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Bio-Techne: A Transformed Company

In its last issue, **IBO** named Bio-Techne as its 2016 company of the year (see **IBO** 1/15/17). In this issue, **IBO** takes a closer look at the firm and the elements of its growth strategy that have revitalized the company.

Founded in 1976 as R&D Systems, the Company became a public company trading on the NASDAQ stock exchange in 1983 as Techne (TECH). Today it conducts business under the Bio-Techne name and is a provider of life science reagents and instrumentation for research and clinical diagnostics, serving a broad range of applications and customer segments. Major product lines include antibodies, cytokines, immunoassays, capillary electrophoresis (CE) systems and calibrators for clinical instruments.

Sixty-four percent of the company's sales are derived from its Biotechnology segment, which offers proteins, antibodies, immunoassays and biologically active small molecules. In fiscal 2016, sales for the Biotechnology

segment totaled \$317.3 million. The Diagnostic segment offers controls and calibrators, as well as bulk reagents, and accounts for 21% of revenues, with greater than 50% of this business conducted on an OEM basis. The company's Protein Platform segment represents 15% of sales, and offers instrumentation for protein analysis.

When CEO Chuck Kummeth was hired in 2013 (see **IBO** 6/15/13), revenues were falling in part due to declines in NIH spending. In addition, as a result of underinvestment, the company's infrastructure was insufficient for a changing competitive environment. As Mr. Kummeth told **IBO**, he "made the strategic decision to leverage Bio-Techne's vast biological content and reagent expertise to expand into adjacent life science tools markets through an active M&A program." The strategy also required other organizational changes. "Bio-Techne's core business consists of thousands of products, with none representing more than \$2 million in annual revenue and sales spanning thousands of customers. Given the company's diverse customer and product mix, returning the core portfolio to consistent growth required significant fundamental changes in how the company approached its end-markets and the overall leadership of the business."

"Bio-Techne made it easier for its customers to do business with the company."

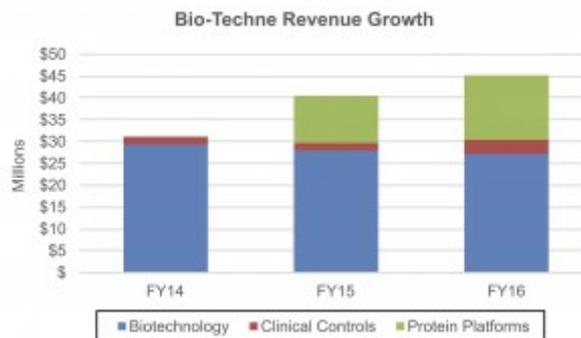
Mr. Kummeth installed a new senior leadership team, hiring 12 senior executives, and revised the compensation plan to link pay to performance. Infrastructure investments included new technology and enterprise-wide business systems. New investments were also made internationally, most notably, the expansion of the firm's Chinese business, through new products offerings, such as the R&D Systems brand, personnel and acquisitions. The 2014 purchase of PrimeGene (see **IBO** 4/15/14) gave the company access to Chinese manufacturing and, consequently, the country's middle market for lower-priced products.

Customer contact was a particular focus. "Bio-Techne made it easier for its customers to do business with the company, making investments to completely overhaul its website as well as forming a partnership with Fisher Scientific, leveraging Fisher's channel and sales force to increase exposure with academic, industrial and governmental customers," said Mr. Kummeth. In fiscal 2016, revenues rose 10.3%, 6% organically, to nearly \$500 million, up from sales of \$310.6 million in 2013, when sales declined 0.4%. Excluding currency, company sales have recorded a three-year combined annual growth rate of 18.3%.

Bio-Techne has quickly expanded through acquisitions. As Mr. Kummeth explained, "These initiatives were coupled with a disciplined M&A strategy, broadening the Biotechnology portfolio offering (Novus Biologicals [see **IBO** 7/15/14], Advanced Cell Diagnostics [see **IBO** 7/15/16]) and geographic presence (PrimeGene, Space Import Export [see **IBO** 7/15/16]), adding critical mass to its Diagnostics segment (Bionostics, Cliniqa [see **IBO** 6/15/15]) and expanding into the instrumentation business (Protein Simple [see **IBO** 6/30/14], CyVek [11/15/14], Zephyrus Biosciences [see **IBO** 3/31/16])." Since 2013, Bio-Techne has completed nine acquisitions. The firm continues to evaluate a large pipeline of potential M&A targets. Priorities include fast growing applications, value-added products and regional expansion.

The purchase of Novus Biologicals, a supplier of antibodies and reagents, not only provided the company with new content but also enhanced online capabilities that have been utilized to increase Bio-Techne's web presence. In particular, the company has credited a new website for its R&D Systems brand as having a significant impact on sales. Last fiscal year, website traffic increased 10% and online orders grew 15%.

Asked how the company distinguishes its website from competitors' sites, Karen Padgett, vice president of Antibody Business Unit and Global Marketing at Bio-Techne, told **IBO**, "The new R&D Systems website has leveraged all of the deep scientific content created by our strong scientific teams by making it more readily available as a resource. There are also 100 scientifically curated, interactive pathways; live chat; customer reviews; and substantially more application data." The new website is a showcase for the depth of scientific expertise behind Bio-Techne products. "We also added an entire feature on our quality systems as well as our state-of-the-art facilities in Minneapolis, Minnesota, and our largely expanded custom service offerings," she noted.



Click to enlarge

Acquisitions also led to the formation of the company’s Protein Platforms segment. The segment includes the former Protein Simple, CyVek and Zephyrus Biosciences product lines; specifically, the Simple Western Platform, which simplifies western blotting, offering improved reproducibility and quantitative results; the SimplePlex system for multiplex ELISAs and a faster workflow; and the Single Cell Western for single-cell western blotting. In addition, the segment offers the micro-flow imaging (MFI) and CE systems for biologics development and production.

Protein Simple formed a foundation for the Protein Platforms segment, while the two start-ups added promising growth engines. Each product line utilizes the Biotechnology segment’s content, driving growth in that segment and creating solutions for end-users. “Moving upstream to include instrumentation that utilizes Bio-Techne content, consumables and reagents was a natural progression for the company,” said Bob Galvin, senior vice president, Protein Platforms. “Through three separate acquisitions, Bio-Techne quickly built its Protein Platforms division to offer a wide range of innovative protein analysis products, many of which leverage the Bio-Techne reagent portfolio,” he added.

The integration also includes sales. “The Biotechnology and Protein Platforms divisions target the same academic and biopharma customers, enabling Bio-Techne to utilize an integrated sales approach across the two divisions,” he explained. “In this integrated approach, Bio-Techne can now simultaneously showcase instrumentation to simplify and improve lab workflow, as well as the highest quality reagents to ensure quality experiments. Going forward, developing or acquiring instrumentation leveraging Bio-Techne reagents and biological content remains a key component of its growth strategy.”

Each of the segment’s four instrument platforms are novel technologies. Asked about the challenges of getting researchers to replace their traditional technologies, Mr. Gavin told **IBO**, “In order to adopt them, scientists require that new techniques solve real scientific problems. New technologies must allow them to perform experiments that they could not otherwise complete in order to justify transition from traditional tools.” For example, the Simple Plex reduces the number of separate steps for an ELISA from 8 to 2.

Customer engagement and education communicate the technology’s advantages. “In the marketing of new technologies like Simple Plex or Single-Cell Western, the focus will continue to be on identifying scientists who can benefit from these tools in a unique way. This is followed by a consultative sales method to work with the scientists who can benefit from acquiring the technology,” explained Mr. Gavin. Applications support is also key. “Finally, a consistent and cooperative application support team after the sale is required to ensure new customers can successfully deploy the technology in their labs. Focusing on supporting the science our customers perform will speed the adoption of innovative technologies.”

Bio-Techne plans to continue to grow through acquisitions, introduce additional value-added products, and expand into high growth markets, such as companion diagnostics and custom product development. Mr. Kummeth told **IBO**, “Bio-Techne continues to execute on its plan and is well on its way to achieving its initial strategic targets, including reaching the milestone of \$1 billion in revenue (includes over \$100 million in China), 4-6 divisions (currently 3) and over 2,500 employees (currently around 1,700).”

China R&D Expenditures on Solid Rise

In the third quarter of last year, the National Bureau of Statistics of China (NBS) released its annual “China Statistical Yearbook,” a compilation of figures representing growth in various socio-economic sectors in the country from the previous year. The NBS’s 2016 Yearbook analyzes data from federal ministries such as the Ministry of Science and Technology, Ministry of Education, the China Association of Science and Technology, the State Administration of Science, Technology and Industry, as well as the NBS itself, with a focus on scientific and technological (S&T) R&D activities in China in 2015 in various sectors, enterprises, and institutions.

