

CONNECT & DEVELOP COMPLEMENTS RESEARCH & DEVELOP AT P&G

Procter & Gamble has undertaken a variety of activities designed to create connections that will enhance technological innovation.

Nabil Y. Sakkab

OVERVIEW: *Connections—both internal and external—are of increasing importance to innovation and business growth at Procter & Gamble. But the challenge of maintaining effective connections is a formidable one for a global corporation with over 8,000 researchers, 40 percent of whom work outside of North America. Consequently, P&G pursues a “connect and develop” strategy that involves the use of corporate intranet and “smart” reporting systems for knowledge sharing, communities of practice, technology entrepreneurs, joint technology development, liberal licensing of intellectual property, government and university capabilities, and a connection-making exposition held down the street from its world headquarters in Cincinnati, Ohio. Together, they are seen as offering the company an unprecedented opportunity to enrich its innovation portfolio.*

Webster’s dictionary defines “connections” as “the relationships between things that depend upon each other; a

Nabil Sakkab is senior vice president, Research and Development—Global Fabric & Home Care, at Procter & Gamble, headquartered in Cincinnati, Ohio. He assumed his current position in 1995 after managing all of P&G’s Asia R&D efforts. Prior to that, he managed R&D for P&G’s East and Western Europe, Middle East, and North Africa laundry businesses. This followed several P&G R&D assignments in laundry, fabric conditioners, household cleaners, dish care, bleach, personal cleansing, and over-the-counter health products for oral, respiratory and gastrointestinal care. A graduate of the American University of Beirut with a bachelor’s degree in chemistry, he joined P&G in Cincinnati in 1974, following a doctorate in chemistry from the Illinois Institute of Technology and post-doctorate studies at Texas A&M. He is the author of several scientific publications and a co-inventor on several patents. His article is adapted from his presentation to the Industrial Research Institute Fall Meeting, Oct. 2000, in Washington, D.C. sakkab.ny@pg.com

logical linking or coherence.” At Procter & Gamble, we actually look for those “illogical,” “unpredictable” or “unobvious” connections—combinations of technologies in applications that go well beyond their original intended use. Linking technologies in unexpected ways lies at the heart of breakthrough innovation in our products, packages and processes—plus, it significantly reduces product costs, improves quality and speeds product delivery.

Connections are in our blood; they are part of our heritage; they are how we have successfully grown and evolved our business. Figure 1 illustrates this point. In the beginning, P&G created candles. And they were good. Candles begot soap from animal fat renderings. And animal fats led to a revolution in food fats with Crisco, the first all-vegetable shortening. And this got us into emulsifiers and surfactants, critical components of synthetic soap products (we call them detergents), then shampoos, dishwashing liquids, and a variety of cleaners. Even better, the processing of vegetable oils, like the crushing of cottonseeds, enhanced our understanding of cellulose, the technical basis for our paper products. Synthetic soaps taught us to control calcium, which led to Crest and fortified beverages and, most recently, Actonel, a breakthrough osteoporosis treatment.

On and on it went, and this was extremely good—and very profitable. But as we grow larger, decentralized and more global, these connections become much more difficult to make. It’s easy to become too internally focused. To continue growing, we have to make new connections across a much broader range of technologies, and an increasing number will not be chemically or biochemically-based. With a lot of energy and attention going against this connection subject across P&G today, we are experimenting with new ways to leverage internal and external capabilities into new business opportunities.

I have tried to capture this with a new “connections” diagram. Figure 2 highlights the technically-oriented, internal *and* external activities that I shall describe here.

