Inside: Brian Van Bower on Professional Edges

WaterShapes

Design • Engineering • Construction

Volume 7
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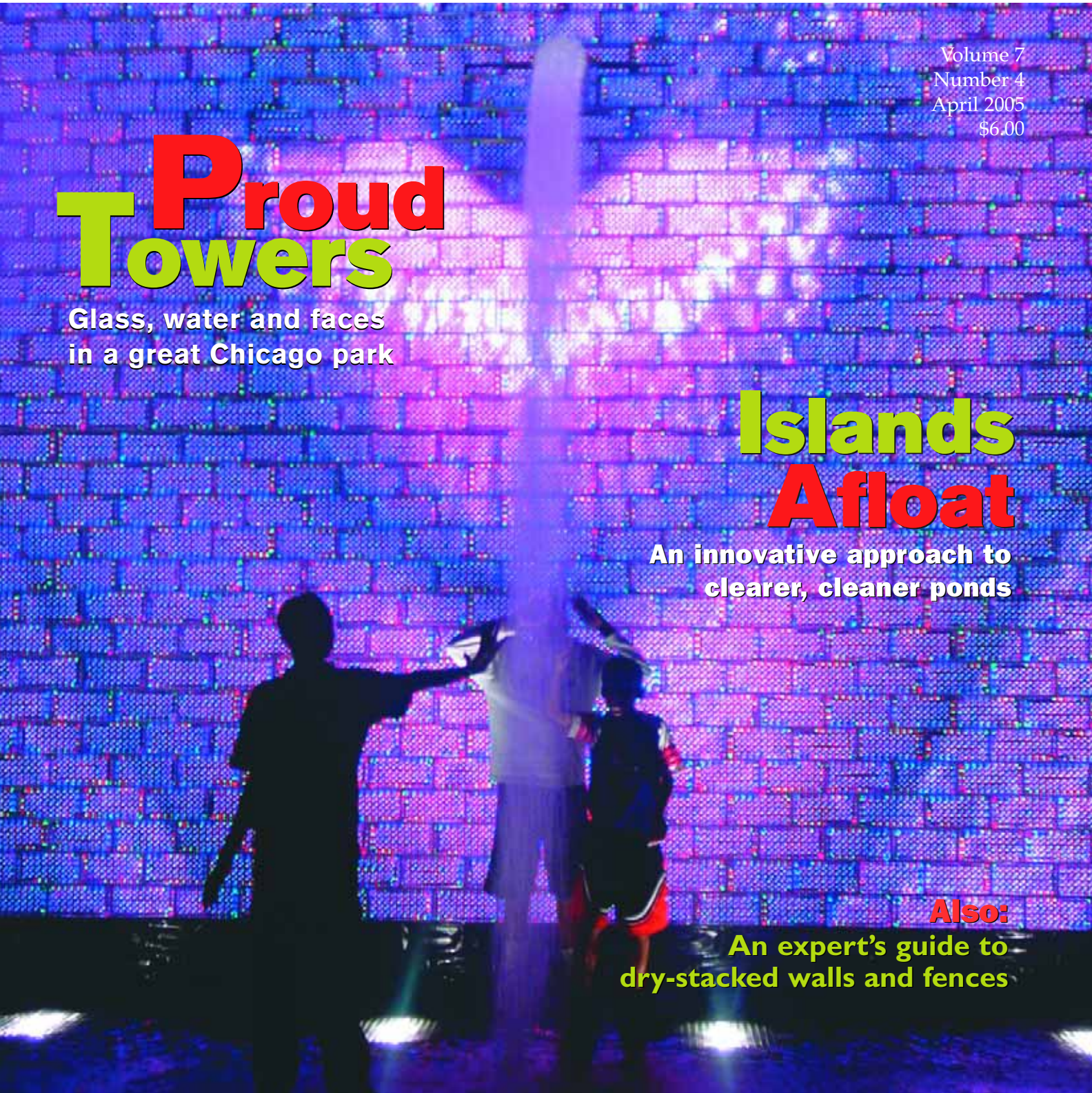

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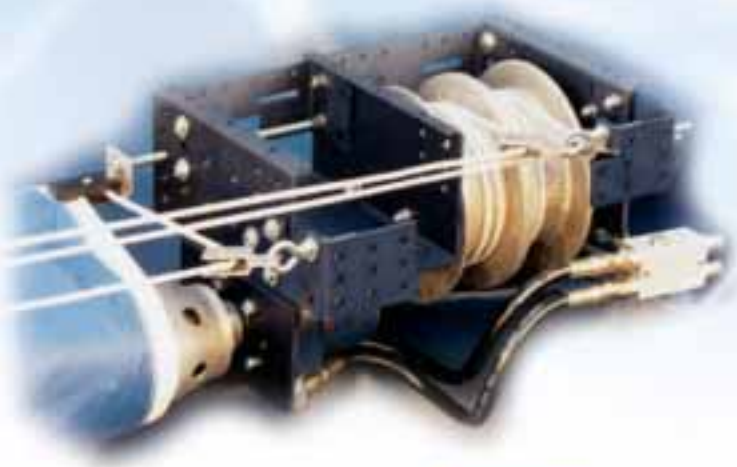

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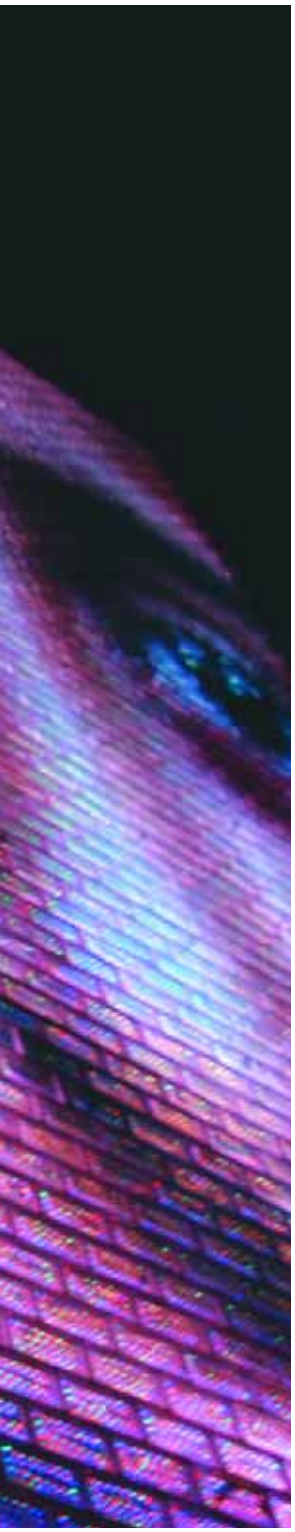

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On the cover:
Photo courtesy Crystal Fountains, Toronto, Ontario, Canada

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By Eric Herman

Contrasting the Arts

If you've been reading *WaterShapes* for any length of time, you've probably noticed that we take more than a bit of pride in presenting the arts and crafts of watershaping in the broadest possible ways. From modest and subtle to bold and elaborate, the work of our contributors truly runs the gamut of artistic and design sensibilities.

Through it all, our goal has been to explore and examine the full spectrum of available techniques, technologies and ideas as a means of defining a wide-open universe of approaches, tools and possibilities for you as a watershaper.

As we see it, this is necessary because watershaping means different things to different people. By demonstrating the linkages between diverse practices, we believe we have forged a perception that no matter where you come from – the pool industry, the fountain business, the landscape trades – as *watershapers* you share a bond that comes from a desire to work with water, stone and plant material to produce work that is exciting, beautiful and enjoyable.

In this issue, we're showing off our affection for diversity in just about the broadest way possible, on the one hand featuring a most ancient handicraft and on the other looking at the leading edge of high technology:

w In "Walls of Stone" (page 30), we take another look inside the artistry of landscape designer Bruce Zaretsky, one of our long-time contributors whose work leans toward the intimate and even spiritual side of watershaping. This time, he details the ancient art of dry-stacking stone walls that are held together by nothing more than gravity, friction and the adroit placement of individual rocks one atop the other.

In preparing this piece for print, it struck me that this article could've been written thousands of years ago, inscribed on clay tablets in the court of Hamurabi. The whole wide world is laced with walls of this kind, some of them thousands of years old and still in use. As Zaretsky demonstrates, these stone structures lend a timeless sense of beauty and amazing durability to a project.

w Moving to the opposite extreme, on page 50 you'll find "A Crowning Achievement" by Larry O'Hearn of Canada's Crystal Fountains. This is the latest among several submissions from this firm, which is known worldwide for design and installation of exceptionally creative fountain projects.

In this case, O'Hearn and colleagues flash their technical chops in a project completed last summer for Chicago's Millennium Park. The Crown Fountain combines huge video screens with computer-controlled water effects synchronized to moving images. I'll leave it to you to absorb the finer details, but let me say that this project just can't be matched when it comes to sheer technological sophistication and daring.

Between these two extremes are limitless possibilities for those seeking to deliver excitement, beauty and delight to their clients. Whether you ever aspire to the technical complexities of a Crown Fountain or apply the craft of a skilled stonemason, we hope that simply placing these diverse possibilities under the same umbrella will help you see that your work is linked to great traditions of craft passed down for generations as well as to a boundless future.

To my way of thinking, that's just the kind of insight that keeps the creative juices flowing.

WATERSHAPES

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April's Writers

Bruce Zaretsky is president of Zaretsky & Associates, a landscape design/construction company in Rochester, New York. Since starting in the landscape design industry in 1979, Zaretsky and partner Sharon Coates have become nationally recognized for their creative and inspiring landscapes, gardens and watershapes in projects ranging from the smallest residential spaces to sweeping landscapes. They emphasize designing and installing healing and meditation gardens for health-care facilities, nursing homes and hospitals.

Bruce Kania is an inventor with a successful track record in the licensing of product concepts in the prosthetic, orthotic, textile and sporting-goods industries. He originated the idea of replicating natural, self-sustaining floating islands while working at his research farm in eastern Montana and runs what amounts to a think tank of independent contractors through his company, Fountainhead LLC of Bozeman, Mont. In his work, he deliberately draws on an enormous talent pool

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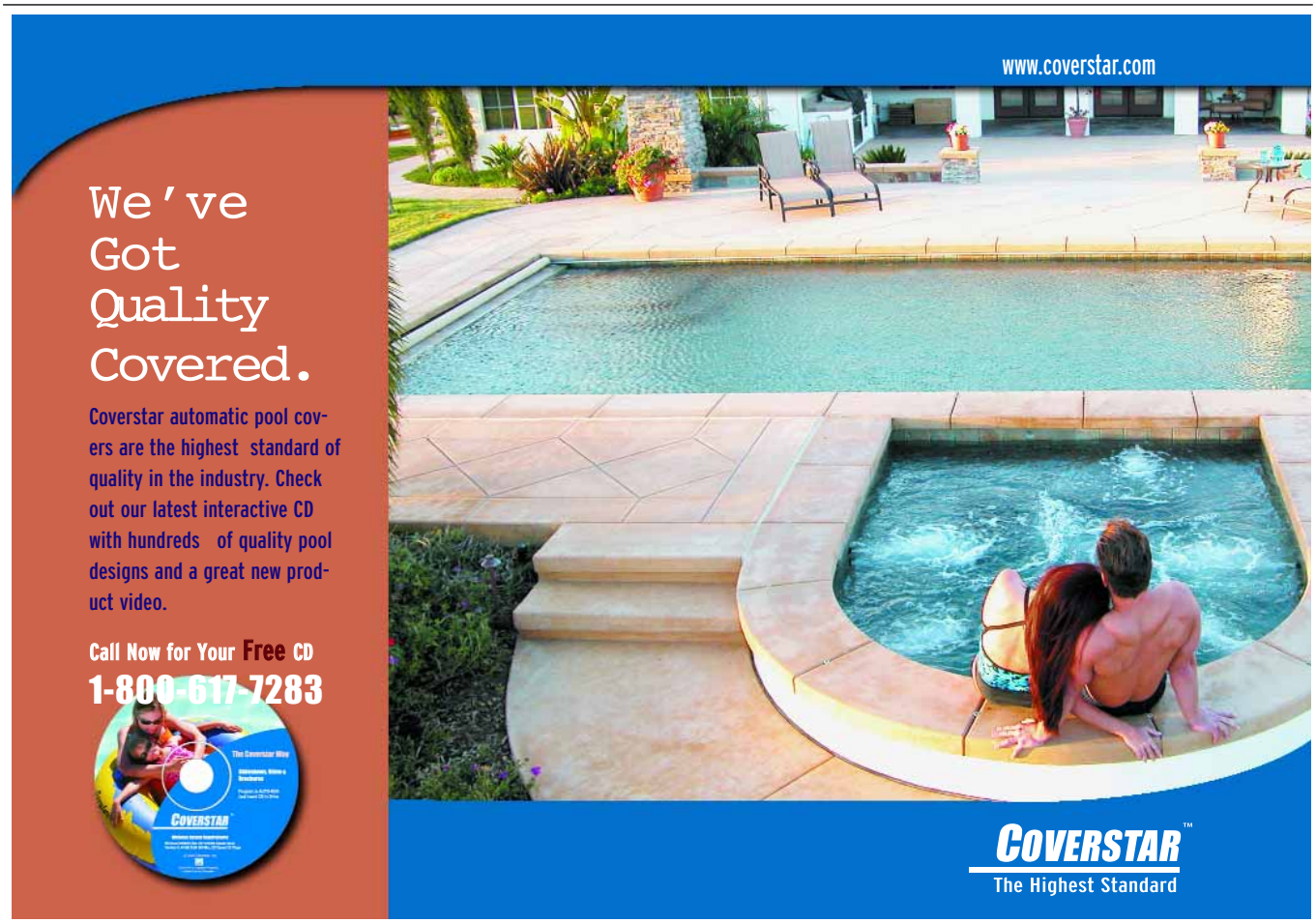
centered in and around the state, finding creative people with the right skills to achieve innovative and marketable results.

Larry O'Hearn is a designer and project manager with the fountain/watershape specialists at Crystal Fountains of Toronto. He is a registered landscape architect and has been a member of the Canadian Society of Landscape Architects since 1985. He graduated with a degree in landscape architecture from Ryerson Polytechnic University in Toronto in 1982 and has been professionally involved in the design and construction of public and private spaces and watershapes for more than 20 years. O'Hearn joined Crystal Fountains seven years ago and currently leads the firm's award-winning project team, which boasts some of the fountain industry's leading design, engineering and product-development experts and works worldwide in creating uniquely enjoyable waterfeatures.



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By Brian Van Bower

Degrees of Separation

Mainstream pool professionals actually have very little to fear from increasing participation in 'our' market by landscape architects and designers.

Through the past few months, I've run across several representatives of the pool and spa industry who have expressed concern that some of us in the business of educating watershapers are encouraging landscape architects to move in the direction of the pool industry's traditional market.

I can understand the anxiety. After all, landscape architects are degreed professionals in a closely related exterior-design field and have been academically trained in principles of design, while most of us in the mainstream pool and spa industry have no such background or relevant certification. It probably isn't paranoia to regard these design-oriented professionals as having something of an edge.

There's also the simple fact that the dynamics of the watershaping trades are changing and those who make a decision to grow with the market and learn to meet the constantly rising expectations of our prospective clientele will prosper while those who cling to the past are risking eventual failure.

