

Inside: Stephanie Rose on Small-Scale Design

WATER SHAPES

Design • Engineering • Construction

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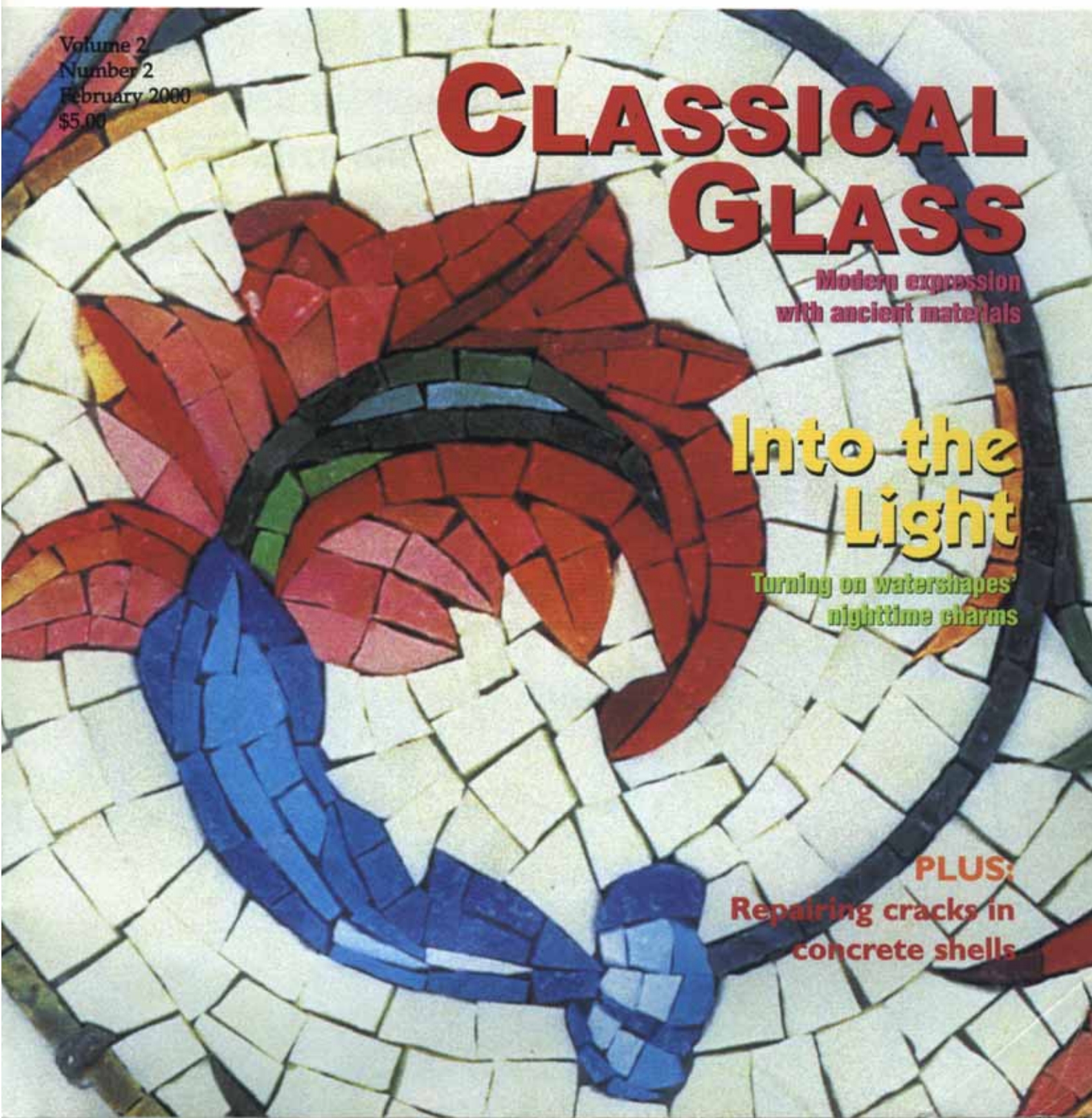