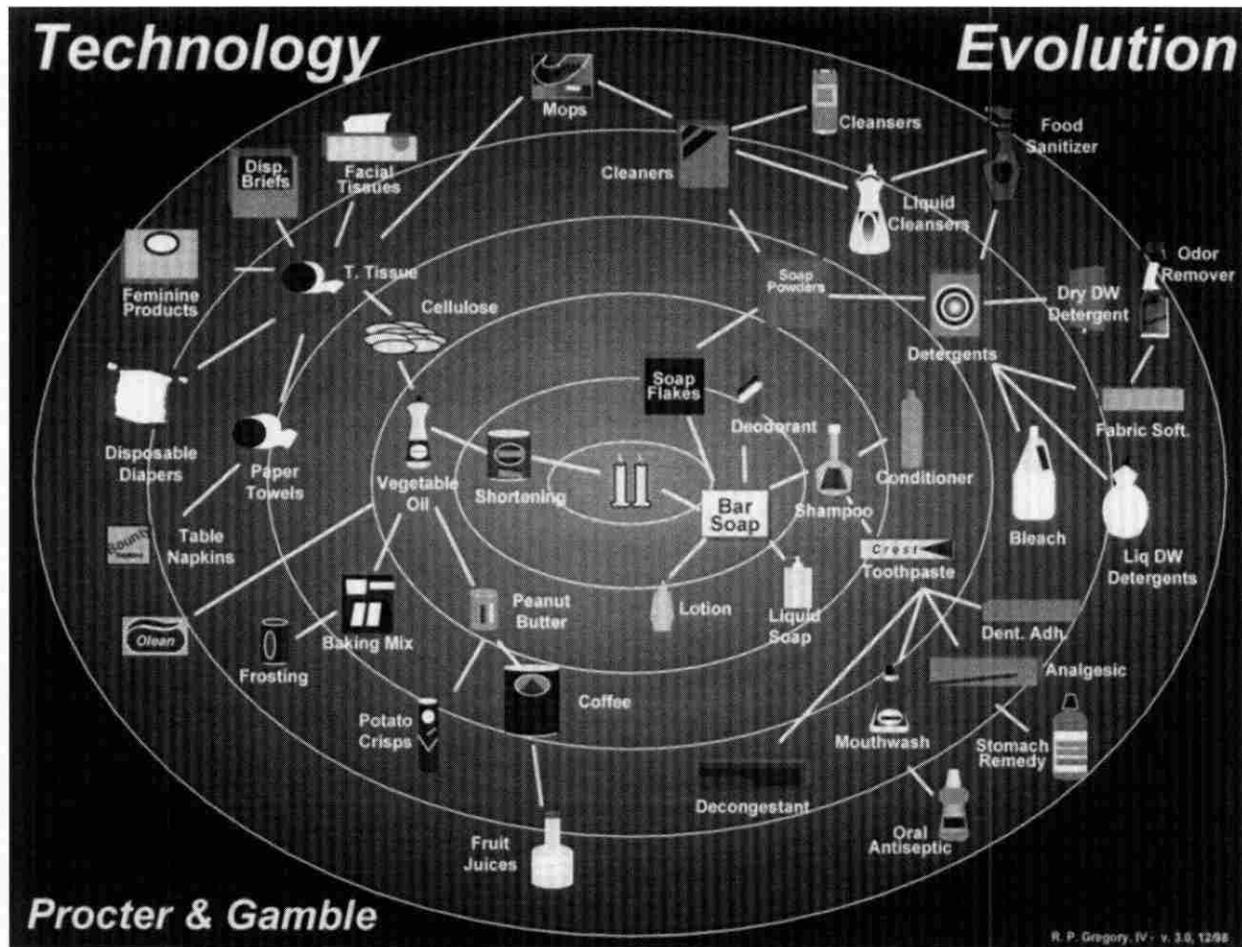


Figure 1.—Connections are part of P&G's heritage, having been the means by which its original product (candles) led to the creation of a multitude of seemingly unrelated businesses over more than a century.

But this chart is simply the framework; it is only one moment in time. It will grow rapidly, encompassing new productive ways to leverage capabilities into existing and new P&G products. Hopefully, it will stimulate readers to identify at least one new way they can make a connection in their own businesses.

As I noted earlier, our internal connections are at the heart of everything we achieve. John Seely Brown, former head of Xerox's famous Palo Alto Research Center, made the comment, "if we only knew what we know . . . we'd be more effective." This makes the point about how difficult it is to fully utilize competencies in a large, globally-dispersed organization.