Data indicated an extremely significant rise in supervised enterprise sampling checks to determine and ensure quality of products. The food sector had the most dramatic increase in this category, most likely due to China’s updated [Food Safety Law](#) in April 2015. Statistics also illustrated a decrease in R&D personnel from 2014 and a drop in postgraduate science graduates.

In 2015, the ratio of R&D expenditure to GDP was 2.07%, a increase of 5 basis points and 8 basis points from 2014 and 2013, respectively. This ratio has been on a steady rise since 2011, when it was 1.78% of GDP. According to [Caixin Online](#), China’s total R&D expenditure for 2015 was over CNY 1.4 trillion (\$202.8 billion), 2.1% of the country’s GDP.

Institutions

As the NBS figures illustrated, the number of established S&T R&D institutions has also increased over the years, with 5,572 official institutes in 2015, up 17.0% from the 4,763 institutions in 2014, and up 3.9% from the 4,583 institutions in 2013, indicating the stable growth of S&T research and innovation in China. Data indicated a total of 29,631 S&T enterprises in 2015, up 6.1% from 2014 and 10.2% from 2013.

There were 11,732 Chinese S&T research institutions in 2015. Of these, 2,560 were higher education institutes (HEI), a 1.2% and 2.8% increase from 2014 and 2013, respectively. Natural Sciences and Technology institutes comprised 1,713 of these HEI.

Number of Chinese R&D Projects by Sector			
	2013	2014	2015
Extraction of Petroleum & Natural Gas	3,284	3,057	2,165
Manufacture of Foods	4,530	4,784	31,589
Manufacture of Raw Chem. Mat. & Chem. Prod.	24,585	26,366	26,387
Manufacture of Medicines	25,419	23,791	21,761
Instruments and Meters	10,210	10,798	9,754

The increase in the number of research institutes correlates to the rise in R&D projects taken on in 2015, as well. A total of 841,520 R&D projects were undertaken in 2015, up 9.8% from 2014 and 18.4% from 2013. The R&D projects amounted to CNY 765.6 billion (\$114.7 billion) in 2015, an increase of 7.8% and 14.2% from 2014 and 2013, respectively.

There were 309,895 S&T R&D projects in 2015. The number of R&D projects was the greatest in Zhejiang, which represented 51,940, or 17%, of all S&T R&D projects, closely followed by Jiangsu with 51,720 or 17%, Guangdong with 37,375 or 12%, Shandong with 30,778 or 10%, and Anhui with 14,100 or 5%.

Graduates

In 2015, the numbers of students completing a second degree in science marginally dropped compared to 2014. By field, in 2015, 48,856 postgraduate students completed science programs, compared to 49,002 in 2014 and 29,992 in 2013. There were 62,602 postgraduates from the medicine field in 2015, up 2.3% from 2014 and 6.9% from 2013, while 20,288 postgraduates completed agriculture programs, an increase of 4.3% compared to 2014 and 16.2% from 2013.

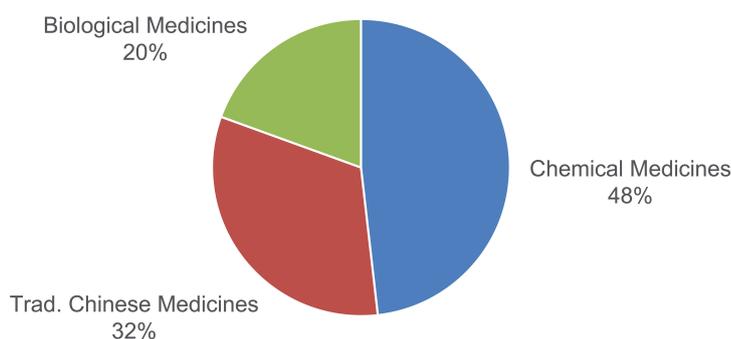
Number of Graduates of HEIs by Discipline			
	2013	2014	2015
Science	248,790	255,304	255,632
Agriculture	58,752	59,796	60,908
Medicine	192,344	209,748	223,917

Scientific Papers and Medicine

China is a top producer of scientific papers, releasing 235,139 in total in 2015. This is an increase of 22.0% from 2014 and 48.3% from 2013. Of the total 2015 scientific papers, 41,378 were in chemistry; 26,520 in physics; 24,885 in biology; 5,949 in pharmacy; 4,486 in energy; 2,732 in agriculture; and 2,247 in food. Many papers also focused on medicine, with 11,589 papers in basic medicine, 2,441 in protective medicine, 119 in special medicine, 930 in traditional Chinese medicine and 31,104 in clinical medicine; These numbers referred to papers published in the *Science Citation Index*.

The increase in medicinal R&D is reflected in the rise of manufactured medicines in 2015. China's medicine focus concentrates on biological, chemical and finished traditional Chinese medicine. There were 7,392 medicines manufactured in 2015, a 4.0% jump from 2014, with 2,416 chemical medicines manufactured, 1,622 traditional Chinese medicines and 975 biological medicines.

2015 Chinese Manufacture of Medicines by Type



Sampling Checks

The Yearbook also provided information on state security sampling checks to determine the quality of products. A total of 24,415 enterprises were supervised for sampling checks, with 3,891 checks in the food sector and 1,699 in the "agricultural means of production" sector. These numbers are significantly higher from previous years. In 2013, 139 enterprises in total were supervised for sampling checks, with only 4 sampling checks conducted for food, and 16 performed in the agricultural sector. In 2014, out of a total of 159 supervised sampling checks, food had 5 sampling checks and agriculture had 11. This weighty increase in sampling checks is likely due to 2015's amended Food Safety Law, in which Article 3 states that food safety is to undergo a "stringent supervision and administration system" to ensure that food manufacturers are held accountable for their products through "social supervision."

Region wise, Sichuan had the greatest number of supervised enterprise sampling check for product quality at 8,886, a 1.5% increase from 2014, but a 2.4% decrease from 2013. Gansu followed Sichuan with 6,777 supervised enterprise sampling checks in 2015, a 98.8% increase from 2014 and 291.5% increase from 2013. In Shandong, 6,617 supervised enterprise sampling checks were performed, up 62.9% from 2014 and 180.5% from 2013.

New R&D Funding

This year, **IBO** begins a rotating feature highlighting new R&D funding announcements that can be expected to impact scientific research and, consequently, stimulate instrument and lab product purchases.

The Breakthrough Energy Coalition, a coalition of business and research investment leaders announced in December 2016, the formation of the Breakthrough Energy Ventures fund with over \$1 billion in funding. The investments will fund clean energy development, including research. The fund plans to work with public and private partners. The Coalition stated, “The only way to provide everyone in the world with access to reliable and affordable energy, food, goods and services without emitting greenhouse gas is through broad public and private investment into a landscape of innovation focused on developing new technologies.” The Coalition’s “Landscape of Innovation” document lays out “technical quests” in five areas: electricity, transportation, agriculture, manufacturing and buildings. Among the cited projects are “lightweight materials and structures” and biomass. Details about investments and the funding’s release have not yet been announced.

Private funding was also behind several major announcements funding disease research and treatment. The health sciences-focused University of California San Francisco (UCSF) announced in January the receipt of a \$500 million gift, the largest in its history, from the Helen Diller Foundation. One hundred million dollars will go towards the new Innovation Fund, a discretionary fund to support research termed high risk and high reward. “These funds will seed areas that will redefine the future of healthcare and could support priorities ranging from genomic surgery to cell engineering, from immunotherapy to microbiome research, and from neuro-technology to next-generation diagnostics for infectious and inflammatory diseases,” stated UCSF Chancellor Sam Hawgood. Of the remaining amount, \$200 million is allocated to an endowment for faculty and \$200 million will fund an endowment to support students.

A \$50 million donation to City of Hope, a nonprofit research center and hospital, from the Wanek Family Project and anonymous donors will fund a six-year goal to develop a cure for type 1 diabetes. The organization’s Diabetes & Metabolism Research Institute will utilize the funding to develop immunotherapy approaches, with a focus on immune modulation, beta cell expansion and replacement, and preventing complications from the disease,

In December 2016, the University of Texas at Austin announced the receipt of a \$75 million donation for the Mulva Family Foundation. Three-quarters of the donation will be used to establish the Mulva Clinic for Neurosciences, a neurology center for both research and treatment, located at the University’s Dell Medical School. The remaining \$25 million will fund the MD Anderson Cancer Center’s melanoma and prostate cancer research projects.

Outside the US, the World Bank announced this month a four-year \$45 million loan to build science and innovation in Peru. The money will increase capacity at CONCYTEC (the National Science and Technology Council) as well as be used to fund research at universities and companies, including equipment purchases. Other goals include supporting the FONDECYT (the National Science and Technology Fund), and upgrading research capacity and evaluation at the country’s major research bodies and universities.