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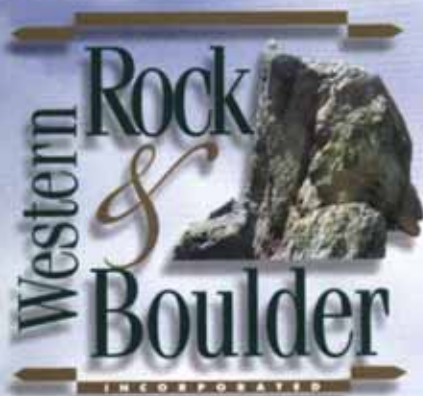
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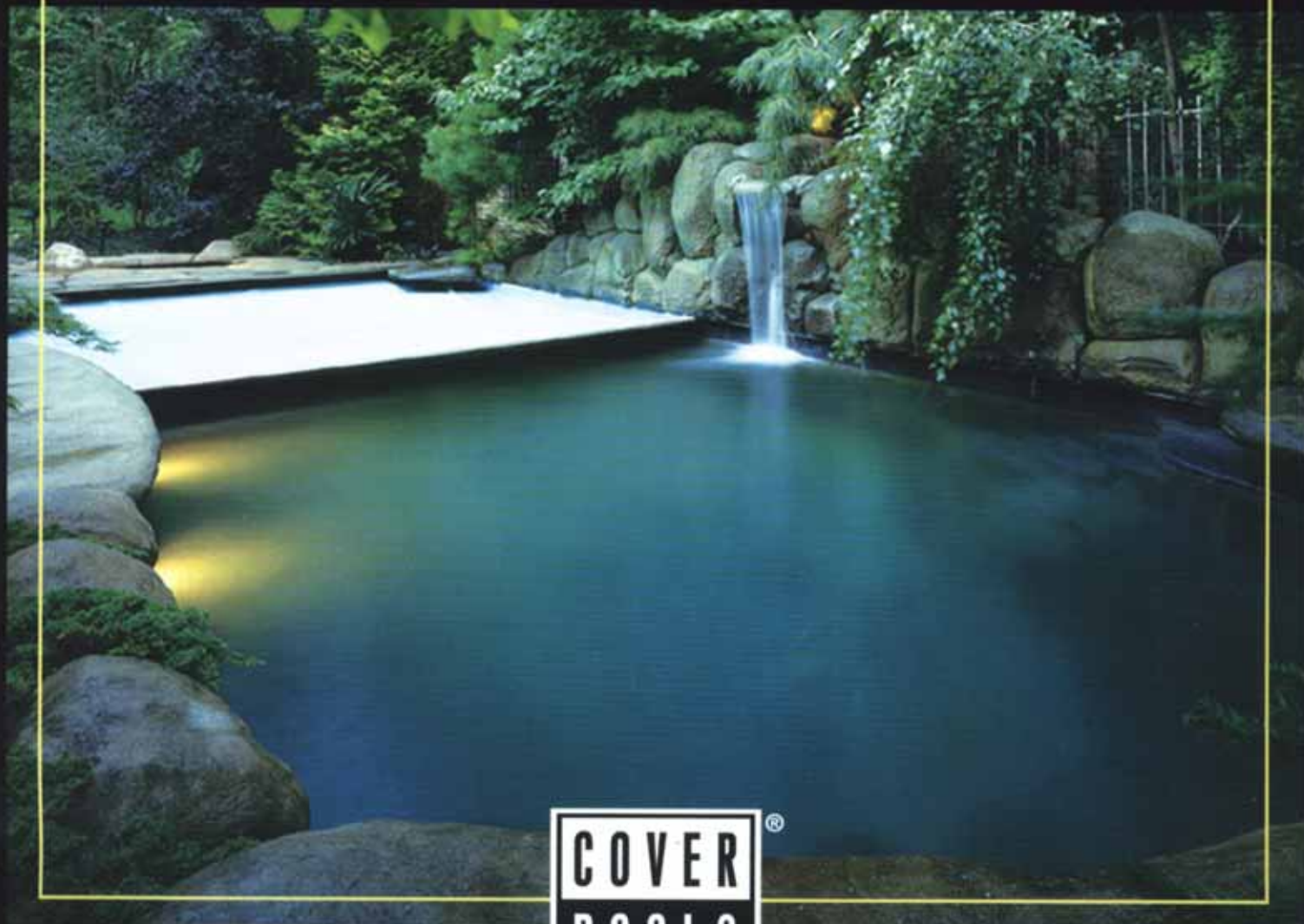


