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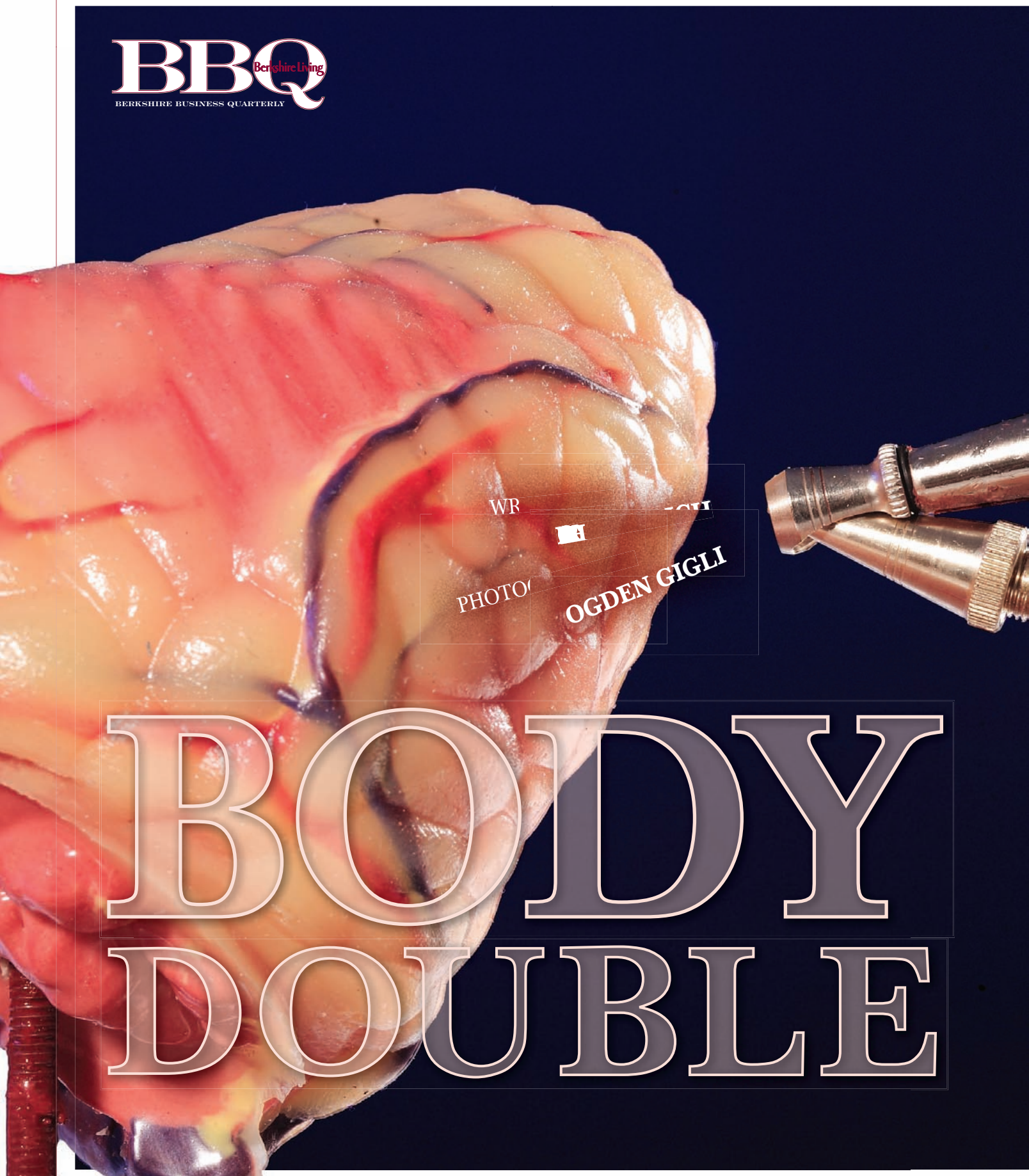