But when you step back and look at the watershaping trades and the true state of education in our field, there's much to be said in favor of an argument that mainstream pool professionals actually have very little to fear from increasing participation in "our" market by landscape architects and designers.

into the void

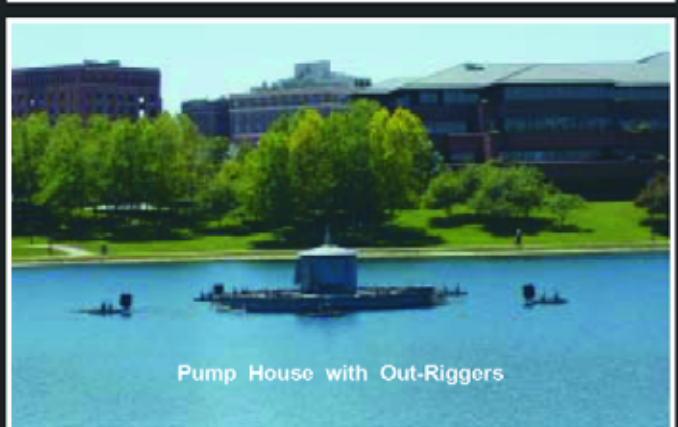
The hard fact is that no college anywhere offers a degree in watershaping. There are people working toward that goal, but realistically there's a long road ahead. As an exterior-design discipline, landscape architecture is perhaps the most directly related field of academic study, but even there, one thing we hear all the time from graduates of those programs is that they offer little or no watershape-related coursework.

What this means is that every single one of us in the watershaping business – pool industry or landscape trades – comes at this activity without the benefit of any focused academic training.

This isn't to say that education has no value. The truth is quite the opposite, and those with degrees in landscape architecture, mechanical and civil engineering, fine art and art history, graphic arts, industrial design and other disciplines are given tremendous stocks of knowledge they can translate from their training and apply to watershaping. They must adapt and repurpose what they know to accommodate a watershape's specifics – something they can do because they've been taught to keep on learning and growing for the duration of their careers.

Keeping things balanced between pool and landscape professionals for the moment is the fact that watershaping is still an emergent art form and the design schools simply haven't caught up to it yet. There is no targeted degree in watershaping, so professional credentials don't yet matter as much as our bodies of work. Ours is still a field in which experience and a track record are seen as badges of expertise.

This leaves us all to fill in the gaps in our own ways. On the landscape side of the equation are professional designers who lend their talents to creating watershapes of true artistic value – but often do so with little or no real experience in building. Conversely, on the pool side we see contrac-



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tors who have years or even decades of construction experience but lack formal training in the dynamics of design.

To me, watershaping is best served where and when the twain shall meet. When the talents of designers are combined with solid construction experience, there exists an opportunity to create truly spectacular work. Sometimes, those talents and experience are found in the same person, but quite often they are not. When you stop to consider what's best for our clients (and our own professional growth), it's clear to me that collaborations between people with construction experience and those with design experience have tremendous potential.

Look at it this way: The best watershape designers are those who understand the realities of engineering and construction, while the best watershape contractors are those who understand and appreciate the principles of design. For my part, I want to be learning what happens on both sides of the scale to be in a position to tip things in my favor.

what you don't know

There is no question that what you don't know can hurt you. We see examples of the detrimental side of ignorance all too frequently in the form of inadequately designed or built watershapes. When you don't seek to fill in the gaps in your own knowledge but bull your way forward anyway, those deficiencies can be a huge problem for you and your clients no matter whether you have a degree or not.

By embracing your own deficits in knowledge and expertise and seeking to fill those gaps, you give yourself a powerful tool. As one who has not had a formal education, I've built my entire career on the principle that each and every project is an opportunity to learn and that each subsequent project offers me an opportunity to apply that knowledge.

In fact, filling in knowledge gaps is among my main professional pursuits, and it's not all about watershape design or construction. Whenever I hear or read a word I don't know, for example, I make a point of looking it up. When someone refers to something that is foreign to me, I take it upon myself to learn about it with a goal of being able to speak intelligently on the subject.

This "constant classroom" habit takes on particular significance when it comes to watershaping, because learning new things translates into better work and, ultimately, greater income.

The difficulty of attacking one's own ignorance is that there can be an intimidating element of mystery about the unknown. How many times have you heard someone say, "I don't know how cook"? Whenever I hear that, I always wonder whether the problem is an inability to read a recipe or some personal issue about using a measuring cup. Recipes are among the shortest, most focused examples of how – in an *incredibly* short time frame – you can learn to do something that will result in an immediate payoff.

Continued on page 14

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When I stop to consider how many of us are more or less afraid to learn how to feed ourselves, I can imagine how challenging it must seem for a builder to learn about design (or a landscape architect to learn how to build a swimming pool, for that matter). All it takes, really, is a willingness to step out of our comfort zones and tackle new challenges or approach old ones from fresh perspectives.

Yes, watershaping requires skills across a broad range of disciplines – geology, soils science, civil and mechanical engineering, drawing, materials science, senses of scale and proportion and color – but none of those elements are entirely beyond the grasp of most reasonably intelligent people. And where they are difficult to reach, it's possible to find qualified professionals who are willing to lend their expertise to a project.

united we stand

The plain fact is that lots of the time all we need to do is find and work with people who have knowledge in one or more of these fields – whether it's design, geology or engineering – to begin to conquer the depths of our ignorance.

After all, watershaping is and has always been a collective effort among multiple disciplines, and we come into daily contact with those who know things we don't. Yes, it's our responsibility to gain fuller understandings of those particular disciplines so we can see our limits and ask the right questions – and with each step in that direction we move into a position where we can exercise our fuller potential.

No, we do not need to become geologists, but it is incumbent upon us to have working knowledge of earth science and soils reports and the effects they have on concrete structures. We do not need to be structural engineers, but we certainly should be able to read plans and understand the process of executing structural details. We do not need to be lighting designers, but we all should understand the basics so that we can work sensibly with talented designers from that field. This list of valuable, essential relationships goes on and on.

In this greater context, pool builders who are intimidated by the thought of landscape architects moving into the marketplace are obviously hamstrung enough by fear that they are not asking themselves a very simple question: Is this design expertise of landscape architects a threat, or is it an opportunity?

To me, the thought of a class of legitimate design professionals entering the watershaping field in ever-greater numbers spells real opportunity – and I say that as one who works on the design side of things rather than on the construction side and might feel the competitive heat sooner than most. And I think the same sunny perspective should be shared by anyone in the pool industry who is long on construction experience but short on design skills: Instead of viewing the presence of design professionals as an assault, I say view it as a chance to work with them and, along the way, learn more about what

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they know that we don't.

Each and every time I work as part of a project team with other professionals, I make a point of listening and remembering what I hear. That doesn't mean that I sit there and constantly and openly display my own ignorance. Instead, I listen, learn and look for nuggets of information or wisdom that I can apply in future situations.

In other words, I join those with degrees in making everything I do a learning experience with real-world value.

making the grade

I've known landscape architects who at one point in their careers "designed" swimming pools by making a blue spot on a plan, but they are now more deeply involved with watershapes because they are trained to keep learning and have paid careful attention to the fine points of watershaping through the years as a means of fueling future designs.

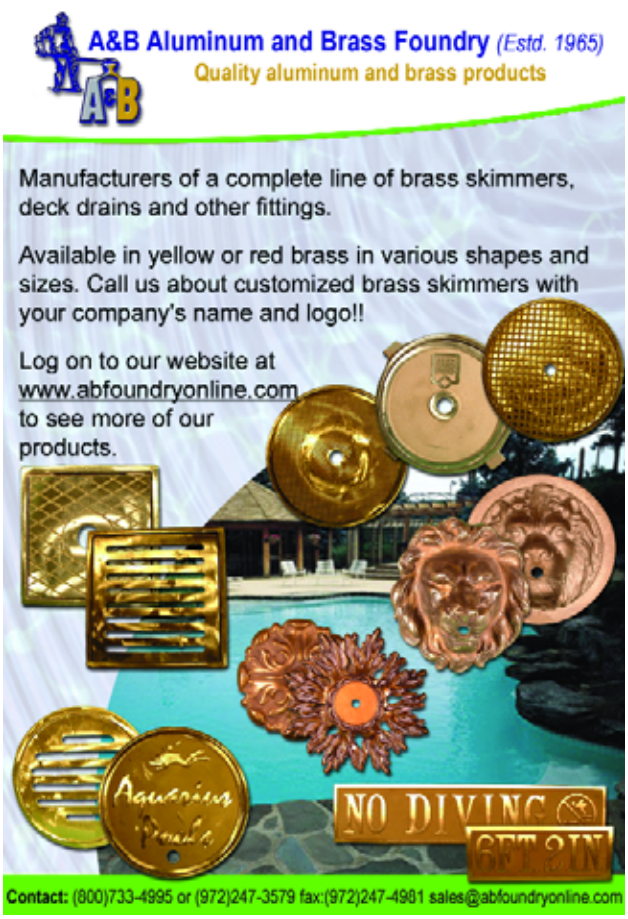
When you find people of like mind who are actively seeking to develop their own knowledge, you're almost certain to discover that they have something to share with you and are generally willing to do so. (Those who cling to their knowledge as a sort of "trade secret" are probably that way because they know their own knowledge is finite and believe it is important to mask its limits.)

When you free your mind and embrace your own ignorance, however, there is never a need to fear what other people know because you get accustomed to viewing the skills they have (and you lack) as being attainable or at least accessible. You can't go to school to get this kind of information, so all we can do is grab knowledge from every available source. Yes, that means seminars at trade shows, seeking input from manufacturers and taking the time to attend classes in art history, color theory or perspective drawing. And yes, it means turning to smart people to enrich and enliven our work.

There is as yet no one-stop shopping for education in watershaping, which is why we must embrace and exploit the knowledge of other people to be successful ourselves. I take this multi-faceted approach to learning as the pool builder's true path to professionalism.

In that spirit, this died-in-the-wool "pool guy" couldn't be happier to see landscape architects and designers stepping into our midst. Through their knowledge, our products are made greater; by the same token, the experience and skills of expert contractors make designers' projects more compelling and powerful. Seems like a win-win to me. WS

Brian Van Bower *runs Aquatic Consultants, a design firm based in Miami, Fla., and is a co-founder of Genesis 3, A Design Group; dedicated to top-of-the-line performance in aquatic design and construction, this organization conducts schools for like-minded pool designers and builders. He can be reached at bvanbower@aol.com.*



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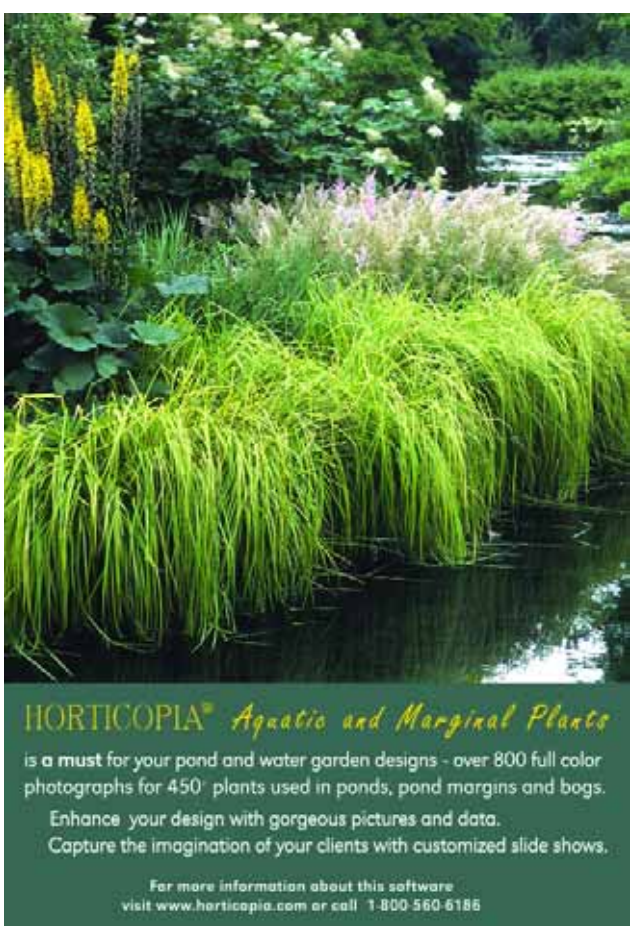

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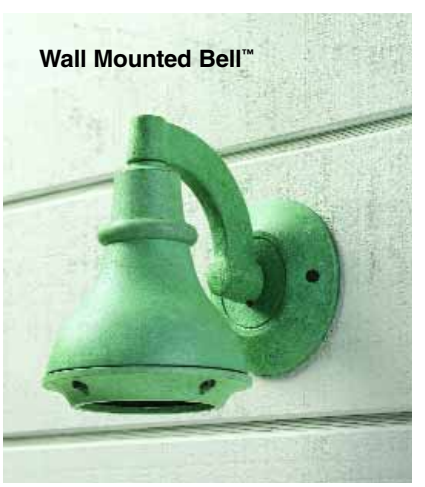
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By Stephanie Rose

Why We Do What We Do

The world would be a dull and sterile place without access to the services of the watershapers and landscape professionals who bring measures of visual vitality to our lives.

I was all set to write a column about the virtues of small jobs compared to big jobs, but I've had an experience that leads me to share something more important with you this time.

Most of us have had these moments in our lives in which we are suddenly jarred into evaluating our existence for one reason or another – episodes that make us pause and reflect on who we are and what we're doing and why we're doing it.

As I write this, I'm dealing with an illness in my family that has quite literally knocked the legs out from under me. As I've spent time these past few days talking with friends and relatives, I've found myself quite often laying on the living-room couch and staring out the window into my backyard – and finding indescribable comfort and solace in the view out to my garden.

Quite simply, what I see out there balances my emotional state and has helped me steady the rollercoaster.

society's needs

I grew up in a traditional environment in which being a doctor, business executive or lawyer was accepted as a basic career goal – stable, strong, substantial life choices. I followed that path for many years, but as life took me forward, I saw that more than a few forks in the road looked quite tempting.

No, I haven't made as much money as a landscape designer as I would have had I remained a securities analyst on Wall Street, but that hasn't bothered me. Yes, there was a tremendous amount of satisfaction derived from being a good analyst, but the work lacked the emotional, aesthetic components I didn't even realize I was missing until I found myself breaking away and taking a different path.

From the vantage point of my couch, I've had a good bit of time to think about the value and importance of my work as a landscape designer and the importance and value of creating beautiful gardens and environments for the enjoyment of our clients (and ourselves).

What I've come to recognize through these past few troubled days is that traditional career choices (doctor, lawyer, business executive) may be held in greater esteem by a public and society steeped in traditional values, but that landscape designers or watershapers offer just as much if not more to a public and society that needs ways to steady their own rollercoasters.

We simply need to look around us to understand the incredible value of any pursuit that enhances our visual surroundings. I'm not knocking doctors and lawyers and their potential contributions, but what I've seen lately is a world in which there's an equal value to what we all do when we create visual harmony. Regrettably, that's not a perspective much embraced by our society.

