Denise Myshko

R&D INNOVATION: A Common Goal

A new paradigm for drug research is emerging as companies begin to work with nontraditional partners to understand disease, access data and new technologies, and ultimately, find new avenues of research.

The challenges pharmaceutical research and development faces — economic volatility, lowered productivity of R&D, stronger regulations, rising costs, evolving technologies, global development — are well known. In this environment, creating value for patients, physicians, and payers is critical.

To deliver value and bring truly innovative and cost-effective therapies to market will require the industry to take a closer look not only at what to innovate but also how to innovate. Industry experts says pharma and biotech companies will have to consider different approaches for finding and assessing potential therapies.

Much of the attrition in the pipeline, particularly in the large Phase III clinical trials, is a result of the inability of large pharma companies to identify mechanisms and targets that are at the heart of human disease and many of the conditions that have unmet medical needs today, says Nick Davies, Ph.D., partner, U.S. pharmaceutical and life sciences advisory services, PwC.

"Thus far, pharma has been unable to use genetic knowledge to make good choices about the mechanisms that it uses to intervene in the pharmacological process," he says. "Disruptive innovation in R&D is about pharma being more innovative in its partnering and in its understanding of disease. If pharma partners with companies to better understand the context of disease, who's susceptible to diseases, and how to identify those patients, better pharmacological intervention will be possible. We expect to see more open innovation and partnering."

Miguel Barbosa, Ph.D., VP of immunology research, scientific partnership strategies, at Janssen Research & Development, a company of Janssen Pharmaceutical Companies of

JOHN BALDONI ▪ *GlaxoSmithKline*

"The precompetitive space is going to emerge as the place where people mingle and assemble to pose hypotheses."

Johnson & Johnson, says disruptive innovation will come from outside the core pharmaceutical R&D communities.

"We need to find a way to tap into highly creative individuals and teams without imposing on them the structure and processes needed to manage large-scale organizations," he says. "An exciting new area for disruptive innovation is likely to come from a focus on holistic patient care with an emphasis in lifelong well-being. The convergence of medical and information technologies will be facilitated by a much more informed patient population that will expect much more than a pill. They will expect an integrated patient solution that will address the underlying disease and improve their life."

But disruptive innovation is a challenging concept for the pharmaceutical industry to grasp, says Reid Leonard, Ph.D., executive director, external scientific affairs at Merck.

"We're trying to practice the most cutting-edge, innovative science possible but we are doing so in a highly regulated industry," he says. "To build in all of the appropriate safeguards to ensure that we're developing quality therapies that are meeting an unmet need in the safest way possible, there are constraints on how disruptive we can be."

Dr. Leonard says the place for disruptive innovation is at the very front end of research, leveraging the latest and greatest innovations coming out of academia and biotech. Companies can then pick from among those opportunities to be translated into a drug discovery program.

Research, especially basic research, in the future is going to be disaggregated, says John Baldoni, senior VP, platform technology and science, at GlaxoSmithKline.

"There will be a large number of idea generators," he says. "There will be people who are hypothesis generators. There will be incubators for those hypotheses that are funded through venture capital and pharma. Additionally, the precompetitive space is going to be much bigger than it is now. As a consequence, deep dive analytics is going to be an incredibly important part of drug discovery and development."

Mr. Baldoni says while connectivity among companies is going to be greater in the precompetitive space, the race to the molecule for the patent is going to be won by the companies that have the capabilities to best translate ideas into tractable products.

"This is already happening, and this trend will accelerate over the next five years," Mr. Baldoni says. "The precompetitive space is going to emerge as the place where people mingle and assemble to pose hypotheses."

Additionally, he says there is going to be a great confluence of electronics, physics, integrated circuitry, and biology that's going to influence therapies in the future.