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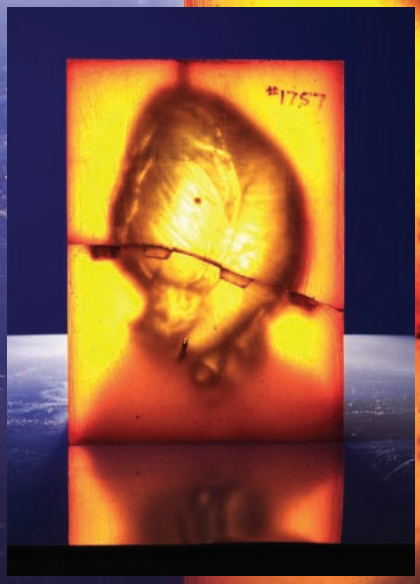
PHOTO

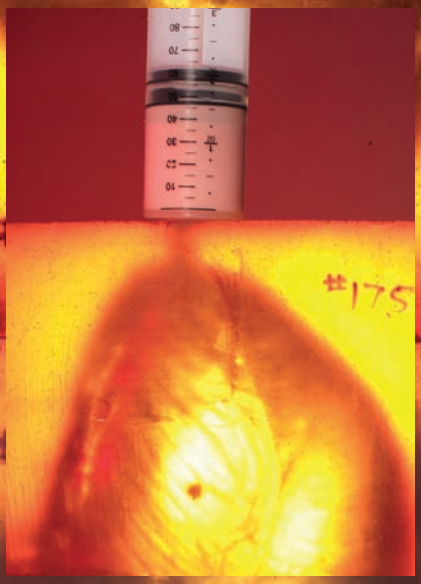
OGDEN GIGLI

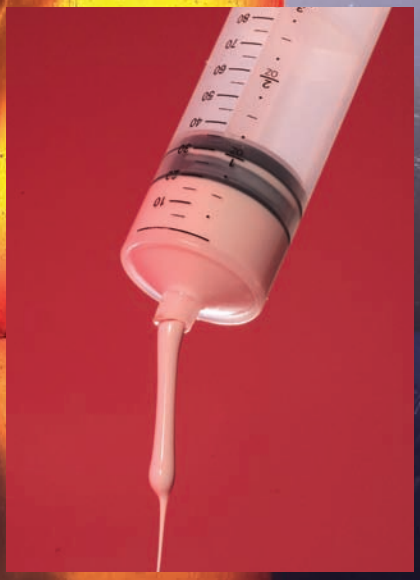
BODY DOUBLE

POLYMERS ARE INJECTED INTO A TRANSLUCENT MOLD IN THE MANUFACTURE OF A MODEL HEART.

They were taking a chance. Surgeons had completely draped the patient, except for a small section of the forearm from which they sought a radial artery necessary for the cardiac bypass procedure. They moved with precision and focus inside the complex system of engineering that is the human body. But this body was sick, and every team member utilized a skill and every instrument had a purpose: to make it healthy again.







Also present in the O.R. was a couple from Stockbridge, Massachusetts. Feeling a bit uneasy, Lisa Chamberlain stood beside Eric, her husband, observing the procedure, focusing on the patient's exposed forearm amongst the whirring and beeping of collected life-sustaining apparatus while the pros worked their craft.

In the operating room, the Chamberlains were strangers in a strange land. Having spent most of their careers in the movie special-effects business, they were merely observers, trying to comprehend the parts that make the body work correctly and the procedures and materials that repair it when it doesn't. Suddenly, the patient's hand slipped out from beneath the drapes into view. A jolt hit them: a complete person was under there; the sum of all these parts! Lisa broke out in a cold sweat and had to leave the room. But Eric hung on to watch. Since the Chamberlains were just entering a new profession, they were in uncharted water—but they found it utterly fascinating.

Now, some nine years removed from that event, Eric is still fascinated and is diligently working in his shop, the approximately 7,000-square-foot Chamberlain Group office on the southern edges of Great Barrington, Massachusetts, where the company designs, manufactures, and markets custom models of the human anatomy so medical device companies can test new products and train doctors on surgical procedures with new instruments. The models are also used by teaching institutions to train surgeons.

Eric is president of the company and heads the design and production departments. He and master sculptor-in-residence Stephen Thurn are collaborating on a model of a beating heart while classical music sweeps across the stockpile of tools, machinery, and gathered creations in various stages of development, including organ-filled torsos, limbs prepared for vascular extraction, and countless other body parts. The beating heart is made from a blend of polymers, tubing, pigment dyes, and secret ingredients. When rigged to an electrical charging device, its ventricles produce a synchronized beat to mimic that of a living patient. Paired with the ambient music of Mozart, their creation offers a vision of some indefinable, universal harmony. Like the other two-hundred-and-fifty-plus models they market to medical device companies, hospitals, and university medical centers, the heart is anatomically correct.