Recipient	Source	Amount	Details
Breakthrough Energy Ventures	Breakthrough Energy Coalition	\$1 billion	Clean energy research
UC San Francisco	Helen Diller Foundation	\$500 million	Faculty, students and research
University of Texas–Austin	Mulva Family Foundation	\$75 million	Neuroscience and cancer research
City of Hope	Wanek Family Project and anonymous donors	\$50 million	Type 1 diabetes research
Peru	World Bank	\$45 million	Science, technology and innovation

Bio-Rad Buys RainDance Technologies

Hercules, CA 1/16/17; Billerica, MA 1/16/17—Life science research and clinical diagnostics products firm Bio-Rad Laboratories has acquired RainDance Technologies for an undisclosed amount. RainDance Technologies’ droplet

microfluidic technology enables ultra-sensitive detection of genetic variations. “The company’s droplet-based solutions will extend our reach into next generation sequencing applications and strengthen our position in the area of Droplet Digital PCR,” said Bio-Rad President and CEO Norman Schwartz. “We look forward to expanding our offering to provide life science and clinical diagnostics customers with solutions for a wide range of nucleic acid detection applications.” The purchase is expected to close in the first quarter.

RainDance sells the RainDrop Digital PCR, and ThunderStorm and ThunderBolts Next-Generation Sequence Enrichment systems. Both Bio-Rad and RainDance offer digital PCR systems (see [Market Profile](#)), with RainDance’s system utilizing microfluidic components to produce a higher number of reactions per sample. The acquisition further expands Bio-Rad’s genomic offerings. Later this year, Bio-Rad plans to introduce its first sequencing system.

Bruker Expands Nanoindenting Business

Billerica, MA 1/24/17—Scientific research instrument and solutions firm Bruker has acquired Hysitron for an undisclosed amount. Hysitron supplies nanomechanical test instruments, including nanoindentation, microindentation, tribology, and in situ SEM and TEM nanomechanical testing products. The US-based company generated \$20 million in revenues in 2016. “As a leader in atomic force microscopy instrumentation, we plan to realize a number of valuable application synergies by adding Hysitron’s instruments to our Bruker NANO Group nanoscale surface and materials characterization product portfolio,” stated Bruker NANO Group President Mark R. Munch, PhD. “In addition, Hysitron’s products are quite complementary to our macroscale mechanical and tribology test instruments, providing the most complete range of testing capabilities to the market.”

The acquisition adds to Bruker’s systems for nanomechanical testing, building its portfolio for materials science and semiconductor applications in particular. Properties measured by Hysitron’s Tribolenter includes elastic modulus, hardness, creep, stress relaxation, interfacial adhesion and fracture toughness.

Illumina Sells Selected Conexio Assets

Brisbane, CA 1/24/17—Molecular diagnostics firm CareDx has agreed to acquire the Conexio SBT Resolver products and Assign SBT analysis software for HLA typing from Illumina. CareDx provides diagnostic surveillance solutions for transplant recipients. CareDx’s Olerup business previously distributed the products. “The sale of Conexio’s capillary electrophoresis SBT portfolio permits Illumina to focus on next-generation sequencing products for HLA typing,” stated Rob Brainin, vice president and general manager, Applied Genomics at Illumina.

Illumina acquired Conexio last year (see [IBO 1/15/16](#)). The SBT (Sequencing Based Typing) Resolver reagents are designed for PCR-based HLA typing for use with Sanger sequencing. In an SEC filing, CareDx disclosed terms of the agreement, including revenue-based quarterly payments to Conexio of up to \$735,000.

NGS Informatics Consolidation

Oakland, CA 1/23/17—Clinical genomics data analysis and reporting provider Omicia has purchased Spiral Genetics for an undisclosed amount. Spiral Genetics offers tools for NGS variant detection, including its graph-based, population-specific reference genome and lossless data-compression technologies. “The strategic integration of Spiral’s technologies effectively cements Omicia’s leadership position in precision medicine,” commented Omicia CEO Matt Tindall. “By removing the need to access multiple software platforms, Omicia improves quality, accuracy

and turnaround time, removing major bottlenecks for clinical adoption.”

*Omicia's Opal Clinical variant interpretation and clinical reporting platform is designed for NGS clinical research and diagnostic testing. This acquisition adds variant detection capabilities to the platform. Mr. Tindall told **IBO**, "Before the acquisition, Omicia did tertiary genomic variant interpretation and reporting only." He said, "The Spiral acquisition makes it possible to provide these tools as part of Omicia's complete end-to-end solution. Spiral's tools also offer a unique expansion of capabilities beyond the Broad Best Practices pipeline, including highly accurate structural variation detection and population-scale comparison." Omicia's Opal solution works with targeted sequencing panels, exomes and whole genomes, and in silico gene panels.*

Synthetic DNA Provider Gen9 Acquired

Boston, MA 1/20/17—Ginkgo Bioworks, a technology platform company, has acquired gene synthesis firm Gen9. Gen9 supplies long fragments of synthetic DNA. Financial details were not disclosed. The acquisition includes Gen9's manufacturing platform and IP, as well as the operations and R&D teams. "Having Gen9's synthesis and assembly technology available to our customers is a valuable addition to our foundries, allowing us to further speed up the process of organism design," commented Ginkgo Bioworks Cofounder and CEO Jason Kelly. Gen9's facilities will become Ginkgo Bioworks' BioFab manufacturing platform. Ginkgo Bioworks was Gen9's largest customer.

Nine Gen9 employees will join Ginkgo Bioworks. The [Boston Globe](#) reported this month that Gen9 laid off employees in December after failing to raise new funding and having manufacturing issues. Gen9 specializes in the automated production of DNA constructs, providing custom gene synthesis, synthetic DNA libraries, and synthetic DNA for research and manufacturing applications. Ginkgo Bioworks designs and manufactures custom products for industrial and consumer applications, such as fragrance, flavor and food. Ginkgo Bioworks announced last summer plans to purchase 300 million base pairs of DNA from Gen9.

*A Ginkgo Bioworks spokesperson told **IBO** that the company does not plan to continue outside sales of Gen9 products but will continue service for some existing strategic customers. In 2013, Agilent Technologies announced a \$21 million investment in Gen9 (see **IBO** 8/15/13) and provided Gen9 with access to its oligonucleotide synthesis technology. Asked about the companies' continuing relationship, Ginkgo Bioworks provided **IBO** with a statement from Jacob Thaysen, president of Agilent's Diagnostics and Genomics Group: "Agilent oligonucleotide libraries have been the starting material from which all Gen9 products are derived. We remain highly optimistic about the potential of gene synthesis, and we will look at investment in any strategic partners that can aid Agilent in this business."*

MTS Reorganizes

Eden Prairie, MN 1/5/17—MTS Systems, a provider of testing solutions, announced a reorganization of its Test business that will divide the business into two business units: Materials Test Systems, and Vehicles and Structures Test Systems. The Materials Test System unit will consist of solutions manufacturing advanced materials, and will be headed by William Becker, a returning MTS employee. The Vehicles and Structures Test Systems unit will encompass solutions for automotive, aerospace, infrastructure and energy markets, and will be led by Steven Harrison, former president of AAR Airlift Group. Dr. William Bachrach, president of the Test business, retired effective January 13. "With the Materials Test business unit largely comprised of standard product offerings, with accessories tailored to meet specific customer needs, and our Vehicles and Structures business unit comprised of our large, complex 'custom and engineered-to-order' projects, we believe this structure will bring enhanced focus for growth and drive increased profitability across the Test business," stated MTS President and CEO Jeffrey Graves.