Gordon Brunner, in accepting IRI's 2000 Medalist award, said, "if we only put to full use what's known, we'd be three times more innovative." Leading-edge technologies are precious—and greatly under-utilized. Connect them to an important consumer need, or complement them with another technology, and you can create major product advances, breakthrough products,

or significant improvements in cost, quality and speed. Gordon advocated that R&D should become "C&D"—for "connect and develop"—to emphasize this critical point. This doesn't mean we are going to abandon the "R" in R&D; it just means we have to connect our own technologies much better, and improve access to technical developments outside of P&G. The faster pace of innovation, the faster access to knowledge, and the availability of good technology are driving all leading-edge R&D organizations to adopt this mode of operation.

Creating the Global Lunchroom

When I began my career (a long time ago) these cross-business connections could be made at our Miami Valley Laboratories lunch table. But, as a company grows and becomes more decentralized, connecting the organization's total capabilities is a huge challenge. At P&G, we currently have over 8,000 researchers working at 19 technical centers worldwide, innovating across five Global Business Units plus Corporate Functions. These days, 40 percent of our R&D organization is located

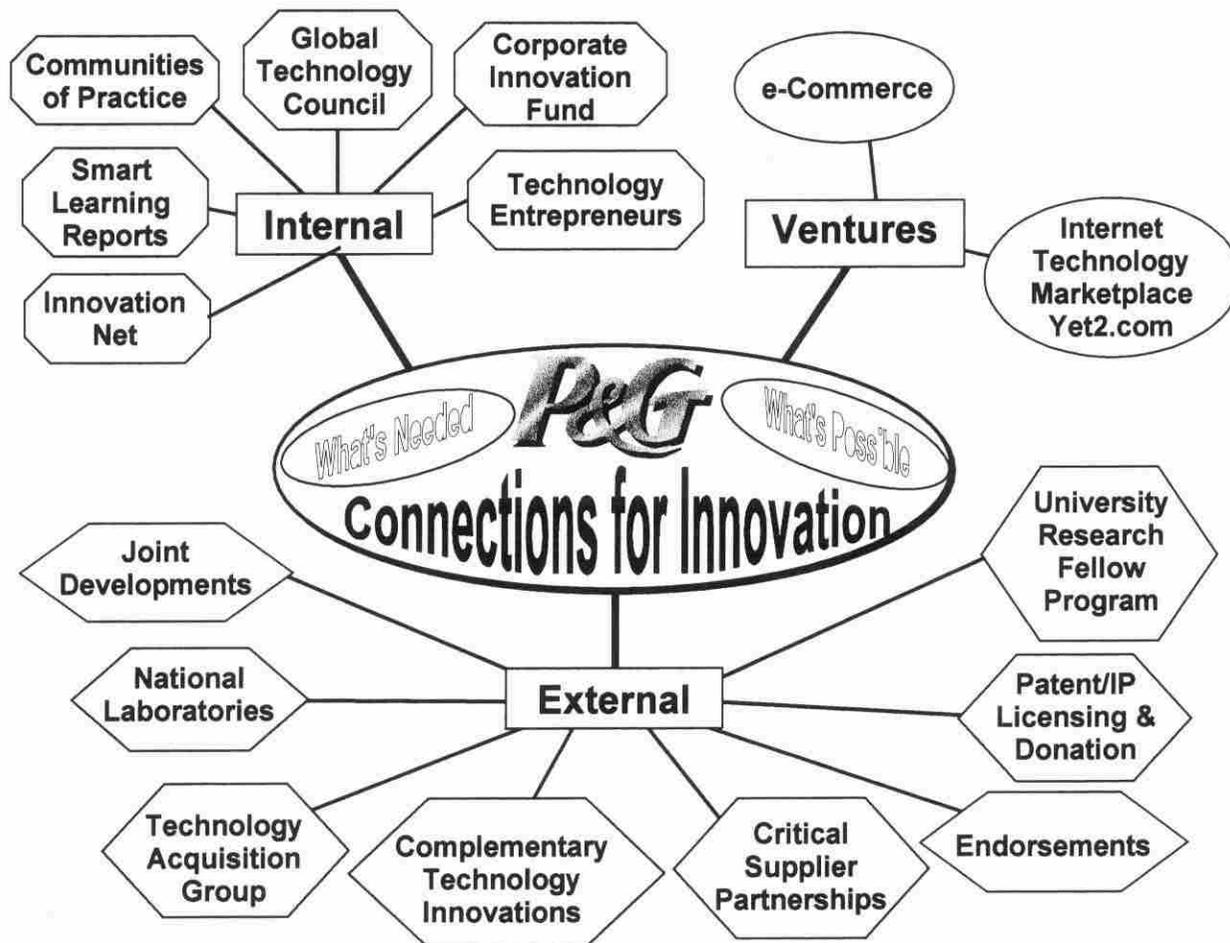


Figure 2.—A variety of internal and external activities underway at this one point in time provide the connections by which P&G hopes to leverage its technical capabilities into new as well as existing products.

outside of North America. Because of this, making connections efficiently is critical—in fact, it is a cause about which I am absolutely passionate.

To help recreate or modernize the “lunch table,” we created the Global Technology Council, which is made up of our business-unit technology directors, corporate R&D heads, and key geographical R&D leaders, to represent all of our competencies. This terrific working forum explores how to leverage our technologies, and serves as an “incubator” for exploratory research and early-stage product development. It is a viable approach regardless of how large we become. It has touched almost every new-to-the-world product we have in our pipeline. Several have started here and have moved through the system to global expansion.

Thanks to the Internet, we have offered our global technical community at P&G a powerful internal website called “InnovationNet” that acts as our global “lunch-room” where our researchers can trade information and make connections across the company.

