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Baylor Research &
Innovation Collaborative



As always, I'm excited to bring you the most current issue of *Research*.

I'm even more thrilled to bring you up-to-date on the Baylor Research and Innovation Collaborative (BRIC). The BRIC, the cornerstone in Baylor's discovery park and the larger Central Texas Technology and Research Park (CTTRP), is on track with Phase I scheduled for completion in first quarter 2012. The BRIC will become home to graduate research, collaborative university and industry partnerships, and high-tech workforce development and training. In addition, the BRIC will house the experimental and theoretical efforts of Professor Marlan Scully, National Academy of Sciences member and Baylor's new Distinguished Academician in science and engineering.

T **THIS ISSUE OF RESEARCH WILL GUIDE YOU THROUGH PHASE I CONSTRUCTION,** introducing you to the history, design and future of the BRIC while also providing a visual description of the physical transformation the former General Tire & Rubber Co. plant has undergone since construction began. It will also introduce you to Professor Scully as well as many of Baylor's national and international partners, without whom the BRIC would not be possible.

There is still much to be done, but the BRIC promises great things ahead! As always, I invite you to learn more about Research @Baylor by visiting our website at www.baylor.edu/research.

Dr. Truell Hyde
Vice Provost for Research

THE BRIC WILL PROVIDE
RESEARCHERS, ORGANIZATIONS
AND PRIVATE COMPANIES—
PARTICULARLY STARTUP
HIGH-TECH BUSINESSES—WITH

330,000 SQUARE FEET OF SPACE
FOR RESEARCH CENTERS, WORKFORCE
TRAINING AND ACADEMIC MEETINGS.

Aerial photograph by Joe Griffin, taken Sept. 2011

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BRIC:
RESEARCH
Under One Roof

Poster
Insert

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BAYLOR
UNIVERSITY

Research,

INNOVATION AND THE PROMISE OF PROSPERITY CREATE THE CORNERSTONE AND HEART OF BAYLOR'S NEW DISCOVERY PARK—THE BAYLOR RESEARCH AND INNOVATION COLLABORATIVE (BRIC).



Since Stanford University unveiled the nation's first research park—the Stanford Research Park—in California's Silicon Valley in 1951, the concept of attracting university researchers and private companies in the knowledge industry to a single location has taken root. And thanks in large part to the technology boom of the 1990s, research parks have been sprouting up more recently in record numbers on college campuses across the country. Today, some 175 university research and discovery parks dot the United States academic landscape. Come next spring, the Baylor Research and Innovation Collaborative, known as the BRIC, will be among them.

BRIC by

BRICK

Housed in the former General Tire & Rubber Co. building near Interstate 35, donated to the university by the Clifton Robinson (BBA '63) family and H. Bland Cromwell, the BRIC is the first facility of a 21-acre discovery park that will evolve into the larger Central Texas Technology and Research Park as tenants populate the park over the next several decades. But like many modern-day parks, the BRIC bears little resemblance to yesterday's research parks, which were considered primarily real-estate deals involving land acquisition, building construction and, lastly, the search for tenants to occupy the space, with big business being the big fish. In fact, the BRIC doesn't signal the beginning of a research park, but rather, a discovery park.



distinction between a research park and a discovery park is a subtle but meaningful one, says Dr. Truell Hyde (MS '80, Ph.D. '88), vice provost for research and project pioneer. *"A discovery park usually has a large-scale interdisciplinary agenda that focuses on innovation and seeks to bring multiple disparate working groups together to interact across boundaries on new and emerging research, often in areas that didn't exist even a few years ago."*

The BRIC will provide researchers, organizations and private companies—including startup high-tech businesses—with 330,000 square feet of space for research centers, workforce training and academic meetings. And even more important, it will provide an environment that fosters the exchange of trailblazing ideas and supply the workforce and tools for applying cutting-edge research in the real world with the anticipated benefit of economic prosperity for the greater Waco community and beyond.

"As part of Baylor's discovery park, the BRIC will allow Baylor to establish research centers across disciplinary boundaries. For example, the School of Business will be linked to STEM [science, technology, engineering and mathematics] research, which will then link to Texas State Technical College (TSTC) Waco workforce development. The BRIC will also provide space for high-tech businesses specifically interested in working with our faculty and students," says Hyde. "The BRIC will serve as the catalyst that leads to the tenants that will eventually populate the park."

"Today's problems require not only a strong disciplinary base, but also innovative interdisciplinary approaches. Increasingly, society expects research that makes a difference."

—Dr. Alan Rebar
Executive director of the Discovery Park
at Purdue University

Park Place

Serving as a model of what a discovery park should and can be is the Discovery Park at Purdue University in West Lafayette, Indiana, a \$600-million research center for interdisciplinary research focused in the science, technology, engineering and mathematics disciplines—and a discovery park that Hyde notes as "one that does it correctly." Researchers at the Discovery Park address today's complex issues—everything from alternative energy to health care delivery to water quality—with solutions from a variety of disciplines.



"HISTORICALLY, UNIVERSITY RESEARCH HAS BEEN DISCIPLINE-BASED AND BASIC SCIENCE ORIENTED," SAYS DR. ALAN REBAR, executive director of the Discovery Park and senior associate vice president for research at Purdue. "Today's problems require not only a strong disciplinary base, but also innovative interdisciplinary approaches. Increasingly, society expects research that makes a difference."

Those differences include current research projects such as the development of biofuels, cancer treatments and software that helps Homeland Security respond to crises, and they come as the result of Purdue faculty and student researchers collaborating with about 100 companies each year, including 22 global partners, as well as students participating in internship programs with startup companies and campus researchers.

Also widely considered a park paradigm is the 351-acre, \$183-million University Research Park, a nonprofit research and technology park partnered with the University of Wisconsin-Madison, where research faculty lay claim to holding more scientific patents than faculty at any other public university in the U.S. Established in 1984, the park houses more than 126 tenants—many focused in biotechnology (a focus that developed as part of the park's natural evolution)—employs more than 3,500 people and has an annual payroll of more than \$260 million. In a recent economic impact study by Madison-based NorthStar Economics Inc., the statewide impact of the university and its affiliated organizations and startup companies totals more than \$12.4 billion, supports more than 128,000 jobs and generates \$614 million in state tax revenue. Research conducted within the park has led to the formation of at least 283 startup companies. But this success didn't happen overnight, says Greg Hyer, University Research Park associate director.

"You need patience for these large-scale projects; long-term perspective is needed by everyone," says Hyer, noting that it took about 15 years before the park was considered a bona-fide success. Contributing to that success are the size and breadth of companies located in the park, "We have a lot of interesting companies with about \$1 billion of research on campus attracting top researchers, which leads to more opportunities for commercialization."

Like many university research and discovery parks, the University Research Park provides an especially inviting environment for small startup companies. "The university connection is huge, even if its affiliation is only in branding that's valuable for recruiting talent and investment," says Hyer. "The university gives startups additional credibility."

U UNIVERSITY PARKS ARE ALSO APPEALING FROM A FINANCIAL STANDPOINT, ADDS HYER.

"In a nonprofit arrangement, leases are different from traditional real-estate leases," he explains. "Often the leases are structured with more flexible terms and offer a lower cost of entry for companies."