The Chamberlain Group's design ingenuity has been a breakthrough for the medical community. Models look, weigh, and feel just like real living tissue and provide a better training device than a cadaver, animal, or lesser-realized product would. "We create imitations of life that are more appealing to work with. They aren't sterile, so the doctors are trained well, and our clients, who are selling their devices to the medical community, are demonstrating them better than before," says Lisa.

As testimony to just how realistic and innovative these models are, in roughly ten years of existence, the Chamberlain Group has become a worldwide leader in medical model design and manufacturing. The company's products are sold to more than one hundred and fifty leading medical device manufacturers and teaching institutions in forty countries, including Russia and India, Asia and the Middle East, and in forty-six states domestically. Their client list is a veritable who's who of health care and high-tech giants: Johnson & Johnson, Medtronic, Cleveland Clinic, Lahey Clinic, Memorial Sloan-Kettering Cancer Center, the Mayo Clinic, and NASA, to name a few. In addition to the beating heart, for which Eric received a U.S. patent for design, and many other body parts created to support cardiothoracic, vascular, gastrointestinal, reproductive, urological, pulmonary, and general surgical disciplines, the company recently unveiled some particularly innovative products. For Boston Scientific, the Natick, Massachusetts-based medical device behemoth (which purchased Guidant Corp. in 2006 for $27.2 billion in a well-publicized merger), the Chamberlain Group developed a full-body model for interventional cardiology and electrophysiology, called the Phantom by the client.

How The Chamberlains Do It

What are your favorite productivity tools?

LISA: E-mail, e-mail, e-mail. It's the English major's gift from the gods. Finally we have a clear advantage over all those MBAs.

ERIC: A pencil and an eraser.

How do you organize your time?

LISA: I make a daily list in a spiral-bound notebook, keep a monthly dry-erase calendar on the wall, and have a vague sense of things upcoming when away from the office.

ERIC: I respond to crises until the day is over, after which I go home, go to bed, and get up and do it all over again. And Lisa tells me if we have social plans on a need-to-know basis.

Are you Mac or PC?

We operate our business on PC, but we are both Mac lovers at heart. We've both switched back and forth a number of times. But CAD and other manufacturing software, as well as the relational database on which our operation hinges, are all PC-based.

Do you enjoy eating at home or going out?

At home. We love to cook.

What books have you read that really had an impact on how you conduct your business?

The Little Engine That Could. Our mothers were, and are, great believers in determination.

What business publications do you read regularly?

We don't have time to read more than the *New York Times* for business news.

What business-oriented websites do you regularly read?

Well, since the *Wall Street Journal* published an article about us on their Health Blog, that may become the new favorite.