InnovationNet has a mammoth target audience of 18,000 innovators across R&D, Engineering, Market Research, Purchasing, and Patent Divisions. Sixty percent use InnovationNet several times a week or more. InnovationNet hosts 600 websites for Global Project Teams, and individual problem-solving and connection-making websites for our 20 Communities of Practice. This adds up to nearly 9 million documents on line, growing daily. Each and every month, over one million pages are accessed. InnovationNet also has automation and artificial intelligence that tracks users’ interests, suggests reading material, and identifies other users with similar interests.

InnovationNet’s true value to P&G is its ability to accelerate innovation. Every day, InnovationNet helps thousands of innovators across the globe make new connections, collaborate with coworkers, and cross-fertilize their expert knowledge in a wide variety of specialized fields. It also helps us link to the outside world as a portal to external databases and via extranet connections to

business partners. InnovationNet makes the virtual lunch table spring to life!

One of the most popular sites on InnovationNet is our recently upgraded Smart Learning Reports, which allows our researchers to easily capture business-building insights from their experimental work, via electronic reports typically posted once per month. Every staff member can now “mine” the insights from these reports via standard search engines and text analysis software that graphically represents related concepts. Smart Learning Reports work 24 hours a day fetching knowledge based upon individual researchers’ interests, identifying “virtual neighbors” with similar interests, and daily e-mailing links to reports on topics they have subscribed to.

Communities of Practice

Our 20 Chartered Communities of Practice cover a wide range of disciplines, as listed below. Some have been in existence for over 25 years. Communities of Practice are recognized and supported by our senior R&D management as a critical force for creating knowledge and mastery, which will drive continuous growth. They are expected to be a significant vehicle for making connections across our Business Units.

Each CoP is sponsored by an R&D vice president appointed by our chief technology officer. The community represents a shared interest across P&G and has a budget and effective leadership to promote cross-fertilization and diffusion of expertise. Some of the larger CoPs have fulltime staff leading them. CoP activities include active problem solving via e-mail conferences, knowledge sharing via live seminars and websites, recognition for expert practitioners and active seeking of both internal and external expertise, and tools for diffusion throughout the organization. There is clear evidence that our CoPs are playing a key role in identifi-

A powerful internal website acts as our global “lunchroom.”

cation, development and deployment of new research methodology, as well as technology connections and problem solving on specific projects.