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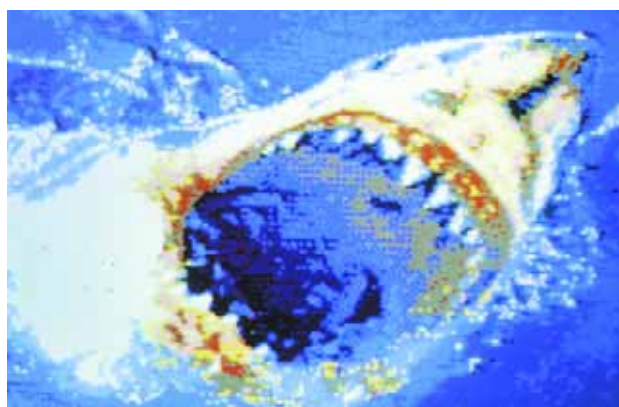
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On the cover:

Photo courtesy

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Pride, Not Pretense

There's an important point about this magazine that I'd like to clarify: A small number of readers have commented that because this magazine tends to cover projects that are on the "high end" of the spectrum in terms of cost, the concepts we encompass somehow do not apply to the work they do.

Glad you brought it up!

Frankly, I've noticed a perception among watershapers that there's some sort of Great Divide out there between those working with wealthy clients and those who work with middle-class customers. This unfairly lumps mid-range contractors in with the cookie-cutter corps, and I agree that's a bad rap. There's also the perception that, by working with prospects who cannot pay \$100,000 for their watershapes, you mid-rangers are somehow not allowed to use your imagination or add value to the work you do.

To that in particular I say, "Bunk!"

The fact is many of the ideas that are presented in the pages of *WaterShapes* can be applied to projects across a broad swath of price levels. You don't have to be building at the so-called "high end" to present your customers with creative ideas that lend interest, efficiency or beauty to the work. You don't need to work for millionaires to employ classic design influences or apply sound hydraulic designs.

Let me get specific: In our January issue, columnist Brian Bower described in some detail a variety of mostly small waterfeatures he offers to clients as part of larger pool/spa projects. As he described them in his "Aqua Culture" column, these features often amount to little more than an arcing stream of water or two mounted in the deck, or a small sheeting waterfall pouring into one end of a pool.

Often, the cost to the customer is just a few hundred bucks, but the value in terms of interest and enjoyment can be immeasurable.

Another example: Way back in our second issue, April 1999, landscape designer Roger Hopkins discussed his love of using real rock in his installations. Although some of the profiled projects were truly massive, others were quite compact and could easily be placed in a backyard setting in conjunction with a swimming pool or spa. For the most part, the artistry isn't in apt placement of tons and tons of stone. Rather, it's all about brilliant placement of a handful of well-chosen pieces — modest increases in costs balanced against extraordinary gains in aesthetic value.

Taking pride in your work does not require million-dollar budgets, exotic materials or intricate design detail. Quite the contrary: Making the most of the project at hand by finding ways to add value within the customer's budget is the key to elevating your craft. Sure, these value-adding items will often raise the price of a watershape, but when the client understands what's going on and is willing to pay, then you've succeeded in doing what so many people say they want to do: You've "raised the bar."



WATERSHAPES

Editor

Eric Herman — 714.685-1854

Associate Editor

Melissa H. Anderson — 315.457-0504

Contributing Editors

Brian Van Bower

Stephanie Rose

Jim McNicol

Art Director

Rick Leddy

Production Manager

Patty Harris — 805.495-5401

Circulation Manager

Simone Sanoian — 818.715-9776

Director, Marketing and Sales

Stephanie Behrens — 818.715-9776

National Sales Manager

Camma Barsily — 310.979-0335

Publisher

James McCloskey — 818.715-9776

Publishing Office

McCloskey Communications, Inc.