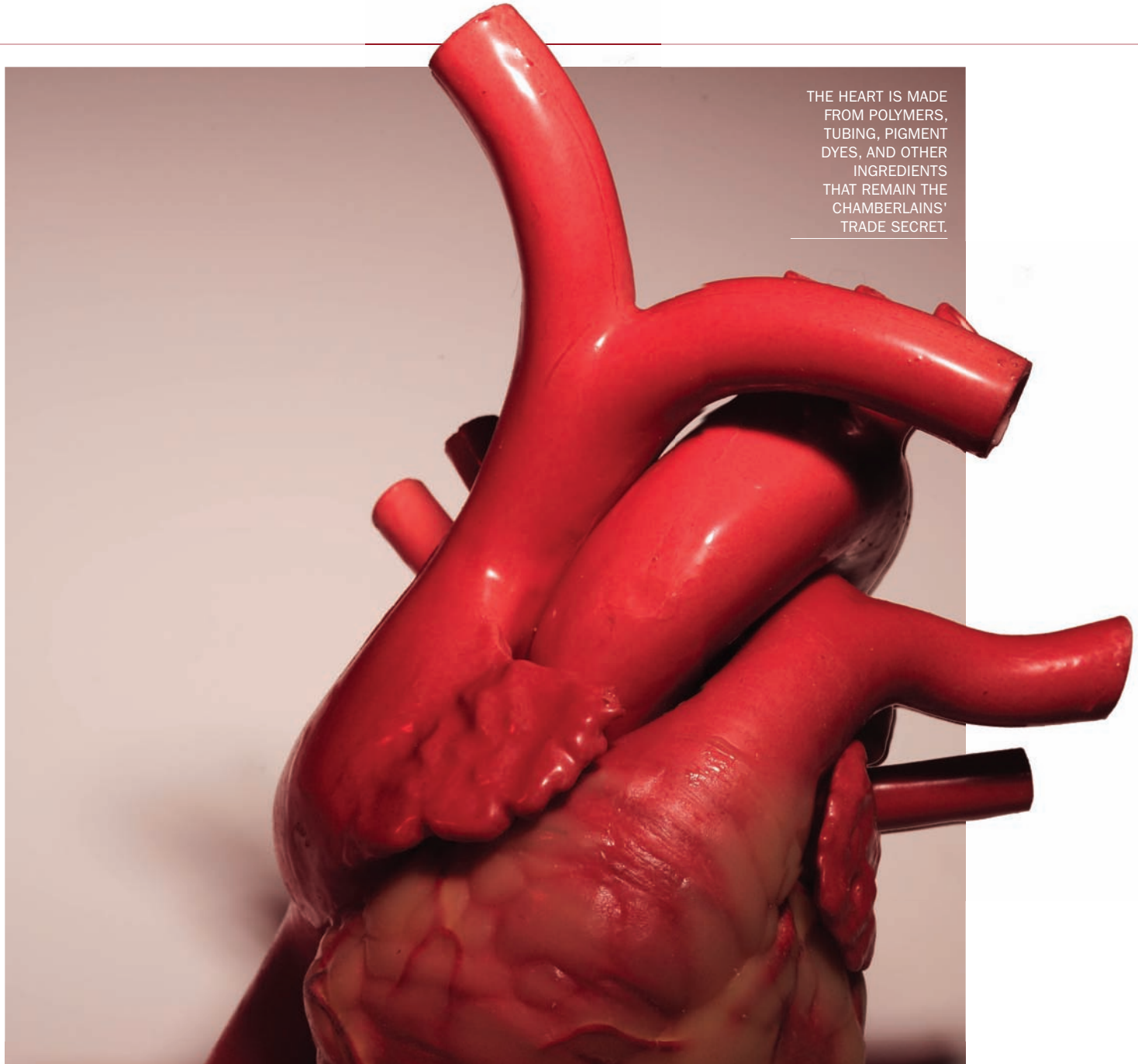
What is the Berkshire-based business you most admire and why?

We love the Snap Shop on Railroad Street in Great Barrington for their consistent quality, customer service, and wearing of shorts in all weather.

Who inspires you?

ERIC: Frank LaPrelle, my first real employer, was a mentor. An architect, designer, pilot, Marine, and associate of Charles and Ray Eames and Buckminster Fuller. He gave me the confidence to know it could just be done, whatever it was, without setting obstacles in my path.

LISA: Rita Sitnick, my colleague, friend, and the first woman video editor in New York. She taught me to be fearless, face adversity with a smile, and do it with style.



THE HEART IS MADE FROM POLYMERS, TUBING, PIGMENT DYES, AND OTHER INGREDIENTS THAT REMAIN THE CHAMBERLAINS' TRADE SECRET.

For Intuitive Surgical, in Sunnyvale, California, they created a Robotic Training Kit, which trains surgeons in the fundamentals of robotic surgery. For EndoGastric Solutions of Redmond, Washington, the EsophyX TIF Trainer (Transoral Incisionless Fundoplication) incorporates an extremely realistic mimetic anatomical design to train physicians on new, less invasive ways to treat gastroesophageal reflux disease (GERD) through the mouth. In addition to the many stocked assorted limbs, pelvises, and organs, other more recent products include atrial fibrillation trainers, pulmonic tissue valves, and prostate surgery trainers.