In total, these internal connections I have described are like primary wiring diagrams for P&G’s global innovation circuit. We must continue to improve this capability, much as chip makers continually improve processing speed.

Technology Entrepreneurs

Shifting now from the internal to the external, our Global Business Units are establishing Technology Entrepreneurs, who are experts in our business units’ technologies and needs, and act as modern-day Internet gatekeepers. Technology Entrepreneurs use the most sophisticated search and information visualization tools to mine the billions of pages on the worldwide web, global patent databases, and scientific literature. P&G has over 8,000 R&D people, but the world has over 2 million researchers. With Technology Entrepreneurs, we can find the proverbial “needle in the haystack” and link it to our business needs.

As an example, one of our Technology Entrepreneurs has made several important connections to new ways to achieve a discontinuity in cleaning performance. Given how much of our business relates to cleaning, breakthrough technology in this area is something we must

Communities of Practice

- Analytical
- Biotechnology/Life Sciences
- Colloid & Surface Chemistry
- 3D Visual Computing
- Fiber—Fabric
- Functional Polymers
- Imaging
- Malodor Control
- Microbiology
- Organic Chemistry
- Packaging
- Perfume/Flavor
- Process Community
- Products Research
- Regulatory & Clinical
- Robotics
- Sensors
- Skin Science
- Statistics/Math
- Wipes/Substrate-Based Products

stay on top of. These leads came from unusual sources outside our traditional cleaning products industry. It is unlikely we would have ever found these connections without this new capability, especially when you consider that when we started this work a couple of years ago, a search on "alternative cleaning" on a leading Internet search engine yielded 1.5 million documents. Even a more specific search on "surfactant" yielded 40,000 documents!

Joint Technology Developments

Another window to the outside world is the broad range of "Joint Technology Developments" with other companies and institutions. Nowhere is this more important than in pharmaceuticals, where it's a way of life. Having the highest development cost of any product field, partnerships are used to identify and develop scientific leads. One example within P&G is our joint clinical development with Alexion scientists designed to reduce heart tissue damage that occurs as a result of heart attacks. We have matched the cardiovascular science and clinical expertise of P&G scientists with the biotech savvy from Alexion to create a great partnership.

Discussing outside partnerships would be incomplete without considering our strategic suppliers. A number of years ago, our primary approach was to solicit bids on the \$14 billion in chemical and packaging materials we use in our business every year. Then we used our significant purchasing power to drive down prices among competing suppliers. Typically, our relationships were strained and at arm's length when we needed to develop new experimental materials.

Today, we are seeing the benefits of a much more open and collaborative approach, which I call "Critical Supplier Partnerships." We now have a number of developments where our people are on site at supplier facilities, working together to develop and commercialize new chemicals, materials and mechanical processes. In effect, suppliers' R&D labs are now an extension of our own innovating capability—an important cornerstone of this program. Some parts of P&G have taken this approach even further with multiple supplier partnerships. In one case, using a Master Collaboration Agreement, which establishes the principles for sharing risk and rewards, a team of three suppliers now works with us at one time on major developments.

The Master Collaboration Agreement is designed to be equitable to all parties from the beginning of a P&G partnership team with multiple suppliers. It sets conditions for how P&G and the supplier team members will operate together on any number of projects, and allows for multiple partners to share information and work together. It defines intellectual property and exclusivity rights within a broad framework of principles, and avoids

**Suppliers' R&D labs
have, in effect,
become an extension
of our own innovating
capability.**

the months of time it can take to negotiate typical Joint Development Agreements on individual projects.

The output of these partnerships has been terrific. New chemicals have been developed in record time. And machine developments in Diapers and Feminine Protection have been accelerated by having P&G engineers in suppliers' facilities.