Of course, that doesn't mean that big business isn't welcome. In fact, at the University Research Park, gold-plate health care companies such as Roche and Merck have acquired smaller companies that spun out of the park—and continue to stay there.

"Since you're nurturing these startups within the park, there tends to be a 'stickiness' for them to keep a footprint in the area," says Hyer. "When you start here, you're likely to stay here." That kind of permanency is not only good for the park, but good for the community, which benefits from higher wage jobs, tax revenues and increased property values as support services—including restaurants and shops—set up new digs in the areas surrounding the park, adds Hyer.

The Measure of Success

Such success stories are more often the rule rather than the exception when it comes to today's university research and discovery parks. According to a survey of 134 North American university research parks conducted by the Tucson, Arizona-based nonprofit Association of University Research Parks (AURP), of which Baylor is a member, in conjunction with Columbus, Ohio-based Battelle Technology Partner Practice, nearly 800 firms graduated from park incubators in the five-year period from 2002 to 2007, with about 25 percent of them remaining in the park and a failure rate of only 13 percent.

The report also showed that university parks employ more than 300,000 workers in North America, and every job in a park generates 2.57 jobs in the economy.

These statistics are in tune with a study of the anticipated local impact of Baylor's discovery park conducted by Dr. M. Ray Perryman (BS '74), founder and president of the Waco-based economic and financial analysis firm The Perryman Group. Perryman's analysis looks at the potential economic impact of the park on business activity in the Waco-McLennan County area and Texas. Among the findings that Perryman noted in his report are the creation of hundreds of jobs—specifically, more than 300 new local jobs are expected to be created when the BRIC becomes fully-operational in 2016, along with additional jobs elsewhere in the state of Texas—and an anticipated \$24 million added to the annual gross product of the Waco-McLennan County economy.

LEADERS at The Greater Waco Chamber of Commerce (The Chamber), which also collaborates on the BRIC, put a lot of stock in those projections.

"Companies in knowledge-based industries—for example, aerospace and engineering—often serve as economic anchors," says Sarah Roberts, The Chamber's senior vice president of Economic Development, pointing to the successes of companies such as Whole Tree, Inc., whose founders licensed proprietary technology for composite materials using coconut fibers from research performed at Baylor. "When you look at all the different economic multipliers that you can use, for every job in a research park, another 2.57 jobs are created. And when you look at [Perryman's report] on the local region, it's not just the sheer number of jobs, but the *types* of job that will be created through BRIC—jobs with strong payrolls and strong education levels."

Funding the Future

Federal funding is a critical component of the university park model—not for the buildings within the park, but rather to support the research, including the innovative new programs and sophisticated scientific equipment, located there.

And research is a critical component at Baylor. With the BRIC comes the promise of new sources of research funding for faculty and students, creating opportunities that will help them attract funding through peer-reviewed grants and contracts, as well as bolster Baylor's academic reputation on an international scale, says Hyde.

"Large-scale research requires federal funding. You can't do this on the backs of students' tuition, and even if you could, that's not ethical," says Hyde, adding that research at the BRIC will be funded externally. "The funding initiatives coming out of the beltway in the next five to 10 years will continue to be interested in pushing international partnerships; it's not only university to university, but university to international university. **You must compete in the global community and prove yourself to be one of the best in the world in order to raise your flag in the international community.**"

If federal funding dollars are any indication, the days of researchers toiling alone in a lab for endless hours on isolated experiments with limited-use equipment may be going away. Dr. Subra Suresh, director of the National Science Foundation, communicates this sentiment.

"We know that discoveries are often found at the interface among disciplines. ...'Science without Borders' captures the ferment and promise that now characterize the research and education enterprise. The old borders—among disciplines, among institutions, among nations, and among people of all cultures—are dissolving. Disciplinary silos are made of mesh and our ideas and innovations slide through to influence multiple disciplines and move us closer to solving complex, cross-cutting problems."

LANDING

major funding today often requires interdisciplinary innovation, says Hyde. "The new discoveries and interesting science are occurring at the boundaries between disciplines."

Faculty will also be in a position to benefit from funding generated by business partners located in the BRIC that understand they need research and development—and the infrastructure to support it—to stay competitive.

"The BRIC will provide support and puts everything in one place," says Hyde. This includes providing a skilled workforce from Texas State Technical College (TSTC) Waco, a major partner that will occupy 45,000 square feet dedicated to technical training in the BRIC; hiring faculty, mentoring them and producing research; leveraging expensive equipment that can be shared by researchers; and offering support for potential commercial applications of research by other university business units, such as Baylor's technology transfer office, and business partners. This is especially important since startup businesses historically have high failure rates when they are unable to translate research into sound business practice, says Hyde.

The BRIC received funding support from the state of Texas and federal, county and city governments. Of the \$32.7 million tab for Phase I of the BRIC, \$9.5 million came from the state (from funding appropriated to TSTC), \$5.5 million from Waco-McLennan County and the City of Bellmead and about \$17.7 million from Baylor commitment. Also among the partners putting money on the table and collaborating in the project are McLennan County, the City of Waco, the City of Bellmead, Waco-McLennan County Economic Development Corporation, Bellmead Economic Development Corporation, Cooper Foundation, and The Greater Waco Chamber of Commerce.



WHILE MOST EVERYONE IN THE GREATER WACO

COMMUNITY IS EXCITED ABOUT THE DISCOVERY PARK AND THE PROSPECT OF PROSPERITY, THEY ALSO REALIZE THAT SUCCESS WILL NOT COME OVERNIGHT OR EVEN OVER A FEW YEARS, SAYS HYDE.

"One strength of our community is that it is far-seeing; people understand the BRIC represents a long-term impact on the health of the economy," says Hyde. "It takes a long time to provide such a large-scale impact—much closer to decades than years."

And for many in the community, there's no better place than in the long-shuttered General Tire building—once the city's largest manufacturing facility and the town's biggest employer—to make an investment to impact the future.

"We've received phenomenal support from everyone in the community; one huge reason for that is the revitalization of the old General Tire plant," says Hyde. "The closing of the plant ripped the heart and soul out of this community, and now it's a phoenix rising out of the ashes."

When the BRIC opens its doors, after a decade in the making, it will open a fascinating new chapter not only in Baylor history but also in the world of discovery parks—a chapter that has yet to be written and imagined.

\$5.5 MILLION

WACO-MCLENNAN COUNTY, CITY OF BELLMEAD

\$9.5 MILLION

STATE OF TEXAS & TSTC

\$17.7 MILLION

BAYLOR UNIVERSITY*

**\$32.7 MILLION
IN BRIC FUNDING
TO SUPPORT
PHASE I**

*Current as of October 2011

"One strength of our community is that it is far-seeing; people understand the BRIC represents a long-term impact on the health of the economy," says Hyde.

And for many in the community, there's no better place than in the long-shuttered General Tire building—once the city's largest manufacturing facility and the town's biggest employer—to make an investment to impact the future."