P.O. Box 306

Woodland Hills, CA 91365

Tel: 818.715-9776 • Fax: 818.715-9059

e-mail: main@watershapes.com

website: www.watershapes.com

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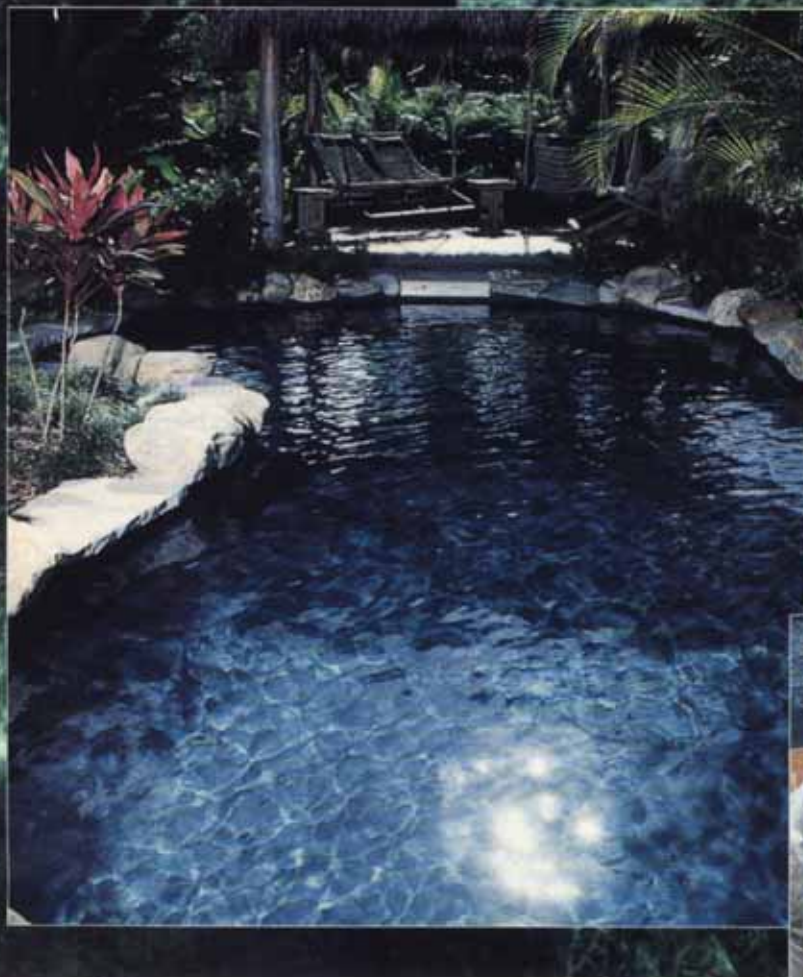

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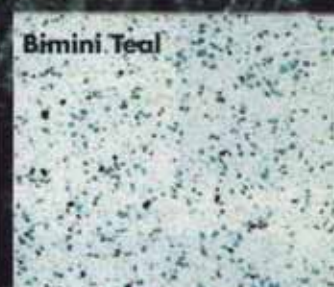
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IN THIS ISSUE

FEBRUARY'S WRITERS

Mike Hersman is president of Night-Hawk Lighting, a landscape lighting design/supply firm based in Miami. With an engineering degree, Hersman began his career in 1971 and has since worked for a variety of engineering and design firms specializing in exterior lighting systems. He recently wrote *Low-Voltage Landscape Lighting*, a self-published book on planning, design, equipment selection, installation, maintenance and safety of low-voltage lighting systems. He has traveled extensively, working as a consultant on projects in the United States and abroad.

Ken Macaire, owner of Environmental Aesthetics of North Hollywood, Calif., has been a landscape designer since 1967. From 1973 to

1984, he owned and operated Macaire Nursery, a landscape supply and nursery firm. During that time, he began developing techniques he now uses to create high-end artificial rock formations. Beginning with modest waterfalls installed in conjunction with small ponds, Macaire's work quickly expanded into larger pool and spa installations. He now works with a variety of contractors, landscape designers and architects. His firm has won several National Spa & Pool Institute Design Awards for projects that have included his artificial rock installations.

Mike Gravenmier is founder and owner of Advanced Grouting & Epoxy Techniques, an Orlando, Fla.-based contractor specializing in



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the pressure grouting of unstable soils and the repair of structural cracks in watershape shells and concrete slabs. He began his work in these specialized fields 17 years ago, when he went to work for a Florida pressure-grouting firm. He founded his own firm in 1984 and quickly moved into the complementary field of epoxy injection. Gravenmier has produced an instructional video detailing both of these repair techniques and routinely makes himself available for consulting and for training of other contractors interested in moving into epoxy-injection and pressure-grouting work.