With all its creativity and engineering prowess, one might think the company would be located someplace a little more, shall we say, cutting-edge and centralized than southern Berkshire. The fact is, they could run this business anywhere, but the Chamberlains chose Great Barrington. And why not? The area first left an indelible mark on Lisa as a twelve-year-old girl when she attended sleep-away camp in Cheshire, Massachusetts. "It was a dream," she reflects. "It was here that I first found out it was okay to do whatever pleases you and you can have fun doing it. That became invaluable to me in life. I also discovered at least three things that I continue to love to this day: tomatoes, the theater, and James Taylor, who I saw live on a camp trip in 1973 or 1974."

Eric concurs. "I'm constantly marveling at the landscape, the natural beauty, the seasons; there's always something new to see." The staff is a balanced mixture of Berkshire-born-and-raised people and film-business veterans who share similar sensibilities. "People hear we're from Massachusetts and

just assume we're from Boston, but we're able to do more here, from a budget standpoint, than we would in the big towns," Lisa says. The Chamberlain Group is one of those leading the charge in extending the so-called Massachusetts Tech Corridor from Boston and Worcester to the western edges of the state.

Their nondescript, utilitarian offices—where the body parts, the parts that make up the body parts, and the contraptions that build them are harbored—is less a cobwebbed, Halloween-inspired workshop for a disciple of Dr. Frankenstein than a multifaceted studio for a modern-day da Vinci. Part artist and visionary, part engineer and master craftsman, Eric is the creative tour de force behind the entire process, moving with precision and focus, manipulating an array of computer design software, high-tech manufacturing apparatus, and an inquisitive mind prone to experiment with materials and forever seeking to push the envelope.

Lisa manages new business development, operations, and everything else concerning the business, much as she did with Eric as an executive producer during their days in the 1980s and early 1990s with one of the leading motion-picture special-effects houses in Lenox, Massachusetts. This came after a stint with R/Greenberg Associates in New York City, where Eric was the head of physical effects. Throughout the decade, R/Greenberg designed and produced miniature models, photography, computer graphics, titles, and special effects on films ranging from *Gandhi*, *Tootsie,* and *The Big Chill* to *Ghostbusters, Predator* (which received an Academy Award nomination for Best Visual Effects), and Woody Allen's *Zelig*. A desire to get away from the hustle of Hollywood types and the bustle of the big city brought them to the Berkshires in the early 1990s, when several members of R/Greenberg moved to a converted freight warehouse on Riverview Road in Lenox to work for Mass Illusion. There, Lisa line-produced some of the more spectacular special-effect sequences for the Arnold Schwarzenegger action film *Eraser*. "Looking at a script and picking out moments in the story where you can do special effects is an enormously satisfying experience," she says. "Getting them on film, however, was always a fun challenge."

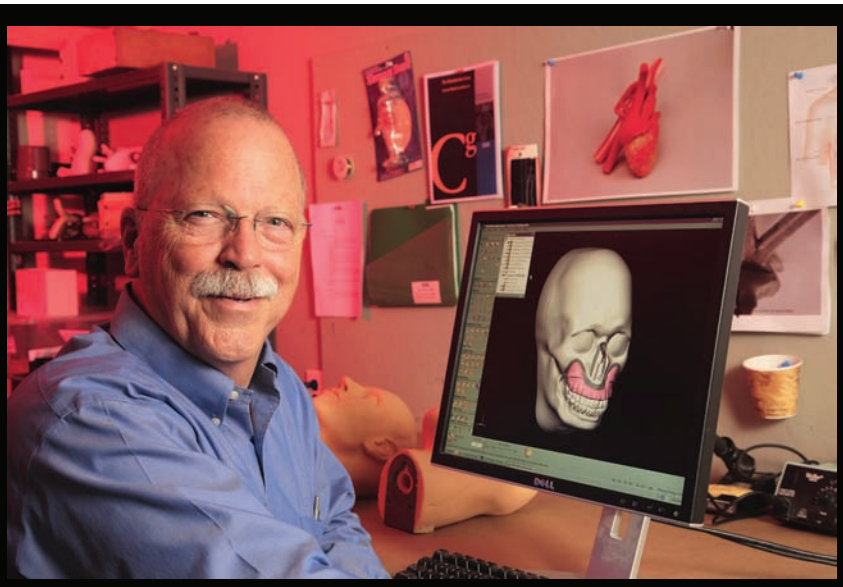
One of the more spectacular feats they collaborated on was the "bullet time" photographic effect for *The Matrix*, which helped the movie earn an Academy Award for Best Visual Effects. The now-famous effect, where the Keanu Reeves character leaps in the air and time appears to suspend while the point of view rotates 360 degrees around him to reveal a series of frozen and hyper-slow motion action poses, was an achievement of considerable visionary and engineering genius. Using computer graphics, a "pre-visualization move" was written and enabled lasers to pinpoint a swooping, circular arrangement of 120 still cameras, which surrounded Reeves's body double and fired one photograph after another in rapid succession around its path, capturing a multitude of still frames which would be composed later to give the illusion of super-slow motion. The effect, which nowadays is something of a Hollywood and Madison Avenue staple, traces its origins back to that warehouse in Lenox. "For us, doing something that no one has ever seen before isn't an intimidating process. It's what we've always done," notes Lisa.