—Dr. Truell Hyde

The Making of the

BRIC PHASE I Construction

THE FORMER GENERAL TIRE & RUBBER CO. BUILDING IS CHANGING DRAMATICALLY, BUT THAT DOESN'T MEAN IT IS FORGOTTEN IN THE MASSIVE DEMOLITION AND CONSTRUCTION PROJECT TO CREATE THE BAYLOR RESEARCH AND INNOVATION COLLABORATIVE (BRIC).



FOR KEVIN KARR, BAYLOR SENIOR PROJECT MANAGER FOR FACILITY, PLANNING AND CONSTRUCTION SERVICES, PRESERVING A PIECE OF WACO'S INDUSTRIAL PAST WAS ESSENTIAL TO REALIZING ITS TECHNOLOGICAL FUTURE.

GENERAL TIRE WAS SUCH A POWERFUL ECONOMIC DRIVER IN WACO FOR SO MANY YEARS, A LOT OF PEOPLE HAVE FOND MEMORIES OF IT," says Karr, who's coordinating the team of planners, designers and builders converting the East Waco plant into the BRIC. "I like the fact that we're reusing this. We're not just leveling it, or buying a greenfield site and building a brand new facility. Those kinds of projects are fine, but I like doing something with some history attached."

Workmen hauled 3.8 million pounds of metal out of the plant during the demolition phase, but not all of it was bound for the scrap yard. Crews salvaged a number of artifacts, including a cardboard press and several large hoists used to pull raw materials through the plant on an overhead rail system.

"Our intent is to treat [the artifacts] like art—to put them back in the building in some strategic location, as a gesture of respect to where we came from," says Karr.

A DIAMOND IN THE ROUGH

Dr. Truell Hyde got his first look at the General Tire & Rubber Co. plant in 2007, and recognized its potential to house the multi-disciplinary research facility he'd been advocating almost since the day he became Baylor's vice provost for research in 2001.

Hyde brought in consultants to explore the feasibility of demolishing the plant's interior and rebuilding it to the standards achieved in the \$103 million Baylor Sciences Building built in 2004. "The concrete portion was built in the '40s, when labor was extremely cheap," he says. "So it's just unbelievably built. Much of what usually costs you so much money to build in a new science building—the ability to have heavy load factors on the concrete slab, the ability to have vibration isolation—this building had by default. And not only did it have it on the first floor—it had it on the second and third floors.

"It would be too expensive to build something like this anymore," Hyde says of the 330,000-square-foot plant, which is split almost evenly between the original World War II era heavy concrete construction that housed General Tire's manufacturing line, and an attached 1970s structural steel addition that served as a shipping and receiving warehouse.

The consultants' estimate was about two-thirds of the cost for a fully-operational, comparable discovery park facility by using the old plant. The initial BRIC plans became a reality.

BRINGING IN THE EXPERTS

Perkins+Will has been named the country's top architectural design firm by *Architect* magazine, has received eight lab of the year awards from *R&D Magazine* and is internationally recognized for its work on research facilities, including large-scale parks in the Middle East and Asia. In the past 10 years, the firm has designed more than 300 laboratory projects. Perkins+Will has a team of individuals working with Baylor on the architectural aspects of the BRIC. Ed Cordes, American Institutes of Architects, science and technology market leader, has been integral to the project since the beginning.

The Beck Group is one of the country's top full-service construction firms and is leading the BRIC renovation. Beck is the only company to be named Architecture Firm of the Year and Contractor of the Year by the American Institute of Architects. *Fortune* magazine named Beck one of the top '100 Companies to Work For' and they are among *Building Design + Construction* magazine's top firms in the nation. Leading the BRIC construction project is Beck Senior Project Manager Hugh Sanford.



National Institutes of Health
Bethesda, Maryland

Tommy Lanier was one of the last workers to walk out of the General Tire & Rubber Co. building when it ceased operations. Lanier worked on the second floor of the plant and mixed rubber for the tires that was then distributed to other General Tire plants up until 1990. Now, Lanier works for the plumbing department at Lockridge-Priest, Inc. as a heavy equipment operator. In this capacity, he is working on the BRIC.

The BRIC in the Making

B BEFORE RENOVATION WORK COULD BEGIN AT THE GENERAL TIRE & RUBBER CO. PLANT, YEARS OF EXPERT COLLABORATION OCCURRED.

"Anytime you try to preserve an old building and turn it into something else, there are a lot of inherent challenges," Karr says.

"We relied a lot on [Perkins+Will's] strengths as far as laboratory planning," Karr says. "There was a lot of time and effort spent in looking at the facility as a whole to make sure that the modular laboratory construction concept made sense for this building."

For Karr and Cordes, the BRIC has provided lessons in adaptive reuse.

One example was devising a way to bring light into the middle of a building as deep, wide and dark as this one. Karr says the entire design team was committed to preserving as much of the original architecture as possible. This led to the team taking advantage of an existing opening for heavy equipment between the first and second floors by duplicating that cutout on the third floor and installing rectangular openings on the roof to admit indirect sunlight.

RESEARCH ON DISPLAY

"We designed the facility so that when you walk in the front doors and turn right, you're actually walking down a corridor that was once the old manufacturing line," Karr says. "You can envision it like a mall corridor. This is going to be a three-story space open all the way to the sky, and the natural light will really make this a great space to work in."

Facilitating academic and industry collaboration was imperative throughout the entire design process. One of the BRIC's primary purposes is to encourage collaboration and each step of the design process kept this purpose in mind, says Hyde.

Corridors will be at the heart of the BRIC's design, lined with glass-walled offices, meeting rooms, research spaces and laboratories on either side. "We think it's critically important that the building has a conceptual layout [that encourages] a collaborative approach," says Cordes. "The building isn't divided among lines of ownership." Technicians will be working hand-in-hand with researchers and the same holds true for industry partners. "There are many areas for researchers to have chance encounters for sharing of information," adds Cordes.

The building itself will represent some of the most energy-efficient systems available. The BRIC will be one of the first buildings in the state of Texas to utilize chilled water beams to cool the space, says Cordes. "It's much more efficient. We're also designing systems to make use of rain water and capturing the condensation from the A/C system that will irrigate the landscape." In addition, there is a high-tech energy management system that will control the lighting as well as the temperature. There are large atriums placed throughout the building to provide almost every space with natural light.

Within the design is shell space for future expansion. This space is equipped with everything above, but it's not

completely built out. "We need to be nimble and be able to reach changing research needs and quickly support an industry or academic partner that has an interesting research prospect," says Cordes. "We don't want to design ourselves into a corner and we don't know what this space is going to be used for, but we know we need to have it."

While making a bow to its industrial past, the BRIC's focus is the future. So high technology will be featured in its public spaces as well. Through Baylor's Center for Astrophysics, Space Physics and Engineering Research (CASPER) and the Baylor Applied Research Institute (BARI), Hyde's office has acquired several artifacts from NASA's decommissioned space shuttle program to exhibit in the building, and Karr's design team is making plans to incorporate "research on display" in the laboratory corridors.

The goal, Karr says, is to give visitors from school children to CEOs a peek behind the curtain: "We want them to actually see some of the research that's going on."