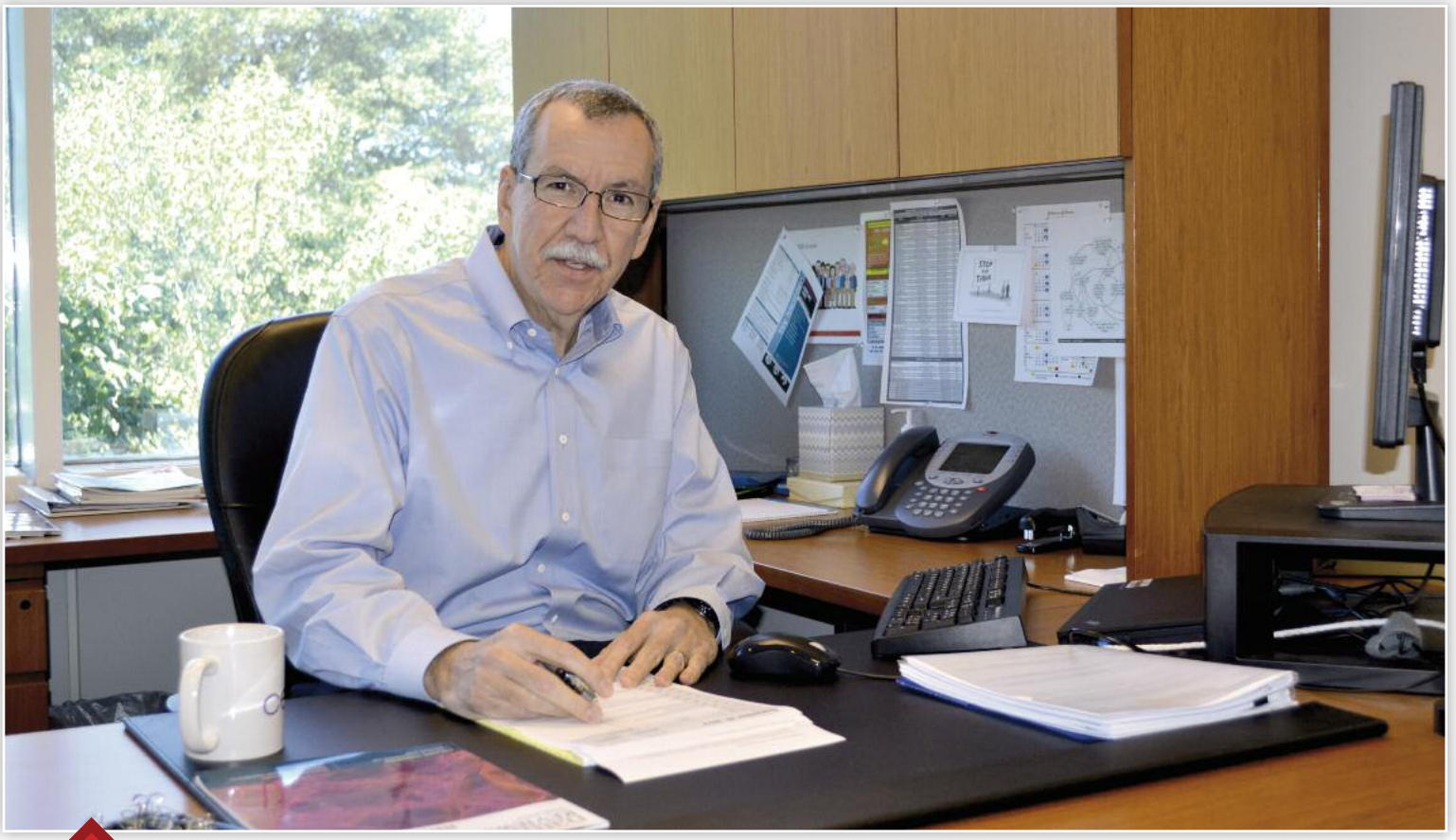
"Computing power that fits into very small spaces is going to change how the industry performs," he says. "Manufacturing of traditional pharmaceutical dosage forms is going to be transformed and the factory of the future will be agile, movable, and totally automated. This will improve access to medicines and reduce the cost of manufacturing medicines."

Phil Vickers, Ph.D., global head of research and development for Shire Human Genetic Therapies, says innovation in the future will be driven by "think tanks" of people from a diverse group of organizations engaged in problem solving.

"Nontraditional partners will become important for the pharmaceutical industry," he says. "Pharma will be working with information companies, companies focused on computational modeling, data visualization of large and complex data sets, and remote monitoring. These are likely to make a big difference in clinical trials."