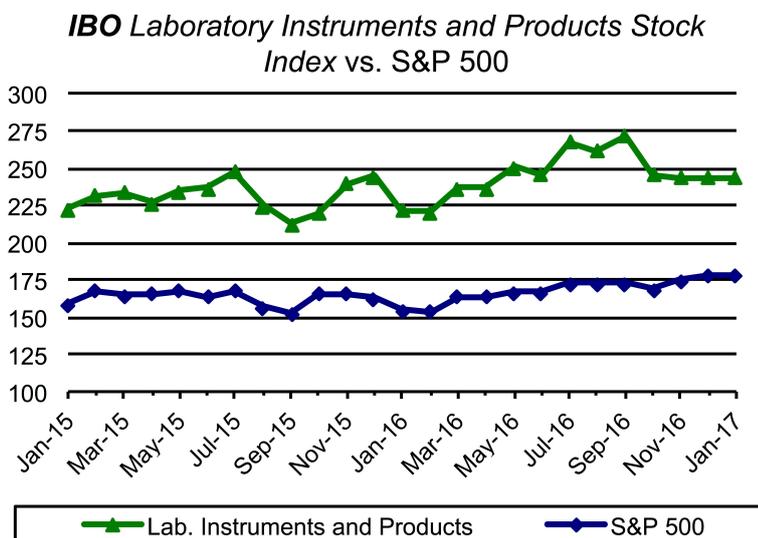
*MTS is one of the largest providers of physical testing instrumentation. The decision appears designed to better focus different businesses within the Test division. The company recently delayed its fiscal 2016 earnings release due to an internal investigation of its Chinese operations (see **IBO** 11/30/16).*

Positive Start for IBO Indexes

US equity markets got off to a confident start in 2017, as the Dow Jones Industrial Average broke the 20,000 mark for the first time. Investor exuberance was spurred by the Trump administration's promise to stimulate funding, reduce taxes and roll back regulations. In addition, economic data signaled progress including strong consumer spending and improved capital goods orders, especially for mining and energy equipment.

Unfortunately, the Dow quickly retreated from the historic mark in the final trading days of the month due to questionable US policy implementations and lackluster economic data. President Trump's protectionist trade and immigration policies incited global dissension and geopolitical concerns. Furthermore, fourth quarter 2016 US GDP growth, despite a strong inventory build, came in below expectations at 1.9%. Nevertheless, equity markets finished higher in January as the Dow, S&P 500 and NASDAQ advanced 0.5%, 1.8% and 4.3%, respectively.

Perhaps the only certainties in 2017 will be heightened equity and currency volatility. While early indications suggest that President Trump's policies will be met with congressional opposition or reprisal in foreign regions, especially if they impose trade restrictions, the net influence of his policies on the US economy, if enacted, remain uncertain. Furthermore, inflationary pressure will put a spotlight on US monetary policy in 2017, which has largely supported equity prices for the last eight years. Should the Fed raise interest rates and wind down bond purchases, markets will need to focus on valuations, which are trending towards the high side based on trailing 12-month EPS.



Laboratory Instruments and Products

The *Index* advanced 8.0% to 262.59 in January as a majority of companies traded higher due to strong earnings results or positive outlooks. Following prominent declines in 2016, NGS firms **illumina** and **Pacific Biosciences** gained 25.0% and 26.8% for the month, respectively, leading the *Index*.

Pacific Biosciences, which ended 2016 at a multi-year low, experienced increased buying volume and was further boosted by new Sequel system purchase agreements. The company reported orders for 15 Sequel systems by two Chinese firms.

Meanwhile, **illumina** regained investor's confidence following several positive announcements at the JPMorgan Healthcare Conference on January 9. The company preannounced fourth quarter 2016 sales growth of 5%, which was above its revised guidance of roughly flat growth. The company also introduced a new high-throughput NGS system and forecasted 2017 sales to grow 10%-12%. Shares jumped 16.6% the following day.

On January 31, **illumina** officially reported earnings, which were slightly above expectations. The company projected 2017 adjusted EPS of \$3.60-\$3.70, including \$0.60-\$0.65 in the first quarter. CL King and Bank of America each upgraded **illumina** from "Neutral" to "Buy" on January 6 and January 10, respectively. Bank of America also raised its price target for the company from \$161 to \$175 per share.

QIAGEN, which improved 3.4% for the month, also initiated its 2017 sales growth forecasts at the JPMorgan Healthcare Conference on January 9. The company maintained its full-year 2016 organic sales growth outlook of 4%-5% and projected 2017 organic sales to grow 5%-6%.

Similar to **Illumina**, both **Thermo Fisher Scientific** and **Waters** posted stronger-than-expected fourth quarter 2016 adjusted EPS due to continued strength in Asia and biopharmaceutical markets, as well as a recovery in European academic spending. The two companies also recorded full-year adjusted EPS growth of roughly 12%. On January 24, **Waters** forecasted first quarter and full-year 2017 adjusted EPS of \$1.26- \$1.36 and \$6.85- \$7.10 for growth of 4% and 5%, respectively. On January 31, **Thermo Fisher** projected 2017 adjusted EPS to grow 10%-12% to \$9.06-\$9.24.

Not all companies started the year on a strong note. **NanoString Technologies** recorded the sharpest decline for the month, falling 19.1%. Shares contracted 21.7% on January 10 as the company preannounced fourth quarter 2016 sales in the range of \$24.2-\$25.7 million, slightly below its previous guidance due to slower academic spending and a smaller-than-expected budget flush from biopharmaceutical customers.

Fluidigm failed to impress investors on January 9 despite improved preliminarily fourth quarter 2016 sales growth. Following weak financial results in the second and third quarters of 2016 due to growing competition and poor operational efficiency, **Fluidigm** preannounced fourth quarter 2016 sales of \$24.7-\$25.2 million for growth of 12%. However, full-year 2016 sales are expected to decline 9% to \$104.1-\$104.6 million, representing a 17% variance from its initial year outlook of \$124-\$128 million. Shares fell 13.0% for the month.

There were several other ratings changes this month. **Becton, Dickinson** was downgraded by JP Morgan Chase from "Overweight" to "Neutral" on January 3, and by Raymond James from "Strong Buy" to "Outperform" on January 5. Deutsche Bank downgraded **VWR** on January 18 from "Buy" to "Hold," and set a price target of \$26 per share.

Conversely, on January 4, Barclays PLC upgraded **Agilent Technologies** from "Equal Weight" to "Overweight," and raised its price target from \$48 to \$51 per share.

Company	Date Rep.	Fiscal Quarter	2016 Adj. EPS	Analyst Consensus	Vs. Estimate	YOY Growth	2015 Adj. EPS
Laboratory Instruments and Products							
ILMN	31-Jan	Q4	\$0.85	\$0.83	↑	\$0.02 5%	\$0.81
WAT	24-Jan	Q4	\$2.21	\$2.12	↑	\$0.09 13%	\$1.96
TMO	31-Jan	Q4	\$2.41	\$2.37	↑	\$0.04 14%	\$2.12
Diversified Instrumentation							
DHR	31-Jan	4Q	\$1.05	\$1.03	↑	\$0.02 -17%	\$1.27
GLW	24-Jan	4Q	\$0.50	\$0.44	↑	\$0.06 47%	\$0.34
HON	27-Jan	4Q	\$1.74	\$1.74	→	\$0.00 10%	\$1.58
ITW	25-Jan	4Q	\$1.39	\$1.37	↑	\$0.02 13%	\$1.23

Diversified Laboratory

The *Index* expanded 4.7% in January to 215.14 with most companies trading higher. Driven by stronger-than-expected financial results, **Corning** and **Danaher** recorded the strongest gains for the month, climbing 9.1% and 7.8%, respectively. On January 24, **Corning** reported that fourth quarter 2016 adjusted EPS grew 47% to \$0.50 due to strength in the Specialty Materials segment. Full-year 2016 adjusted EPS grew 11%. The company projected positive momentum going into 2017.

On January 31, **Danaher** reported that comparable fourth quarter and full-year 2016 adjusted EPS advanced 16% and 21% to \$1.05 and \$3.08, respectively, due to continued margin expansion, strong biopharmaceutical sales and sturdy demand in China. The company also reaffirmed its 2017 adjusted EPS outlook of \$3.85-\$3.95, which it initiated at the JP Morgan Healthcare conference on January 9. First quarter adjusted EPS are expected to be \$0.82-\$0.85.

Illinois Tools Works also beat analysts' fourth quarter 2016 consensus on January 25 but missed on revenue expectations. The company reaffirmed its 2017 adjusted EPS outlook of \$6.00-\$6.20 for growth of 9%. Shares

improved 3.9% for the month.

Honeywell also stayed positive for the month, advancing 2.1% despite missing fourth quarter 2016 sales expectations on January 27. However, adjusted quarterly EPS were in line with consensus. The company projected 2017 adjusted EPS of \$6.85-\$7.10.

International

Asia Pacific equity indexes were mostly positive in January, led by Hong Kong's Hang Seng and Singapore's STI, which rose 6.2% and 5.8%, respectively. Japan's Nikkei 225 slipped 0.4%. The Bank of Japan surprised the markets by increasing its bond purchases to lower yields.

Most Pacific Rim companies in the **IBO** Stock Table traded higher for the month, led by **GL Sciences**, which jumped 29.4%. On January 27, the company raised its fiscal 2017 sales growth outlook from 6% to 9% due to improved results for its analysis equipment and semiconductor businesses. The company also boosted its fiscal EPS estimate by 58% to ¥115.35 (\$1.05) for growth of 53% due to significant cost reductions.