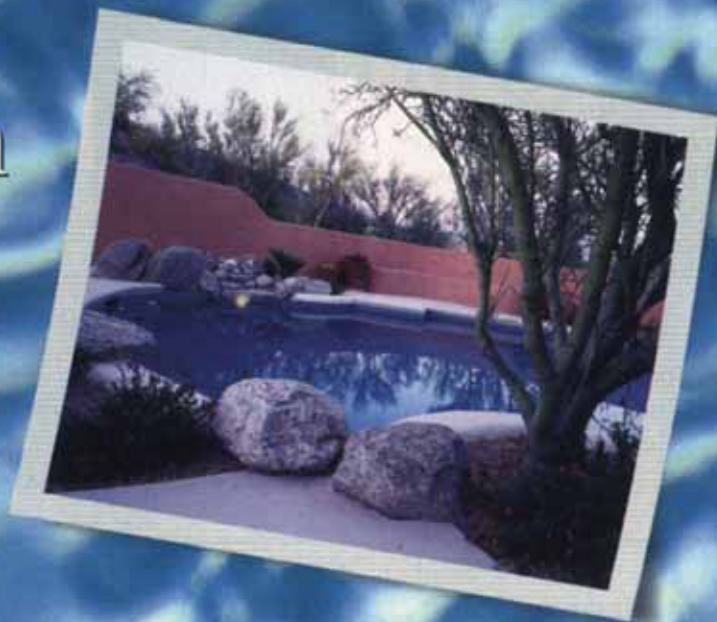
Dan L. Andrews is president of Andrews Consulting Inc. and serves as the U.S. mar-

keting representative for Mosaicos Venecianos de Mexico. During his time with the watershaping industry, he has developed marketing and operations-improvement programs for builders and retailers and conducts seminars for professional groups on techniques for ornamenting pools and spas with glass tile. He is also widely known as a business consultant. With a specialty in visual merchandising, he has developed marketing, customer service, sales and management-training programs for a variety of firms ranging from health-care organizations to independent retailers. He has written ten books, including *Bottom-Line Marketing*, a how-to marketing text currently available through the National Spa & Pool Institute.

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Fear Not The Future

By Brian Van Bower

Not long ago, a gentleman who had attended one of the Genesis 3 schools was discussing an encounter he'd had with some other pool builders. Much to his surprise, one of the people he was talking to told him he'd been crazy for taking the time and spending the money to attend the school.

To me, this is indicative of the sort of mentality that holds our industry back. What the Critic was saying was that his colleague was foolish to have attended the equivalent of a college-level course in aquatic design – a course designed to help him advance in his own line of work.

It boggles the mind, like that whole “dead architect” question and the difficulty some people have in valuing what we can learn from designers who have gone before us. When I'm asked what we, as exalted pool builders at the turn of the millennium, have to learn from masters like Frank Lloyd Wright or from leading modern architects, landscape architects and other visionaries, I say *just about everything*.

Once you open your mind to the vast stores of knowledge that are out there, it's amazing what you can learn – and how much you don't know. I believe it's a basic fear of the unknown that results in attitudes like those expressed by the Critic. The fact is, any educational program, whether through Genesis 3 or NSPI or any other organization, is a good thing. Indeed, only through the process of education can we as an industry really face the challenges of the future.

WHEN TIMES ARE GOOD

Of course, when you talk about the value of education, many people will say (or at least think) that they've heard it all before and that when you get right down to it, they already know enough about their trade as it is. Sure, there's some value in maybe picking up a thing or two here and there, but as for really opening the gates to lots of new ideas – “Well, maybe I'll see you later.”

That's a fairly seductive position, given the current robust economy. We are in a time when the economy is good, people have disposable income and are spending money on



From my perspective as a pool builder, good times are the best times to embrace a broad range of ideas.

things like art, luxury cars and custom watershapes. They are reaching further for the finer things in life, developing greater appreciations for art and craft with each passing day.

While this increase in appreciation for the good life continues and demand is moving forward, we actually see our industry working beyond its capacity to perform. You hear it all the time: People simply aren't able to get to all the work they have coming in. So why on earth would we

want to expand our knowledge and improve what we do when we're already selling so much product? Who has time to learn when there's real work to do?

Well, here are a few things to consider in these fat times: First of all, you don't have to be a student of history or economics to know that we cycle through peaks and valleys. Right now we happen to be riding an unbelievable, almost unprecedented crest. One thing we know for sure is that there will again come a time when the economy will slow and demand will shrink as a result. How will we as an industry and as individuals respond to that pressure?

The last time that happened, early in the 1990s, a whole lot of people went out of business, never to return. We saw an increase in production of cookie-cutter pools, and to my way of thinking, the industry debased itself in its effort to survive. Flipping this situation entirely on its head, I believe that by taking advantage of the current prosperity and seiz-

ing the opportunity to expand what we do and what we know, we will position ourselves to respond (without similarly debasing ourselves) when things cool off again.