Another area of disruptive innovation will involve modeling.

"Structure-aided drug discovery and design will allow us to focus on the molecular structure of a protein target," Dr. Leonard says. "Modeling can also be applied to the discovery of new chemical structures and disease processes at multiple system levels. This is one area where we hope that continued break-



DR. MIGUEL BARBOSA ▪ *Janssen Research & Development*

"An exciting new area for potentially disruptive innovation is likely to come from a focus on holistic patient care with an emphasis on life-long well-being."

throughs will help the entire drug discovery and development process to be much more effective and efficient. We're starting to see tools emerge that, hopefully, will give us greater predictive power in determining at the earliest stages of testing whether a new drug, new vaccine, or biologic will have the potential to be effective in a human disease. The earlier we can get that data either in animals or in virtual modeling systems, the more intelligent choices we can make about the very time-consuming and expensive testing phases that come later."

Innovation in Data and IT

The pharmaceutical industry is expected to continue to experience innovation with regard to data and information technology, which will allow companies to have a better picture of all information related to diseases to be able to make data meaningful.

Neil de Crescenzo, senior VP and general manager, at Oracle, says there is a new emphasis in thinking about data management and data liquidity.

"Clinical trial data have been digitized for many years," he says. "But over the years there has been a lot of data that have been used outside the clinical trial process. These data were quite laborious to collect and maintain and use because the information wasn't digitized. And if it was digitized, it may not have been with a common set of standards."

This, he says, is changing, and systems are evolving to allow more meaningful insights to be gleaned.

Mr. de Crescenzo also says genomic data and technologies are increasingly being used, especially in oncology trials because the cost of next-generation sequencing is rapidly dropping.

"Genomics and other 'omics' technologies allow for insights at a molecular level of the variation of disease," he says. "Often this leads to more accurately targeting a clinical trial to more rapidly lead to a successful therapeutic."

The driver for change in pharmaceutical R&D is the adoption of technology, says Jamie Macdonald, chief operating officer at INC Research.

"The technology has existed for many years; we've gone through cycles in terms of adopting technology within the development space," he says. "For example, the adoption of EDC had been very slow; it has taken 15 years to 20 years to get to a state where it is being used in 70% to 80% of trials."

He says the next round of change on the technology side may be using existing systems but with far greater integration across those systems with a willingness among sponsors, CROs, regulators, and other collaborators to look at process change using already existing technologies.

"There is a movement away from extensive source document verification to a more risk-based assessment of quality using some of the techniques that have existed in other industries, such as quality by design tools or failure mode effect analysis, to use the data to better drive the clinical trial process," he says.

Mr. Macdonald says another potential for disruptive innovation using technology will be in the area of study design.

"The industry has been reticent to share data on failed trials and therefore, every new trial essentially establishes its own hypothesis and builds itself assuming that we know nothing about that particular drug or the comparator or placebo effect," he says.

"Companies should look at the data from a patient population needs perspective for approval and make even more stringent post-marketing commitments," he continues.

DR. PHIL VICKERS ▪ *Shire HGT*

"In the future, there will be networks of external partnerships that work toward a common goal."

"Then maybe we can alter the perception of placebo-based trials, and outcomes can be more relevant for physicians, patients, and caregivers."

Open Innovation

Industry leaders say collaboration, including precompetitive data sharing, is critical to ensuring continued progress to improve industrywide clinical trial practices. But partnerships in this environment are likely to be different from those of the past.

"We are now seeing less prescriptive and more open-ended innovation," says Hugh Davis, Ph.D., VP and head of biologics and clinical pharmacology, Biotechnology Center of Excellence at Janssen Research & Development, part of the Janssen Pharmaceutical Companies of Johnson & Johnson. "Companies are funding research with a more open willingness to share intellectual property. There is now a more open network of partnerships and consortia."

He says historically the industry had siloed groups that moved projects from group to group.

"This is changing," he says. "Now, it's all about data. Data really can come from an open forum from anywhere in the world. It's important to use the critical data that we generate and be able to respond in a way that can make a meaningful difference to patients. We want to be able to look at the collective knowledge that is generated across the industry and not necessarily be concerned about the individual intellectual property."