Hitachi High-Technologies, which climbed 2.8% for the month, reported stronger-than-projected earnings on January 27. Fiscal third quarter EPS ending December 31, 2016, grew 19% to ¥89.82 (\$0.82). The company raised its fiscal year EPS guidance by 10% to ¥283.58 (\$2.58) for growth of 8%.

Two Pacific Rim companies declined this month, **Precision System Science** and **Techcomp**, which fell 2.0% and 10.9%, respectively.

European equity markets were mixed in January. Sweden's OMX and Germany's DAX improved 1.9% and 0.5%, respectively, while the UK's FTSE 100 and Italy's MIB contracted 0.6% and 3.3%, respectively.

With the exception of **Oxford Instruments**, which slipped 3.4%, all other UK-based companies in the **IBO** Stock Table finished the month in positive territory. **Horizon Discovery** gained the most ground for the month, climbing 21.5%. The company provided a trading update on January 24, which fell in line with its previous expectations of more than 19% sales growth for 2016. The company also projected 2017 sales to grow in the 30% range to £30-£35 million (\$33-\$39 million) including currency tailwinds.

On January 10, **Abcam** reaffirmed its fiscal-half year outlook ending December 31, 2016, which included sales growth of 30%, or 10% excluding currency. Shares advanced 6.8% for the month.

Scientific Digital Imaging, which advanced 2.7% for the month, reported on January 24 that adjusted EBIT climbed 143% to £421,000 (\$0.5 million) for the six months ending October 31, 2016, due to the acquisition of Sentek. Share improved 2.7% for the month.

Prices for other European companies in the **IBO** Stock Table were mixed in January. **Datacolor** improved 5.2%, while **Sartorius** recorded the largest decline for the month, falling 9.3%. On January 30, the company reported strong adjusted 2016 EPS growth on January 30, which jumped 23% to €1.93 (\$2.14). However, the company projected slower currency-neutral sales growth of 8%-12% in 2017, compared to 20% in 2016. Capital expenditures are also expected to climb in 2017, which will slow net income growth.

Company: Exchange	Market Value (US M)	52 Week Range		Price 1/31/17	Change 1 Month	Change YTD	P/E (ttm)	EPS (ttm)
		Low (\$)	High (\$)					
Laboratory Instruments and Products								
Agilent Technologies: n	\$15,750	34.15	49.48	\$48.97	7.5%	7.5%	35	1.40
Becton, Dickinson and Company: n	\$40,995	129.50	181.76	\$177.29	7.1%	7.1%	39	4.49
Bio-Rad Laboratories: n	\$5,615	122.96	194.20	\$190.08	4.3%	4.3%	57	3.33
Bio-Techne: o	\$3,801	82.00	117.42	\$101.75	-1.1%	-1.1%	39	2.62
Bruker: o	\$3,806	19.59	29.85	\$23.73	12.0%	12.0%	27	0.88
Enzo Biochem: n	\$309	4.00	7.51	\$6.68	-3.7%	-3.7%	8	0.84
Fluidigm: o	\$184	4.31	11.05	\$6.33	-13.0%	-13.0%	NM	-2.46
Harvard Bioscience: o	\$103	2.25	3.90	\$3.00	-1.6%	-1.6%	NM	-0.60
Illumina: o	\$23,504	119.37	186.88	\$160.10	25.0%	25.0%	52	3.07
Kewaunee Scientific: o	\$68	16.10	27.60	\$25.35	3.7%	3.7%	14	1.83
Luminex: o	\$881	17.29	23.75	\$20.22	0.0%	0.0%	23	0.87
Mettler-Toledo International: n	\$11,193	291.33	434.50	\$426.63	1.9%	1.9%	32	13.49
MTS Systems: o	\$969	41.53	62.27	\$58.10	2.5%	2.5%	28	2.06
NanoString Technologies: o	\$379	11.30	23.45	\$18.04	-19.1%	-19.1%	NM	-2.24
Pacific Biosciences: o	\$447	3.76	13.98	\$4.82	26.8%	26.8%	NM	-0.64
PerkinElmer: n	\$5,827	39.50	57.28	\$53.19	2.0%	2.0%	25	2.14
QIAGEN: o	\$6,535	20.73	30.12	\$28.98	3.4%	3.4%	58	0.50
Thermo Fisher Scientific: n	\$60,198	119.75	160.68	\$152.39	8.0%	8.0%	30	5.10
VWR: o	\$3,408	21.56	31.75	\$25.91	3.5%	3.5%	19	1.33
Waters: n	\$11,414	112.00	162.53	\$141.65	5.4%	5.4%	22	6.41
Diversified Laboratory								
AMETEK: n	\$11,826	42.82	52.83	\$51.10	5.1%	5.1%	22	2.30
Corning:	\$24,530	17.61	26.99	\$26.49	9.1%	9.1%	8	3.23
Danaher: n	\$58,048	62.82	84.11	\$83.92	7.8%	7.8%	23	3.65
Honeywell	\$90,175	99.42	120.02	\$118.32	2.1%	2.1%	19	6.20
Illinois Tool Works: n	\$44,648	88.00	130.16	\$127.20	3.9%	3.9%	22	5.70
Roper Technologies: n	\$19,460	157.18	191.94	\$191.85	4.8%	4.8%	29	6.70
Teledyne Technologies: n	\$4,293	75.89	129.36	\$122.87	-0.1%	-0.1%	23	5.46
Xylem: n	\$8,846	34.71	54.99	\$49.31	-0.4%	-0.4%	27	1.80
Laboratory Instruments and Products								
				262.59	8.0%	8.0%	32	
Diversified Laboratory								
				215.14	4.7%	4.7%	22	
Dow Jones Industrial Average				19,864.09	0.5%	0.5%		
S&P 500				2,278.87	1.8%	1.8%		
NASDAQ Composite				5,614.79	4.3%	4.3%		
Region	Market Value	52 Week Range		Price	Change	Change	P/E	EPS
Company	(Local M)	Low (L)	High (L)	1/31/17	1 Month	YTD	(ttm)	(ttm)
Pacific Shares								
GL Sciences: t	¥10,209	510	995	¥1,145	29.4%	29.4%	12	¥95.75
Hitachi High-Technologies: t	¥677,338	2,625	4,960	¥4,845	2.8%	2.8%	16	¥304.92
HORIBA: t	¥251,721	3,135	6,000	¥5,940	9.8%	9.8%	22	¥270.99
JEOL: t	¥56,337	350	726	¥568	11.4%	11.4%	247	¥2.30
Precision System Science: os	¥8,303	290	573	¥399	-2.0%	-2.0%	NM	-¥77.11
Shimadzu: t	¥563,438	1,344	1,969	¥1,909	2.5%	2.5%	24	¥81.08
Techcomp: hk	HKD 317	1.07	1.95	HKD 1.15	-10.9%	-10.9%	15	\$0.01
European Shares (London)								
Abcam: l	£1,648	5.72	9.06	£8.19	6.8%	6.8%	44	£0.19
Halma: l	£3,506	7.74	11.31	£9.25	3.1%	3.1%	32	£0.29
Horizon Discovery: l	£169	1.04	1.88	£1.75	21.5%	21.5%	NM	-£0.10
Oxford Instruments: l	£412	6.10	8.10	£7.07	-3.4%	-3.4%	73	£0.10
Scientific Digital Imaging: l	£17	0.09	0.22	£0.19	2.7%	2.7%	11	£0.02
Spectris: l	£2,873	14.41	25.17	£24.17	4.5%	4.5%	25	£0.95
European Shares (Other)								
Biotage: st	SEK 2,977	21.90	49.00	SEK 46.00	0.2%	0.2%	31	SEK 1.48
Datacolor: s	CHF 113	510.00	745.50	CHF 683.50	5.2%	5.2%	19	CHF 36.36
Merck KGaA: g	€ 13,137	70.68	103.95	€ 101.65	2.5%	2.5%	30	€ 3.42
Sartorius: g	€ 4,942	53.90	78.99	€ 66.00	-9.3%	-9.3%	51	€ 1.29
Tecan: s	CHF 1,743	126.10	174.90	CHF 154.80	-2.6%	-2.6%	33	CHF 4.73

Digital PCR for Research

Digital PCR was first described in 1992 by PJ Sykes, PhD, et al., and perfected by Bert Vogelstein, MD, and Kenneth W. Kinzler, PhD, in 1999. The technique is a new approach to nucleic acid detection and quantification that offers an alternative to real-time and traditional PCR. Digital PCR offers an accurate and sensitive method that directly counts individual nucleic acid molecules based on on/off signals, providing absolute quantification data.

The sample is prepared in a manner similar to that for real-time PCR but then is separated into thousands of partitions, each containing zero, one or a few template molecules. Partitions with a target molecule will amplify via PCR and a fluorescent probe is used to detect the amplified target (positive reactions).