Another point to consider along these lines is the notion that if our industry is not meeting the current demand, then somebody else will recognize the opportunity and step in to fill the void. Perhaps landscape architects who like working with water will expand into the traditional realm of the pool builder. The point is not that these watershapers are, per se, a threat; rather, it's that many in the landscaping trade are accustomed to learning as a natural (even mandatory) part of their professional lives and will be mentally prepared to do what it takes.

From my perspective as a pool builder, good times are the best times to embrace a broad range of ideas. If we do it now, when times are good, we can accommodate change and growth and stretching

before we find ourselves in a situation where we need to react. To face the future, in other words, I believe we must learn to embrace the process of learning, both individually and as an industry.

FUTURE TRENDS

Fact is, no one knows what's going to happen in the future. We can, however, make some educated guesses based on the things we see happening right now. Having just seen the zeros tumble on a New Millennium, I feel empowered to take a stab at some predictions – call it Brian's List of Industry Prognostications, or BLIP for short.

❑ **Matching sets.** We'll see a time when equipment will be sold as true packages, with a matched pump, filter, heater and more as part of a well-designed system. Gone will be the days when we selected individual components to create an equipment set. This is already happening to an extent, but I believe manufacturers will get even more

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involved and assume much greater responsibility for putting systems together.

In doing so, they'll be borrowing a page or two from our colleagues in France, where equipment sets have long been sold in ready-made vaults or been set up artfully in the field with everything plumbed, bonded, grounded, set and balanced — ready to go! You look at their equipment pads and you see something that looks like a watchmaker had a hand in assembling it. In fact, you see more care put into things that the client will never see than many builders in the United States put into highly visible workmanship at the waterline.

□ **Under control.** Unless I've lost it altogether, there will be an increase in acceptance and development of controls and automation. This process is another that's already under way, but I think that the mounting demand among consumers for greater and greater convenience will accelerate the process and speed development of

products that fill the need.

I remember the first time I sold a low-voltage control system, an old Jandy Time Master. At the time, my clients snickered at the idea and bought the thing mostly to show off. I'm not sure they really appreciated or understood the value of automation in conjunction with a swimming pool at the time, but I'd be willing to bet it'd be a priority for them now!

These days, in fact, you talk to customers about controllers and they define them as necessities. We live in an age of increasing automation, and it really seems out of whack to more and more people to spend \$75,000 on a pool and face the fact that they still have to go into the bushes to turn valves. Much better, they now say, to be able to call home from a cell phone and turn on the spa so that it will be hot and bubbling by the time they get home.

And it won't be long before computers set off a new chain of revolutions in watershape care. In fact, control sys-

tems are already being linked to home computers so that, rather than breaking out reagents and vials, consumers will keep tabs on their pH and sanitizer levels with a few strokes at the keyboard.

□ **Hitting the optimums.** Increased demand for energy efficiency is another area that will gain momentum as the New Millennium unfolds.

Partly, this has to do with basic hydraulics and all we've learned about plumbing sizes of late. For years, we've been shown, pools have been built with undersized plumbing and filters and oversized pumps. As our understanding of energy efficiency grows and the consumer demands that we pay attention to it, we will turn those mistakes upside down by using adequate plumbing with big filters and small pumps.

I also think this trend will influence watershape structures as well. We may begin to see the advent of insulated pool shells in some areas, for example,

Continued on page 14

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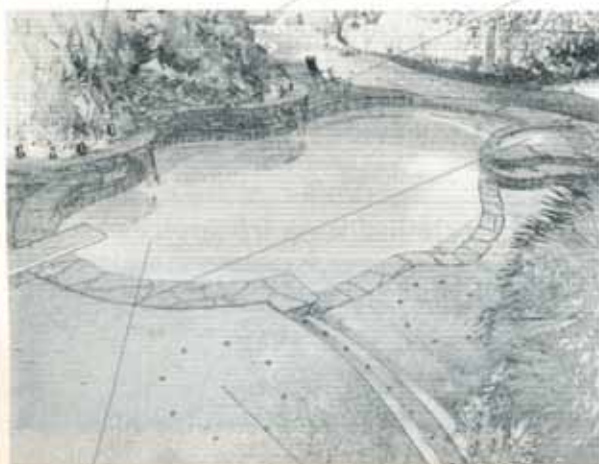
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and certainly a movement toward insulated plumbing. We'll also see more plumbing looped around the entire pool to create further hydraulic efficiencies, not to mention return lines plumbed to fixtures mounted on the floors of pools, where heated water will be more efficiently used and chemicals will be more thoroughly mixed. Indeed, I believe we will become more energy efficient in all areas.