But determining who holds the intellectual property rights is a challenge for open collaboration, says Dominic Behan, Ph.D., co-founder, director, executive VP and chief scientific officer, at Arena Pharmaceuticals.

"The challenge with this type of interaction is determining the vision and who owns the intellectual property associated with it," he says. "It is critical to have a clear understanding of objectives and a common vision when entering into these collaborations. In some but not all circumstances, non-exclusive options on the intellectual property produced can facilitate open collaborations by providing freedom of operation to the parties concerned."

Developing IP together is not impossible, especially through a framework of "extrapreneurship," says Noubar Afeyan, managing partner and CEO of Flagship Ventures.

"Companies are now collaborating with external entities that produce innovations that are in line with the company's needs, deep technical know-how, and market understanding without outright ownership of the IP, but with the ability to in-license the IP when the time is right," he says. "Open innovation should lead large pharma companies to properly foster the innovation supply chain that is so critical to their drug pipelines and long-term viability. They can link with the entrepreneurial innovation ecosystem as a partner, collaborator, and ultimately customer as opposed to simply a 'window shopper,' fostering meaningful interaction throughout the innovation process and not just focusing on later-stage transactions."

It's important to unleash the everyday pieces of innovation and create an environment that allows everybody to be innovative, says Perry Nisen, M.D., Ph.D., senior VP of science and innovation at GlaxoSmithKline.

"Every day, there is something new and different that we can do but teams often are pressed by time and deliverables," he says. "The question is how do we incubate new ideas for the next generation and provide resources to let people try some of these ideas."

Dr. Barbosa says open innovation provides an opportunity for the industry to access highly creative teams and their output in a manner that does not disrupt their continued creative productivity.

Where Disruptive Innovation Will Happen in R&D

- **Information:** The industry has only just scratched the surface in applying innovation around information in pharmaceutical R&D. Genomics, computational biology, and remote monitoring of patients will make available a tremendous amount of information. The industry is in its infancy in understanding how this information can be brought together to lead to new medicines.
- **Novel therapeutics:** Exquisite targeting of drugs to precise tissues — for example, noninvasive delivery of drugs to specific sites in the brain — could dramatically impact the way therapeutics are administered.
- **The ability to identify new drugs:** New technologies will help developers understand a drug target and the biology, limiting the need to screen hundreds and thousands of drugs.

Source: Dr. Phil Vickers, Shire HGT

"We strive to build collaborative relationships with individuals and laboratories based on a shared vision and unwavering commitment to addressing unmet medical needs," he says. "We are very willing to share our expertise and capabilities to help further our partners' scientific mission, not simply accessing a service for our internal programs. But we are careful not to impose our culture and processes on our collaborators. Further, we explore the opportunity to have our scientists participate in key collaborations in a way that they are exposed to external creative environments that broaden their experiences and position them for future leadership roles in R&D. Additionally, we take a long-term view of R&D and are willing to invest in emerging fields of science to help nurture development in new, promising areas to a point where they may reach the level of validation expected for a portfolio type investment."