We are also pursuing "Complementary Technology Innovations," which involves joint developments with companies whose expertise is in strikingly different technical areas. This takes the connection concept of Figure 1 and forges a connection with companies having world-class competencies in other areas like electromechanical technologies, imaging and membranes, just to name a few. When you think outside of the chemical, mechanical and biochemical boxes that bind our expertise, there are many major new technology areas that we are now tapping. I don't just mean technology acquisition; I mean actual joint product development efforts. I have been amazed at how many big, exciting new ideas have emerged from this radical connection approach.

Licensing

In the past, one could characterize P&G's policy toward licensing as, well, rigid. We didn't really reach for outsiders' ideas, and we certainly had no intention of selling our own. We borrowed this approach from the halcyon days of the Kremlin and the CIA—it was called the Cold War.

Three years ago, P&G's Technology Acquisition Group was created to give us an external door to actively seek out new technologies and products. We hoped that stepping up the licensing of technologies would allow us to access complementary technologies that would fill gaps in our intellectual property portfolio. TAG, as it's called, has become a primary portal for soliciting external technologies. It provides a vehicle for inventors and technologists to submit their ideas for prompt evaluation.

The TAG is just one aspect of our new corporate licensing attitude. We are also actively licensing or donating P&G technologies to increase returns for our intellectual property portfolios.

P&G is a technology-rich company: 27,000 patents, 4,000 unique titles and 3,000 new patents each year. We invest \$1.8 billion annually on R&D. We have a world-class technical staff that includes over 1,200 PhDs. Needless to say, “We got technology!” In fact, more technology than we know what to do with. We use less than 10 percent of our technologies in our own products, and there is a lot of value to be had in the remaining 90 percent.

P&G is not unique in commercializing only 10 percent of its patents—our benchmarking indicates that we are typical. Until recently, the 90 percent of unused technologies have been virtually “sitting on the shelf.” We were very protective of our patents and know-how. We treated them as “corporate secrets.” Licensing was seldom, if ever, considered, and if it was, it was viewed as the avenue of last resort.

Today we have a new patent strategy, aimed at improving our innovation process. This policy, very simply, defaults all of our technologies to license at the latest three years after market introduction, or five years after patent approval. The revenue stream goes back to the Business Unit which owns the technology. We will even license competitors. We have gone from “protective” to “proactive.”

We have opened the door to see our innovations in the marketplace, not only in our products but also in unexpected applications in totally unrelated fields. And all of it generates real dollars for our shareholders.

P&G has responded by investing in its global licensing capabilities. The multifunctional Licensing group focuses on four major areas: technology and know-how licensing, donations, trademark licensing, and Internet commerce.

We are not limited to any predetermined method of extracting value. We will license for fees and royalties. We will sell, donate, swap, or collaborate with suppliers for capital avoidance, or trade for lower pricing. We will even use IP to minimize our litigation costs. Bottom line, if you can measure it, and if it delivers value for our shareholders, we’ll do it!

We have learned a lot. For example, our external focus also led us to realize how inefficient the global technology transfer is today. Finding and selling technologies is too often, “Who do you know?” and, “How good is your Rolodex?” It’s hard to make connections. That’s why we were so excited to see the advent of the Internet-based technology transfer marketplace.

We have partnered with Yet2.com and believe that it and the marketplace in general, hold huge potential for P&G,

both as a way to market our technology and, perhaps more importantly, as a way to find technologies that can solve important problems. This concept was so compelling that P&G signed up as a founding sponsor and, subsequently, we made Yet2.com P&G’s first B2B equity investment.

The database of these marketplace players is more than just patents. Many technology packages provide a functional description of the benefits and possible applications. Our objective is to have each technology communicated in a way that is easily understood by someone other than the inventor. You can also post “Technologies Wanted” to invite specific solutions to your challenges. As we have monitored our partner, Yet2.com, formal introductions between those with technologies available and those with technologies wanted are starting to take off as the site achieves a critical mass of postings and membership.

