

RAPID INJECTION MOLDING **Journal**

2006 ISSUE 3

The Protomold Company, Inc.



Design: **A Creative Process**

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The Leverage of Early Education

Today's Tots are Tomorrow's Tinkerers

During this election season (which seems about as long as the holiday season these days), we hear much about the huge impact that can be made in a child's life by investments in early education. It's all about leveraging the effect an early change in a child's direction can have much later in their life. If you'd prefer a literary analogy, consider the saying "As the twig is bent, so grows the tree."

As most people would agree, the job of our educators is one of the most challenging and least appreciated in the world today. In addition, teachers are only the formal part of a process that extends from the living room to the classroom, and from the playground to the Playstation®. And to make matters more complicated yet, in a world that is changing as quickly as ours, some of today's knowledge and beliefs may quickly become as out of date as phrenology or the flat earth (Thomas L. Friedman notwithstanding). But because the creative directors, architects and engineers

we'll be looking for in 10 or 15 years are today's grade schoolers, now is the critical time to make the investment.

The good news is that an investment in early education can have enormous impact because our children are busy little learning machines. But bear in mind that, for better or worse, when they are young they believe just about anything they are told. Teach them that the world is a dangerous place, and they will grow up fearful. Teach them that money talks, and they'll grow attuned to its ring. And if we teach them that we know all the answers, they'll lose the natural curiosity they were born with.

The truth is that kids are born scientists, eagerly eating bugs just to see how they taste. They are artists, as any parent who has ever tried to apply paint over crayon can attest. They are journalists, who will faithfully report what you said when you hit your finger with the hammer, and they are storytellers whose imaginations go to work the minute you ask "Who spilled the milk?"

As frustrating as those experiments and exercises can sometimes be, they are critical lessons in the education of tomorrow's inventors, researchers, and designers. It's a process in which the kids themselves are fully invested, and as parents, teachers, and citizens, we *must invest in it as well*, not just with money, but with our time, energy, and ideas. See page 6 for a fascinating example of someone who did—and still is.

In this issue of the journal, we look at some of the changes our society is going through and what they mean for children and adults alike. I hope you'll find it useful.



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Living by Design

Most living things on our planet thrive by doing the same things over and over. Acorns grow into oaks; squirrels collect acorns; hawks collect squirrels. Humans, on the other hand, have to innovate—in the words of writer Douglas Adams, to “keep banging the rocks together, guys” until they yield a cutting edge or a spark that can be blown into a flame. Of course, having

At the same time, primarily due to technology, the “industrialized” world has ceased to be driven primarily by scarcity. For most of its citizens, obesity is a greater concern than starvation, a shift that affects food, clothing, leisure, and more. Cars are no longer mere transportation; they are statements about us. Hybrid owners pay a premium to express their environmental concern.

The result is “decommoditization” on a massive scale. Cell phones, MP3 players, tools, appliances, and even industrial machinery are acquiring personalities, and the designer who forgets that does so at his or her peril. The biggest challenge is time pressure. The good news is that modern tools offload much of the drudgery of development to automated systems, freeing the designer to observe, imagine, design, and test ... and redesign and test again ... and again. We at Protomold are proud to be one of those tools.

“Cell phones, MP3 players, tools, appliances, and even industrial machinery are acquiring personalities, and the designer who forgets that does so at his or her peril.”