☐ **Quality counts.** Finally, I see a real trend toward craftsmanship. As consumers demand better work, forward-thinking people and organizations will open their thinking to new techniques and alternative materials. Why, for instance, do we hardly ever see pools with granite interior surfaces despite the fact everyone is after both beauty and durability?

I suspect this trend will see a greater prominence for all-tile pools. People often say that tile is expensive, and they're correct – but what other surface

lasts as long? And what is so beautiful? It's not going out on much of a limb to say that we'll see a greater and greater demand for expensive tile and elaborate tile mosaics as consumers begin to see their watershapes as works of art.

Along these same lines, we will continue to see the integration of watershapes with traditional landscape elements, thus increasing their value in the overall environment. Admittedly, we may have a way to go on that last one as far as true increases in value are concerned, but who knows?

GATHERING INFLUENCES

Don't hold me to having all of this occur overnight: Some of these trends may work their ways into our lives quickly, but others may take a generation or two to kick in fully. Whenever these trends take hold, we know one thing for certain: Expanding into these areas will add to the initial cost of jobs. The point to bear in mind is that they

also add tremendous value.

(This begs a question about today's market: What would be wrong with increasing cost and value in a market where we're not meeting the demand as it is? Maybe we'd get fewer jobs, but we'd sure make more on the ones we did because there will always be greater margins associated with increased value. Just a thought.)

Another point to consider: All of these advances require a willingness to learn, to open up to new ideas, to reach out across barriers in our thinking. There are many ways to do that, and one of my favorites is looking at the way things are done in other countries.

In France, for example, you see a much greater emphasis on beauty and design. I traveled to Lyons a few years ago and was blown away by what I saw. I was also gratified to see that I had things to offer that people over there were interested in exploring.

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on this notion of craftsmanship. The Germans are more than a little serious about having everything, from the equipment and the plumbing to the shell and the finishes, be the absolute best quality money can buy. Everything is clean, efficient and shiny – mostly brass and stainless steel – and it's a real eye-opener to anyone who's ever studied equipment pads in the United States.

These distinctions, and our desire in Genesis 3 to force the issue and open the watershaping world to new ideas and ways of executing them, is what Genesis 3's new Global Design Competition is all about. We want to see how U.S. water-shapers stack up against our colleagues overseas and expose people on our side of the world to the values, approaches and techniques used elsewhere.

One of my personal goals is to see a day when we can sit down with experts from foreign markets and discuss common problems and interests. We at Genesis 3 will give the idea a trial run this fall with a trip to the next Lyons show. I'd be willing to bet that just about everyone who takes advantage of this opportunity will come away with something he or she didn't expect to find.

And that's the real beauty of opening up your mind: It may sound simplistic, but until you do, you don't know what you don't know.

When you throw the doors open and begin gathering information, you'll run into things that are unfamiliar and even surprising – better ways to do things in your work, and better influences that can shape your business for years to come.

One of the best chefs in the United States happens to be a friend of mine. His name is Norman Van Aken, and he runs a fantastic restaurant in Coral Gables appropriately named Norman's. What has made him so good for so long is that he takes classic influences and combines them with ingredients from around the world to create what he calls his "New World Cuisine."

I think this brand-new century will see the rise of "New World Water-shapes" and that we'll see classic influences being used in new and creative ways. And if our projects turn out any-

where near as good as Norman's food, we'll be very happy.

But whatever happens and when, one thing is certain: We will all be better prepared to meet the future when we let go of our fear of the unknown!

Brian Van Bower runs Aquatic

Consultants and is a partner in Van Bower & Wiren, a pool-construction firm in Miami. He is also 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.

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Small Solutions

By Stephanie Rose

What do you do with a space that seems too small for a water-shape and too small for plantings?

The answer: *Think small.* You don't have to compromise on style or substance, but simply by thinking on a smaller scale, you'll open up a lot of possibilities you might not have considered.

About three years ago, for example, I was brought in on a job to do a quick fix for a very small but prominent area of a client's yard. The homeowner wanted to completely rework the entire property, but it was clear there was a lot of other work to do first.