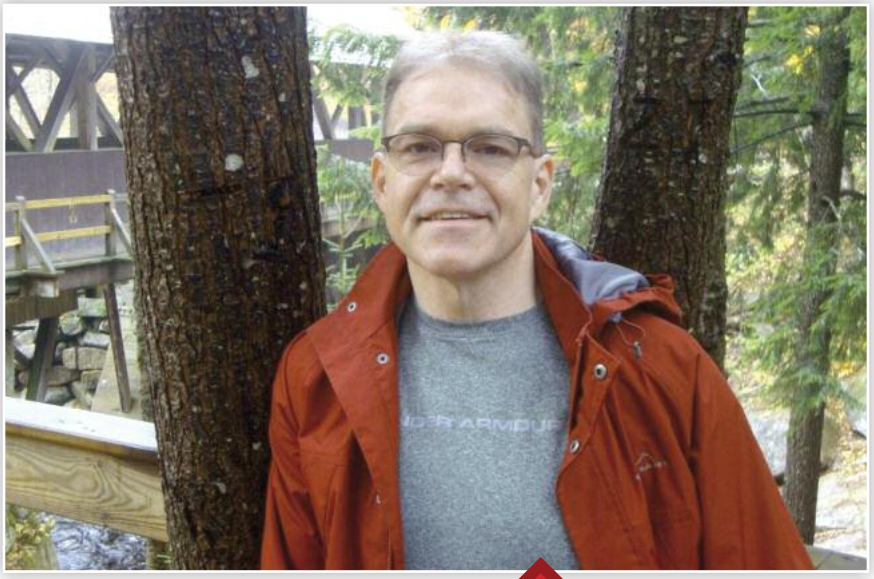
Collaborative Opportunities

Companies are actively working with universities, joining precompetitive discovery groups, and working with nonprofit foundations.

"One area of great opportunity involves partnerships between pharmaceutical R&D

DR. PERRY NISEN ▪ *GlaxoSmithKline*

"It's important to unleash the everyday pieces of innovation and create an environment that allows everybody to be innovative; but teams often are pressed by time and deliverables."



DR. REID LEONARD ▪ *Merck*

"The place for disruptive innovation is at the very front end of research, leveraging the latest innovations coming out of academia and biotech."

and patient-centric nonprofit foundations," Dr. Barbosa says. "This is an area where some pioneering work has been done in the biotech industry; success in these efforts could define a path for the more established pharma R&D organizations to participate. With the evolution of healthcare across the full spectrum, from the higher knowledge base accessible to patients to financial incentives for prevention, I expect opportunities for convergent partnerships across companies from different sectors. For example, there is significant opportunity for potentially synergistic partnerships between the pharmaceutical and the human nutrition industries."

Recent studies find increased collaboration in early development. In fact, pharmaceutical companies in 2012 focused much of their partnering efforts on discovery collaborations as they worked to externalize their research operations, according to Burrill & Company. Of the $36.5 billion in potential value of partnering deals, $16.2 billion were for discovery collaborations or preclinical-stage assets. Burrill researchers say this trend will continue as drug makers seek to reduce their costs and broaden their sources of innovative ideas.

One such group is the Pistoia Alliance, a global, nonprofit, precompetitive alliance of life-sciences companies, vendors, publishers, and academic groups that aims to lower barriers to innovation by improving the interoperability of R&D business processes. The alliance was first conceived by informatics experts at AstraZeneca, GlaxoSmithKline, Novartis, and Pfizer who were attending a meeting in Pistoia, Italy. It was founded in 2009 initially to explore the feasibility of certain technical standards to streamline specific workflows in biology and chemistry. But the alliance has evolved to identify the common barriers to innovation.

More recently, in September 2012, 10 biopharmaceutical companies formed a nonprofit organization to accelerate the development of new medicines. They launched TransCelerate BioPharma to identify and solve common drug development challenges. Five projects have been selected by the group, including: development of a shared user interface for investigator site portals, mutual recognition of study site qualification and training, development of risk-based site monitoring approach and standards, development of clinical data standards, and establishment of a comparator drug supply model.

"Through participation in TransCelerate, each of the 10 founding companies will combine financial and other resources, including personnel, to solve industrywide challenges in a collaborative environment," says Dale Edgar, Ph.D., Lilly Distinguished Research Fellow, at Lilly. "Together, member companies have agreed to specific outcome-oriented objectives and established guidelines for sharing meaningful information and expertise to advance collaboration."

Dr. Barbosa says the hope is that open innovation will lead to a much more productive harvesting of the creative thinking available globally into innovative treatments as well as a whole new paradigm for healthcare, from pharmaceuticals to holistic patient solutions.

"The future of R&D could look like a global network of small teams, with the deep expertise and the passionate drive to overcome the challenges of difficult scientific and clinical problems," he says. "These teams are likely to span across the academic and biotech landscape, structured within a flexible contractual framework that allows them to form and disband according to the scientific challenge and engagement of the experts rather than some artificial financial exit required for reinvestment purposes."