In 1997, Mass Illusion began a migration to Los Angeles, leaving Lisa and Eric wondering what they were going to do with themselves. Fate intervened in the form of an unexpected phone call. "Somebody who knew we worked in special effects wanted to see if we could build a human leg from which doctors could practice minimally invasive saphenous vein dissection," Lisa recalls. "I did a double take. It sounded intriguing. We had years of model-building experience, but mostly on a miniature scale. We never had worked with soft-tissue components before and we were going from building things that were being viewed on screen for a couple of seconds to things that were going to be held and one-to-one in scale." They educated themselves. They researched. They buried their noses in anatomy books for hours upon end, asked questions of doctors, and were invited to observe that first open-heart surgery. "Attend a surgery? At the time, I could barely stand to have blood taken, let alone watch videos of surgeries or view one in person," Lisa admits.

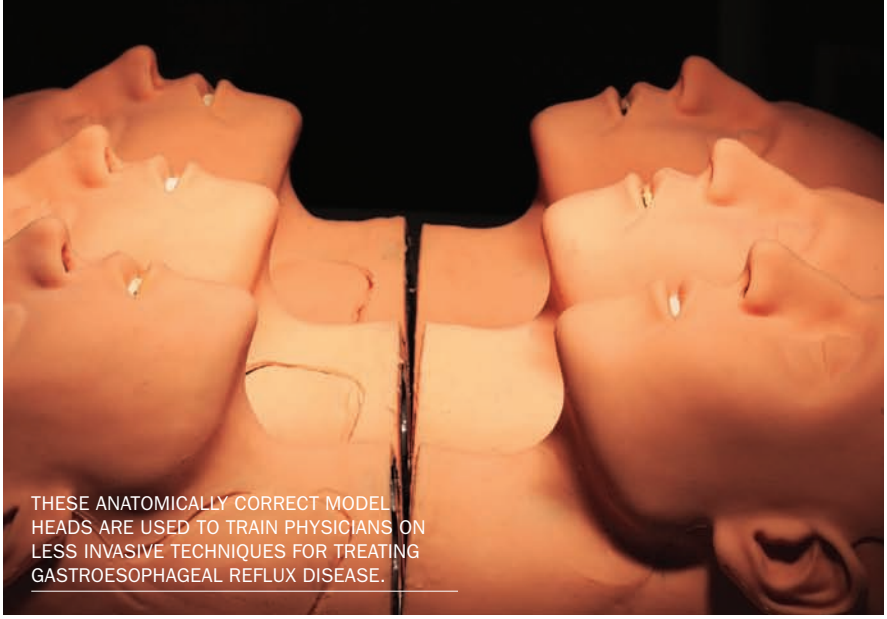
It was the proverbial risk/reward scenario. The movie business had been good at training them to think three-dimensionally, which could help them understand how all the intricate systems of the human anatomy work. So they took a chance. In 1999, with some of the Mass Illusion talent that stayed behind, they founded the Chamberlain Group, made that first model, and continued to delve into anything else they could get their hands on, including television commercials, an MTV pilot, and holiday windows for Lord & Taylor in New York City. The medical models business was a promising new frontier, supporting a ripe, growing medical device industry. But back then, they didn't know yet how to pursue it.