The tethered satellite system (TSS) shown here is one of more than 50 NASA artifacts competitively awarded to date to Baylor by NASA after being decommissioned. These artifacts will be on display within the BRIC and CASPER for educational and informative purposes. This TSS was the centerpiece of a NASA experiment designed to generate electricity in space. Once extended, the Italian-made satellite was to sweep through Earth's magnetic field at the end of a cable one-tenth of an inch wide, with the goal being to develop a system that could be used to power the space station.

Image courtesy of NASA

KEEPING IT LOCAL

Local subcontractors have always been a point of emphasis for Baylor, Beck and the regional stakeholders. But the collaborative nature of the BRIC has brought local participation into even sharper focus.

The biggest single contract in the initial construction phase went to Waco mechanical and plumbing contractor Lochridge-Priest, one of 19 local firms participating in the project to date. The level of participation by small/minority/disadvantaged business for subcontractors awarded to-date is 39% and the current level of local subcontractor participation is approximately 36%.

"It's an important topic for the city of Waco," says Sanford, who also managed work on Baylor's Simpson Athletics and Academics Center and the Allison Indoor Football Practice Facility before starting on the BRIC. "For any contractor from out of town, you have to be acutely aware that this is a local deal, something that the community is behind, and certainly we want to contribute back to the community. We are not here to take your money and run. We're very sensitive to the fact that we want to keep it local where we can."

Hiring local firms isn't just good politics, says Karr. It's good business.

The most visible element in Phase I—the 232 precast concrete panels that make up the BRIC's skin—were fabricated by a Waco company, Lowe Precast, Inc., at a cost of about \$1.3 million. The panels are 10 feet wide, up to 40 feet tall and weigh as much as 15 tons each. They were poured in one piece and incorporate an L-shaped brise soleil (French for sun-blocker) at the top and side of each window opening. Perkins+Will studied the sun's progression around the building and the concrete panels are designed to reduce energy consumption, especially during the afternoon hours.

"It's a feature that people may not notice or appreciate," Karr says, "but it shows that there was a lot of thought put into making this an efficient building."

Having the subcontractor 15 minutes from the job site improves efficiency as well.

"(Lowe Precast, Inc.) is one of our big local success stories," Karr says. "It makes it nice from a quality-control perspective, from a scheduling perspective. And if there's an issue, they're right down the street. We can get good response, get things taken care of and keep the job on track."

During the demolition and cleanup effort, workers wore Tyvek suits—synthetic waterproof coveralls that protect against chemicals and other contaminants—and masks or respirators.

Even worse, the carbon black was impervious to most cleaning methods.

garnet for reuse, and separated the carbon black and paint into 55-gallon drums bound for a smelter.

"None of the material had to go to a hazardous landfill," Sanford says, a significant factor in limiting the project's waste stream and securing Leadership in Energy and

Environmental Design (LEED) certification, which is mandated by Baylor. "We got it all in one fell swoop, allowing us to move through the demolition and cleanup phases much, much quicker. And we wound up with the shiny concrete finishes, which was what the architect wanted all along."

The building's brickwork has been demolished and replaced by a skin of insulated precast

says. Elevator elements are under construction within the shaftways, and bathroom plumbing is going in or is already complete. The gallery's still-unpolished terrazzo floor has been laid down, with doors to meeting rooms in the main building and a monumental staircase to more meeting and symposium spaces on the upper levels of the Jewel Box to be installed soon.

And then there's what Sanford calls the "brains and nervous system" of the building: the electrical and mechanical systems, along with the miles of conduit and ductwork needed to distribute data, power and air through a building that's roughly the size of six football fields.

"Almost a full 25 percent of the contract is mechanical and electrical," Sanford says. "I think the mechanical work alone is somewhere close to 60,000 man-hours." Phase I is scheduled for completion in the spring of 2012.

Construction of portions of research and laboratory spaces is part of Phase II, scheduled to begin this spring, with Baylor officials hoping to reach what they call "critical mass"—actual operating research in the facility—by early 2013.

MERGING THE PAST AND PRESENT

The public display of artifacts and symbolic "reopening" of what was once General Tire's production line resonates with TSTC Waco president Dr. Elton Stuckly Jr., who says many Waco residents have an emotional connection to the plant.

"I've had a lot of people tell me they're just thrilled to see something happen with that building," says Stuckly, who spent seven years at the plant as an electrical technician. "Even though it's going to be completely different, it's just the idea that for every bad thing that happens, there's always the chance that something good will come out of it."

concrete panels. The main entryway is crowned by second and third floor glass wall conference rooms. Dubbed the "Jewel Box" by Perkins+Will, the glass walled conference rooms are going up at the junction of the original concrete building and the 1970s addition. A new 5,000 square feet gallery with a two-story angled glass facade running along the front of the building completes the grand entrance to the BRIC. Sanford says roofers are now on the job; insulated metal panels, curtain wall systems and high-performance, double-paned exterior windows are being installed all around the exterior of the building.

In addition, Sanford says, all the site utility work is complete—water and sanitary sewer systems, storm drains, electrical and communications duct banks—and preliminary landscaping is under way.

Inside, some of the interior walls are already up and others are being framed and drywalled, he



What did work was a high-pressure application of garnet. A by-product of the marble industry, garnet is finer than sand yet harder and more durable, and it scoured off everything, down to bare concrete.

The garnet was so effective at stripping the carbon black and paint, Sanford says, it made the cleanup of the lead and most of the remaining asbestos a non-issue. With the building sealed to hold in all the material, eight men walked through with sandblasters while a negative air machine sucked out all the particulates, filtered the

PHASE I MOVES TOWARD COMPLETION



CONSTRUCTION OFFICIALLY BEGAN SEPTEMBER 10, 2010.

More than a year later, the appearance of the old General Tire & Rubber Co. manufacturing plant is a memory and the BRIC is taking shape.

Before any exterior changes, the interior had to be tackled. Though General Tire had done a lot of cleanup before shuttering the plant, some asbestos remained as well as lead-based paint on surfaces throughout the building.

The stickiest problem, however, turned out to be a substance far more common yet uncommonly tenacious: carbon black.

"You can equate it to graphite," Karr says. "You get that very fine powder, and it just coated every surface in the building. You'd walk in there, and if you touched something you were just covered in it."

Hiring local firms isn't just good politics, it's good business.

—Kevin Karr

Senior Project Manager, Baylor Facility,
Planning and Construction Services

The NE^XUS

of the Next Generation of NEW Discoveries

INTERDISCIPLINARY
RESEARCH AND PIONEERING
INDUSTRY MERGE—AND
EMERGE—AT THE BAYLOR
RESEARCH AND INNOVATION
COLLABORATIVE (BRIC).

Conducting top-notch research, incubating innovative ideas, starting up competitive companies and commercializing cutting-edge products are far from new endeavors for Baylor faculty, students and graduates.

In fact, Baylor has been marking achievements in these areas, in one form or another, for the past several decades through the university's research centers and institutes and entrepreneurship programs. Right now, and at any given time, some 200 research initiatives are in progress throughout the campus; an estimated 20 to 30 of those projects are poised for commercialization, says Jim Kephart, director of program development for the Baylor Advanced Research Institute (BARI), which helps create new research opportunities and translates new discoveries into practical applications in industry.