We are typically taught that you go to school, get a good job, establish a career, make money, you buy the things you want and do the things you chose to do. It's a simple formula, but why do we stick to it? Why do we so often follow convention rather than spend our time pursuing more creative endeavors?

When I was growing up, I was taught that art and other such pursuits were only to be considered as hobbies. "You can't make a living doing that" was a message I was not alone in hearing, and like so many others I stuck to the straight and narrow. I can remember being fascinated by (and more than a bit jealous of) people who bucked the system and made their way into realms of visual beauty. I also remember that moment when I made my own decision to take a whopping pay cut and follow my heart.

visual cures

There on my couch, I thought about what the traditional path would be like without access to the products of the creative few. I thought about how our urban and suburban environments would look if not for the efforts of creative thinkers. And I thought about all those successful traditionalists being left on their own without access to the services of the watershapers and landscape professionals who bring measures of visual vitality to their lives.

In my humble opinion, that world would be a dull, mechanical and sterile place.

So how do we counter the view that a career as a doctor or lawyer has intrinsically greater value than one as a watershaper or landscape designer? To me, it's all about keeping a dialogue going that emphasizes the importance of our work. This is part of what *WaterShapes* does for all of us: It's about building skills and self-esteem and a greater sense of the value of what we do as designers, engineers and builders. It's about ideas and spreading them far and wide.

The doctor or lawyer who, in a world without visual joys, spends all day at work and comes home to a simple box of a home devoid of tasteful furnishings and surrounded by unlandscaped dirt is probably someone who is not going to be all that happy or emotionally fulfilled. Fortunately, however, this is *not* a world devoid of visual joy, and we help those medical and legal eagles enhance their aspirations and surroundings by applying our own talents and skills.

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dous (but not always tangible) value to the lives of all those who intuit or understand the need for visual beauty in their lives.

Whether it's a plant, a watershape, an arbor or even a simple expanse of lawn, the things we offer in some way contribute to the emotional well-being of those who observe them. When someone looks out over his or her yard and sees only dirt and fences, he or she won't find that emotional support.

I'm not suggesting that we turn society on its head and that everyone needs to follow paths of aesthetic fulfillment. I'm not even suggesting that every backyard needs to be a fabulous expression of artistic possibility. What I'm saying is that when our clients engage our services, one of the motivations we need to consider (even if *they* don't) is their need for an environment that speaks to their emotional well-being or even to their spirituality.

powerful comfort

As I draped myself on my couch, overlooked my garden and pondered deeper meanings in my life, I found comfort in what I saw through the window. I found as well that I had a new appreciation of the value of what we all do as artists involved in visual environments of all shapes and sizes.

I'm certain I'll still have moments when I'll wonder why I took the path I've chosen, but I know now that even in those odd moments I'll keep an eye on the big picture. This belief is unshakeable: Watershaping and landscaping offer emotional boosts to people that can be just as powerful as any drug or any amount of money. I still want to win the lottery, but I know in my heart of hearts that there's real value in what I do, and I am happy about that.

I've been told that a person's emotional state when he or she is ill and physically compromised is just as important as the medical care he or she is receiving. If we can provide people with environments that support and enhance their emotional health, who's to say our contribution is not as important as a physician's care?

Approaching our designs with confidence in and an understanding of their value is just another way for us to instill confidence in ourselves, elevate our professions and develop new ways of enhancing the world around us.

As I trust I've made clear by now, I am truly committed to the thought that my career in landscape design is just as valuable as anyone else's chosen career. WS

Stephanie Rose runs Stephanie Rose Landscape Design in Encino, Calif. A specialist in residential garden design, her projects often include collaboration with custom pool builders. If you have a specific question about landscaping (or simply want to exchange ideas), e-mail her at sroseld@earthlink.net. She also can be seen on episodes of "The Surprise Gardener" on HGTV.

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By David Tisherman

The Gap Attack

Sometimes, it's the simple things that trip you up the most.

As a case in point, I was recently called by a homeowner who was wondering why the tile was falling off the outside wall of a raised pool that had just been installed by another builder. Unfortunately, that builder apparently hadn't known how to pull off this standard detail.

The pool had been raised eight inches out of the ground in keeping with the design intent. This is a detail I use frequently to create a seating area around pools, but I was a bit mystified by this particular choice of elevation: It was too high to be a step (most building codes call for maximum 7-1/2-inch outdoor risers) and too low to serve all that well as a bench. (Actually, it was probably just about right for creating a natural trip hazard, but that wasn't really the problem.)

I was further puzzled that the builder used three-inch-square tiles to veneer the raised wall, which meant that a whole row of tiles had to be cut to make the pieces fit. It was fairly nice tile, too, and I have to say the overall look wasn't bad, either. Still, I had the feeling that it was one of those situations where a contractor was trying something new without really thinking things through with enough care.

It took me about three seconds to diagnose the cause of the falling tile: It was plain that the builder hadn't properly set up the transition between the wall of the pool and the surrounding deck.

normal forces

It took me about three seconds to diagnose the cause of the falling tile: It was plain that the builder had no idea how to set up the transition between the wall of the pool and the surrounding deck. Making matters worse was the fact that the builder told the homeowner that the problem was the result of earth movement and therefore that he was not liable.

He was right that earth movement had caused the damage, but the builder was dead wrong about liability, as he had done nothing to accommodate the slightest expansion of the soil. In fact, the way he executed the detail virtually ensured that whenever the inevitable ground movement came, some tile would pop.

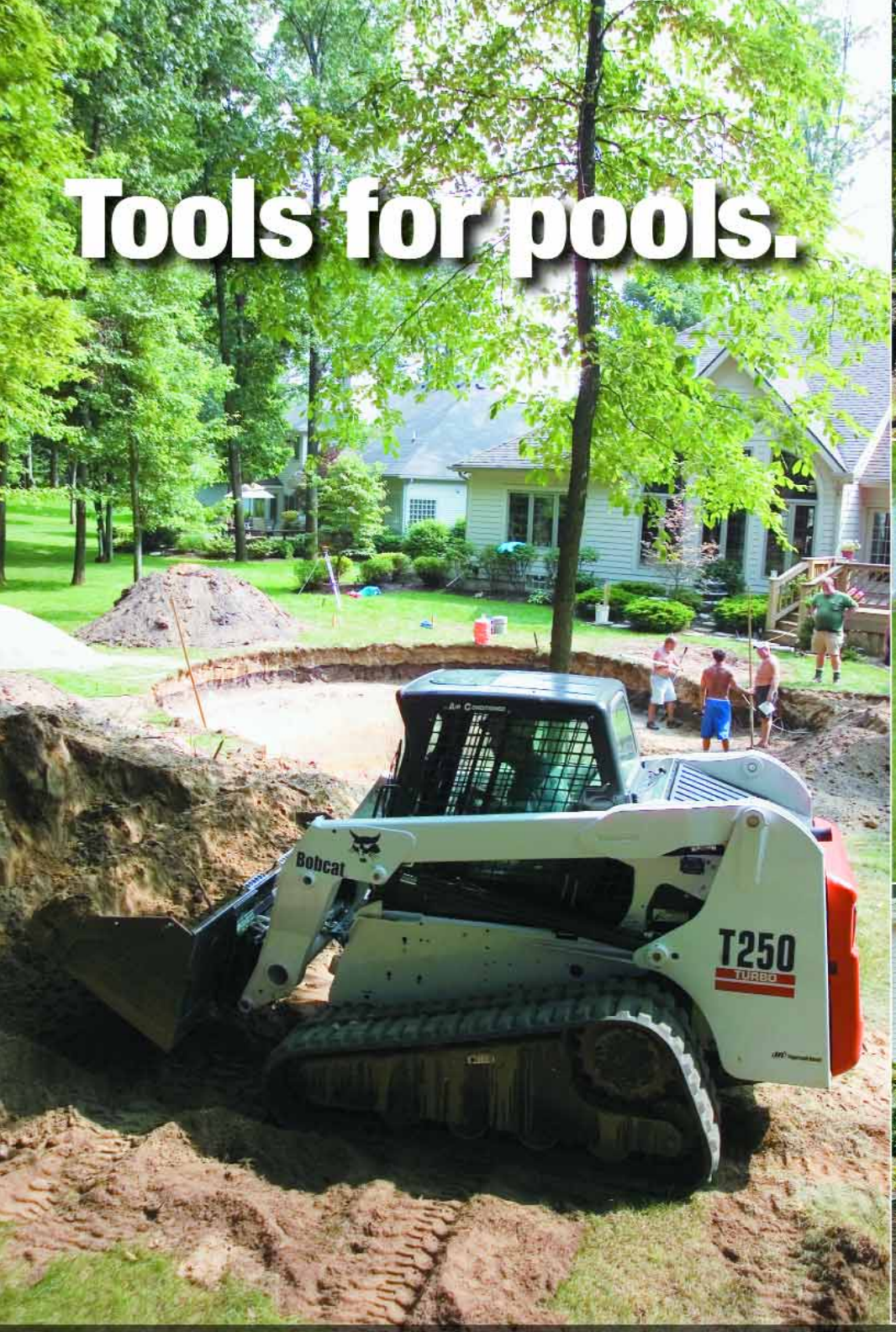
What the uninformed builder didn't know is that there are two basic ways to handle veneering the outside of a raised pool and intersecting that wall with the surrounding deck: You can cantilever a structural deck off the side of the pool so that the pool and deck move as a unit; or you can leave a gap between the wall of the pool and the deck to allow the two structures to move independently.

Cantilevering a structural deck is the expensive option and requires heavy-duty, fully reinforced construction, sound engineering and knowledgeable execution. In this case, the builder should have picked the more affordable and less challenging second option and simply created a gap between the deck and the pool.

Instead, he chose a third and entirely wrong option and ran the deck right up to the wall of the pool before installing the tile so that the bottom edge of the bottom row was basically resting right on top of the deck's edge. In some places, the float was more than an inch thick, so the tile was basically cantilevered right onto the top of the concrete deck.

Continued on page 24

Tools for pools.



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Given that set up, even the *slightest* upward movement of the ground could (and did) destroy the tile job. And it came as no shock to me that the homeowner started experiencing these problems immediately following the run of heavy rainstorms that recently pounded Southern California.

spacing out

I've seen this fundamental mistake many times, and if you've ever messed up a nice tile job in this way, you're not alone. The good news is that doing things the right way the next time around doesn't add significant cost to the project and is not at all difficult to pull off. Here's what you do:

After the pool is shot and the forms are stripped, you set forms for the deck so that there's a gap of an inch to an inch-and-a-half between the sub-base for the concrete deck and the wall of the pool. After the deck has been poured and the forms stripped, you place foam in the gap to act as a spacer during the rest of the construction process until it's time to install a final mastic joint.

If you're surfacing the deck with a stone, tile or modular pavers, do not finish the edge of the deck next to the pool. The size of the remaining gap will vary depending on the materials. With tile or a modular system, for example, the gap can be small because you know exactly how and where the pieces will lay out. With irregular flat stone, by contrast, the gap you

There must be a gap at the intersection of a vertical pool wall and a non-structural deck to isolate each one from any possible movement of the other. As work proceeds, the gap is protected by a foam insert (A). (I pulled one end up a little to make its position obvious.) When the decking has all been applied, the foam is removed (B).

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leave might be as wide as 15 inches.

(Another way to approach stone veneers is to notch the wall to receive the stone – see "Details," March 2001, page 18. This is a great method, but it doesn't relieve you of the need to create a gap between the vertical pool wall and any deck that might flow up to it.)

Now the tile installer should come in to float and veneer the vertical wall of the pool. As the tile or stone goes in, the masons can work on the rest of the decks throughout the project. (In my case, I send my masons home because I only want one trade on a job at a time.)

My tile installers start with a coating of Xypex (Xypex Chemical Corp., Richmond, British Columbia, Canada), a polymer material that holds the calcium in the concrete and prevents it from leeching through the tile. Then we apply any type of waterproofing material we need, install the float, then set the tile and grout it. Now the tile is standing out from the bottom of pool approximately one inch and is rest-

The gap at the intersection of the pool wall and decking is ultimately filled with a mastic compound that will protect both the wall and the decking against each other's movement. The joint material's color can be chosen to blend well with grout, and its texture can be made to do the same by sprinkling it with a little sand.

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ing on the foam spacer we'd previously put in the gap.

Now the remainder of the deck-surfacing material is installed, the foam is removed and the mastic joint is installed. It's that simple – and you can enhance the aesthetics of the mastic by covering it with a thin layer of sand to make it look more like grout, or by having your supplier match the material to the color of the grout you've used.

If it happens that the deck moves upward because the soil beneath it expands, it will now move independent of the wall of the pool and the tile on the wall will be protected by the mastic, which is flexible and will press against the tile or other veneering material without making it fall off.

The mastic joint also provides an important measure of protection in the case of lateral movement in the ground or any slight expansion of the concrete pool structure itself. Again, this adds virtually no cost at all to the project, and all it takes to make it work is doing things in the right sequence.

much tougher

Getting everything right with the structural-deck option is, however, quite a different matter.

You don't need to worry about preserving a gap, of course, because the pool wall and deck are tied together so there will be no differential movement where the deck surface meets the wall veneer. You *do* have the choice of installing

With stone, we always leave a substantial gap as we work the decking toward the pool wall to allow for maximum flexibility in applying the finishing touches to our work. The approach may look different, but the goal is the same: We're establishing a gap that will protect the wall against movement of the deck – and vice versa.

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the wall veneer or the deck material first, however, which is largely a matter of exactly how you want the transition to look. (Personally, I prefer to install the surface material on the deck first and then put the tile on top of it. This hides the joint most effectively and gives the work a cleaner, more-finished look.)

In this case, your client is paying for a cantilevered structural slab, which, depending on the size of the cantilever, can make costs skyrocket. This is why these decks generally appear in projects where the pool structure is sitting on piles – on a hillside, for example, but in other settings as well – and there's to be a minimal amount of decking around the pool.

Every structural deck we do is different and must be properly engineered with a variety of factors in mind, so it's difficult to offer generalizations much beyond the fact that you need to obtain an engineered structural detail and follow it to the letter.

For a majority of pools raised out of the ground, separate deck structures are fine so long as you're mindful that the deck and the pool are going to move in different directions. If you miss the mark on that one, saying it isn't your fault and blaming the error on ground movement just isn't going to cut it. WS

the earth-movement dodge

Too many times, I've heard contractors try to wriggle away from responsibility for tile popping of the sort described in the accompanying text by blaming earth movement for the problem.

That's not valid in California and probably elsewhere: The contractor is the assumed expert on the condition of the soil into which the pool is being installed and is responsible for making certain earth movement will not be a factor before construction commences.

If there's any doubt, geologist's and soils reports must be obtained and, if there's any indication of potential movement, the structure must be engineered to withstand the shifting that might occur. That includes assuring that the pool structure is physically isolated from any nearby decking through use of a proper mastic joint.

Simply put (and in California at least), there is no earth-movement excuse to shield the contractor from liability.

– D.T.

David Tisherman is the principal in two design/construction firms: David Tisherman's Visuals of Manhattan Beach, Calif., and Liquid Design of Cherry Hill, N.J. He is also co-founder and principal instructor for Genesis 3, A Design Group, which offers education aimed at top-of-the-line performance in aquatic design and construction.