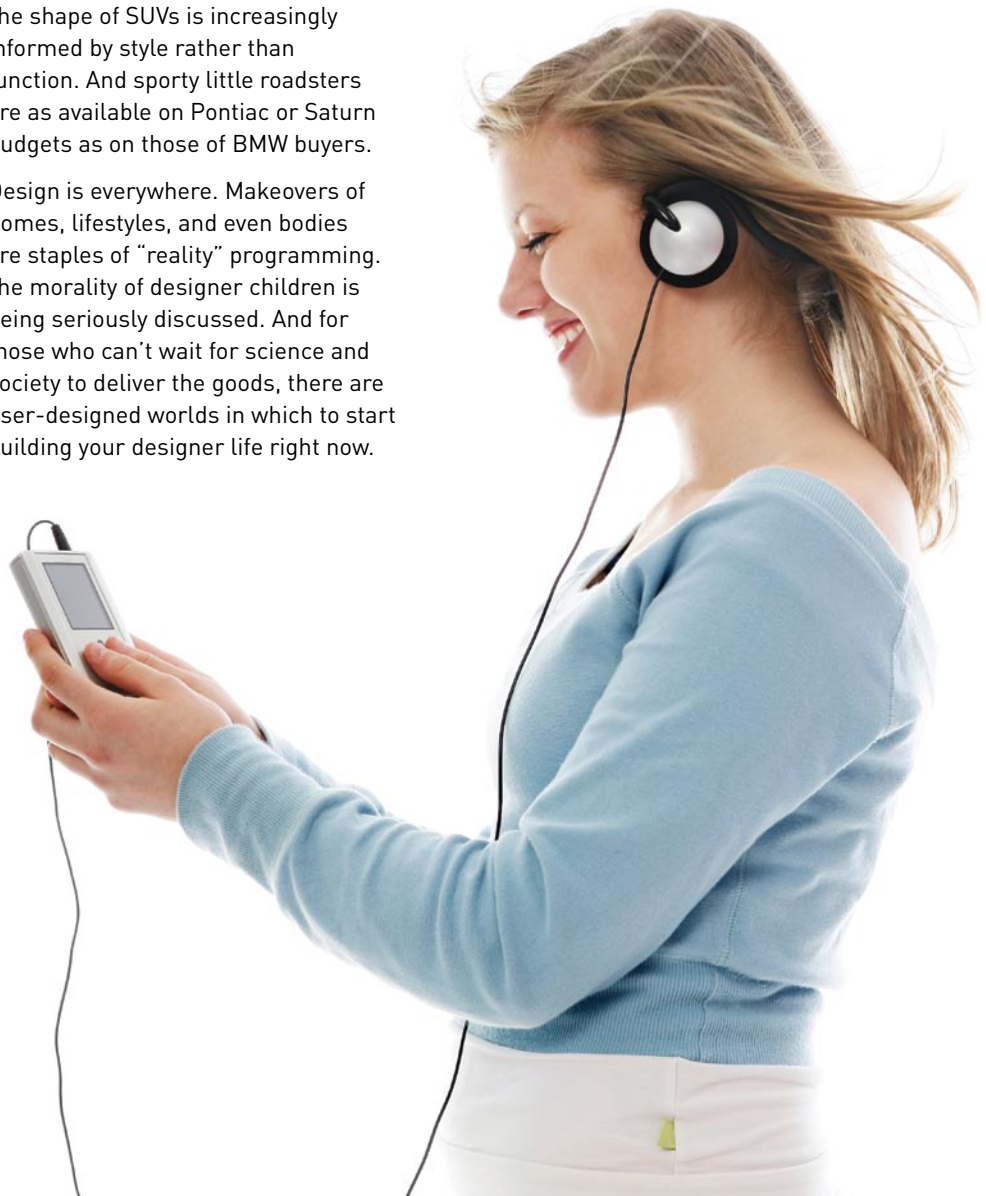
achieved fire and tools, we may spend generations doing little more than sitting by the hearth churning out arrowheads. But we only do that until someone notices that throwing the right kinds of rocks into the fire yields shiny stuff that can be beaten into sharper, more durable arrowheads.

In other words, while the creative mill runs continuously, its output depends on the grist, which varies over time. The difference between dark ages and renaissance can be a technology like metallurgy, internal combustion, or genomics. It can be an import like gunpowder, silk, or spices. Or it can be access to new ideas.

Arguably, there have been four “revolutions” in the transmission of ideas. The first was speech, which allowed us to communicate ideas more complex than “food here” or “tiger there.” The second was writing and printing, which allowed us to transcend time and space, accessing the ideas of people we could never meet face-to-face. The third was telecommunications, which made communications instantaneous. And the fourth has been the Internet, which provides on-demand access to all the information in the world.

The shape of SUVs is increasingly informed by style rather than function. And sporty little roadsters are as available on Pontiac or Saturn budgets as on those of BMW buyers.

Design is everywhere. Makeovers of homes, lifestyles, and even bodies are staples of “reality” programming. The morality of designer children is being seriously discussed. And for those who can’t wait for science and society to deliver the goods, there are user-designed worlds in which to start building your designer life right now.



What a VC Sees: Design in a Changing Tech Landscape

Joy Lindsay, the president and co-founder of StarTec Investments, believes that building a successful company takes a good linear left brain and a good conceptual right. Of course the two need not reside in the same head. "Ask any venture capitalist what they look for and one of the first things they'll say is a strong management team," says Lindsay. "Sometimes you find an individual who's both right-side creative and left-side analytical, but it's a fairly rare combination. More often, you find a team of people who are complementary."