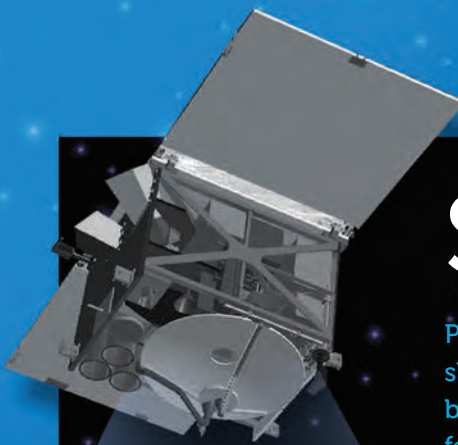
WORKING WITH GOVERNMENT AGENCIES SUCH AS NASA AND PRIVATE INDUSTRY LEADERS LIKE L-3 COMMUNICATIONS, Baylor researchers are currently blazing new trails in the areas of advanced composite technologies—including aerospace, space systems, predictive modeling and sustainable composites—and sensor research and development, including space science and small satellite exploration and research in the Center for Astrophysics, Space Physics and Engineering Research (CASPER). University researchers are also making strides in cancer research and environmental studies in the lab and in the field.

But even with these advances, never before have Baylor researchers and industry collaborators had a place where they could meet, mingle their ideas, meld their research and reach a critical mass to leverage their successes and translate their work into commercial applications—even leading to the launch of new companies—that is, never before until now, when the Baylor Research and Innovation Collaborative (BRIC) opens its doors.

"We've been producing research, working with industry and realizing commercial applications for some time at Baylor, but we've been running all over campus and all over town to accomplish this," says Kephart. "The BRIC provides the infrastructure necessary to put all of this in one place to help researchers make vital connections and produce benefits greater than the sum of the parts."



Jim Kephart
Director of Program
Development, Baylor
Advanced Research
Institute



Space Allocation

Phase I of the BRIC will bring the long-shuttered General Tire & Rubber Co. building back to life with 330,000 square feet of space for engineering labs, research centers and institutes, industry, workforce training and public meeting space.

About 175,000 square feet will be dedicated to Baylor research space, centers and institutes—including Electrical Engineering; CASPER; the Baylor Institute for Air Science (BIAS); the Center for Spatial Research (CSR) and the Hankamer School of Business' Innovative Business Accelerator (IBA). An additional 50,000 square feet will be reserved for collaborative industry partnerships (particularly high-tech startup companies), and about 45,000 square feet will go to advanced technology training and workforce development for project partner

Texas State Technical College (TSTC) Waco.

An additional 30,000 square feet of space will be devoted to research symposia and public meetings. Space will also be set aside for STEM outreach programs, such as Baylor's U.S. Department of Education Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR UP) grant. And for much of the space throughout the BRIC, visitors can see "research on display" with viewing areas of research laboratories and interactive support centers in public corridors.

Beyond Bricks and Mortar

Although the repurposed building itself is awe-inspiring, it's not the bricks and mortar, but the ideas and possibilities churning around inside the BRIC that will ignite the real inspiration for translating dreams into realities.

"Interdisciplinary centers and institutes provide opportunities for collaboration, external funding for research and getting young businesses off the ground," says Dr. Truell Hyde, vice provost for research. "This leads to establishing critical mass—and establishing world-class centers of excellence at Baylor."

Such opportunities also attract internationally recognized faculty, as Baylor's School of Engineering and Computer Sciences recently experienced with four new prominent faculty members joining the school's ranks.

Dr. Benjamin Kelley, dean and professor of engineering, says Baylor is a very strong academic institution and the opening of

the BRIC will not only maintain its outstanding academic history, but also accelerate its growth as a research institution. "Think of it in terms of baseball. Baseball players who can hit home runs *and* steal bases are looking for a ballpark that's outstanding. Baylor didn't have that ballpark to play in—until now with the BRIC."

AN INDUSTRY PERSPECTIVE



A KEY PURPOSE OF THE BRIC IS TO STIMULATE COLLABORATIVE RESEARCH INTERACTION WITH INDUSTRY. Research magazine sat

down with Nick Farah, executive vice president of L-3 Communications Platform Systems (a business area of five divisions that report to Farah including a major aircraft integration and modification facility located in Waco), to discuss the BRIC from an industry perspective.

Industry collaboration with university researchers is a good idea for both. "From the industry perspective, technology is changing every day," says Farah. "I graduated in 1985 and since that time there have been significant changes. The only way for me to keep up with those changes is to collaborate with education. It keeps [industry] honest and allows us to refine our capital investments to be competitive."

The collaborative benefits don't end there. "We have a lot of capacity and when I visited the BRIC I imagined a section of our engineers collaborating with the researchers and bringing industry in with one section belonging to L-3," says Farah. "I can see that in our future. We are currently using Baylor in a critical area that will help us grow business and our future and we're looking to increase that. We haven't talked in detail, but I envision us having a permanent location in the BRIC." He adds, "Having a Fortune 200 company like L-3 and a great university like Baylor, attract

talent on their own. Putting them together is a great thing. ... We can benefit together and impact the community. We become a better force together."

L-3 Communications is a major stakeholder in Waco's community. L-3's hiring demographic extends beyond Texas, but the BRIC, along with Baylor University and L-3, should attract more local talent—talent that could be hired by L-3. "People who love [Waco] will stay in this area. Having the BRIC in our backyard and having that collaboration is a huge plus and offers long-term cost savings in recruitment."

In addition to hiring locally, Farah sees the potential impact the BRIC will have on the local community. "The impact on the community is very positive," he says. "When you bring in educated and talented people in the area, the pay comes with it. Engineers, scientists, educators are well-paid individuals and that means the local economy will improve."





University Meets Industry

Most experts agree that interdisciplinary research is the way of the future, and that universities and industry achieve more together than they could working alone when they leverage their talent and resources.

As research problems grow more complex, tackling problems requires interdisciplinary research teams. Problems often stretch beyond a single discipline—and university-industry collaboration is key.

“Universities and colleges are increasingly central in the 21st century economy. In addition to traditional roles in research and education, many now engage in local economic development activities through collaborations with business and industry,” says Dr. Subra Suresh, director of the National Science Foundation. “...Industry relies more heavily on university research than ever before in history.”

Along with developing centers of excellence and giving wings to new research-oriented programs such as the graduate programs in the School of Engineering and Computer Science, the BRIC will serve as the nexus for university-industry collaboration. Companies such as Whole Tree, Inc., whose founders are Baylor researchers, who patented technology

for developing composite materials using coconut fibers, and aerospace leader L-3 Communications will have a prominent presence within the BRIC as they continue collaboration efforts with Baylor faculty and students.



“ON THE INDUSTRY SIDE, WE WANT TO ATTRACT PEOPLE TO THE BRIC, BUT WE WANT TO ATTRACT PEOPLE WHO ARE INTERESTED IN WORKING WITH OUR FACULTY, STAFF AND STUDENTS,” SAYS HYDE. This symbiotic relationship includes not only sharing ideas, but sharing facilities, high-tech equipment and a skilled workforce.

That’s where the role of Texas State Technical College (TSTC) Waco is pivotal to the BRIC. “Our mission is to help provide a trained workforce to the state of Texas,” says Dr. Elton Stuckly Jr., president of TSTC Waco, noting that TSTC technicians have a long and successful history working in the lab with Baylor researchers from CASPER. “Bringing business and industry to Texas is a must to put Waco on the map.”