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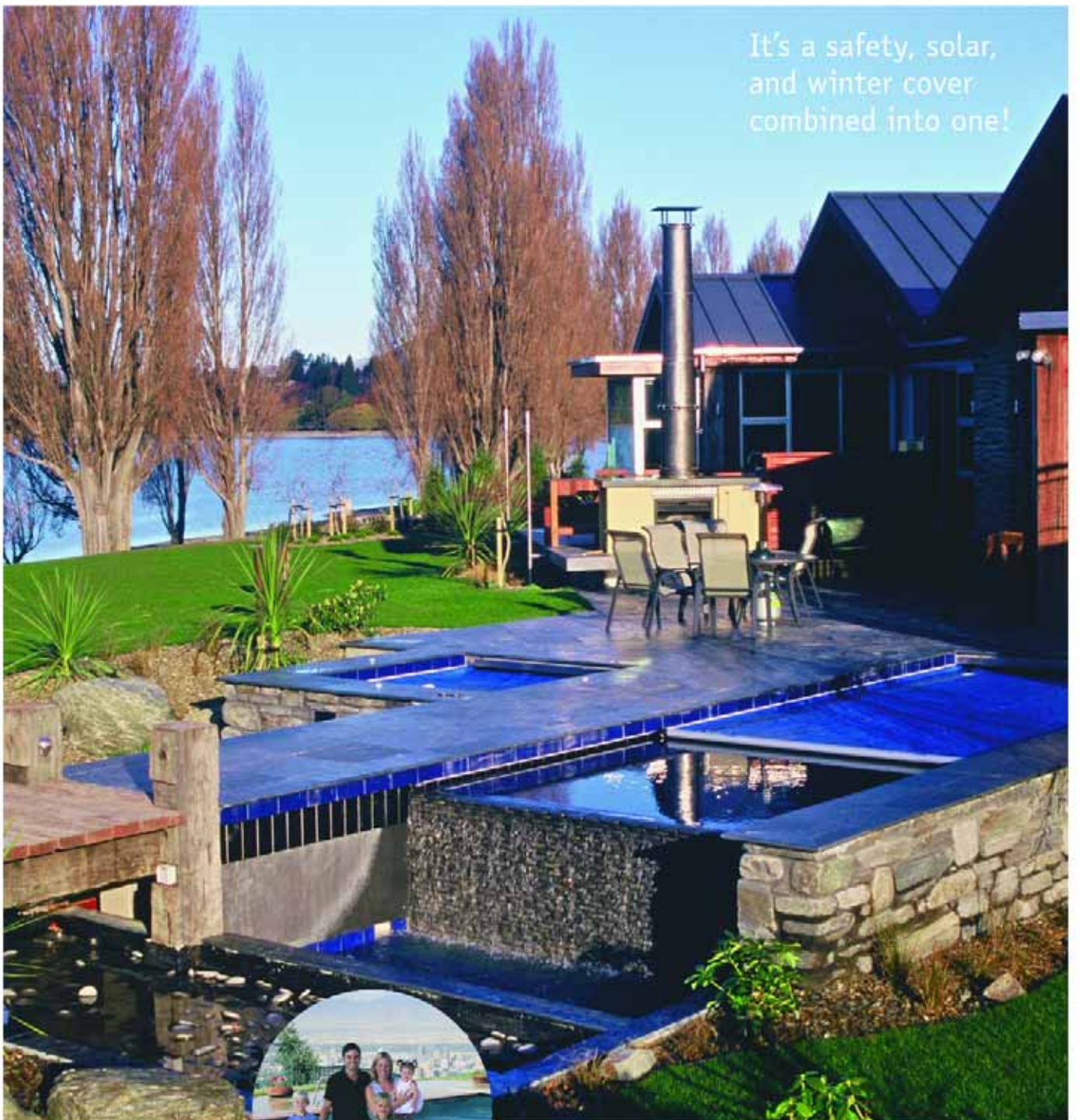

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Walls of Stone

By Bruce Zaretsky

Landscape designer Bruce Zaretsky has a passion for stone walls, especially those of the dry-stacked variety made without the aid of mortar. Observation of the handiwork of others and his own experience have shown him that there's a fine line with these walls between those that are beautiful and enduring and those that are little more than expensive heaps of rock. Here, he shares a number of practical tips aimed at results of the beautiful, enduring kind.

As a landscape designer and installer, I have an abiding fascination with stone.

I love the feel of it and its myriad colors, veins, streaks, shapes and textures, and I particularly admire its strength and flexibility. We pave with it, sculpt it and run water over, under and through it. Stone doesn't need painting or much care, looks great with plant material and has, as those who work with stone will point out, a timeless quality that cannot be reproduced with artificial materials.

The best thing about stone is that when you use even one piece in an aesthetically meaningful way, you've created art: It becomes *sculpture* just by being.

At Zaretsky and Associates (Macedon, N.Y.), our goal in building any wall is to make it practical, beautiful and functional – practical and functional in its ability to hold up an embankment, separate a garden into "rooms" or create seating; beautiful in that every such wall is unique, a work of art, a piece of sculpture.

One of my favorite applications of stone is in the form of dry-stacked walls. Indeed, these walls are among the most beautiful to be found in any landscape: With plants growing over, through or in front of them, a well-designed dry-stacked wall can look hundreds of years old in a matter of months.

As is true with all objects of beauty that are actually used, however, these stone walls require great care, patience and skill in the making. Whether you're building a fence or retaining wall, the work is hard and labor intensive – and mistakes are costly.

Fences and Walls

An ancient technique that takes a great deal of practice, the art of dry-stacking boils down to selecting and placing stones so that gravity and friction result in a fence or wall that possesses structural integrity.

w **Stone fences** are freestanding, "faced" on both sides, and can be built to almost any

height so long as they are structurally sound enough to stand without the possibility of collapse, which includes resisting movement related to freeze/thaw cycles and incidental vibration caused, for example, by passing vehicles.

w **Retaining walls** are "faced" only on the exposed side and can also be built to almost limitless height – but they must be strong enough to hold back the embankment and withstand ground-shifting forces such as the hydrostatic pressure that may build up on the slope side of the wall.

In all cases, the work begins with understanding the raw material – and there are countless types of rock available for use in wall construction.

In most cases and for two reasons, it's more practical and cost effective to use stone that is native to the area in which you are working: first, a native stone will more often than not look like it belongs; second, the cost of shipping will be significantly reduced. In our budget-conscious business, the high cost of shipping usually precludes the use of more exotic materials. In the northeast, fortunately, we have the availability of a number of stones, including Pennsylvania Bluestone, limestone and fieldstone in various shapes, sizes and colors, all within a five-hour drive.

Each variety of stone works in a different way. Some need to be worked with a hammer more than others to create surfaces that allow for a good fit. The more "sculpting" you need to do, the more time installation will take and the more waste you'll generate. Again, with budget in mind, it makes sense to use a stone that will look great but also fit together relatively quickly, so while we use a number of different stone species, for efficiency's sake we tend to select relatively flat stones to keep the

SOLID PERFORMANCE: Dry-stacked walls work as either free-standing fences (A) or as retaining walls (B). In both cases, they can be of just about any height and either linear or curved. When engineered properly for retention, they can bolster substantial slopes (C, a 'before' view of B) – without the aid of any mortar.

cutting and fitting to a minimum.

In most of the projects in the photographs seen here, we used a flat stone called Colonial Wall Stone. On a good day, two experienced "wallers" can install about two tons of this material – about 25 to 30 square feet of wall face.

The key to that kind of performance? *Experience*.

Built to Last

There are a number of ways to build stone walls. The biggest variable driving a choice among various techniques is climate.

Everything shown here was built for a climate in which we expect a frost depth of 42 inches, so in our case, base preparation is the key to prevention of settling and wall movement.

In every case – frost or no frost – it is of the utmost importance to be aware of soil conditions beneath your installation. Much of our work is done on new construction, where cuts and fills are a way of life. You need to know where the soil has been manipulated in this way: Too often, I've seen sites where someone has built a wall or patio or deck on top of as much as fifteen feet of fill and then wonders why it has settled.

If the site has been filled with anything more than a foot of soil, the only way to settle the soil for proper wall construction is with water. My general preference is to wait through a winter before we build on any new construction site and let nature take care of the settling. In fact, we've found that winter's freeze/thaw cycles will settle the subsoil very nicely without our intervention.

If there are any remaining doubts about compaction when we come on site, we will set up soaker hoses in our work areas and direct the homeowner to run them for one hour per day for two or three weeks. These basic precautions have never failed us.

Once the subsoil is fully compacted, we begin to prepare the base for construction of the wall or fence. In both cases, we dig a base that is twice the width of the wall and vary them in depth from six inches to as much as two feet, depending upon soil conditions.

For well-compacted, gravelly soils, for instance, we only need to dig to the minimum necessary depth because these soils drain well and lock in tightly. By contrast, sandy and clay soils need extra consideration. With sandy soils, we'll dig a little deeper and line the trench with landscape fabric. With clay, we dig to the maximum necessary depth and make sure the soil is wet when it is being compacted. Clay expands when saturated, so if you build on dry clay, the wall will heave when it gets wet.

In climates unaffected by frost, it's usually sufficient to build stone walls on reliable excavated ground. We never use pea gravel, because it acts like ball bearings. Instead, we install a base layer of crusher run (a mix of crushed stone and stone dust that locks up solidly when compacted) or plain compacted crushed stone. Crushed stone locks in tight and drains well – two very important and necessary features of a good wall base.

The thickness of this base layer varies with the size of the wall. If in doubt, err on the side of having too much: It will never let you (or your wall) down.

Three Keys

In assembling a stone fence or retaining wall, keep in mind three specific techniques: battering, the use of "through-stones" and what is called the "one over two/two over one" principle.

w **Battering** is the concept of stepping the wall back slightly as you go higher. This is done for several reasons: First, by battering on both sides of a fence, you shift the center of gravity more toward the center of the wall, so, as frost movement and other natural events affect them, the stacked stones will tend to move to the wall's midline. (The same principle also works in soil retention: A battered retaining wall will be significantly stronger than one with a straight vertical contour.)

Second, a battered fence uses less stone than a vertical one. Third, because the top of a battered fence or wall is not as wide as the base, it gives you a natural place to use smaller stones to cap things off. (As anyone who builds these types of walls and fences knows, large flat stone are relatively few and far between.)

When building a battered fence on a straight line, it is worth the time and effort to use *batter boards* – simple wood-

To Cut or Not to Cut?

The choice of whether to fit a stone as is or cut it with a hammer is just that: a choice.

In making that choice, we are sometimes influenced by the look of the home or site factors and will cut stones to give a wall or fence a more sculptured, architectural look – or leave them alone for a more rugged, rustic look.

I know stonemasons who cut every stone – and others who won't even carry a hammer. I fall somewhere in between, invariably finding that something I see on site will guide me in my decision. So let the site talk to you: Ultimately, the stone will find its way.

– B.Z.

Art vs. Productivity

It's no secret that a great many clients want two things above all: beauty and affordability.

For that reason, I believe it's critical to build quality structures and overall landscapes while being sensitive to cost. I call it a compromise between art and productivity and see it as a challenge that just about every thoughtful artist and craftsperson will face.

Productivity can be increased by using products that work faster on site. It's like using meshed tile instead of setting tiles one at a time: We try to buy stone that already has a good, flat bottom and a clean face so that all we need to do is dress the front of the stone with a hammer (to make it look hand-cut) and set it.

This means less waste and lower material costs. Such stone is usually easy to find where we operate, and choices are broad enough in most places to work this measure of efficiency into the process.

– B.Z.

PROPER PITCH: Although the angle is visually slight (D), the fact that these retaining walls are pitched back slightly from the vertical in a process known as 'battering' lends them a significant extra measure of structural integrity.

en frames built to the size of a cross-section of the stone fence. One is placed on each end of the area where the fence is to be built: Strings attached to the batter boards provide a straight line for use in aligning stones. As you go higher, the strings are raised at the same time, maintaining a consistent angle.

All this said, we batter our stone fences back as little as possible, simply because I do not like the look of an excessively battered fence. The look of a perfectly vertical corner that's cut out of stone is a thing of beauty: So long as we prepare our bases properly, use a good number of through stones and cap the structure as tightly as possible to keep water out, the fences will stand. (We do, however, always batter our retaining walls!)

w **Through-stones** are large, single pieces that extend through the wall from front to back. These are necessary because a stone fence is essentially two walls built back-to-back and there needs to be something that ties the two sides together. Without these stones, the two sides inevitably will begin to fall away from each other.

The more through-stones you use, the stronger the fence. And not only

STEPPING UP: The use of a 'through-stone' (the large piece pushing out past both sides of the fence) lends strength to the overall structure by linking the separate faces of the wall. They have the added benefit of providing a convenient step for crossing over the fence in either direction.

OVERLAPPING: Another key to a dry-stacked wall's structural integrity is avoiding vertical seams. We avoided them in this small wall section as a means of using gravity and friction to their fullest possible extents in ensuring long-term strength.

should they run fully from the face of one side to the face of the other: They should also be overlapped with other through-stones as frequently as possible to create a good friction bond that strengthens both sides of the fence.

As the fence is built up, there will invariably be rubble left over from cutting or breaking the rock. We use this "waste" as infill within the wall, tightly packing it into gaps between the two fence faces. This is *not* just thrown in; instead, it is carefully placed so that it will not settle over time. These pieces also serve the useful purpose of shimming face stones into place, leveling and locking them in.

w **The "one over two/two over one" principle** is a simple rule about overlapping joints as much as possible. Looking at this the negative way, just remember that long vertical seams are sure points of eventual failure.

It also pays to remember that dry-stacked walls rely on two forces: *gravity* (or mass, hence the use of the largest possible stones) and *friction*. One stone sitting on top of two will apply gravity and friction to both under-

Measuring Skill

A great many of the stone walls and fences you see today are installed "dry" – that is, no mortar is used. In many cases, their stones are cut to fit with a hammer and are carefully placed. When properly installed, in fact, a dry-stacked wall will outlast a mortared one.

Regrettably, very few installers in our "get it done fast" world truly practice the ancient art of stone-wall building. Fortunately, organizations such as The Stone Foundation (Santa Fe, N.M.) and The Dry Stone Conservancy (Lexington, Ky.) are working hard to educate the public and interested dry-stone-wallers in the proper execution of this most noble art form.

The Dry Stone Conservancy has a certification process that some of the more experienced wall-builders pursue. These certificates don't involve studying from a book and taking a test: They're about going into the field and building walls – *lots* of them – within a certain time frame. They are judged on the quality of the execution, and very few pass and get certified the first time through.

And that's good, because the standards *should* be high. It also makes those who fail that much more eager to be better at their craft.

– B.Z.

SYSTEMATIC: There's a logical progression to installing retaining walls, starting with marking the site to guide excavation, base preparation and installation of the behind-the-wall drainage system (G). As the wall goes up, we backfill with crushed stone to make sure all gaps are filled and install through-stones for increased stability (H). In this case, the through-stones double as poolside benches (I). Many of the stones are hammered and chipped to ensure tight fits; the spoils are used behind the wall as we go to fill gaps and lock the wall stones in place (J). The gap behind the finished wall is ready to be filled with topsoil for planting (K).

lying stones, creating a much stronger interface. Building in this way essentially ties the whole wall into itself as a unit, making for an indestructible feature.