The Federal Government

Another important source of “connect and develop” is the U.S. Federal government, which funds about \$30 billion in basic research, much of it conducted at National Laboratories. This includes the National Institutes of Health (medical research), the National Science Foundation (university research), and a big chunk of Department of Energy research. The latter is conducted at the well-known “physics labs” like Los Alamos, Sandia, Oak Ridge, Lawrence-Livermore, and others.

These labs are the bomb people. They invented the technology behind the atomic and hydrogen bombs, they process plutonium and they figure out how to reprocess fuel rods from nuclear submarines and electric power generating stations. They rely upon the largest and most talented concentration of physicists anywhere in the world to do their work. Los Alamos and Sandia are the largest New Mexico employers with R&D organizations, each of which is larger than our own. Los Alamos designs the physics package; Sandia engineers the warheads and then puts them on the shelf in the hope they will work, if needed, 25 years later.

What is a Cincinnati, Ohio consumer products company doing in New Mexico with the high-tech physicists at Los Alamos? We are studying the fluid dynamics of high-speed diaper assembly and machine reliability—what else! Los Alamos has the most sophisticated computational models designed to simulate what happens when a bomb is detonated. But they no longer have any data, while we have literally tens of millions of pieces of data but no computational models. What a connection; what a combination!

We have hardly touched the surface of available Government research. The National Institutes of Health and Department of Energy laboratories invest over

\$25 billion in R&D each year. Many of these programs are cutting edge, with potential applications in our existing categories and new businesses.

University Research

Our funding of joint university research goes back a long way. One of the earliest and most productive was our 1950s collaborative work at Indiana University which led to the development of Crest, the first fluoridated toothpaste. Although we've been at it ever since, the interaction with universities has not been efficient. It is very difficult to make the right connection, and to be agile and fast. Consequently, we are trying a new approach to more effectively tap into this wealth of leading-edge knowledge.

We have had a great program on women's health at Columbia University, an important part of the "Speaking of Women's Health" initiative that has been touring U.S. cities. During a program review at Columbia about two years ago, we agreed (in the spirit of the renowned chef Emeril Legasse) to "kick it up a notch" by creating our first University Research Fellow Program. One of our Corporate Researchers has been on assignment at Columbia as a scout for technology connections.

These external programs are only the beginning of what is really possible—and what is needed to be truly effective. Figure 2 shows a small fraction of what can be done; it is still "under construction," but it is a vision of how we have to operate in a highly connected world. We must keep pushing out the innovation boundaries, extending the envelope, racing at the edge.

Innovation Expo

With so many sources of connections, how do we pull them all together? How do we leverage the research of external partners to make connections with our internal research and drive innovation in ways we might never have thought of otherwise? To answer this question, we created a one-of-a-kind "deal-making/technology trading expo" that we called "Innovation 2000."

This three-day exposition in June, 2000 showcased over 100 of P&G's most promising, cutting-edge technologies with a global audience consisting of R&D, Engineering, Marketing, and General Management. We had over 5,000 P&G researchers in attendance. For those who could not attend, we used the latest in webcasting and satellite technology to create our own Innovation News Network, INN, complete with news anchors, reporters and even commercials. We broadcast live reports from the Cincinnati Convention Center, so that R&D employees from around the world could get access directly at their desktop computers. Also, we distributed hundreds of cell phones to P&G participants with the sole purpose of recording new ideas and new connec-

**The trick is to make
innovation a
deliberate process.**

tions as they were discovered on the exhibit floor. All ideas were recorded into a central database.

Taking this whole "connection-making expo" thing a step further, we invited external suppliers to showcase their technologies as well. In addition to the P&G-sponsored technologies, there were over 600 representatives from about 50 exhibitors of non-P&G technologies—all under one roof at the Cincinnati Convention Center, right down the street from our world headquarters. Participants included developmental suppliers, university collaborators, federal laboratories, and research institutes from around the world. Japanese and European representatives even made the trip at their expense to participate in this showcase innovation event. This was the largest exposition of cutting-edge technology we had ever assembled! It offered not just a glimmer of ideas in the minds of upstream, white-coat researchers, but technologies that had been developed to the stage of commercialization.