In the winter of 2000, during a Florida trip to visit her mother, on a whim, Lisa and Eric dropped in on a medical device convention for the Society of Thoracic Surgeons in Fort Lauderdale. "We went in there not knowing what to expect. Maybe we'd collect some business cards and see how devices were being marketed," Lisa says. "It was a real eye-opener. Our products were there and looked great. But other companies were demonstrating their devices on chicken breasts, cuts of steak, or other models that were poorly made. Suddenly, I became a salesperson. I would tell people to check out our products and ask them if they needed any. It was one of those 'aha' moments where we saw we could really make a go of this business and felt that in a year's time, all these conventioneers are going to know who we are and our products are going to be everywhere." The Chamberlains surely seized that moment. Since then, they've enjoyed more than a 600 percent increase in revenue with double-digit annual growth. Today, the approximately twenty-person company has revenues in excess of two million dollars. "It's amazing that you can stay local and be global largely through strong word of mouth and the Internet," Lisa says. "It's really a testament to the quality of what we do."

They do it in a space that's more than doubled in size since 2000, on a stretch of Route 7 dotted with gardening shops, antique stores, and restaurants. But if you didn't know where to look, you'd never find it. For most businesses, an unassuming location with an absence of signage might suggest gross naiveté. For the Chamberlain Group, going semi-incognito, with a small, tight group of talented people, is an integral part of the recipe for invention. "We're self-contained and kind of isolated, but that lets us get a lot accomplished," says Eric. "Everyone here has access to everything. We can turn on a dime because



ERIC AND LISA CHAMBERLAIN



THESE ANATOMICALLY CORRECT MODEL HEADS ARE USED TO TRAIN PHYSICIANS ON LESS INVASIVE TECHNIQUES FOR TREATING GASTROESOPHAGEAL REFLUX DISEASE.

we're the ones making all the decisions, right then and there. A situation may come up and we'll just say, 'Yes, let's try that!'" Being lean, mean, and quick on the draw is another approach culled from the movie business. "When you're on a set and called upon to solve a problem, you've got to be skilled, know how the materials work, and be able to improvise quickly," he adds.

When they start the process of creating a model, the Chamberlains will frequently call upon the knowledge of doctors. "We'll ask them to show us how they perform procedures and hold devices," Eric says. "We've found that doctors really like to talk, and we've spoken to some of the best in the world." Eric uses licensed computer-design software to draw what he wants to build and the data can be output to everything from an ordinary mold-making apparatus to one of their two computer numeric control mills, which can cut three-dimensionally. There's even a three-dimensional printer, which creates an intricate "print"—a model of the computer-generated drawing using thousands of thin layers of powder, which adhere together. It looks kind of like any office printer, except that this one costs roughly the same as a new car. This printer also copies negative space. For instance, if Eric needs to create a hollow body part, like a vein, the printer will make a solid representation of the interior so he can create the tissue around it. Some of the licensed software he uses is so sophisticated it can capture intricate patient data that will allow Eric to re-create anatomy with ultimate precision. Using haptic technology—cutting-edge science, which combines software and force feedback—Eric can manipulate the data through touch sensation.

For example, a CT image of a lung can be scanned into the computer and that data can be sculpted using a virtual tool. Other software can replicate anatomy based on its density. Measurements of the airwaves within that patient's lung can be fed into the computer and visualized. In the case of a lung's air passageways, the data would present a tree-shaped figure around which a mold could be cast. With these powerful tools, Eric can create meticulous anatomical models based on actual patient data, whereas in the old days, he'd be relegated to starting with pictures and a simple lump of clay in his hands. That's a good thing, because many of their products train professionals on minimally invasive techniques, so lifelike veins, arteries, muscle, and tissue

are something of a specialty for him.

The net result is something like art imitating life. But art may be in the eye of the beholder. "People may look at our products and tell us how real they are," says Eric. "They'll say, 'That's a great bone structure,' but we didn't design it originally. The human body is the real thing of beauty. We're just copying it." But getting the copy done correctly is tantamount to the success of their business and critical to the valuable training of doctors. "We're bringing practice to the practice of medicine," says Lisa.

That said, one of their newest and most promising products on tap for the fall of 2008 is the resident surgical learning system, developed in conjunction with Baystate Medical Center, a leading teaching hospital in Springfield, Massachusetts. The system is a physical model plus a curriculum sold together as a unit, representing a breakthrough in surgical training. In this partnership, the surgeons at Baystate write the curriculum and the Chamberlain Group creates the anatomy. Their standalone models have already been staples for resident practice, but this is the company's first major venture into the academic environment that involves curriculum. "Residency training is a growing market, and increasing attention is being given to how surgeons are trained," says Lisa. "Only recently has there been standardization overseen by the American College of Surgeons. So the [system] represents tremendous growth potential for us, because the curriculum immediately validates the trainer and provides proof to the customer base that it works."