A tip: Always bear in mind how you are using individual stones that should be laid with the longest profile projecting into the wall. Using them the other way and stacking long, thin stones parallel to the face of the wall just won't work for the long haul. Even though it's hard to resist the temptation to place a really beautiful stone with a long, clean face on it, think about how that stone is going to affect the integrity of structure before using it in that way.

Retaining Strength

All of the discussion above focused mainly on stone fences, but each point applies to retaining walls as well. The single biggest difference between the two was mentioned at the outset: A retaining wall has to withstand the pressures of the slope it is retaining and deal with water in either its liquid form (as hydrostatic pressure) or its solid form (as frost heave). Thus, it is absolutely critical that proper drainage techniques be used in building a stone retaining wall.

One advantage of a dry-stacked stone wall is

Topping Off

Capping or coping a stone fence can be done in a number of ways, the most common being selection of stones that are large enough to span the width of the fence. These specimens are then carefully cut, leveled and placed on top of the fence, making full contact on both sides. The tighter the stones are fitted, the less water will reach the wall's internal spaces.

A technique that has worked for us involves the use of flagstone caps. We buy flagstone by the tractor-trailer load in thicknesses ranging from an inch and a half up to three inches. When we take delivery of the material, we reserve the thickest pieces for capping. This way, we have a consistent surface and a beautiful top.

We usually shim the coping stones to level them up and, if necessary, will mortar them into position being careful to place the mortar so that it does not show either along the face of the fence or between the coping stones. Over time, the mortar will separate – but will still act as a perfectly formed shim stone in the fence.

– B.Z.

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that it allows water to weep out of its face, but while this certainly helps, it is not sufficient on its own. Our philosophy is simple: The more crushed stone we can place behind a wall, the less moisture will be retained behind it. As a rule, we dig out the area behind the wall to its natural angle of repose – that is, the point at which the soil is self-sustaining.

That is sometimes a difficult angle to determine, so knowing that the sides of the pyramid will not collapse as long as no other outside influences affect it, we work the soil behind the wall to an angle of 45 degrees. Knowing the height of the wall, we dig into the slope so that the distance from the back of the *bottom* of the wall is about two feet into the slope (to allow for crushed stone at the base of the wall) and that the distance of the soil from the back of the *top* of the wall is two feet plus approximately the height of the finished wall.

All of this area should be filled with a large, crushed stone (we use #2) at a minimum. If the wall will have plantings on top, we typically will fill to within about 12 or 18 inches of the top, lay down landscape fabric and then cover the fabric with topsoil. (The fabric keeps the soil from filtering down into the crushed stone.)

That last little detail leads me to observe that there are *many* little details that must be accommodated in building a stone wall of any kind. When building a stone fence, for example, we start by setting aside any stones that are at least two feet longer than the fence is wide. As we go, we set these stones up as an exposed staircase into the fence, allowing people to climb up one side and down the other. This was a fairly common technique in centuries past: It keeps folks from pulling on the wall and its cap stones in attempting to scale the fence and works to the structure's long-term benefit.

In the same vein, we sometimes use those long stones in retaining walls to create benches. We often place six-foot-long slabs of stone into walls, projecting out from the face about 18 inches. The bench itself is the proverbial tip of the iceberg, with more than four feet of stone buried in the wall and the gravel beyond. One and all can rest assured that such a bench will not move.

The Test of Time

Stone walls and fences have proved their worth through the centuries. Done properly, they are beautiful, structurally sound and extremely satisfying to build and will endure to the benefit and enjoyment of countless future generations

People travel the world and stand in awe before the pyramids of Egypt, the Great Wall of China, the aqueducts of the Roman Empire and castles and stone fortresses the world over – the works of faceless masons in whose traditions we operate to this very day. What greater compliment could we be paid as designers and builders than to have a future traveler stand and appreciate our work in the same way?

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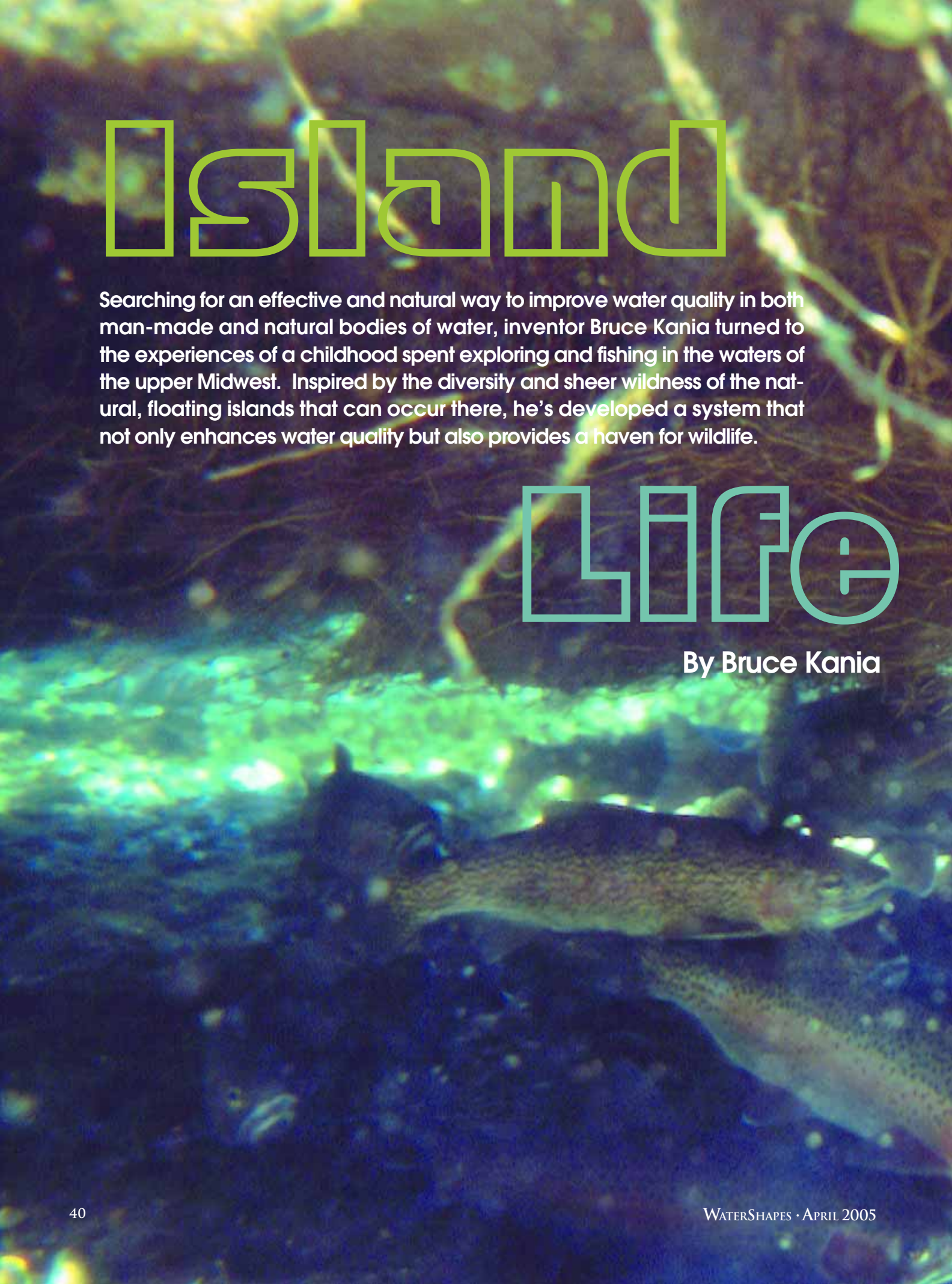


Island Life

Searching for an effective and natural way to improve water quality in both man-made and natural bodies of water, inventor Bruce Kania turned to the experiences of a childhood spent exploring and fishing in the waters of the upper Midwest. Inspired by the diversity and sheer wildness of the natural, floating islands that can occur there, he's developed a system that not only enhances water quality but also provides a haven for wildlife.

By Bruce Kania

So often, the art and science of invention begins with the study and appreciation of nature.

While growing up in Wisconsin, I was repeatedly exposed to the naturally occurring islands often found floating on bodies of water amid the conifers in the northern, peat-bog region of the state. I couldn't help noticing that these islands were *exactly* the best places to go fishing. They were just terrific, presenting a structure under and around which fish, for whatever reason, loved to spend their time.

Moreover, every floating island I've seen in nature is host to all sorts of flowering plants including American Speedwell, Monkey Flower, Blue Flag and even examples of the few native varieties of North American wild orchids along with incredible varieties of other broad-leaf plants, grasses and even trees. In many cases, I've seen species that don't abound in the surrounding environment but thrive to exceptional levels on their floating havens.

In case it isn't obvious by now, I've always had a passion for plant life, and it didn't take me long once I began to think about these peat-bog islands to recognize that plant material thrives beyond the norm amid these naturally occurring hydroponic platforms. And it's not just plants: These islands also play host to a wide variety of beneficial insects, fish, invertebrates, predators and just about any other species that draws its life from the water.

Finally, I also noticed that the quality of the water immediately associated with these peat-bog islands was almost always pristine.

From the Farm

Although I didn't know exactly where all of these observations were headed, it ultimately became clear to me that something highly dynamic was going on in and around these bog islands. Based on my lifetime of observation and subsequent study of natural systems at work, I began to see more and more potential in a man-made product that would replicate many of the systems occurring on these dramatic examples of the world's bio-complexity.

Things began to coalesce in a practical way several years ago, after I'd purchased a research farm

in Shepherd, Mont., as an adjunct to my ongoing invention business.

The site is located at the end of a 60-mile irrigation ditch that fills with runoff from surrounding farmland. The property is rich with water, including fourteen springs, two streams and two ponds. Given this large volume of flowing and percolating water and our proximity to farmland, it's no surprise (but something of a disappointment) that water on the property is *loaded* with phosphorus and nitrogen – that is, fertilizer runoff.

As we developed the water systems on the property for a variety of reasons unrelated to floating bog islands, we ran into a range of fairly serious water-quality problems, not the least of which was the foul odors our dogs would wear for days after they went swimming in the ponds or streams. It occurred to me that if we had issues such as this in the headwater zone of Montana, how bad must it be in Louisiana?

The answer to that question is grim. In fact, there's an aquatic "dead zone" at the mouth of the Mississippi that covers 22,000 square kilometers of ocean. This is an area that should be rich with life, but that is essentially devoid of oxygen because of the contamination of the river water with fertilizers and other man-made wastes. I soon learned that there are 34 other dead zones, many of which are growing, in various places around the planet.

At that point, I started thinking seriously about how these nutrients might be removed from the water in ways that would not involve the use of materials or chemicals that would bring additional consequences with them. As I so often do in my inventive processes, I started by wondering if there wasn't some natural phenomenon that could be borrowed and applied.

I soon began thinking about the islands I'd often seen as a child – with the thought clinched by another factor: Predators (foxes, minks and other rapacious creatures) were ravaging ground-nesting birds on our farm, and it made me think about ways in which floating islands might provide sanctuary for birds and waterfowl.

I've oversimplified the developmental chain in the interest of getting on with the bigger story, but you get the idea: My foul-smelling dogs precipitated a line of thinking that led quite directly to artificial floating islands.

Expert Assistance

As is the case with most of my new inventions, I immediately went about engaging talented people to develop the concept. In this case, I turned first to Frank Stewart, a civil engineer who specializes in hydrology and who had already dedicated more than ten years to pond, stream and watercourse design – and immediately saw potential in the project.

> It became apparent that the test island was a lot more than a raft with plants growing on it. It had become a haven for a diverse community of plant, microbial and animal life forms.

As design ideas emerged, Stewart and I enlisted Thomas Coleman and Russell Smith of Aquatic Design & Construction Services (ADC Services) of Livingston, Mont. Coleman, an environmental engineer, and Smith, a degreed environmental conservationist, have spent years designing and implementing sustainable watershapes and have led waterway-restoration projects throughout Montana – for stream and river systems; lake and pond habitats; and wetlands and their associated uplands.

With their extensive experience in building ponds that conserve water while providing environments in which fish thrive, they offered the horticultural and biological knowledge crucial to developing the floating-island concept.

Starting with materials scavenged from other projects around the farm, the team began building prototypes. During the next several years and more than 200 prototypes later, the current island-body configuration starts off at about six inches thick and can be made in any free-form shape. From the outset, our aim was to create a bio-mimetic replication of a wild floating island, and we now believe we've captured many of the most critical systems that happen on wild floating islands.

The basic idea is that plants grow through the island's structure and that their roots extend into the water beneath the island to absorb nutrients – thus serving the dual purpose of feeding the plants on the island and essentially filtering the water and clearing away algae-feeding nutrients.

After investigating materials and exploring possible structural forms, we settled on a recycled-polymer matrix as our main construction material. The filter-like batting worked well as both structure and growing surface, creating an adjustably buoyant "island" that easily could be trimmed to various shapes and sizes. The polymer also presents a tremendous volume of surface area and is well suited to serve as host to plants, microbes and beneficial insects. All these life forms represent bio-complexity, the result of which is, ultimately, a healthy environment.

Bio-Complexity

For help with the nutrient challenge, the project team turned to Al Cunningham, a professor of civil engineering at Montana State University (Bozeman, Mont.) who specializes in aquatic microorganisms (including bacteria), and to Jim Keeton of Keeton Industries (Fort Collins, Colo.), a firm with 30 years' experience in public and private water-treatment systems in the United States and abroad.

Keeton developed a way to use phosphate-eating microbes to counteract the eutrophication process (see the sidebar on page 46 for details). To effect this scientific plan, he takes the low-tech approach of lobbing a water-soluble bag of microbes into the pond so it bumps up against the island – a step that basically turns the im-

From a humble start topped by shoots and seedlings, the illusion created by floating-island technology quickly becomes remarkably convincing. What looks like a natural patch of green on the water of this small pond is actually a completely artificial structure with an important role to play in the pond's ecology.