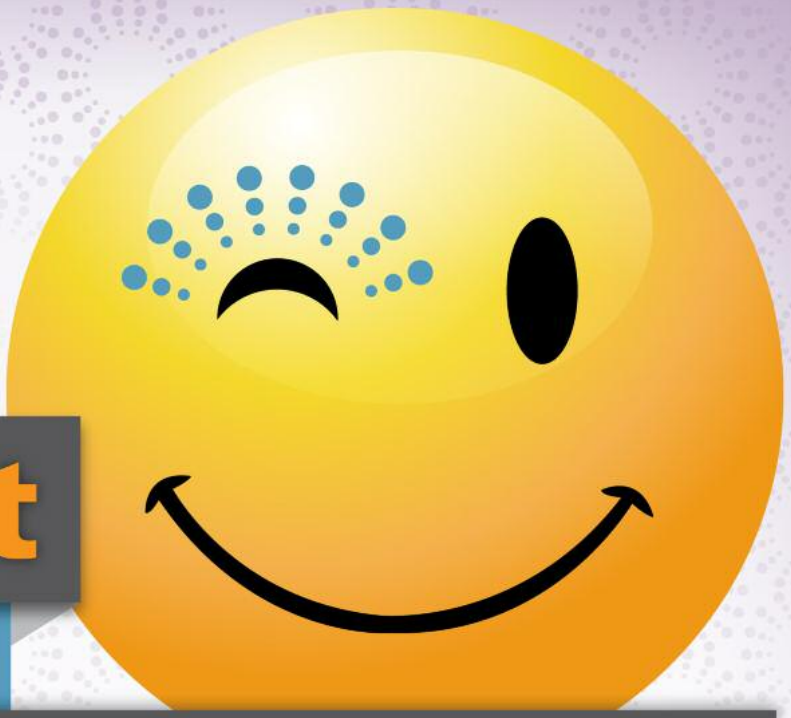
Dr. Edgar says open innovation means inviting the entire scientific community to help solve a problem in a shared risk, shared reward environment, with the end goal being identifying ways to help patients.

"Each year, researchers throughout the world design and synthesize compounds in university and biotechnology laboratories," he says. "But for a range of reasons, including the lack of resources or barriers to engaging in the drug discovery and development process, they are not able to advance their work."

Dr. Vickers says open innovation is about getting access to all of that knowledge outside an individual company's walls that can be applied to the problems being faced and partnering in more creative ways.

"Increasingly, some of the problems that we face will not be addressed by people with classic pharma ways of thinking," he says. "This is particularly powerful and exciting. Scientists from a wide variety of disciplines and experts in other fields will get involved in problem solving. New ideas may come from anywhere." PV

USE YOUR QR CODE READER OR GO TO bit.ly/PV0313-R&D



Cenduit for Happier Sites

SMARTER SOLUTIONS, SMOOTHER STUDIES & COMPLETE CONTROL

From our smart IRT systems to our tailored processes, Cenduit provides the simplest, most straightforward approach to conducting trials. Best of all, it works.

- Patient Randomization
- Drug Supply Management & Drug Allocation
- Study Simulation & Forecasting
- Drug Accountability
- Custom Reporting
- eClinical Integration

Ready to conduct smoother, happier trials with Cenduit?

THE CENDUIT PATH TO PATIENT DRUG COMPLIANCE IN YOUR CLINICAL TRIALS

Understand the protocol

Consider the patients and sites

Design the process

Cenduit delivers

Happier sites

Every Patient. On Time. Every Time.

+1 919.998.3860 www.cenduit.com

CENDUIT Happier Sites

Denise Myshko

COMPANIES ARE Driving Innovation

Here is a look at how our experts' companies are driving innovation through open networks and external partnerships.

Thanks to several of our industry experts who provided us with a glimpse into their R&D programs, we have a sense of how innovation is shaping target identification, collaborations, early-stage research, and more.

Eli Lilly and Company

Through the Open Innovation Drug Discovery program (OIDD), Lilly has established a network of top global research talent at academic and biotech institutions to provide them access to proprietary, in vitro phenotypic and target-based assays (PD2 and TargetD2). The program has more than 300 affiliated academic institutions and small biotech companies working together, and thousands of compound samples have been evaluated in the OIDD screening panel, resulting in several collaborations currently ongoing.