Innovation 2000 was great for us, but no consumer, customer or shareholder cares how many technologies and patents we are able to display. What they care about is how many branded products and services we can commercialize and bring to market—and, as a result, improve consumers' everyday lives. The trick—the way to meet that very basic but extremely demanding expectation—is to make innovation a deliberate process, to make it as predictable and reliable as any other part of a well-run business. And to do that, you have to organize for innovation. And you have to catalyze it. That's what an event like Innovation 2000 did remarkably well.

Over 2200 ideas for new products and important new uses of P&G and external technologies were generated and entered into our Innovation 2000 database. Numerous technical problems were solved right on the exhibit floor, and the speed to market of many existing projects will be increased significantly. Based on feedback from internal and external attendees, and conversations with many of the key managers in attendance, Innovation 2000 exceeded everyone's expectations. And even though the business teams are still working through these new connections, our goal of one, actionable, major new product idea in each Business Unit was easily surpassed. Here are just a few of the statistics recorded so

far, which speak to the record-breaking nature of this event:

- There were 110,000 hits on the InnovationNet website the week of Innovation 2000—employees providing solutions to technical problems, watching the simulcast, and recording their ideas for new connections.
- An exceptional number of new, innovative ideas were received by every Business Unit. We are continuing to evaluate, prototype, and prioritize these ideas. Many of them have been advanced and some are approaching market entry now. What a wonderful problem to have—choosing the biggest and best opportunities from among such a large array of options!
- Based on questionnaires sent to attendees, the event officially achieved “breakthrough” status according to our standard criteria.
- To top this off, about 90–95 percent of voluntary comments were strongly positive (this is particularly impressive, since we at P&G are generally pretty critical of ourselves).
- Based on feedback to date, the external exhibitors identified dozens of new connections where their technologies could solve our problems and form the basis for new product benefits.
- Several Confidential Disclosure Agreements were prepared on the spot by our Technology Acquisition Group, which also facilitated several technology transfer discussions.

We expect to repeat an event like Innovation 2000 in the future.

What did we learn from all of this? What’s the relevance?

- First, despite today’s communications technology, the barriers to connections are more substantial than ever. Both of the parties—the owner of the technology and the one in search of a solution—must be proactive and persistent in their mutual search for connections.
- Non-obvious connection-making requires more energy than obvious connections.
- Non-obvious connection-making works best when a large community of participants are involved. That means more technologies in the database and more searches. This really goes beyond “critical mass.”
- Connections in general, and unobvious ones in particular, occur more frequently when the language of “what’s needed” and “what’s possible” is more universal. Put another way, two highly experienced scientists from the same field talk to each other in a technical language so unique that it becomes a barrier to connections outside their field. We need to communicate

**Despite today's
communications
technology, the
barriers to
connections are
more substantial
than ever.**

in more general/universal terms to facilitate unobvious connections.

- Diversity is also a *big plus* in this context.

Internal/External Ventures

Our last group of external developments—our internal and external ventures—are about as new as the common use of the Internet. P&G’s internal Corporate Innovation Fund has helped to create several products now in global distribution, or in some form of learning market, and a pipeline of other breakthrough products that are extremely exciting.

However our ventures are not intended to fund internally-generated business propositions alone. We have been busy working on new business opportunities that depend upon the Internet. The company has created an Internet Venture Fund to fund those external ventures capable of creating discontinuities in the direct-to-consumer marketing of our products, the procurement of raw materials and services, and streamlining our supply systems.

Unprecedented Opportunity

In conclusion, I trust these examples illustrate the unprecedented opportunity we all have to enrich our innovation portfolios: opportunities to take technologies ready now for commercialization and apply them to upgrades of products, introduce new benefits in existing product categories, and bring forward new-to-the-world products; opportunities to connect technologies with latent customer needs; opportunities to dream about products which have never been, and bring them to life for the benefit of the world’s consumers. This will, in turn, drive the business growth that will benefit our employees and shareholders. ☺