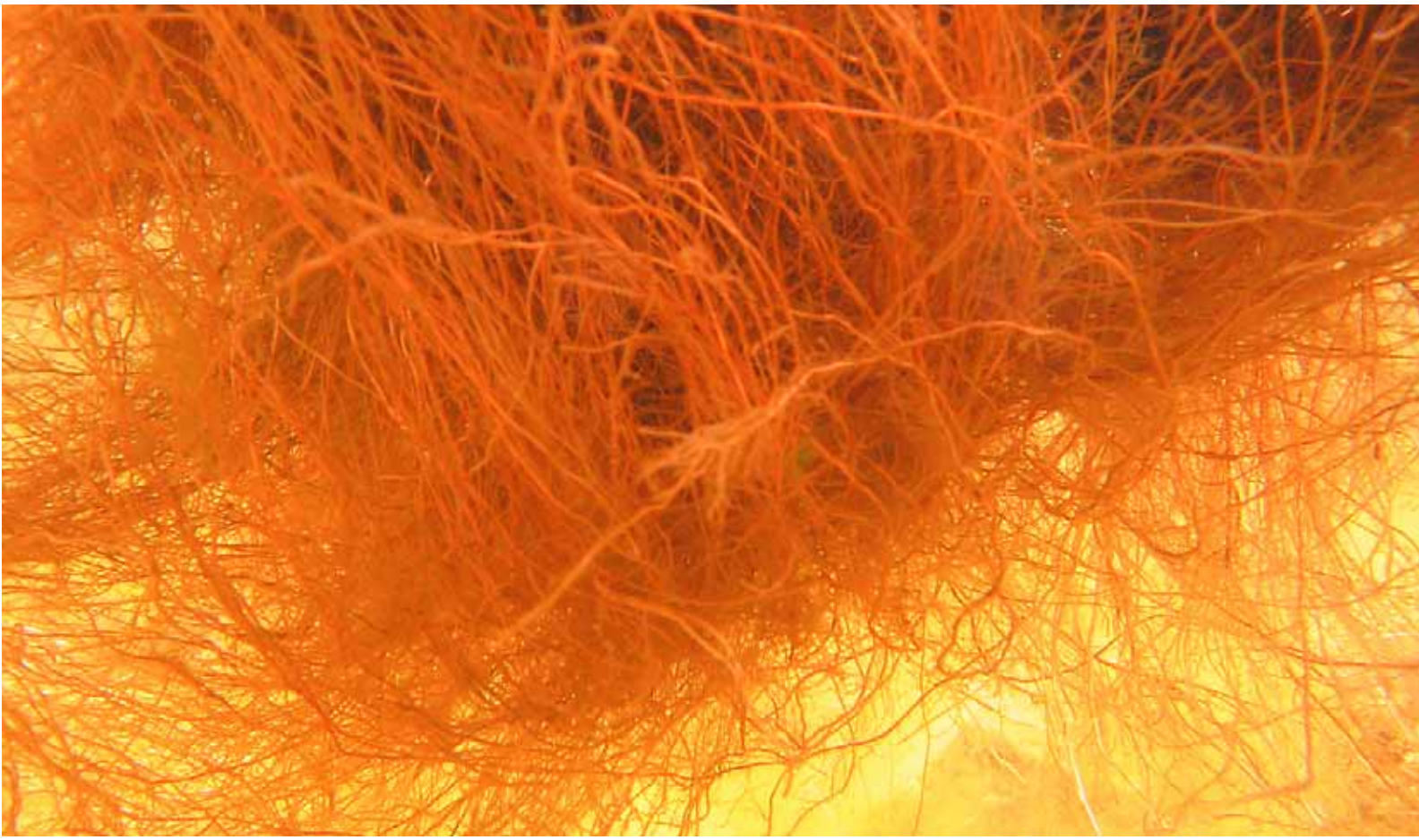
mense surface area of the island structure into a giant, phosphate-removing biological filter.

Root growth is the other major component in aquatic-system health. Given the surface area of the island matrix as well as its porosity and the fact that plants grow right through it, there's a great deal of contact between the water and a large amount of root material. As mentioned above, this aids in the uptake of nutrients, but the roots also provide shade, safety and cover for fish while helping to control algae growth.

From the start, we were all amazed at how well the concept worked in field tests. Not only did the water in the area clear up as measurable residuals of various organic compounds plummeted in the pond, but we also observed an abundance of fish congregating beneath the island. We even started seeing leopard frogs on the island – a species we'd never seen anywhere on the property – as well as damselflies, needle bugs and other insects.

It soon became apparent that the test island was a lot more than a raft with plants growing on it. Instead, it had become a haven for a diverse community of plant, microbial

Floating islands can range from small to quite large, as seen here, and have enough buoyancy to support rocks and substantial animal life. One of the focuses of our research has been finding the right relationship between the size of a pond and the size of its floating island.



The permeability of the island's structure allows roots to reach down into the water where they take up nutrients and provide safe haven for fish and other aquatic life. In this way, the system helps ponds and other biological water systems fend off challenges posed by nutrient-rich runoff.

The plants that can be sustained on floating islands are as various as the range of specimens found in any wetland terrain. Those seen here are species commonly found in the mountains of Montana, but just about any plant that thrives in an aquatic environment will do well.

Inspired by the Wetlands

Wetlands typically occur in low-lying areas saturated by fresh water at the edges of lakes, ponds, streams and rivers — or by saltwater in coastal areas affected by tides but protected from waves.

In wetlands of both varieties, the surface of the water (that is, the water table) is usually at, above or just below the land surface for long enough periods that the variety of plants is limited to those that are adapted to wet conditions and which in turn promote the development of soils characteristic of a wet environment.

The floating island product described in the accompanying text is essentially a manufactured wetland form that provides an optimal environment for the establishment of aquatic plants. In addition, these diverse habitats benefit fish that require different conditions for spawning, feeding or seeking shelter from predators, and they also provide combinations of open water and protective emergent plants that are preferred by waterfowl. Finally, they offer a variety of food and cover for smaller organisms that are used as food by birds and larger animals.

Some plants and animals are specially adapted to living in a wet environment. Most emergent plants, for example, have air spaces in their stems that enable oxygen to be transported to roots that may be growing in sediments that have no oxygen. Some of the trees that grow in swamps form a set of roots above the soil surface or above the water that allows them to transfer oxygen to their submerged lower roots. In saltwater wetlands, there are even plants that have developed specialized cells that limit the amount of salt that enters a plant – or specialized organs that excrete salt from the plant.

In addition, some wetland microorganisms have adaptations that allow them to live in water or wet soil without oxygen. The symbiotic nature of micro-flora and -fauna that develop under floating islands is the key to the product's overall potential. In an optimized environment, the plants work in conjunction with our inoculated microorganisms to significantly raise the potential for the uptake of excess nutrients – the major cause of algae problems in living water systems.

In our tests, we have used mostly plants native to our neck of the woods in the northernmost reaches of the Rocky Mountains, including wetland grasses and forbs. We've found certain species of forbs to be the quickest colonizers and more suitable for the application because of their rapid growth.

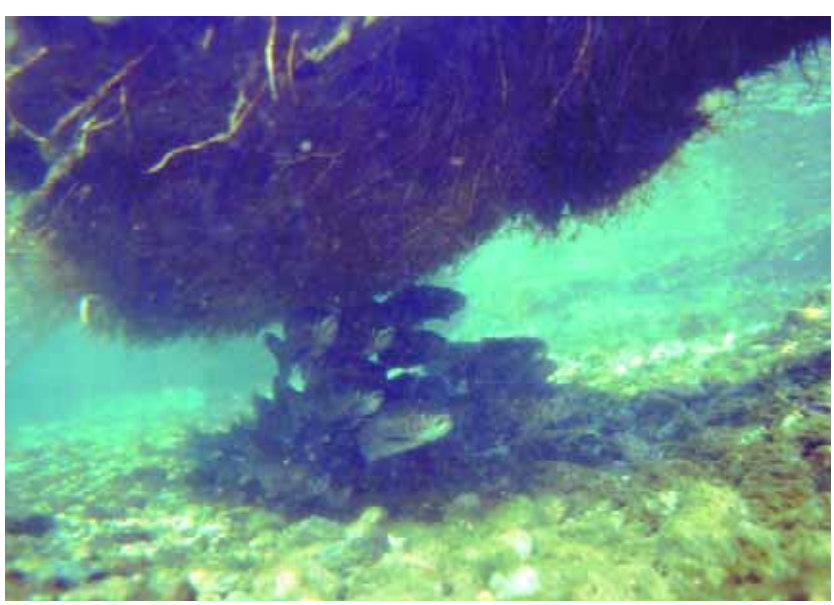
Veronica americanus (American speedwell) has shown the most remarkable growth of all plant types, but this does not preclude the use of other wetland plants. In fact, use of a diversity of plants enhances aesthetics and makes for an island ecology that's not only easy on the human eye but also serves a greater range of purposes for multiple species of microbes, insects and animals.

– B.K.

and animal life forms, and the rate and level of nutrient uptake was far exceeding what might have been expected from the presence of plants alone.

As we've moved carefully toward the marketplace, we've also studied island size and location as well as ways in which the islands are planted. In a controlled environment such as a backyard, for example, a homeowner can consider use of non-native ornamental species. A golf-course landscaper, by contrast, might choose from species with optimal nutrient uptake and waterscape-beautification features, while a conservation organization might select native species particularly compatible with local fish and waterfowl.

With aeration, ready access to nutrients and a consistent supply of water as the islands rise or fall with the level of a waterway, plants on these islands may grow at several



Perhaps the most noticeable byproduct of the island technology is wonderfully clear pond water, whether seen from perspectives outside the water or with a fish-eye view.

times the rate of their shoreline counterparts. With the natural, seasonal cycle of plant growth and die-off, young islands especially may be expected to become higher and denser over time.

Stewardship

The design process continues even though floating islands are now ready for market. We're currently doing research (as just one example among several) in conjunction with Delta Waterfowl of Bismarck, N.D. This 90-year-old research organization, founded by Aldo Leopold, is North America's leader in examining waterfowl ecologies. The goal of our collaboration is development of inexpensive, predator-resistant islands.

On the broadest level, it is our hope that our floating islands will someday play a useful role in the preservation and restoration of natural rivers, lakes, wetlands and perhaps, thinking again about the estuary of the Mississippi River, even oceans. It's our belief that by working wisely with the resources nature provides us, these precious resources can be maintained or returned to healthy biological states.

On a much more focused and immediate level, we want to see these islands applied where they will simplify maintenance and enhance the health of all species that draw life from aquatic environments in backyards as well as parks and golf courses.

To get there, we need to raise awareness of the balances involved in living-water systems and make it clear that floating islands, much like a garden, require careful installation and ongoing stewardship if they're to do all they are capable of doing. We are certain that the result will involve more holistic approaches, fewer chemicals and less overall maintenance.

In the meantime, we continue our research and have developed a wealth of information about the way natural biological processes and habitats work and how floating islands can become part of the mix. We've studied the effects of such issues as plant selection, island size relative to the size of the body of water, nutrient loads, care and maintenance procedures and formation of land-animal habitat. We are constantly expanding our pool of knowledge.

As work proceeds in conjunction with a select group of watershapers, we're carefully studying the results and making refinements in our recommendations and the data we provide those who want to deploy our systems. We're also hearing from the field that island installations look beautiful and enhance environments in eye-pleasing as well as practical ways.

In the meantime, to commemorate the inspiration for our island project, we've named what was once a cesspool of nutrients Red Dog Pond. It now produces big fish, leopard frogs and damselflies instead of smelly red dogs.

Being around this project and perceiving its great promise fills us all with a sense of hope. Maybe we can figure out a way to live more gracefully and compatibly with natural systems that embody true health.

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Of all the side benefits of this project, the one that has produced the most happiness in my family is the fact that our dogs can swim to their hearts' content and emerge without the foul odors that were an unpleasant fact of life when we first moved to the shores of Red Dog Pond.

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A Crowning Achievement

The Crown Fountain in Chicago's Millennium Park is an ingenious fusion of artistic vision and high-tech water effects in which sculptor Jaume Plensa's creative concepts were brought to life by an interdisciplinary team that included the waterfeature designers at Crystal Fountains. Here, Larry O'Hearn describes how the firm met the challenge and helped give Chicago's residents a defining landmark in glass, light, water and bright faces.

By Larry O'Hearn

In July last year, the city of Chicago unveiled its newest civic landmark: Millennium Park, a world-class artistic and architectural extravaganza in the heart of downtown. At a cost of more than $475 million and in a process that took more than six years to complete, the park transformed a lakefront space once marked by unsightly railroad tracks and ugly parking lots into a civic showcase.

The creation of the 24.5-acre park brought together an unprecedented collection of world-class artists, architects, urban planners, landscape architects and designers including Frank Gehry, Anish Kapoor and Kathryn Gustafson. Each contributed unique designs that make powerful statements about the ambition and energy that define Chicago.

One of the key features of Millennium Park is the Crown Fountain. Designed by Jaume Plensa, the Spanish-born sculptor known for installations that focus on human experiences that link past, present and future and for a philosophy that says art should not simply decorate an area but rather should transform and regenerate it, the Crown Fountain began with the notion that watershapes such as this one need to be gathering places.

Urban Inspiration

In pursuing his design for the fountain, Plensa looked to history for guidance. Even a cursory view of art history tells us that in ancient times and in a variety of cultures, fountains often originated as wellheads around which people gathered for conversation, interaction and personal reflection. The Crown Fountain stands a purely modern version of that basic concept.

Plensa's contemporary version of such a gathering place consists of a pair of 50-foot-tall glass-block towers that face each other across a broad, shallow skin of water. Projected onto the inner sides of the towers are the videotaped faces of more than 1,000 Chicago residents from seven to 80 years of age.

Each face is projected on the towers one at a time for 13-minute periods. Water falls down all four sides of the glass structures, providing an interactive element that brings children and adults close to the images as living counterparts of the artwork. During the final minute of each display period, the lips of the videotaped faces purse – and a spout of water appears to shoot from their mouths.

Our role at Crystal Fountains was to design the water effects and advise the project team on a variety of key issues based on our experience in creating interactive, computer-controlled water elements for public spaces. The result is one of the most advanced systems we've ever developed, and it's been no small point of pride to see this work unfold in such a culturally significant setting.

The towers were built and clad in glass block while construction proceeded on the reflecting pool that stretches between them (A and B). The key to the gargoyle effect is hidden inside: A special nozzle was fabricated in clear materials (C) so it disappears when the spout isn't in operation and emits a hefty flow when periodically activated (D). We thoroughly tested the system to make certain the flow wouldn't be so strong that small children would be bowled over by the force of the stream (E).

The design of the Crown Fountain is all about the faces, which were selected and filmed by students of the Art Institute of Chicago to represent the racial and ethnic diversity of the city. Participants were asked to pose facing the camera for 12 minutes and then, for the last minute, were told to blow a kiss. Current plans call for adding to the registry of faces at a rate of 500 to 1,000 in each five-year span.

Plensa sought to create a sort of dialogue between the images and the surrounding environment – a conversation perceived particularly well in the evening, when the character of the fountain transforms, the faces beam at their brightest, waterfalls and streams clearly emerge and the towers' other surfaces glow with changing colors.

Physical Boundaries

The glass-block towers are situated within a reflecting pool measuring 232 feet long by 48 feet wide. Surfaced entirely with African black granite pavers,

the pool serves in basic functional terms to collect water flowing down the towers. To that end, the pavers sit over a reservoir that is actually about two-and-a-half feet deep. Atop the pavers, however, is a mere 1/8-inch skin of water.

The use of this thin sheet of water started with Plensa's dream: "I don't swim, so one of my dreams has been to walk on water. I wished to share my dream with the people here and say, 'Please, come to my piece and walk on the water.'"

On either side of the pool are benches framed by trees and other plantings to create a welcoming area for visitors who don't want to get wet. By its nature, the fountain captivates children and adults alike: Children play in the fountain and wait breathlessly to run under the spouting mouths, while adults enjoy the "show" and the playful interactions of people, lights, sounds and water.

From the beginning, we knew that this design would embody the highest possible aspiration of water as an art form. The combination of the human face, interactive water and the magic of programmable animated features seemed to meld all the best that watershaping has to offer in public settings.

The water appears to emerge from the mouths of the projected images; when the flow stops, the source of the water has to disappear.

At the same time, we knew that making all of this come together in a seamless fashion would be no small task.