"Each year, researchers throughout the world design and synthesize compounds in university and biotechnology laboratories," says Dale Edgar, Ph.D., Lilly Distinguished Research Fellow, at Lilly. "But for a range of reasons, including lack of resources or barriers to engaging in the drug discovery and development process, they are not able to advance their work. The OIDD platform provides a point of entry into Lilly's drug discovery process for external researchers who may not have previously worked with the company and, in doing so, may uncover innovation above and beyond what Lilly researchers are producing in their labs."

The platform provides scientist-to-scientist connectivity and consists of three components:

- **TARGETD2**, or target drug discovery, a new component that screens submitted molecules for their potential to interact with known disease targets.
- **PD2**, or phenotypic drug discovery, which continues to screen submitted molecules in complex cellular assays with the goal of identifying potential new medicines acting by novel mechanisms or pathways.
- An additional component that screens molecules for their potential in the fight against multi-drug resistant tuberculosis **(MDR-TB)** — a form of tuberculosis (TB) that is resistant to at least two first-line TB medicines — through the Lilly TB Drug Discovery Initiative.

Another program, The Lilly Research Awards Program (LRAP), identifies and supports early-stage research and technology collaborations between Lilly scientists and external academic experts worldwide. It is a two-way, collaborative program in which scientists in academia gain access to research tools to conduct basic research and, in turn, Lilly scientists receive critical information to help inform the future of drug discovery and development as they look to build Lilly's pipeline of tomorrow.

An example of a collaborative research project selected for funding under LRAP is with the Department of Neurobiology, University Hospital Copenhagen, Denmark. This two-year project will further explore the potential expression and function of novel nicotine receptor variants in the brain to generate more robust findings regarding its role in cognition, particularly as it relates to schizophrenia and Alzheimer's disease, which could lead to the advancement of new medicines into clinical development.

Lilly also is collaborating with the National Institutes of Health to generate a publicly available resource to profile the effects of thousands of approved and investigational medicines in a variety of sophisticated disease-relevant testing systems.

Comprehensive knowledge of the biological profiles of these medicines and molecules may enable biomedical researchers to better predict treatment outcomes, improve drug development, and lead to more specific and effective approaches.

Through the collaboration, the NIH's newly established National Center for Advancing Translational Sciences (NCATS) and Lilly Research Laboratories have agreed that NCATS' Pharmaceutical Collection of 3,800 approved and investigational medicines will be screened using Lilly's state-of-the-art Phenotypic Drug Discovery (PD2) panel. This panel features assays that are designed to reveal novel mechanisms or pathways of potential medicines and, as part of this collaboration, approved medicines as well.

GlaxoSmithKline

GlaxoSmithKline has put in place several new processes for driving innovation at the company. One tactic is quarterly innovation retreats; the first was in the spring of 2012.

Perry Nisen, M.D., Ph.D., senior VP, science and innovation at GlaxoSmithKline, says he began doing the innovation retreats as a way to give voice to new ideas throughout the R&D organization. One question at a recent retreat, for example, was how to address undruggable targets. Another retreat looked at solutions for implementing personalized medicine.

"I spend a lot of time teaching people how to go from a thought and idea to something that can be implemented," he says. "We hope to give a venue and mechanism for people to pursue, explore, and consider new approaches."

Another GSK program to unleash new ideas is the company's open innovation lab for neglected diseases, which began in 2010. GSK's research center at Tres Cantos in Spain concentrates on global health priorities such as malaria and TB. They work closely in public-private partnerships, with groups including

the Medicines for Malaria Venture and the Global Alliance for TB Drug Development.

This open approach has allowed GSK to share its anti-malarial data with 14 research institutions around the world, resulting in a number of new research projects. Several labs are also involved in an open source drug discovery project for malaria using an idea called Open Notebook Science. This involves publishing the notebook of the researcher online, along with all of the raw and processed data and any associated material, as it is recorded. Led by the Todd Lab at the University of Sydney with MMV and GSK's Tres Cantos facility, this new practice hopes to speed up the collaboration process.

In addition, in October 2012 GSK announced it was adopting the same open approach to TB research, by putting about 200 TB "hits" into the public domain, making TB data freely available to the public online. The hope is the release of these data will encourage a fully open approach to TB research.

"There is a lot of information and data that we share, and it's important for others to be able to analyze and to do experiments collaboratively," Dr. Nisen says. "We are increasingly finding ways to collaborate and partner with academics."