StarTec focuses on early-stage, Minnesota-based technology companies. The company's portfolio includes Apprise Technologies, Magnum Technologies, WindLogics, Restore Products, and Compellent among others. One aspect important to StarTec's investment decision is a company's intellectual property. "We're used to looking at intellectual property—patents and copyrights," says Lindsay. "I understand the importance of design in today's markets, but it's harder to define than technology and function, and harder to protect."

"In the past, especially in technology, you could take a primarily analytical approach," she says. "It was all about function. Today, products still have to be functional with a clear value proposition but the trend is toward the creative side. The fact that a product, particularly one aimed at millennial or gen-xer consumers, is 'cool' can actually have a place in a business plan. It isn't always easy for analytical individuals to see the value of design and it's difficult to measure a product's 'coolness', but



it can be an important part of an evaluation. Of course, if you can't see it, you can always ask your kids."

Lindsay sees the Internet, a product of the Information Age, as a stepping stone to what Daniel Pink* calls the Conceptual Age. Since the advent of the Internet, she suggests, we've gone from filling a need for information to sorting through an overabundance, and creativity can be a critical component of that sorting process. As a result, she, like Pink, she sees the need for the whole mind and a new equality between the left and right brains.

Entrepreneurs tend to be significantly right-brain-oriented individuals," she says. "If they weren't creative and innovative, they wouldn't be entrepreneurs. They're looking for new and different ways to solve problems. Engineers, on the other hand, have to be more methodical as they work through the options, applying science and mathematics." In working together, however, Lindsay sees individuals with complementary talents learning one another's processes. "Creatives" can become more analytical while linear thinkers learn to conceptualize and synthesize.

Design, she suggests, can be the bridge between the two. Designers build for functionality but, increasingly, for meaning as well. But unlike functionality, which can be measured in a lab, meaning can only be evaluated by consumers. (Protomold's suggestion for effective measurement of meaning is, of course, frequent market testing of prototypes.)

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*See *A Whole New Mind* book report on page 7.

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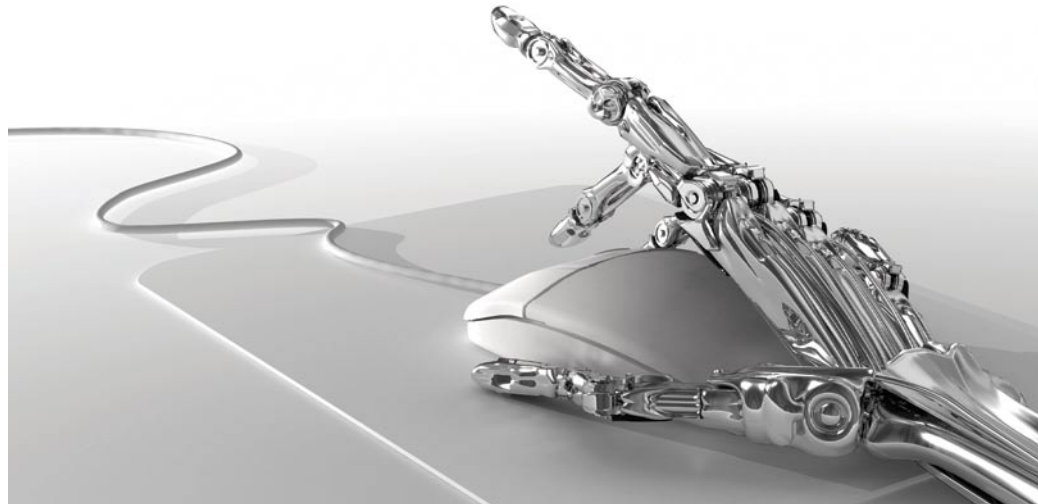
The Bionic Designer

cy·borg (‘sI-”borg), n. a bionic human [cybernetic + organism]

Daniel Pink, in his book *A Whole New Mind* (see review, page 7), addresses the cultural shift in dominance from the analytical left brain to the conceptual right brain. One of the key drivers of that change is automation. Because automated systems are more cost-effective—perhaps even more effective—for routine tasks, they are displacing human labor in these areas. But for many, they are not actually replacing the worker; rather, they are power tools that allow the worker to perform more, more sophisticated, or more conceptual work.

In essence, the computer is becoming an extension of the left brain, tirelessly performing a variety of rules-based tasks. For the financial analyst, spreadsheets replace hours of tedious, error-prone calculation. For the publisher, software handles formatting and paste-up. And for the parts designer, CAD systems have eliminated tedious calculations and manual fit checks. At Protomold, we are working to extend that process farther still.