The ratio of positives to negatives in each sample is the basis of quantification. Digital PCR does not rely on the number of amplification cycles for molecules quantification like real-time PCR does; rather, it relies on Poisson statistical data analysis to determine the absolute template quantity. In the end, the number of positive reactions is proportional to the total number of molecules present in the sample. Because it is not dependent on reference standards, digital PCR data can be compared across instruments or labs, which enhancing collaborations among the scientific community and increases results reliability.

Although it is a relatively young technique and instruments are the priciest among PCR systems, digital PCR is burgeoning in the pharmaceutical and biotechnology sector as well as in academic laboratories. It is ideal for applications such as rare mutation detection, pathogen detection and quantification, GMOs detection, NGS libraries quantification and data confirmation, developments for real-time PCR references and others.

Undoubtedly, Bio-Rad Laboratories is the leading vendor in the digital PCR market. Bio-Rad's QX200, introduced in 2013, is a high-throughput instrument that offers the highest sensitivity and accuracy in terms of absolute quantification among PCR instruments that are currently on the market. RainDance Technologies is the second largest supplier in the niche market of non-diagnostic digital PCR instruments, with its picodroplet technology-based RainDrop ddPCR platform. The RainDrop System is designed exclusively for research use, and is the only unified platform for NGS amplicon enrichment and digital PCR. Thermo Fisher Scientific offers the QuantStudio 3D digital PCR system, which features a chip-based workflow. Other vendors include Fluidigm, Formulatrix and Stilla Technologies.

In 2015, the total market for digital PCR was about \$64 million. It has an expected growth rate of 9.0% for 2017, explained by its absolute quantification prowess and utility with NGS applications, as well as its rising number of utilizations in the liquid biopsy arena.

Digital PCR at a glance

Leading vendors:

- Bio-Rad Laboratories
- RainDrop Technologies
- Thermo Fisher Scientific

Largest Markets:

- Biotechnology
- Pharmaceutical
- Academia

Instrument Cost:

- \$30,000-\$150,000

Energy

Big oil companies remain cautious about investments as they seek to pay down debt and respond to shareholders. In contrast, smaller shale operators are ramping up investments, focusing on production volume. While many larger companies fear that oil prices could fall again due to actions of the Organization of the Petroleum Exporting Countries, shale drillers are more secure that they can adjust to price declines. In addition, shale producers' smaller-scale projects require less capital than major firms' projects. Independent producers in the US plan to increase spending by more than 25%, given that oil prices remain over \$50 per barrel, according to Wood Mackenzie. For major oil firms, Wood Mackenzie forecasts investments to decline 8% in 2017. Nonetheless, shale companies still face challenges to operating profitably. AlixPartners forecasts oil producers of all sizes will outspend their cash flow by \$43 billion in 2017.

Source: [Wall Street Journal](#)

Biotechnology

On January 17, the FDA released its draft guidance on demonstrating biosimilar interchangeability. Originally expected to be released in late 2015, the long-awaited guidance concentrates on recommendations for proving that a potential therapeutic protein product, specifically, can be interchangeable with an FDA-licensed biological reference product when submitting a marketing application or supplement under Section 351(k) of the Public Health Service (PHS) Act.

Since 2015, the FDA has approved four biosimilars under the Act: Sandoz's Zarxio and Erelzi, Pfizer and Celltrion's Inflectra, and Amgen's Amjevita. In contrast, 20 biosimilars have been approved in Europe. Interchangeability is a significant component of the development of biosimilars, as biosimilars can be replaced with their respective reference products at a pharmacy level as per the PHS Act.

The draft guidance recommends that sponsors consult with the FDA early in their development of biosimilars to gain information on how to adequately demonstrate interchangeability for their products, since each interchangeable product is different. It also suggests that studies should take place on alternating the biosimilars and its reference product two or more times to ensure that the product is still safe and effective. For these studies in particular, the Agency states that the reference product should be US-licensed to limit the number of "subtle differences" between US biological products and biological products in other regions. However, if the product is only to be used once, sponsors then need to provide an explanation justifying their decision to not conduct the alternating study.

Source: [FDA](#)

Government

Earlier this week, the Trump administration mandated a temporary blackout on the EPA for press releases, contract approvals and grants. The blackout comes just as the agency was preparing to approve almost all pending contracts currently under review, which total \$3.9 billion. The temporary hold dictates the blockage of all existing published content on the EPA's website as well as new work on projects, requiring EPA scientists to undergo a review conducted by the new administration before details can be released to the public. Doug Ericksen, communications director for the Trump administration, stated that all EPA content will be reviewed on a case-by-case basis; after a thorough review, the administration will decide whether scientific reports and data compiled by the EPA on subjects such as climate change, air monitoring and water pollution will be subject to removal from the EPA's website and social media pages. Scientists are showing concerns regarding the potential loss of funding for programs such as drinking water protection and hazardous waste oversight.

The new administration also targeted environmental rules carried out during Barack Obama's presidency, including revised pollution rulings in various states, standards for renewable fuel and formaldehyde limits in wood products.

Source: [Associated Press](#)

Finland

In 2015, the Finnish government imposed major budget cuts in basic funding at universities, resulting in an increase of Finnish academics and researchers emigrating abroad. Federal funding to Finland's 15 universities and 26 polytechnic institutions was reduced by nearly €500 million (\$530.4 million) over the next four years, while research funding was slashed by €100 million (\$106.1 million). Between 2011 and 2015, the number of PhD-educated citizens moving abroad increased by 37%. The decreases in academics is affecting research and faculties at universities, with institutions being forced to let go of employees to meet funding requirements. The University of Helsinki stated it will cut approximately one thousand staffed employees by the end of 2017 to decrease the institution's budget €106 million (\$112.4 million) by 2020. Similarly, Aalto University decreased its workforce by 17% and announced that the institution will lose 25% of its total €400 million (\$424.3 million) budget by the end of next year. Academics in Finland have stated concerns about the impact of the budget cuts, indicating that the cuts have caused great damage which may be difficult to reverse.

Source: [Times Higher Education News](#)

Argentina

Between 2004 and 2015, R&D in Argentina steadily grew at a rate of 8%-10%, and the previous government had plans to increase the number of Argentine researchers in 2017 by 10%, calling for one thousand new researchers last year. However, in November 2016, Congress approved budget cuts of approximately 16%, down from the original 30% in cuts new president Mauricio Macri had proposed due to protests from the scientific community. In 2015, after elections, President Macri had stated his plans to increase Argentina's science and technology investments from 0.7% of the country's GDP to 1.5% of GDP, but academics believe the recent cuts to science R&D will not achieve this. The cuts will impact funding of research projects, new infrastructure and salaries. Researcher salaries are already lower in Argentina than in other countries, and grants are estimated to be about 20 times lower than the average research award in Europe. The ongoing declines in R&D budgets have academics worried about a "brain drain," as 55% of new researchers will not be supported this year, a decrease of 500 people from 2015, which will impact new and ongoing research projects in the country.

Source: [Chemistry World](#)

Asia Pacific

Earlier this month, PwC released its 20th annual "Global CEO Survey," comprised of data compiled from interviews with 1,379 CEOs from 79 countries. Conducted during the last quarter of 2016, the Survey interviewed CEOs about their outlook on the global economy and how they believe it will impact their businesses.

The majority of CEOs in Asia Pacific believe that global economic growth will stay the same in 2017, while 28% believe it will improve. In regards to revenue growth in 2017, 49% of CEOs responded that they were "somewhat confident" in their companies' financial prospects this year, while 31% indicated they were "very confident." When it came to confidence in revenue growth over the next three years, however, 50% of CEOs stated they were "very confident," while 40% were "somewhat confident."

For 77% of Asia Pacific CEOs, a priority this year is organic growth; for 53%, it is cost reduction; and for 53% it is new strategic partnerships or joint ventures. Only 11% of CEOs indicated that they plan to sell a business or exit a market in 2017, while 15% and 22% specified interests in outsourcing and collaborating with entrepreneurs or start-

ups, respectively.

Regionally, 56% of CEOs feel the US is the most important country for their companies' overall growth prospects in 2017, followed by China at 38% and the UK at 16%. When it comes to potential economic, policy, social and environmental challenges to their companies' growth, 36% of CEOs are most concerned about over-regulation, 36% cited uncertain economic growth, 32% are concerned about exchange rate volatility, while 25% noted increasing tax burdens and 25% identified geopolitical uncertainty. In regards to business threats, 39% of CEOs cited concern for the availability of key skills, 39% identified the speed of technological change, and 35% chose changing consumer behavior. To capitalize on new opportunities, 24% of CEOs aim to strengthen innovation capabilities, while 15% aim to increase human capital and 14% plan to bolster their competitive advantages in the market.