Additionally, Dr. Nisen says GSK works to develop "coopetition" models where the company works with other big sponsors to develop molecules together that could have a benefit for patients.

"In oncology early development there is a belief that if two drugs are added together there may be an impact that is greater than either can have alone," he says. "We have one oncology program where we share and communicate information, which allows us to make a decision to keep going together. At the end of the day, what works best for patients is what creates the most value."

The Seekers, another GlaxoSmithKline program, began in 2011. The objective was to look at industries that have similar deliverables, high-value products, and look at how these companies organized themselves to deliver those high-value products and whether those technologies or processes could be applied to the pharmaceutical industry.

"This program was inspired by a series of observations I made when I would visit different companies and talk to them about what they were doing," says John Baldoni, senior VP platform technology and science at GlaxoSmithKline. "There is an opportunity for us to see where connections are not occurring with other industry sectors that may have technologies and process that can be used to address challenges in pharma."

One example of the technology the seekers found was a petrochemical company using a novel catalysis in its chemistry program. GSK now has an agreement with the technology holder to take that approach and apply it to the problems in continuous manufacturing.

GSK has also created an internal incubator for ideas that don't naturally fit into current business lines. It is in here that the technology and its application will be explored further and team members develop a business case for moving ideas along.

Johnson & Johnson

Johnson & Johnson has initiated four different innovation centers: San Francisco, Boston, London, and Shangai. These are geographical areas with concentrated research expertise. The centers focus on "onboarding" the most promising early-stage opportunities at the local universities, academic centers, and even the biotechnology companies that are set up in these areas.

This model is intended to give companies across J&J the opportunity to invest their capital in research instead of infrastructure and to focus resources on progressing science instead of day-to-day operations.

"We are hoping to gain access to novel approaches, including data management and data mining to address unmet medical needs," says Hugh Davis, Ph.D., VP and head of biologics and clinical pharmacology, at the Biotechnology Center of Excellence at Janssen Research & Development, part of the Janssen Pharmaceutical Companies of Johnson & Johnson.

Merck and Co.

For Merck, open innovation is about seeking the best science regardless of location or source, says Reid Leonard, Ph.D., executive director, external scientific affairs at Merck.

"To the extent that translates into the ability and the willingness to collaborate on some questions with entities that may be a commercial competitor in a different setting, we are very open to doing that," he says.

He cites Merck's research collaboration with AstraZeneca as an example of this approach. In June 2009, AstraZeneca and Merck entered into an agreement to conduct joint Phase I clinical trials of their respective cancer drugs: AstraZeneca's MEK inhibitor AZD6244 (ARRY-886) and Merck's AKT inhibitor MK-2206.

The companies are evaluating the co-administration of the compounds for the treatment of solid cancer tumors. The partnership is the first time that two large pharmaceutical companies have collaborated to evaluate the potential for combining candidate molecules at such an early stage of development.

"The sole purpose was to provide data to the clinical oncology community that would be of the highest quality possible so that as these products moved forward, patients would get the benefit of this knowledge," Dr. Leonard says. "In the old days, the only way this would happen is that after the drugs were approved a combination trial would have to be conducted. By working together we found a better way."

Dr. Leonard cites another example of an innovative partnership: Merck's recent agreement with GE Healthcare. In December 2012, the companies developed a partnership to use GE's imaging system as a biomarker system in the development of an Alzheimer's therapy.

Shire

Shire has an external partnership with Boston Children's Hospital. In November 2012, the company announced a three-year, broad research collaboration in rare diseases. The goal of the collaboration is to develop novel therapies to treat a number of rare pediatric diseases with high unmet medical need, leveraging Boston Children's research expertise and Shire's development and commercialization capabilities. The emphasis will be on opportunities that have the potential to deliver a development candidate in less than three years from project initiation.

"Boston Children's Hospital has incredibly rich knowledge in biology and rare diseases," says Phil Vickers, Ph.D., global head of research and development for Shire Human Genetic Therapies. "We let them loose to come forward with ideas. We are now in the middle of getting their ideas back, and then we will refine those ideas with a view to establishing some of them as research programs." PV