“Universities and colleges are increasingly central in the 21st century economy. In addition to traditional roles in research and education, many now engage in local economic development activities through collaborations with business and industry.”

—Dr. Subra Suresh
Director, National Science Foundation

And that’s another compelling benefit for potential businesses setting up shop in the BRIC: a skilled and experienced high-tech workforce, in place under one roof, ready to hit the ground running. That includes everything from design consulting, 3D modeling and rapid prototyping, to manufacturing support, product testing and documentation writing. TSTC students spend more than half of their time working hands-on in the field with the tools, technology and equipment, keeping current with advances and national standards.

“Industry seeking a competitive edge can take advantage of the business accelerator and support of R&D and product commercialization, and they’re also interested in the TSTC-trained technicians,” says Kephart. “Rather than train, companies have ready-made new employees who are able to help them bring their product to market, sometimes six to eight months earlier.”

Also, to help new companies survive the initial financial strain, they can take advantage of attractive lease rates and offsets for industry capital assets—for example, shared equipment for research projects which will be located within the BRIC. Grant proposals for shared interdisciplinary equipment may also be better positioned to apply for federal funding.



Dr. Terry Maness
Dean, Baylor’s Hankamer
School of Business

Building Companies

Of course, all of these advantages aim to attract businesses to Waco—businesses that may never have considered putting down roots here if it weren’t for the BRIC—giving birth to new businesses and helping everyone flourish.

“In the U.S., we’re evolving from a manufacturing economy to a knowledge-based economy, and the BRIC will get us into the next generation of the world economy,” says Bill Clifton of The Clifton Group and Waco-McLennan County Economic Development Corporation, a collaborator in the BRIC. “Startup companies are higher risk because they often have ideas and the elbow grease but not the resources to get to the marketplace. Discovery parks like the BRIC provide resources for folks with ideas to give their dreams realization.”

That realization comes in part due to efforts by the Hankamer School of Business’s Innovative Business Accelerator (IBA), which will take research and projects within the BRIC and work on making products commercially viable, explains Dean Terry Maness.



"Faculty and students will work with companies to develop a business plan, perform market research and discover market niches," says Maness. "If you have a patent and all it does is sit on a shelf, you haven't reaped the full benefits for the company or the community."

T **THROUGH ENDEAVORS SUCH AS THE BAYLOR ANGEL NETWORK, WHICH PROVIDES FUNDING FOR ENTREPRENEURS,** and Baylor's Technology Entrepreneurship Initiative, which offers student-consulting opportunities in the U.S. and China, Baylor business faculty and students have been engaged in the type of interdisciplinary challenges that they will pursue at the BRIC as far back as the 1970s; however, they've been doing everything in pieces, notes Maness.

"The BRIC is an expansion and refinement of what we've learned from the prototype [programs] we've established, allowing us to take the best of our experiences and implement them into the IBA," says Maness. "With the BRIC, for the first time we'll have a home to expand into. It's a natural evolution for us to 'put feet on the ground.'"

Sarah Roberts
Senior Vice President of
Economic Development, The Greater Waco
Chamber of Commerce



Rebuilding a Community

It's this technology transfer that will benefit not just select individuals, but the collective community, says Elizabeth Smith, executive director of the nonprofit Cooper Foundation, which provided funding for feasibility studies on the BRIC project.

"The BRIC creates a synergy by providing a place where all of the assets of the community are able to play off one another and create a culture of entrepreneurship."

—Sarah Roberts

"The BRIC will help bring a better quality of life to Waco by increasing opportunities for everyone in the community," she says. "The BRIC takes academic research and translates that into a useful product that can benefit us financially, giving business a boost and even spinning off new businesses. It will also help engage students in higher education and help them envision their future in Waco."

Leaders at The Greater Waco Chamber of Commerce (The Chamber) not only see the BRIC as an economic anchor—and one that will help keep more of the 32,000-plus current college students in the area after graduation—but as a meaningful symbol in the transformation of the greater downtown area.

"The BRIC creates a synergy by providing a place where all of the assets of the community are able to play off one another and create a culture of entrepreneurship," says Sarah Roberts, senior vice president

of Economic Development of The Chamber. "It also creates an energy and excitement to see a part of the community [the old General Tire building] that used to be a strong economic center and blighted areas become transformed. The BRIC is a great first symbol of the rebirth of the urban core of our community, an anchor that will create job opportunities. The whole community is hoping and believing in [the BRIC]."

It's the spirit of interdisciplinary research and collaborative innovation that spawns business, creates jobs, raises wage scales and benefits Baylor's mission, says Kephart, also cautioning expectations for hurried results. "The BRIC is a long-term project," he says. "When the doors of the BRIC open, that's just the beginning."

D **DR. ELTON STUCKLY JR., TEXAS STATE TECHNICAL COLLEGE (TSTC) WACO PRESIDENT** believes that no single company or institution will have a bigger impact on Waco's growth in the coming decades than the BRIC. The unique combination of workforce development with research and industry makes the BRIC stand apart.



"Any time you have engineers, you have to have technicians," he says. "And there's not another research park in the country that has that combination of a university and a technical college. It gives us the best of both worlds."

Stuckly's collaboration with Hyde began with TSTC's partnership in CASPER. He believes the BRIC represents an opportunity for Waco and Central Texas to become full partners in the lucrative Interstate 35 technology corridor after years as a way station.

"We're in a prime location, but you have to have something to provide that push and that shock," Stuckly says.

"And this is it."



Dr. Elton Stuckly Jr.
President, Texas State Technical College Waco

WORKFORCE DEVELOPMENT PERSPECTIVE

THE BAYLOR RESEARCH AND INNOVATION COLLABORATIVE (BRIC) HASN'T OPENED ITS DOORS, YET INTERNATIONALLY RENOWNED PHYSICIST DR. MARLAN O. SCULLY HAS JOINED BAYLOR AS A DISTINGUISHED RESEARCH ACADEMICIAN OF SCIENCE AND ENGINEERING.

S **SCULLY WILL HAVE A NUMBER OF RESEARCH LABS AT THE BRIC,** and all will be related to photonics and quantum engineering.

In addition to his membership in the National Academy of Sciences, Scully is a member of the Academia Europa, the Max Planck Society, and the American Academy of Arts and Sciences. He also holds faculty appointments at Texas A&M and Princeton University.

Scully's accomplishments include numerous awards and honors such as the Elliot Cresson Medal of the Franklin Institute, the Schawlow prize of the American Physical Society, the Townes medal of the American Optical Society, the Walther award of the German Physical Society,

and a Guggenheim Fellowship. He was recently appointed a Loeb Lecturer at Harvard University.

Scully's research interests include quantum optics, laser physics and bioengineering. He has written definitive textbooks on quantum optics and laser physics and has more than 700 professional research articles in journals.

Scully says he is drawn to Baylor for its unique combination of Christian roots and academic excellence. "Baylor is a unique,

dedicated Christian university on one hand, and is academically excellent and moving towards becoming really outstanding in research on the other hand. This is unusual," he says, "great universities were typically founded by the church but in more recent times have become secular. Baylor remains committed to its spiritual foundations, is committed to becoming strong in research and is moving forward on the world scene. This unusual combination drew me to Baylor and is what makes me enthusiastic about Baylor."