Quoting is a purely analytical function. Whether it is done by a human’s left brain, or by a



computer, it is a straightforward (though not-always-simple) matter of inputting a 3D CAD model along with requirements and getting back a price quote. At Protomold, a bank of computers handles the left-brain drudgery, returning an interactive online ProtoQuote® overnight. If the

even thousands of calculations, it is far better suited to a computerized “left brain” than one made of flesh-and-blood. Once the design is accepted and approved, the computer performs one final left-brain task: converting the customer’s model into instructions for a computerized mill.

ProtoView® 3D now delivers design analysis in a user-controlled, fully rotatable model.

designer chooses to “tweak” the quote—experiment with alternative resins, finishes, lot sizes, delivery times, etc.—the system performs the necessary calculations and adjusts the price in real time. That’s the easy part.

ProtoQuote also provides feedback on the design itself, based on accepted rules of good design and the requirements of Protomold’s process. While this analysis is more complex than quoting, it is still a purely analytical process. It simply compares the model to a list of requirements and, based on established rules, points out weaknesses in the design. This, too, is a left-brain function, but since it can require dozens, hundreds, or

By taking over these essentially clerical chores, the computer frees the designer for the higher lever, conceptual design, marketing, and problem solving tasks at which the human right brain excels. And while the computer cannot perform right-brain functions, it can now aid the right brain’s task of seeing the “big picture.” ProtoView 3D now delivers design analysis in a user-controlled, fully rotatable model. It’s the next best thing to holding the finished piece in your hand; no small accomplishment for a part that exists only in the designer’s imagination and a computer’s. For an interactive demonstration of ProtoView 3D, go to www.protomold.com.

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Learning Lots by Building ‘Bots

“We spend two years teaching kids to walk and talk and the next sixteen years telling them to sit down and shut up.”

— ANONYMOUS

A lot of what we consider “traditional” schooling—sitting at desks and memorizing facts, figures, and formulae—is directed toward the linear, analytical left brain. Arguably, that approach is an invention of the industrial age. Prior to that time, most learning took place through formal or informal apprenticeship in which individuals learned by doing.

Today we are seeing a resurgence of experiential learning both in and outside of school. The Internet certainly deserves part of the credit, allowing students to find their individual ways through vastly more information than they could ever find in a textbook or

library. But students are also being given the opportunity to creatively solve problems of the same sort they may one day face in the real world.

FIRST LEGO League (FLL) lets kids build and program robots to compete head-to-head performing a variety of defined tasks. In the process, they learn to work in teams, analyze complex problems, brainstorm solutions, test their ideas, and, ultimately, fine-tune their most successful solutions in competition with other teams. Dr. Don Krantz, Vice President of Development at Protomold, has worked for seven years with INSciTE (Innovations in Science and Technology Education),

the non-profit organization that sponsors FLL in Minnesota.

“The kids use LEGO Mindstorms as the building blocks for their robots,” says Krantz. “That lets them focus on creative problem solving rather than the mechanics. As a judge for the competition, I’ve seen all kinds of innovative solutions to the problems they’re given. One year there was a group that built a teetering tower on top of their mobile platform. The task was to get something over an obstacle, and when the vehicle hit the obstacle, the tower collapsed forward. It wasn’t what we had in mind, but it did the job. Of course, the next year we outlawed that particular solution.”

“It’s interesting to see how the different teams work. Newer participants tend to find a solution that works and stick with it. More experienced groups keep looking, not just for something that works, but for what works best. These kids are 14 and under, and they’re thinking like engineers.”

Krantz notes that, while a disciplined approach can help in some aspects of the competition, it often isn’t what wins. Many times, what makes a team stand out is a really creative approach, even if it isn’t perfectly executed. “In a very real sense, what they’re doing over the six to eight weeks of each competition is prototyping and testing,” says Krantz. “Given a little more time and a bigger budget, they could be the next generation working at NASA.”

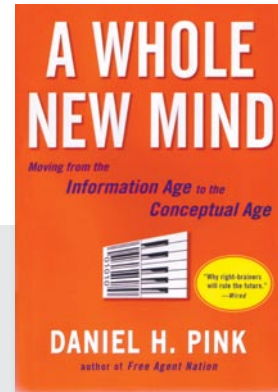
Want to see young robot builders in action? Visit <http://www.usfirst.org/jrobotcs/>. And if you have time (and bandwidth), you can go to http://www.hightechkids.org/?1-3-20-fll_dragonfly.mpg and download a 47 MB, eight-minute video showing team of young participants in competition.

“These kids are 14 and under, and they’re thinking like engineers.”