An overview of the medical device business suggests their future continues to look bright. Recent statistics show the industry is responsible for more than 411,000 jobs and $86 billion in domestic revenues ($220 billion internationally), with a 10 percent annual growth rate. (At over $20 billion, Massachusetts-based medical device companies ranked third in the nation in terms of increased market value creation.) Over the last five years, the medical device industry has outperformed the S&P 500 in terms of both gross margins and earnings per share. And with 78 million American baby boomers maturing, it's a safe bet to assume that there will be increasing demand for improved tools and treatments, in particular for cardiovascular and orthopedic care, which account for almost half of the industry's sales. Internationally, markets will continue to grow as one-third of the populations in developed countries are forecast to age past sixty and underdeveloped countries start becoming tapped.

As an innovator and leader in support of this robust sector, the Chamberlain Group has a lot to feel confident about. "It motivates us even more," says Lisa. "Our products provide training solutions, from basic resident training for fundamental surgical procedures to training physicians on the most advanced intuitive surgical robots on the planet, so we're in a terrific position to be able to grow and continue to do great work as the marketplace demands." Has it been much different from doing great things in the film business? "I had another one of those 'aha' moments when I realized we were able to do things that other stable companies do," she adds. "Back when we worked on a film project, it meant that we'd come in and work for the number of weeks it takes to complete the project, and then we'd be done. It'd be over until the next assignment happened to come along. The Chamberlain Group exists beyond just project-to-project. We're established now and able to provide steady income and benefits, like health insurance, for our employees, and that's very important to us as business owners." That dedication hasn't gone unnoticed. In 2003, the Chamberlain Group received the Governor's Entrepreneurial Spirit Award for Outstanding Service to the Commonwealth of Massachusetts in the Areas of Job Creation and Economic Development.

Their sentiment is borne out of their community—the pastoral surroundings of the Berkshires that inspire so many creative people to do good work. When they're not spending long hours practicing their craft at the office, you might find Eric painting or Lisa gardening at their eighteenth-century home in Stockbridge. The Chamberlains have discovered a number of perfect ways to unwind—exploring a newfound path in the woods, searching the heavens with a telescope, a picnic on the lawn at Tanglewood, or a canoe trip down the Housatonic River. "I love the social contract of the Berkshires more than any single aspect of life here. I love the basic respect people have for neighbors and the land," reflects Lisa. "It's a self-imposed frame of mind which earns us the title of citizen."

Like painters or musicians, they're creating a universal language. In this case, it's the human body. Having the vision and knowing how the materials work is all part of the genius of their art form. One might ponder why an artist—or a businessperson—does what he does. The answer for both could be simply that he finds it necessary, or there may be something else that drives him, hiding in shadow, that to others seems intangible. For the Chamberlains, in addition to thriving as a company, it's about doing something valuable: contributing, making a difference. "Most people don't understand how medicine works," offers Lisa. "We've had a behind-the-scenes view and it's kind of like a stage technician that's seen the back of the stage set and now has a greater appreciation for the theater, because he understands how the magic is done. That's me now. I've seen a lot more surgeries, endoscopies, and such, and I'm a much better patient than I used to be." Eric adds with a smile, "I think the future of medicine looks great. There are some very dedicated people out there constantly searching for new ways of helping others." So, too, are some talented folks, neighbors of ours, who are pushing the limits, blending art and technology, figuring out how to make things work better and reaping the rewards. BBQ

Rob Ulrich is a freelance writer living in New York City and Monterey, Mass.

TAKEAWAY

BE FLEXIBLE
With creative thinking, taking one set of skills and adapting it to a new field of endeavor can produce multiple benefits.

TAKE RISKS
The Chamberlains have spent their careers doing things that have never been done before, including the creation of lifelike medical models.

DEVELOP EXPERTISE
Immersing oneself in research, education, and direct experience is essential when venturing into a new field.

THE RECIPE

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