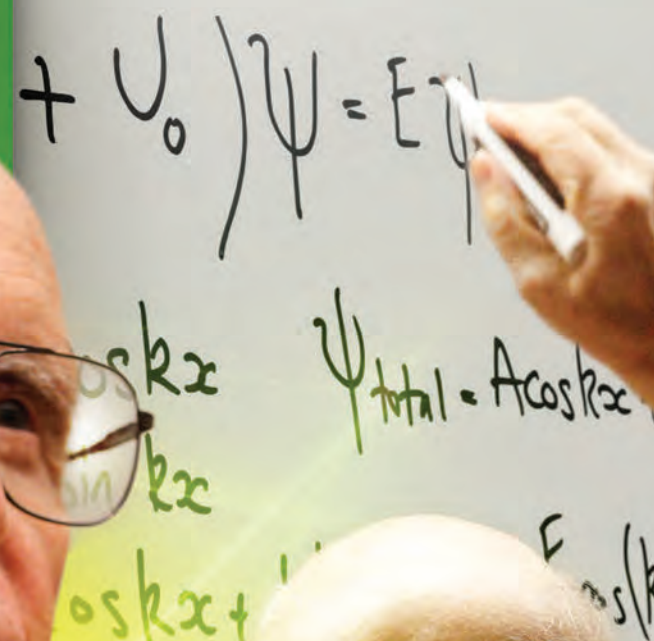
"BRINGING A FACULTY MEMBER OF MARLAN'S STATURE TO BAYLOR BRINGS AN IMMEDIATE UNDERSTANDING EXTERNALLY THAT BAYLOR IS SERIOUS ABOUT MOVING FORWARD AS A RESEARCH UNIVERSITY," SAYS DR. TRUELL HYDE, VICE PROVOST FOR RESEARCH.

"To also have some of Marlan's experimental and theoretical groups located in the BRIC will be an added benefit, since it provides Baylor with another tool for attracting world-class researchers and companies."

The BRIC is being built to encourage interdisciplinary and industry collaboration. Scully says his research focuses on cross-disciplinary academics because real-world situations require broad academic expertise. His theoretical group collaborates with experts from all around the world. "It's just a natural way of moving from simulations to developing real-world devices. You go to the experts where they are." He adds that it's even more important today to collaborate with other experts and researchers given the costly nature of modern research. "It's just natural that you collaborate."

"Marlan has been conducting interdisciplinary research since long before it was in vogue," says Hyde. "His research interests are so broad that he easily moves between departments and disciplines. As such, he is a wonderful gift to our faculty, particularly our younger faculty, in terms of the mentorship he brings with him everywhere he goes."

Scully is adding Baylor and its faculty, students and researchers to his collaboration resume. "One of the great challenges facing the U.S. and the world in the 21st century is stewardship of resources. We have the obligation to prepare the young minds that are going to solve the many problems enabling us to continue life as we know it," says Scully. "Baylor has a long-term tradition of producing people dedicated to stewardship and service. "It's my pleasure and privilege to join Baylor."



Baylor Research Labs Welcome Internationally Renowned Physicist, Dr. Marlan O. Scully

Capturing Construction, Click at a Time

IN DECEMBER 2010, THE GENERAL TIRE & RUBBER CO. PLANT'S EXTERIOR WAS JUST BEGINNING TO BE REMOVED, BRICK BY BRICK, AND AS THE BRICKS CAME DOWN, THE CLICKS FROM TWO CAMERAS MOUNTED ON POLES OUTSIDE THE BUILDING CAPTURED THE DEFINING MOMENTS.

The Office of the Vice Provost for Research wanted to document the building transformation and asked Curtis W. Callaway, Department of Journalism, Public Relations and New Media lecturer, if he was willing to take on the massive endeavor. Callaway jumped at the opportunity, along with journalism and public relations major Kyle Beam, and the pair have been documenting the General Tire & Rubber Co. building literally turning into the Baylor Research and Innovation Collaborative (BRIC), click by click.

The image frequency has varied throughout the year, but the cameras are currently snapping away every 15 seconds from 7 A.M. to 5 P.M. to ensure activity isn't missed. In the course of a year, the two cameras have taken more than 800,000 images. "Kyle and I were both pretty shocked at this number," says Callaway. "It's going to make editing very interesting and time consuming."



CALLAWAY
AND BEAM
ARE GOING
TO CREATE

A TIME-LAPSE VIDEO FROM THE IMAGES TAKEN. "The exterior changes over the past year can be seen on a day-by-day basis, but being able to deconstruct the activity and string it together in a time-lapse video is going to be fascinating," says Callaway. "And you'll be able to see it in minutes, versus days, months and years."

Aside from downloading, culling and editing 800,000 images, Callaway says the opportunity as a professional and student is priceless. "This is such a unique opportunity for a professional and most especially a student," says Callaway.

"It has been a learning experience for both of us in many ways. I wanted to make sure that Kyle was involved in everything including client meetings, planning, research, construction of units, maintenance and post production. This is something that you cannot teach in a classroom. He is getting hands-on experience with a real job, start to finish."

Beam is grateful for the opportunity and says working with Callaway has been an experience of a lifetime. "To work side-by-side with a photographer as experienced as [Callaway] is something I never would have imagined doing when I first came to Baylor."

"We are so appreciative of Curtis and Kyle for documenting the BRIC transformation," says Dr. Truell Hyde, vice provost for research. "Their work will become part of both General Tire and BRIC history."



Curtis W. Callaway

Kyle Beam



Editor's note: Time-lapse images in this issue of Research, as well as many others throughout the magazine, were provided by the Callaway-Beam project.



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CTTRP CENTRAL TEXAS TECHNOLOGY & RESEARCH PARK

The Central Texas Technology and Research Park (CTTRP) is the not-for-profit corporate entity responsible for both the 21-acre Baylor Research and Innovation Collaborative (BRIC) Discovery Park and the larger master-planned research park area north of Baylor University. The CTTRP master plan will establish joint strategic agreements for development of property bounded by Interstate 35 to the west, the Brazos River to the south, and the BRIC Discovery Park to the north. The CTTRP has assigned development and operations of the BRIC Discovery Park to Baylor University and is also participating with community stakeholders in a master planning process

for the acreage surrounding the BRIC Discovery Park and designated for future research park use. These agreements will ensure commonality among the various landowners and development stakeholders regarding municipal zoning, free-trade agreements, and tax and lease policies. BRIC stakeholders have coordinated and approved the foundational master planning document establishing criteria for locating in the CTTRP. The CTTRP stakeholder advisory boards will ensure a balanced approach to research park development that serves top-tier university research capabilities, high-tech industry business needs, workforce development initiatives, and community economic development goals. In addition, the CTTRP seeks to develop a successful master plan capable of providing convenient access to modern transportation infrastructure, goods, services, and a pleasant work and recreation environment.