Source: [PwC](#)

Life Science Consumables

Company Announcements

In December 2016, **Molecular Assemblies**, developer of a proprietary enzymatic DNA synthesis technology, closed a \$2.3 million oversubscribed seed round of financing. Investors included **Agilent Technologies**.

Neogen announced in December 2016 the resignation of Charles Fischer from its Board for health reasons.

In December 2016, 3-D human tissue provider **Organovo** signed an exclusive distributor agreement for Japan with **Cosmo Bio** for its NovoView Preclinical Services.

STEMCELL Technologies announced in December 2016 an exclusive license agreement with **Cincinnati Children's Hospital Medical Center** to commercialize its fundamental technology for generating gastrointestinal organoids from PSCs.

Ascendance Biotechnology signed an agreement in December 2016 with **GE Healthcare**, providing it with the right to manufacture, market and sell the Cytiva brand of human stem cell-derived heart muscle cells used for evaluating potential cardiotoxicity.

Following an agreement with the **US Department of Agriculture** (see **IBO** 7/15/16), **Santa Cruz Biotechnology** ceased sales of polyclonal antibodies as of December 31, 2016.

In January, genome engineering solutions firm **Synthego** announced that it raised \$41 million in Series B financing, bringing the total raised to \$50 million. Synthego's CRISPRevolution synthetic RNA is used for CRISPR genome engineering.

SomaLogic announced in January that it joined China-based **iCarbonX's** "Digital Life Alliance" to build a digital health ecosystem for individualized health analysis. SomaLogic will provide proteomics data and applications expertise, and the companies will establish a Chinese joint venture to provide SomaLogic's SOMAscan proteomics assay for research and health applications. iCarbonX also made an equity investment in SomaLogic.

In January, **Illumina** announced a collaboration with genomic informatics firm **NRGene** to accelerate development of new molecular breeding tools for cattle to support global food production.

Meridian Life Science announced in January an agreement to exclusively distribute **Microbix**-branded antigen products in China, Hong Kong, Taiwan and Macau. Microbix will also provide bulk-finished product to Meridian to sell under the Meridian label to customers in Asia Pacific.

InDevR entered into an agreement in January with the **US FDA** for licensing monoclonal antibodies, enabling it to consistently manufacture and control the supply of antibodies for use in its potency assays.

In January, **Horizon Discovery** amended its licensing agreement with **ERS Genomics** to include the commercial rights for the use of CRISPR-edited cell lines for GMP manufacturing of biotherapeutics. The company also

announced a two-year collaboration with instrument firm **Solentim** to develop an automated manufacturing platform for the genome editing of mammalian cells.

StemBioSys, which provides the HPME (High Performance Micro Environment) advanced stem cell culture system, announced in January a US and Canadian distribution agreement with **VWR**.

In January, **Synthomics**, a developer of systems for oligonucleotide synthesis, completed a seed round financing.

In January, CRO **Crown Bioscience** announced plans to increase its focus on its Life Science division, which sells over one hundred products, including antibodies for in vivo and in vitro studies, recombinant proteins, recombinant cell lines, tumor samples, immune checkpoint antibodies and tumor tissue microarrays. The company forecasts triple-digit growth for the division this year. In connection, Crown Bioscience plans to more than double its offering of recombinant cell lines for important oncology targets and pathways.

Product Introductions

Enzo Life Sciences launched in November 2016 the IL-6 (human) ELISA kit, which is able to detect IL-6 levels down to 0.057 pm/mL, with detection in three hours.

In November 2016, **Olink Proteomics** introduced three new biomarker panels: Immune Response, Organ Damage and Metabolism. Each panel offers high-throughput immunoassays for simultaneous analysis of 92 protein biomarkers using 1 µL of biological sample.

In December 2016, **HumanZyme** released Wnt3A, a new addition to its HumanKine authentic recombinant human product line for stem cell research and regenerative medicine applications.

Cellecta launched in December 2016 its new pooled single molecule CRISPR Human Genome-Wide 80K Knockout Library, featuring four sgRNAs per gene. It allows for the study of gene disruptions across the entire human genome in a single screening experiment.

In January, **Innova Bioscience** introduced the Conjugate Check&Go! Kit, its first lateral flow product specific to antibody labeling, designed for confirmation of successful conjugation.

Eurofins Genomics introduced in January the expansion of its Express Oligo service, which allows US customers to receive their primers in a shorter turnaround time without a price premium or compromise in quality.

Becton, Dickinson released in January the BD Precise WTA (Whole Transcript Analysis) kits, providing an easier method to identify and quantify genetic information in individual cells for genomics-based research. Specialized reagents extract RNA molecules from individual cells and tag each molecule with a “molecular index” to enable researchers to count each individual molecule and attribute the molecule to a specific cell. The kits are optimized for use with the BD FACS flow cytometers.

In January, **SCIEX**, a **Danaher** company, introduced the Fast Glycan Labeling and Analysis Kit for quantitative glycan analysis in biopharmaceutical characterization. Average time for sample preparation is one hour for up to 96 separations, and does not require ultra-centrifugation or advanced pipetting techniques. Analysis uses capillary electrophoresis.

Nucleus Biologics launched in January a high quality feta bovine serum, featuring Farm-to-Flask traceability back to the animals and long-term pricing arrangements.

Informatics

Company Announcements

Cheminformatics firm **Optibrium** announced in November 2016 a collaboration with **Molport**, a provider of a

chemicals database, marketplace and order fulfillment platform.

Optibrium announced in January a collaboration with chemical source database firm **eMolecules**.

In January, **Optibrium** named **Zastra Innovations** as its sole distributor for India for StarDrop software for small molecule design, optimization and data analysis.

In November 2016, Dr. David D'Argenio retired from **Simulations Plus**'s Board.

Certara's Simcyp Division launched in December 2016 a new strategic Quantitative Systems Toxicology initiative to advance mechanistic modeling. It leverages the company's Quantitative Systems Pharmacology expertise and Cardiac Safety Simulator.

In January, **Dotmetrics** and **3E**, an environmental health and safety compliance and information management service, announced a strategic alliance. Dotmetrics will integrate 3E's 3E Online Safety Data Sheet management solution and Ariel substance-level chemical regulatory content with several of its products.

Schrödinger announced in January the integrations of the open source QUANTUM EXPRESSION density functional theory modeling software with its Materials Science Suite for the expanded use of first principles simulation. It expands applications to include chemical structures with crystalline structures.

Product Introductions

Life science R&D software firm **Benchling** introduced in November 2016 its Bioregistry system for complex biological entity registration and strain management, stating that it can accommodate the complete hierarchy of antibody discovery workflows.

In November 2016, **Core Informatics** released a validated cloud infrastructure offering built on Amazon Web Services for regulated and GxP customers.

Dotmatics launched in November 2016 Vortex for Bioinformatics, an easy-to-use program for analysis and visualization, which can handle whole genome, antibody, protein and peptide data types.

In November 2016, **PerkinElmer** released enhancements to its PerkinElmer Signals Perspectives platform, providing advanced text analytics and semantic understanding for unstructured data.

Wiley launched in November 2016 the Wiley Spectra Lab Desktop edition and Server edition for managing analytical data.

In December 2016, **CloudLIMS.com** introduced CloudLIMS Lite, enabling enhanced batch editing and centralized sample management, and featuring a new user interface.

RURO announced in December 2016 that its Limsfinity framework is now available on RURO's Cloud.

In January, **Certara** introduce Simcyp Population-based Simulator v16. The platform is used to determine first in-human dose selection. New features include an enhanced lung model and new dermal absorption model.

In January, **Certara** launched D360 v9, featuring "virtual compound support" for creating and sharing new chemical structure ideas, and D360 Express.

IDBS launched in January the E-Workbook Cloud, an enterprise platform featuring eight modules: ELN, Integrations (application user interfaces for integration of existing systems), Assay, Inventory, Connect (supporting B2B collaboration), Biology, Chemistry and Request.

In January, **Genedata** introduced Data Science Services for on-demand, project-based expertise in omic data analysis and interpretation for precision medicine. It is designed for use by pharmaceutical R&D organizations for omics-based patient profiling projects.

Lab-Ally released in January its CERF ELN v5.0, a combined ELN and document manager.

Sales and Orders of Note

ACD/Labs announced in November 2016 that **Boehringer Ingelheim** selected its ACD/NMR Workbook Suite, ACD/NMR Predictors and ACD/Spectrus Processor for use by several hundred scientists.

In January, **LabVantage Solutions** announced it was selected to replace an existing, custom LIMS at industrial technology firm **Kennametal's** Quentin C. McKenna Center.