New Mind for a New World

Title: *A Whole New Mind: Moving from the Information Age to the Conceptual Age*
Author: Daniel H. Pink
Publisher: Riverhead Books, 2005
ISBN: 1-57322-308-5



Daniel Pink sees cataclysmic change in our future. While Pink is, by his own admission, a fairly left-brained guy—logical, linear, and analytical—the changes he foresees work to the benefit of the synthesizing, empathizing, not-quite-so-logical right brain. The left brain, he assures us, will always have its place, but its glory days—the Information Age—are behind us.

The change from left-brain to right-brain dominance is being driven by three trends. The first is abundance, the flood of affordable goods pouring out of factories and making producers vulnerable to profit-killing

commoditization. The second is Asia, where low wages act as a magnet for manufacturing and, increasingly, white collar jobs. The last is automation, which enables computer to take over routine tasks like drafting and “number crunching” from humans. As a result of these trends, the future looks bleak for those who currently get paid for sequential, left-brain thinking.

But Pink brings good news as well. As the Conceptual Age unfolds, everyday products are being imbued by designers, including some at the very pinnacles of their professions, with “beauty” and “meaning” to differentiate their products

and escape the trap of commoditization. New jobs and a new economy are being created, and those with the appropriate skills are thriving.

The demand for creators and empathizers, those with skills that cannot be mass-produced, outsourced, or automated, is exploding. It comes not just from new-economy startups but from “old school” entities as well. The head of Global Product Development at General Motors has said that GM is “in the art business.” Medical schools are adding empathy training to their curricula. And in many businesses, according

to Pink, the MFA—the master of fine arts degree—is rapidly overtaking the MBA as a sought-after credential.

But Pink isn’t satisfied with generalities. He identifies and examines six “high-concept, high-touch” senses that will be of use in the new era:

- **Design** differentiates a product by adding beauty or emotional engagement to mere function.
- **Story** engages the listener and improves information retention by replacing the simple statement of facts with compelling narrative.
- **Symphony** weaves disparate parts into a meaningful whole, replacing left-brain analysis with right-brain synthesis.
- **Empathy** fuels interpersonal contact at an emotional or motivational level, improving communication and interaction.
- **Play** adds an element of fun to business, reducing stress and strengthening relationships.
- **Meaning** adds value and significance that cannot be found in product alone.

Recognizing that “a whole new mind” is a tall order, the author has kindly incorporated workbook sections into discussions of the six senses. These include resources and exercises that a motivated reader can use to awaken and strengthen the right brain.

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What's New

National Recognition

It may not be the Guinness Book, but *Inc.* magazine has named Protomold, for the second time, to its list of the 500 fastest growing companies in America. Protomold ranked 267 on the list with three-year growth of about 500 percent. This is Protomold's second consecutive appearance on the *Inc.* 500 list. We have also been named once again to the prestigious Deloitte Fast 500, a list of the fastest growing technology companies in North America. Protomold was number 129 on the list.

Local Recognition

Our growth has also garnered attention at home. The *Minneapolis/St. Paul Business Journal* has named Protomold to its 2006 Fast 50. Protomold ranked #11 on the 2006 list after having been number one in 2004 and number four in 2005.

North American Expansion

Our second U.S. manufacturing facility is now fully operational bringing total domestic operations to about 66,000 square feet.

European Expansion

Protomold's Telford, UK facility handily beat our aggressive first year projections and recently won the 2006 Manufacturing Excellence Award for Integrated e-business. Presented by the Institution of Mechanical Engineers, this has been described as "the toughest industry award in which to succeed." The new plant, which serves customers in the EU, now has 12 CNC machining "centres" (as they say in the UK) and a staff of 30. Also, Protomold has opened a sales office in Mosbach, Germany.

Meanwhile, in Asia...

Protomold has incorporated in Japan and plans to be open by mid-2007 to serve customers in that country.

Everything By Design



"Well sure, I'd like to be a manager someday, but Chuck's the one with the people skills."

A Little Something on the Side

Protomold is actively producing molds with up to four side action cams, allowing the production of parts with undercuts that could not be duplicated in simple straight-pull molds. In addition, we have recently increased our maximum milling depth to 3.0 inches from the parting line, depending on geometry.

More to See on ProtoQuote®

Online ProtoQuotes now include a ProtoView® 3D display of parts to more clearly show any suggested design modifications. It's very cool, so if you haven't seen it yet and use Internet Explorer, give it a try.

And Speaking of Seeing

Come see us at Solidworks World on February 4-7, 2007 at Morial Convention Center in New Orleans, LA. Booth #200.



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