-67.6%
Honeywell (Performance Materials & Tech.)	Q1	31-Mar	$2,069.0	-9.3%	$471.0	2.2%	NA	NA
HTG Molecular Diagnostics	Q4	31-Dec	$1.5	19.9%	($5.2)	1.8%	($5.7)	0.5%
HTG Molecular Diagnostics	FYE	31-Dec	$5.1	27.0%	($24.3)	-28.8%	($26.0)	-21.7%
IDEX (Health & Sci. Tech.)	Q1	31-Mar	$199.7	7.2%	$42.2	3.8%	NA	NA
Illinois Tool Works (Test & Meas. and Elec.)	Q1	31-Mar	$480	3.4%	$96	33.3%	NA	NA
Illumina	Q1	31-Mar	$598.0	4.5%	$60.0	-50.4%	$372.0	313.3%
MOCON	Q4	31-Dec	$16.9	10.2%	$2.1	289.4%	$1.8	561.3%
MOCON	FYE	31-Dec	$63.3	4.2%	$6.3	44.2%	$5.0	68.2%
NanoString Technologies	Q4	31-Dec	$25.2	13.1%	($9.9)	-30.2%	($11.6)	-31.5%
NanoString Technologies	FYE	31-Dec	$86.5	38.0%	($41.2)	0.2%	($47.1)	-3.3%
Neogen	Q3	28-Feb	$88.4	15.2%	$14.4	27.5%	$10.3	23.8%
Pacific Biosciences	Q1	31-Mar	$24.9	30.3%	($23.3)	-25.5%	($23.9)	-23.3%
Roka Bioscience	Q4	31-Dec	$1.9	27.0%	($7.4)	28.4%	($13.3)	-33.2%
Roka Bioscience	FYE	31-Dec	$7.2	21.0%	($29.5)	16.5%	($38.5)	-5.3%
Roper Technologies	Q1	31-Mar	$1,086.3	20.4%	$258.3	5.4%	$158.1	4.4%
Roper Tech. (Energy Systems & Controls)	Q4	31-Mar	$125.0	5.3%	$30.2	25.0%	NA	NA
Roper Tech. (Medical & Scientific Imaging)	Q1	31-Mar	$348.2	4.8%	$119.8	4.7%	NA	NA
Thermo Fisher Scientific	Q1	31-Mar	$4,765.0	10.9%	$622.4	20.2%	$551.4	37.1%
Thermo Fisher Sci. (Life Sciences Solutions)	Q1	31-Mar	$1,363.5	12.0%	$433.9	23.5%	NA	NA
Thermo Fisher Sci. (Analytical Instruments)	Q1	31-Mar	$1,052.0	38.5%	$191.8	71.7%	NA	NA
Thermo Fisher Sci. (Specialty Diagnostics)	Q1	31-Mar	$866.4	1.4%	$233.9	1.7%	NA	NA
Thermo Fisher Sci. (Laboratory Prod. & Serv.)	Q1	31-Mar	$1,699.0	3.0%	$216.2	-8.7%	NA	NA
Waters	Q1	31-Mar	$498.0	4.8%	$118.9	5.5%	$105.6	12.2%
Other Currencies								
Biotage	Q1	31-Mar	SEK 185.2	16.6%	SEK 34.9	48.2%	SEK 35.3	54.3%
Eppendorf	FYE	31-Dec	€ 651.5	3.6%	€ 140.1	13.8%	€ 96.3	19.1%
Hitachi High-Technologies	Q4	31-Mar	¥181,619	6.9%	¥9,580	-21.6%	¥6,933	-20.3%
Hitachi High-Techs. (Sci. & Medical Systems)	Q4	31-Mar	¥51,300	3.2%	¥5,300	-13.1%	NA	NA
Hitachi High-Technologies	FYE	31-Mar	¥644,545	2.5%	¥53,636	11.3%	¥40,170	11.6%
Hitachi High-Techs. (Sci. & Medical Systems)	FYE	31-Mar	¥186,100	5.1%	¥27,100	1.9%	NA	NA
Sartorius	Q1	31-Mar	€ 343.1	13.6%	€ 84.6	17.0%	€ 26.6	9.5%
Sartorius (Bioprocess Solutions)	Q1	31-Mar	€ 251.1	10.7%	€ 68.4	12.1%	NA	NA
Sartorius (Lab Products & Services)	Q1	31-Mar	€ 92.0	22.7%	€ 16.3	43.0%	NA	NA

NA = not available, NM = not material