We were asked to join a project team of architects and engineers by developer U.S. Equities, with which we've collaborated on several past occasions. Our scope of work included the mechanical and electrical aspects of the towers along with a variety of other technical, aesthetic and practical issues – including our advice on interfacing the fountain systems with the architecture, public safety issues, risk assessment and the "personalities" that the feature would encompass.

All of our work was shaped by the thought that this was a public feature that would enable people to interact with the water. As a

The faces of the citizens of Chicago are projected on the towers' inner faces, connecting the Crown Fountain to its community in a unique and intimate way. More than 1,000 people have lent their visages to the project so far, and the plan is to continue adding to this remarkable registry of faces in years to come.

The artist who designed the Crown Fountain – Jaume Plensa – wanted those who walked onto the fountain's reflecting surface to have a sensation of walking on water – a feat we achieved by covering the area with an eighth-inch skin of water that wells up between the gapped pavers from a reservoir below the deck.

result, our design work specifically included a formidable level of due diligence with respect to safety and accessibility.

The Gargoyle Effect

The spouting of water from the faces of the fountains, for example, presented certain risk factors. Based on our experience with other interactive fountains, we made several key recommendations about the volume and velocity of water allowed to fall on the small children who would stand in the stream.

We also made key aesthetic recommendations having to do with creation of a nozzle array for the spouting effect that would be completely invisible when not in use. The spout also had to be scaled in such a way that it suited the enormity of the images on the front of the fountain.

In what became affectionately known as the "gargoyle effect," this stream of water – actually the output of a number of jets – emerges from the towers to give the realistic impression that the water is spouting directly from the pursed lips of the faces. There's a huge LED video screen visible behind the

glass face, so we weren't able to use a large array of bronze nozzles.

Indeed, there was a premium on invisibility: The water appears to emerge from the mouths of the projected images; when the flow stops, the source of the water has to disappear. We'd created systems in the past with clear materials and invisible sources of water, but even with that background, we all knew that this system was different and would involve a great deal of design development to make it work visually.

Our solution involved development of an acrylic box that includes an array of nozzle openings on its face. This box in turn is mounted flush on the face of the glass-block structure, where it appears as part of the wall with no visual discontinuity. To ensure practical invisibility, water is fed into the nozzle array via clear acrylic tubing.

The solid acrylic nozzles contain internally drilled passages that disperse the narrow flow from the tubing into a spray pattern eight inches in diameter – thereby seriously diminishing the force with which the water reaches people standing in the stream.

The flow/pressure and starting dynamics of the spout effect are adjusted by coupling the pump motors to variable-frequency drives. The drives enable variable start-up and shut-down ramps for the effect – of great importance not only for minimizing the impact of the spray at floor level, but also for accommodating the wildly variable wind conditions that are so much a part of life in Chicago.

We started system development by setting arbitrary benchmarks for flow and velocity, then conducted extensive tests at Crystal Fountains' test facilities with mock-ups to make sure we could follow through with the finished product. This testing included placing people of various sizes in the flow of water (including children and senior citizens) to be sure that a sudden flow of water from the fountain wouldn't cause any kind of injury.

Reflections

As mentioned above, a major element of Plensa's design was about giving visitors a sensation of walking on water in the large reflecting pool. The 1/8-inch depth was established as a standard – enough to give the desired impression without doing anything more than wetting the soles of visitors' shoes.

This was simple in concept but posed a range of technical issues. For one thing, we had to figure out how to introduce the water without anyone seeing the source or disrupting the delicate skin of water. For another, we knew the shallow

Good Company

The Crown Fountain is only one of several spectacular parts of Millennium Park. As mentioned at the outset of the accompanying text, the project involved the work of an array of renowned designers.

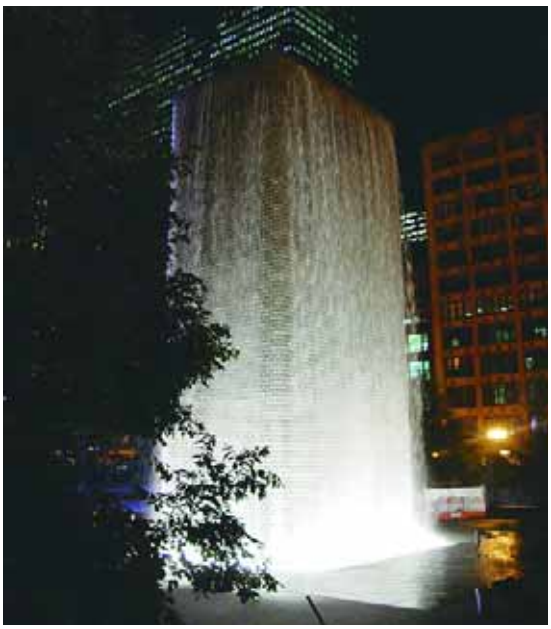
w Designed by architect Frank Gehry, the Jay Pritzker Pavilion is perhaps the most sophisticated outdoor concert venue of its kind in the United States. With a seating capacity of 11,000, the pavilion stands 120 feet high and has a billowing "headdress" of stainless steel ribbons that frame the opening.

A sinuous pedestrian bridge provides access to the pavilion, acts as an acoustical barrier and links Millennium Park to the rest of Chicago's lakefront. A series of criss-crossed steel pipes form an overhead trellis that covers the lawn and houses a state-of-the-art sound system.

w Sculptor Anish Kapoor designed "Cloud Gate," a striking feature of the park's SBC Plaza. Assembled from a series of seamless, highly polished stainless steel plates, the 110-ton sculpture cleverly captures and reflects the Chicago skyline and Millenium Park along its surfaces. Inspired by liquid mercury, the sculpture is among the largest in the world at 66 feet long, 47 feet wide and 33 feet high.

w Kathryn Gustafson designed The Lurie Garden. A U.S.-based landscape artist known for her considerate, emotionally tuned public spaces, she won the commission in an international competition. The year-round garden covers 2.5 acres on the southeast corner of the park and features imaginative sunny and shaded spaces, benches, a meeting grove set among flowering trees, seasonal plantings and dramatic lighting in a true 21st-century landscape.

– L.O.



In addition to the signature spout detail, the fountain features waterfalls emitted from stainless steel troughs that run around the top perimeters of the two towers. Kids quickly pick up the timing for each effect and line the base of the monoliths when the water is about to flow. Some stay in for the duration, while others step away from the torrent.

water would heat quickly under the summer sun. In addition, the overall water system had to accommodate the substantial flow down the tower walls and from the spouts.

These considerations drove us to develop a system that creates a convincing illusion of shallow depth while meeting all of the circulation, filtration and concealment issues.

All of this had to be accomplished atop a massive underground parking garage. (In fact, the entire park was built over a multi-level parking structure.) As a result, we didn't have room for a huge reservoir; instead, we used the full footprint of the fountain area and suspended the granite pavers over a shallow (but collectively large) reservoir below.

The pavers sit on prefabricated pedestals and the water is introduced via a manifold system from below, welling up in the narrow gaps between pavers. The amount of water and size of the gaps took considerable testing to ensure that the flow was invisible.

Surge capacity for the entire system was, of course, a major consideration in system design. A collection trough runs around the full perimeter of the reflecting pool to handle the flow. The towers also have independent reservoirs that serve as sources for their water effects and handle a portion of the surge capacity. This integrated system enabled us to run the skin of water right up to the bases of the towers.

Water level is controlled by a series of electro-mechanical float switches that activate at different set points. These set points are keyed to the operating parameters of the fountain and take into account such factors as pool draw-down and lighting protection. When a low water level is sensed, a solenoid valve allows fresh city water to enter the system reservoir. Once the valve is opened, the system monitors the water level by observing the on/off states of the float switches.

All of this works to create seamless reflections of the faces on the towers as well as the surrounding Chicago skyline. Indeed, the reflecting pool is an ever-changing canvas of moving light and images upon which visitors move and thereby become part of the artwork. In very special ways, this fusion of physical movement and visual interaction links the energy of the city to the people who inhabit Crown Fountain's moving tapestry.

Falling Waters

The towers themselves are quite remarkable in their function and sophistication – all while retaining a profoundly simple aesthetic presence. Because they are made of glass, the internal structural,

Continued on page 60

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r **August 1999** (Vol. 1, No. 4)
Anderson on stream design; **Adams** on community waterparks; **Gutai** on spa hydraulics.
r **October 1999** (Vol. 1, No. 5)
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r **December 1999** (Vol. 1, No, 6)
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r **April 2001** (Vol. 3, No. 3)
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r **May 2001** (Vol. 3, No. 4)
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r **January 2004** (Vol. 6, No. 1)
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diGiacomo & Holden on watershaping's role; **Allen** on integrated spaces; **Grusheski** on a river's history.
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lighting, audio-visual and mechanical elements are all visible and were designed to become part of the artwork itself.

Stainless steel troughs run around all four sides of the towers' tops. The front sides (with the LED panels) can operate independent of the troughs on the other three sides, with the rate of flow down the face and the sides determined entirely by the rate of flow that is fed up to the troughs.

Based on the flows tested in demonstrations, the average spill rate out of the troughs is 20 gallons per minute for each linear foot of the trough. Depending upon wind speed, however, the pumps will provide flows ranging from 0 to 35 gpm per linear foot. An anemometer located at the top of each tower monitors the wind speed, reducing pump speed and flow as the wind picks up. When the winds spike, the flow stops altogether to prevent an undesirable misting effect.

We spent a lot of time with the design team storyboarding all of these water effects. The ultimate sequence includes the pursed lips and spouting water followed by a torrential downpour from the tops of the towers. Kids playing in the fountain have been quick to figure this out, and there's a tremendous sense of anticipation as they wait both for the spout and then the downpour – after which the towers revert to a more sedate flow as the next face appears on the LED screen.

The faces currently appear at random, and the programming we did allows for steady addition of new faces to the sequence. It certainly would have been much easier to set things up for a limited range of faces in a certain order, but the project specifications called for continuous change and expansion as an expression of the artistic intent, so that's the path we followed.

The operator's control station (OCS) is the nerve system for the entire fountain complex. Its primary purpose is to monitor all aspects of waterfeature operation, perform routine system tests, send warnings and alarms and, if required, shut down the system for safety reasons. It is linked to the audio-visual sequencing system in such a way that the "visual show" controls the spitting nozzles and waterwalls and processes input on wind speed and fountain status generated by the OCS. The interaction of these two control systems is designed for maximum flexibility.

The timing and flow rates for the tower troughs and the gargoyle pumps were established in coordination with Jaume Plensa and the full project team. We adjusted the control system accordingly, and it now monitors everything – vacuum switches, GFCIs, the automated water-treatment/filtration system and more – to maintain desired settings and specifications.

Waterworks

As is the case with any system designed for human contact, water treatment was important both for public safety and to ensure reliable operation.

Water is drawn from the reservoirs and pumped under pressure through sand filters. The filters are sized to control the buildup of waterborne particles and contaminants and operate 24 hours a day, seven days a week. Because water quality is a matter of public safety rather than aesthetics, the OCS constantly monitors the filtration process and produces alarms if there are any failures in the filter units.

Electronic chemical controllers provide continuous monitoring and control of pH levels and chlorine concentration in the reservoir water. When water quality deviates from set parameters, pumps add chemicals as needed. This automatic water-conditioning equipment operates independent of the fountain control system – but reports to it.

This "watchdog" arrangement ensures that all water-treatment systems are performing as required, with the main control package providing the operating power for the chemical system. This means that the chemical system also shuts down

Credit All Around

The Crown Fountain project would never have come to fruition without the full support of the donor family and the contributions of other members of the project team.

Donor: Henry Crown & Company
Artist: Jaume Plensa
Program manager/client representative: U.S. Equities Development, LLC
Architect: Kreuck & Sexton
Structural engineers: Halvorson & Kaye
Mechanical/electrical/plumbing/fire protection engineers: Environmental System Design
Lighting consultants: Schuler & Shook
Civil engineers: Teng Engineers/Architects/Planners
Construction managers: W. E. O'Neil Construction Company
Mechanical contractors: Northwestern Industrial Piping
Electrical contractors: Huen Electrical, Dynamic Electrical
LED display: Barco Projection Systems
Glass structure: Circle Redmont

– L.O.

The spout really is the main event at Crown Fountain, with children lining up at just the right time to catch a cool blast of water from the pursed lips of the faces on the towers. It's a tremendous attraction made possible by a marriage of control technology, hydraulic know-how, the determination of our staff and the formidable genius of the sculptor.

when the main fountain control panel is turned off.

The parameters for water treatment are based on standards of the State of Florida for the treatment of swimming pool water. We've worked in a number of markets and have identified Florida's standards as the most stringent in North America. It simply made sense to apply these high standards in this exceptionally high-use environment.

All of these integrated systems work in the service of what is one of the most intense and inventive aesthetic applications of the watershaping arts we've ever encountered. As it stands, Plensa's remarkable creative vision is now enjoyed daily by thousands of visitors.

Unlike other programmable water effects in which much of the joy comes from the awe inspired by modern technology, this system is unique in the way it integrates the citizenry of Chicago within its overall program. There's great fun in watching children and the young at heart frolic in the water, but there's also a profound sense of civic identification that illustrates how a community consists of individuals and how their faces define its character.

For our part, this project is a crowning achievement in our portfolio of fountain technology – a source of pride and pleasure that will stay with us in the smiles it brings to our faces and to those of the people of Chicago.

Of Interest

The following information has been provided to WaterShapes by product suppliers. To find out how to contact these companies, look for the Product Information Card located on page 58.

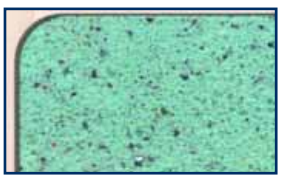
Pool/Spa Product Catalog

Circle 135 on Reader Service Card

BALBOA DIRECT has published a catalog on its full line of pool and spa products. The 44-page booklet covers EcoMatic salt chlorinators, outdoor control centers, spa-side controls, wired and wireless remote controls, temperature sensors, circuit boards and a range of accessories including fiberoptic and LED lighting, ozone sanitizing systems, GFCI switches, electrical components and more. **Balboa Direct**, Tustin, CA.

Pool Finish

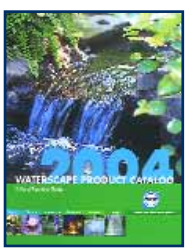
Circle 136 on Reader Service Card



PEBBLE TECHNOLOGY has introduced Pebble Fina, a pool finish with a smooth texture and a refined aesthetic look. The system includes silica and other natural materials for enhanced durability; colorful aggregates selected from around the world; and six European-inspired colors (blue, aqua, gray, pale blue, black and white) – most containing small seashell pieces to add sparkle. **Pebble Technology**, Scottsdale, AZ.

Waterscape Catalog

Circle 137 on Reader Service Card



OASE has published a catalog on its complete line of waterscape products. The 52-page, full-color booklet covers water-movement equipment (pumps, specialty systems, fountain nozzles and floating fountains), water-quality products (filters, clarifiers and skimmers) and lighting systems as well as accessories, kits and software for pond design and decoration. A planning guide is also included. **OASE,** Ventura, CA.