IDBS announced in January that genome editing firm **Precision BioSciences** implemented its E-Workbook.

GC & GC/MS

Company Announcements

Zyomic Technologies announced in fall 2016 that it is now distributing South Korea-based **YL Instruments'** GC and GC/MS systems in the US.

INFICON's third quarter Security & Energy sales grew 62.7% to \$9.6 million, or 12% of company sales.

Product Introductions

Markes International debuted in fall 2016 the HiSorb product range of probes and accessories for thermal desorption. Utilizing a new technology for high-capacity sorptive extraction of organic chemicals, the products can be used for immersive or headspace sampling of liquids, as well as headspace sampling of solids.

In November 2016, **FLIR** launched the portable Griffin G465 mobile ion trap GC/MS system with real-time vapor survey mode.

INFICON released in November 2016 the Micro GC Fusion 4-Module system, adding to the existing 2-Module configuration.

In November 2016, **PAC** introduced the SeNse Sulfur Chemiluminescence Detector, featuring sensitivity of 0.3 pg S/sec and using air instead of oxygen.

Shimadzu released in January the Smart Pesticides Database v2 for residual pesticides in food using triple quadrupole GC/MS, which contains 530 pesticides. The optimal recommended calibration reagents, sample pretreatment kits and GC consumables are also available. The database also contains information on single quadrupole GC/MS.

Laboratory Automation

Company Announcements

Thermo Fisher Scientific announced in November 2016 a partnership with **Hamilton Storage** to offer the fully automated Thermo Scientific Decapper 500 and 550 Series tube capping systems. The systems can cap and decap both Thermo Scientific Matrix and Nunc automation tubes on the same system. They are designed for use in medium- and high-throughput labs.

For the fiscal year ending September 30, 2016, Brooks Automation Life Science Solutions (LSS) sales jumped 58.7%

to \$108.1 million to represent 19% of revenues (see **IBO** 10/31/16), driven primarily by the acquisition of **BioStorage Technologies** (see **IBO** 11/15/15). Organic LSS sales declined 2.5% as adoption of automated cryogenic storage systems was slower than expected. Following profitability in the fiscal fourth quarter, fiscal 2016 LSS adjusted operating loss narrowed 70.6% to \$5.0 million due to the acquisition. Fiscal 2017 sales are projected to grow more than 40%.

Berthold Technologies announced in November 2016 that its TriStar² S LB 942 and Mithras² LB 943 Multimode Readers have been granted assay certification to run **Bellbrook Lab**'s Transcreeper TR-FRET and FI assays.

In December 2016, **Labcyte** announced a collaboration with **Notable Labs**, which is developing a personalized treatment service for cancer patients, for use of its Echo acoustic liquid handling technology to screen individual cancer patients' tumor cells.

Tecan announced in December 2016 that Dr. Stefan Traeger, head of the Life Sciences Business, will leave the company no later than June 30 to become chairman of photonics firm **Jenoptik**.

In January, **Labsis Laborsysteme**, a provider of lab automation software, announced the acquisition of software developer **Mikrotek Laborsysteme**.

BMG LABTECH announced in January a collaboration with **Genedata** to integrate its multimode microplate readers with the Genedata Screener data analysis and management platform for in vitro screening technologies as part of Genedata's Ready-to-Run program.

Product Introductions

Opentrons Labworks released in November 2016 an application programming interface for its OT-One line of pipetting robots, which start at \$3,000. The API can be used to automate complex workflows with shareable protocols, and to connect the robots to other software tools and lab equipment.

In December 2016, **Hamilton Storage** introduced the SAM HD, a low-capacity automated sample management system. Models are available for storing samples at 4°C, -20°C, -40°C and -80°C, with capacity up to 60,000 tubes in standard racks or 86,250 tubes using RackWare racks.

Hamilton Storage released in December 2016 upgrades to its LabElite DeCapper and I.D. Capper systems, including a 6-channel headed for use with 24-well tube racks. The updated LabElite I.D. Reader features ColdScan technology to scan tube racks directly out of the freezer, combatting fog and condensation on barcode scanners.

Hamilton Storage announced in December 2016 updates to its Verso automated sample storage system to include the Verso S1 SE configuration for labs with ceiling heights as low as 7.10 ft (2.4 cm) and the Universal Picker, which accommodates 96-well tubes, 1 dram vials, and other types of plates and vials.

Reported Financial Results

\$US	Period	Ended	Sales	Chg.	Op. Prof.	Chg.	Net Prof.	Chg.
Corning (Life Sciences)	Q4	31-Dec	\$206.0	2.0%	NA	NA	\$13.0	44.4%
Corning (Life Sciences)	FYE	31-Dec	\$839.0	2.2%	NA	NA	\$58.0	-4.9%
Danaher	Q4	31-Dec	\$4,584.3	6.0%	\$728.6	11.8%	\$747.0	8.5%
Danaher (Environ. & Applied Solutions)	Q4	31-Dec	\$959.1	3.5%	\$229.9	12.1%	NA	NA
Danaher (Life Sciences)	Q4	31-Dec	\$1,454.1	5.8%	\$244.8	84.6%	NA	NA
Danaher	FYE	31-Dec	\$16,882.4	17.0%	\$2,750.9	27.2%	\$2,553.7	-23.9%
Danaher (Environmental & Applied Solutions)	FYE	31-Dec	\$3,692.8	4.0%	\$870.0	0.4%	NA	NA
Danaher (Life Sciences)	FYE	31-Dec	\$5,365.9	61.9%	\$818.9	148.8%	NA	NA
Honeywell (Performance Materials & Tech.)	Q4	31-Dec	\$2,228.0	-4.7%	\$566.0	19.7%	NA	NA
Honeywell (Performance Materials & Tech.)	FYE	31-Dec	\$9,272.0	-2.1%	\$2,050.0	3.0%	NA	NA
Illinois Tool Works (Test Meas. Elec.)	Q4	31-Dec	\$487.0	-2.6%	\$98.0	8.9%	NA	NA
Illinois Tool Works (Test Meas. Elec.)	FYE	31-Dec	\$1,974.0	0.3%	\$372.0	15.5%	NA	NA
Illumina	Q4	1-Jan	\$619.3	4.7%	\$143.0	-0.7%	\$123.9	18.6%
Illumina	FYE	1-Jan	\$2,398.4	8.0%	\$587.0	-4.2%	\$454.1	-1.6%
Thermo Fisher Scientific	Q4	31-Dec	\$4,953.2	6.5%	\$752.6	9.0%	\$629.5	4.5%
Thermo Fisher Sci. (Life Sciences Solutions)	Q4	31-Dec	\$1,336.0	10.4%	\$445.0	16.5%	NA	NA
Thermo Fisher Sci. (Analytical Instruments)	Q4	31-Dec	\$1,217.0	31.5%	\$298.5	45.6%	NA	NA
Thermo Fisher Sci. (Specialty Diagnostics)	Q4	31-Dec	\$834.4	-3.5%	\$227.4	0.3%	NA	NA
Thermo Fisher Sci. (Laboratory Prod. & Serv.)	Q4	31-Dec	\$1,757.0	-3.3%	\$256.2	-4.2%	NA	NA
Thermo Fisher Scientific	FYE	31-Dec	\$18,274.1	7.7%	\$2,449.2	4.8%	\$2,021.8	2.3%
Thermo Fisher Sci. (Life Sciences Solutions)	FYE	31-Dec	\$4,978.1	12.1%	\$1,514.7	13.3%	NA	NA
Thermo Fisher Sci. (Analytical Instruments)	FYE	31-Dec	\$3,668.2	14.3%	\$745.2	21.6%	NA	NA
Thermo Fisher Sci. (Specialty Diagnostics)	FYE	31-Dec	\$3,339.2	2.9%	\$909.8	4.2%	NA	NA
Thermo Fisher Sci. (Laboratory Prod. & Serv.)	FYE	31-Dec	\$7,030.0	5.5%	\$1,052.1	5.3%	NA	NA
Waters	Q4	31-Dec	\$628.8	7.2%	\$208.3	14.9%	\$174.4	15.4%
Waters	FYE	31-Dec	\$2,167.4	6.1%	\$624.3	10.0%	\$521.5	11.2%
Other Currencies								
Hitachi High-Technologies	Q3	31-Dec	¥158,078	9.0%	¥16,620	21.7%	¥12,353	19.2%
Hitachi High-Techs. (Sci. & Medical Systems)	Q3	31-Dec	¥42,200	0.7%	¥7,200	9.1%	NA	NA
Scientific Digital Imaging	6 Mo.	31-Oct	£4.9	33.5%	£0.4	1400.0%	£0.4	3076.9%

N/A=not available NM=not meaningful