BRIC RESEARCH UNDER ONE ROOF

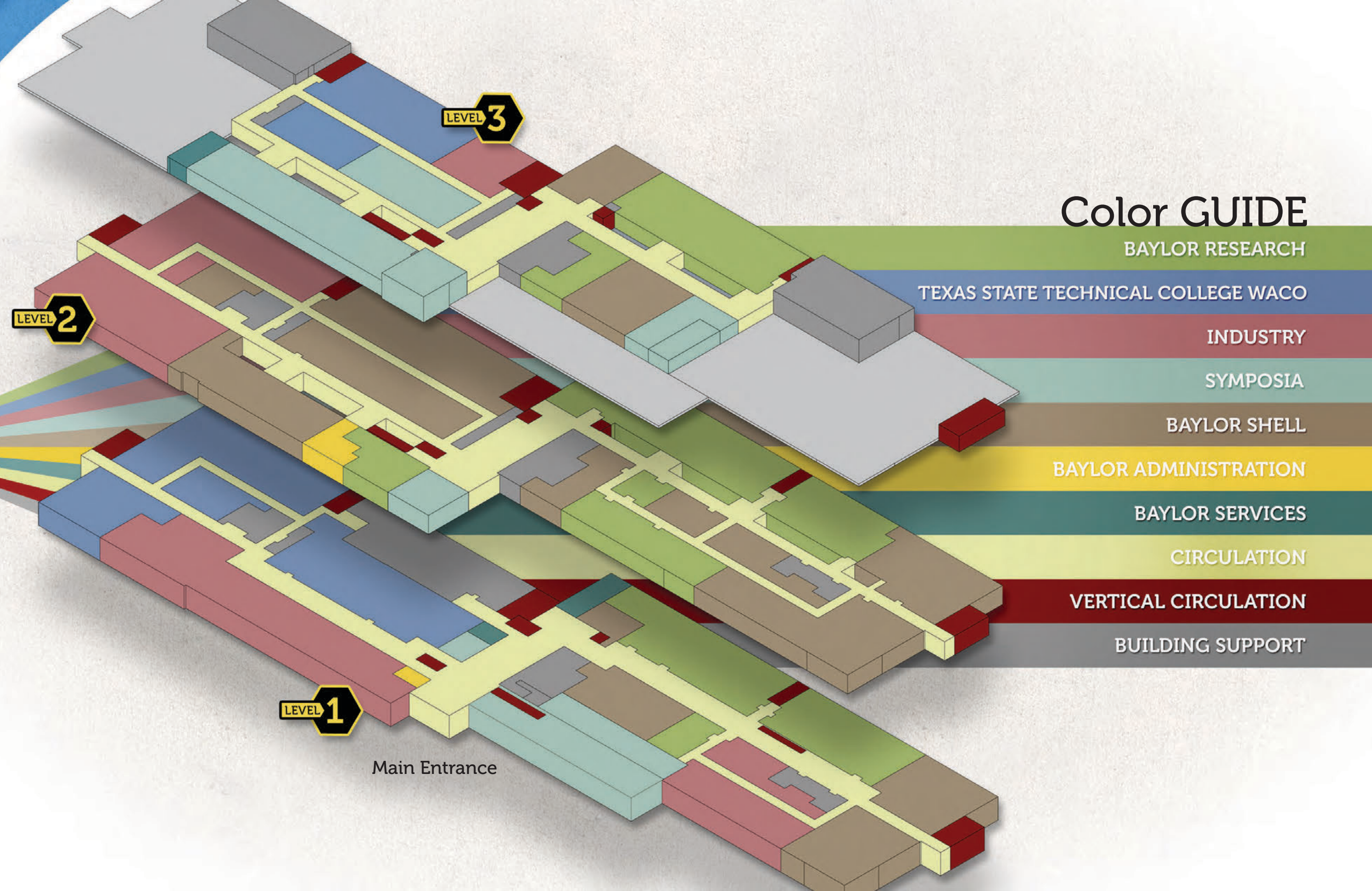
The Baylor Research and Innovation Collaborative (BRIC) discovery park, an interdisciplinary engine of invention, is the cornerstone development within the broader Central Texas Technology and Research Park (CTTRP). Situated on 21 acres within the CTTRP the 330,000 square foot BRIC facility includes:

- Baylor School of Engineering and Computer Science Research
- Baylor interdisciplinary research centers and institutes, faculty and graduate student research labs
- High-tech workforce development centers
- Industry collaborative research space
- New business incubation and startup facilities
- Science, Technology, Engineering and Math (STEM) K-12 learning environments
- Meeting and symposia space for national/international meetings and conference

The design of the BRIC facilitates daily interaction and cross-fertilization of ideas across all of the occupant categories. This frequent interaction in a single facility between university research, workforce training, industry, and economic development communities is a unique feature of the BRIC. The discovery park concept is nationally and internationally accepted as the most successful starting point for the development of larger research park environments. Combining university and industry research collaborations, workforce development, training and education in one place provides the basis for initial development of new technologies, processes and products. New products and processes then achieve full commercialization growth as they establish their individual infrastructures and company identities within the larger research park environment.

The BRIC is on schedule to begin initial operations in early 2013.

The opening footprint will include 40,000 square feet of fully-furnished Baylor research labs and offices, 30,000 square feet of common symposia areas, and 50,000 square feet of collaborative industry and technology support shell space. An additional 45,000 square feet has been designated for Texas State Technical College Waco for their high-tech workforce development and training facilities.



BAYLOR RESEARCH & INNOVATION COLLABORATIVE DISCOVERY PARK



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Air Science and Environment — IMES
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Biomedical Engineering — BSE/MSBME,
BSECE/MSBME, BSME/MSBME, MSBME
Biomedical Studies — MS, PhD
Business Administration — MBA, MBA/JD,
MBA/ME, MBA/MSCS
Business Administration, Dallas, Austin — EMBA
Business Administration in Informational
Systems Management — MBA/ISM
Business Administration in
International Management — MBA/INTM
Business Administration/
Information Systems — MBA/MSIS
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Church Music — MM, MM/MDiv
Church-State Studies — MA, PhD
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Collaborative Piano — MM
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and Disorders — MA, MSCD
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PhD, PhDECE
Engineering — BSECE/ME, BSME/ME,
BSE/ME, ME, ME/MBA
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Environmental Science — MES, MS
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and Preventative Health — PhD
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Geology — MS, PhD

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Fort Sam Houston — MHA, MBA/MHA
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Journalism — MA
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Nutrition, Fort Sam Houston — MS
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Physical Therapy, Brooke Army
Medical Center — DScPT
Physical Therapy, Fort Sam Houston — DPT
Physical Therapy, West Point — DScPT
Physician Assistant Studies, Brooke,
Madigan, Darnell and William Beaumont
Army Medical Centers — DScPAS
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Piano Pedagogy and Performance — MM
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Transition Doctor of Physical
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University Research Centers and Institutes

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Baylor Advanced Research Institute
Baylor Institute for Studies of Religion
Center for Analytical Spectroscopy
Center for Spatial Research
Center for Astrophysics, Space Physics & Engineering Research
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Center for Christian Education
Center for Christian Ethics
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Center for Community Learning & Enrichment
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Center for Drug Discovery
Center for Exercise, Nutrition & Preventative Health Research
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