Commercial Pumps

Circle 138 on Reader Service Card

PENTAIR manufactures the EQ Series of commercial-grade pumps. Designed for durability, efficiency and quiet operation, the units feature 6-inch suctions and 4-inch discharges and are also lightweight, corrosion-resistant and suited to a wide range of commercial water applications. A unique impeller system moves more water more quickly, which means the motor doesn't work as hard and lasts longer. **Pentair**, Sanford, NC.

Misting System

Circle 139 on Reader Service Card

MISTAMERICA offers TrueFog misting systems for use in residential and commercial settings. Capable of reducing outdoor temperatures by as much as 30 degrees, the systems can be used to enhance the appearance of landscapes, expand living areas, attract the attention of passersby and control dust and flying insects. Easy to install or retrofit, the systems come with long warranties. **MistAmerica,** Scottsdale, AZ.

Pool Safety Covers

Circle 140 on Reader Service Card

AUTOMATIC POOL COVERS offers the AutoGuard line of pool safety covers. Available in both under- and top-track configurations, the coated-vinyl covers come in seven standard colors (gray, charcoal, light blue, navy, royal blue, tan and green), fit almost any pool and feature a bow-resistant lead bar and SmartMotion, a key-operated system with maintenance-reducing diagnostics. **Automatic Pool Covers**, Fishers, IN.

Structural-Repair System

Circle 141 on Reader Service Card

AMERICAN POOL RESURFACING has introduced the Torque Lock system for stabilizing structural cracks on any solid cementitious surface. The system's staples are countersunk into the structure, so they can easily be hidden by plaster, tile or stone. They come in standard 3- and 6-inch as well as custom sizes and create 5,000 pounds of torque between the steel reinforcement pins. **American Pool Resurfacing**, Delray Beach, FL.

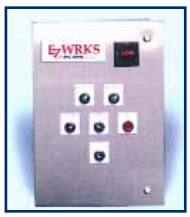
Glass-Tile Catalog

Circle 142 on Reader Service Card

VIDREPUR has published a catalog on its full line of glass-tile products. The 36-page, full-color booklet displays the range of available colors as well as several standard patterns – transitional fades, borders, mixes and mosaic designs – along with many pages of application photographs. Technical specifications are offered, as are installation instructions for both paper- and mesh-mounted sheets. **Vidrepur**, Miami, FL.

Pool-Control Panel

Circle 143 on Reader Service Card



WRKS ELECTRIC has introduced the EZ WRKS Mac Series of control panels for pool management and protection. The secure, weather-tight, stainless steel box has filter and cleaner timers inside. On the panel's face are switches for the filter, heater and cleaner, pool lights and the dual, GFCI-protected utility outlet on the bottom of the unit. A red indicator light warns of potential problems. **WRKS Electric**, Horsham, PA.

Ceramic-Tile Mosaics

Circle 144 on Reader Service Card

ARTISTRY IN MOSAICS has published its 2005 product catalog, an eight-page, full-color brochure on its line of hand-crafted mosaic designs in frost-proof ceramic tile. Standard products include dolphins, crabs, marlins, koi, mermaids, turtles and more. There's also the Shadow Line, which adds dimension to a pool by projecting gray-tile "shadows" of sharks, dolphins and turtles onto the pool floor. **Artistry in Mosaics**, Fort Pierce, FL.

Hand-Held Photospectrometer

Circle 145 on Reader Service Card

ACU-TROL has introduced Acu-Check3, the first hand-held, battery-operated device offering complete pool and spa water testing via photospectrometry. The device, which uses basic DPD chemistry and is designed to be used with reagent tablets (three packets of 30 included), is designed for commercial or residential use and provides an easy-to-read digital display with accuracy within 0.1. **Acu-Trol**, Auburn, CA.

Watergarden Products

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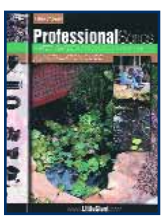

LITTLE GIANT offers a catalog covering its Professional Series of watergardening products. The 16-page, full-color brochure opens with an installation guide defining typical elements of watergarden construction, then covers complete kits, liners, external pumps, submersible pumps, skimmers, waterfall bio-filters, water-treatment chemicals and accessories, including lighting, valves and fittings. **Little Giant,** Oklahoma City, OK.

Continued on page 64

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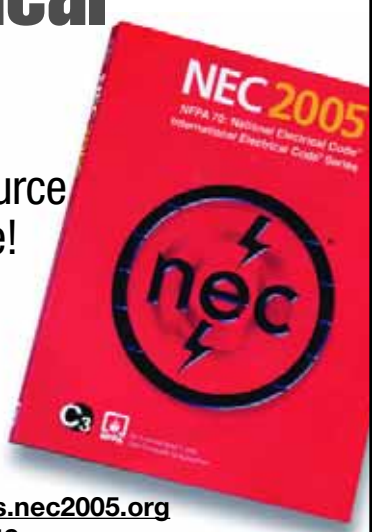

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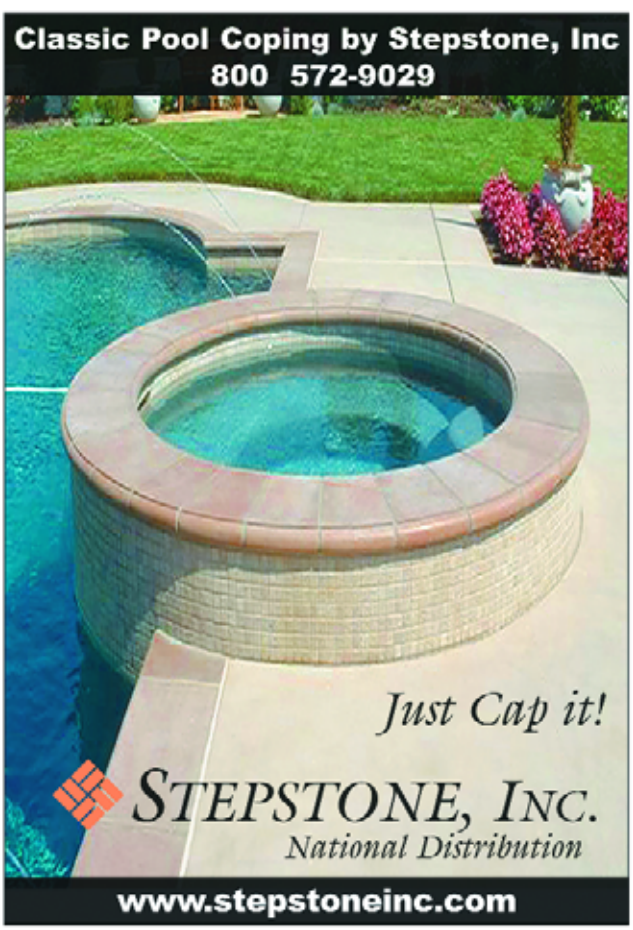

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Robotic Pool Cleaner

Circle 147 on Reader Service Card

AQUA PRODUCTS has introduced the Aquabot Turbo T2 robotic pool cleaner. The device has two motors, with one acting as the robot's brain and guidance system and allowing the robot to scrub and move; and the other feeding a series of washing jets to get at difficult-to-reach debris and vacuum a pool's floor, walls and most stairs to get rid of fine sand, silt and algae as well as large leaves and twigs. **Aqua Products**, Cedar Grove, NJ.

Deck-Drainage System

Circle 148 on Reader Service Card

DECK-O-SEAL offers the Deck-O-Drain drainage system for concrete pool decks and patios. Made of tough, long-lasting, wear-resistant and non-corrosive PVC, the system collects and carries water away in channels 1-1/2 inches wide and 3-1/4 inches deep. The product comes in three standard colors (desert tan, stone gray or dura-white) and two special-order colors (black or redwood). **Deck-O-Seal**, Hampshire, IL.

Pump Motors

Circle 149 on Reader Service Card

A.O. SMITH has published Bulletin 1082 on its pump motors for swimming pools and spas. The 12-page booklet offers a motor-replacement guide, mounting diagrams, a selection guide and information on C-flange pool motors (single speed, two speed and three phase), square-flange pool motors (single speed/energy efficient, two speed and three phase) and pool-sweep motors. **A.O. Smith,** Tipp City, OH.

Programmable Controller

Circle 150 on Reader Service Card

SANTA BARBARA CONTROL SYSTEMS offers the Chemtrol PC7000 controller for automatic governance of water chemistry and filtration. Designed for commercial- and public-pool applications, the device includes a solid-state sensor for free chlorine, ORP and pH control, shock treatment and chloramine control routines and full remote-control capability. **Santa Barbara Control Systems**, Santa Barbara, CA.

Bronze Pumps

Circle 151 on Reader Service Card

AQUA-FLO offers the A Series pump line for swimming pool and spa applications. The pump, motor bracket, impeller, volute and trap are cast as a unit from corrosion-resistant bronze and are available in sizes from 1/2 to 3 horsepower as well as in commercial 3- and 5-horsepower models. Each unit is equipped with a heavy-duty, 56-frame motor; non-motorized units are also available. **Aqua-Flo**, Chino, CA.

Artistic Waterfeatures

Circle 152 on Reader Service Card

SPIRIT ELEMENTS offers water-art features for installation in a variety of settings, both residential and commercial. The fountains combine organic materials, handcrafting and, in some cases, a unique copper patina to produce shimmering surfaces and attractive textures. Some lightweight models can be hung on walls, bringing the sounds of flowing water to a full range of interior spaces. **Spirit Elements**, Boulder, CO.

Artificial Rock

Circle 153 on Reader Service Card

UNIVERSAL ROCKS USA offers artificial rock based on Australian sandstone formations. Available as self-contained, fully plumbed pond or waterfall units or as waterfalls, ponds, stone creek beds, cascades, waterfalls, cover rocks and rockscapes that can be integrated into overall designs, the lightweight materials have also been formed as caves, edge rocks, pinnacles and rock walls. **Universal Rocks USA**, Corona, CA.

Commercial-Pool Catalog

Circle 154 on Reader Service Card

SPECTRUM AQUATICS has published a catalog on its full line of commercial swimming-pool equipment. The 120-page color booklet has sections on assisted-access systems; deck equipment; clean-up necessities; facility accessories; filters and pumps; fittings; heaters and covers; paints and repair systems; lane markers and hardware; safety and training systems; toys and more. **Spectrum Aquatics**, Missoula, MT.

UV Water Treatment

Circle 155 on Reader Service Card

ADVANCED CONTROL LOGIX has introduced a new reactor for its AWDX UV-water-treatment system. Designed for swimming pool and spa applications, the reactor's stainless steel vessel features a microprocessor-based control panel supported by a temperature sensor, a 50% power option for a longer lamp life and an easy-to-remove lamp/thimble assembly for quick cleaning. **Advanced Control Logix**, Colfax, CA.

Faux-Stone Equipment Cover

Circle 156 on Reader Service Card

SAVIO ENGINEERING introduces a durable, lightweight cover for its line of Skimmerfilters and Livingponds filtration systems. The covers provide natural-looking camouflage in the form of a granite outcropping made with impressions taken from actual stone. Ideal for maintaining a complete naturalistic illusion in pond environments, one size fits all company products. **Savio Engineering**, Santa Fe, NM.

Automatic Pool Cleaner

Circle 157 on Reader Service Card

ZODIAC POOL CARE offers the G4 automatic cleaner for inground pools. The suction-side system, which is pre-assembled and installs in minutes with no tools, removes dirt, debris, bugs, twigs, leaves, sand and pebbles and has just one moving part. It also features a self-adjusting flow-control valve to regulate water flow and ensure peak performance, even with low-horsepower pumps. **Zodiac Pool Care**, Pompano Beach, FL.

Sand-Filter Medium

Circle 158 on Reader Service Card

ZEOTECH CORP. offers Zeobrite medium for sand filters. Made up of a naturally occurring mineral, the material traps clay and silt down to three microns and also adsorbs water contaminants including ammonia and chloramines. This combination, which works in all sand filters, produces superior water clarity and is environmentally sound – and the product lasts as long as normal filter sand. **Zeotech Corp.**, Fort Worth, TX.

Need More Information?

Use the Reader Service Card!

Circle 45 on Postage Free Card

By Mike Farley

Concrete Discussions

Concrete is so essential to the work of watershapers and so pervasive in all forms of construction that it's a bit too easy to take it for granted. Using myself as an example, I'll confess to having fairly thin knowledge of the material's history – until, that is, I looked through *Concrete: A Pictorial Celebration* (published by the American Concrete Institute in 2004).

This wonderful, 260-page book offers a (mostly) visual tour of the fantastic and utterly essential applications of concrete that have indelibly marked the worldwide advance of modern society. It's organized into several sections, each one chock full of great photos accompanied by informative (but brief) textual passages.

It's not a technical discussion by any means; instead, it's an almost dizzying tour of the seemingly infinite ways that this durable and flexible material has transformed our lives.

It begins with a section on the history of concrete, and the information was a surprise to me to learn that concrete's use as a common building material is of much more recent vintage than I had thought. In fact, the book indicates that the first batch plant for concrete didn't appear in the United States until 1891 – and that the first concrete street wasn't built until 1909.

From that time forward, however, we witness an absolute explosion of concrete applications and technology – all covered in a series of additional sections.

As one might expect, there is an extensive section on our transportation infrastructure, including highways and roadway bridges. There is a section that deals with concrete's use in residential architecture, featuring the soaring cantilevered decks of Frank Lloyd Wright's Fallingwater, and another that covers applications in high-rise buildings and other substantial structures.

One of the most interesting sections has to do with concrete's use in public-works projects, including images of aqueducts and dams and a particularly compelling look at the trailblazing construction of Hoover Dam. That Nevada landmark is particularly noteworthy when you consider the daring involved in undertaking so huge a project after just two short decades of experience in using the material for large-scale projects.

Equally fascinating is the section that deals with concrete in conjunction with water. There's no mention of swimming pools here. Instead, we see seawalls and foundations for bridges sunk directly into the floors of oceans, lakes and rivers. There is also a section that looks at the bold use of concrete in the cantilevered structures that comprise sports stadiums and other large public venues.

Some of the most surprising entries in the book have to do with the use of concrete in the arts and in cultural or religious contexts. There are wonderful images of public monuments made of concrete as well as huge churches, synagogues and temples. And there are some impressive works of art, including the statue of Christ overlooking Rio de Janeiro's harbor.

Although this publication doesn't offer a shred of how-to information or a single insight into the intricacies of concrete science, it *does* offer a powerful testimonial to the creative flexibility that concrete affords all of us who use it. Through these striking images, we discover the true, expressive nature of a material that is a vital, integral part of our work as watershapers and definitely has been the foremost design/construction material of the modern age.

Ultimately, the book challenges us, with every page and image, to think about ever more creative ways to use a material that has, as much as any other, transformed our lives in barely a century. WS

Mike Farley is a landscape architect with more than 20 years of experience and is currently a designer/project manager for Gohlke Pools in Denton, Texas. A graduate of Genesis 3's Level I Design School, he holds a degree in landscape architecture from Texas Tech University and has worked as a watershaper in both California and Texas.

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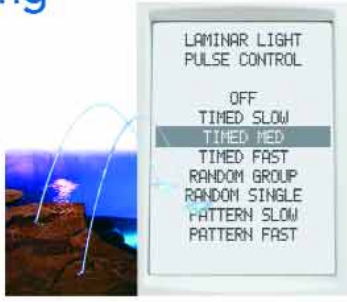

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