The quick fix went very well and the clients were pleased, so they asked me to look at an interior atrium they wanted redone. They wanted some sort of waterfeature there and had approached a few watershapers but were told the space was too small, that it would be too expensive and that it wasn't worth the time.

OPPORTUNITY'S KNOCK

More time passed, and they had grown even more tired of looking at the glass-enclosed eyesore in the middle of their house.

A trapezoidal space about 10 feet by 5 feet, the atrium had a white stucco wall, rock-hard dirt about 6 inches below grade and could be seen from the kitchen, family room, living room, dining room and main outdoor enter-

taining space. It's pure California-style '60s living, a very open environment with many windows both interior and exterior that expose any area of the main living space to views from many angles.

Stuck right in the middle of this space, the atrium needed to blend into the existing style of the house but become a clearer focal point. The owners wanted to hear the soothing sound of water gently flowing in the background; they also wanted to soften up this very exposed space, so plants were a must, which meant we needed to break up the space to contain both a small garden and a small watershape.

This required more specific planning and patience, always with a goal to

make sure the space would be used to its fullest and that not an inch was wasted. This presented a design challenge as we worked to integrate the interior design of the house with a new watershape and landscaping.

As is the case with many of my projects, this house has a very unique style. Wood and natural rock are blended in the walls, ceiling beams and even the floors. The family room, which borders the open side of the atrium with a sliding-glass door, has a concrete floor with large, exposed aggregate. This had originally been an outdoor space and had been brought indoors with a roof and skylights.

In keeping with this style, we went searching for some kind of treatment



for the wall of the atrium that would soften its prominence and maintain its use of natural materials. We settled on chocolate moss stone and other lichen-covered boulders.

As I came to know them, I valued the homeowners for being easy to work with – but very particular about how they wanted the wall to look. To make sure we did things right and at modest cost, I hired a stonemason who would work weekends as a side job. This was perfect: The clients were around while the mason worked, making it easier to achieve the specific look they wanted.

MAKING IT HAPPEN

Once work started, we decided to partially ledger the wall. In the middle of this wall is a window, which allows you to see into the kitchen from the family room.

The mason completed a 5-by-3-foot section to begin with, then together we selected pieces to fill in the next small area. Working in small sections, the process took about three months to complete but resulted in a natural-looking wall that melds beautifully into its surroundings.

No pattern is evident in the ledgering: Larger, flatter stones were specifically selected to lay flat against the wall, which breaks up the ledgered look and shows the unusual stratification and fossil-like qualities of many of these rocks.

We also created true “ledges” using flat stones cantilevered out from the wall; these are capable of holding small pots and allowed us to place plants anywhere on the wall to soften the stone as much as we wanted. We colored the mortar black, adding depth to the wall and lessening any impression that this is a “manufactured” formation.

What about the watershape?

It juts out of the wall as a natural, spring-like waterfeature that has small trickles of water flowing over lichen-moss boulders into a small, 3-inch-deep basin that surrounds the entire rock formation. A removable stone covers the return line and keeps the water flowing gently over the stone instead of shooting up from the hole.

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The basin allows water to flow from any direction over the rocks, creating a soothing sound that echoes off the surrounding windows of the atrium.

The watershape was constructed on a concrete base that was poured in only half of the atrium. This left enough space – about 5 feet by 5 feet – to plant a great interior garden.

ADDING DRAMA

You probably think I'm nuts for getting so excited about such a small space, but small spaces can offer the best opportunity to create unique gardens. The key here is finding the right specimens to complete the environment and make a dramatic statement.

With a skylight above, we worried that the plants would get fried on a hot day. So we started by securing a shade cloth over the skylight on the roof.

Through our many trips to unusual nurseries, we settled on a bamboo specimen that definitely makes a statement:

Bambusa vulgaris has a single, 7-foot-high trunk with about a 4-inch diameter cane. The cane is yellow with prominent green stripes scattered vertically along its length, while the foliage primarily grows from the top of the cane, creating a canopy for other plants below it.

This particular bamboo usually maintains its lonely, single-cane status, but this one proved to be so happy, it grew a friend. We topped that cane about a foot below its benefactor, basically because we weren't sure what to do with it. So far, we're waiting to see what it does over the next year before determining if it will get too large for the atrium and should be transplanted elsewhere. In the meantime, it seems to be staying small – almost as though it knows the consequence of getting bigger is almost certain death by transplanting.

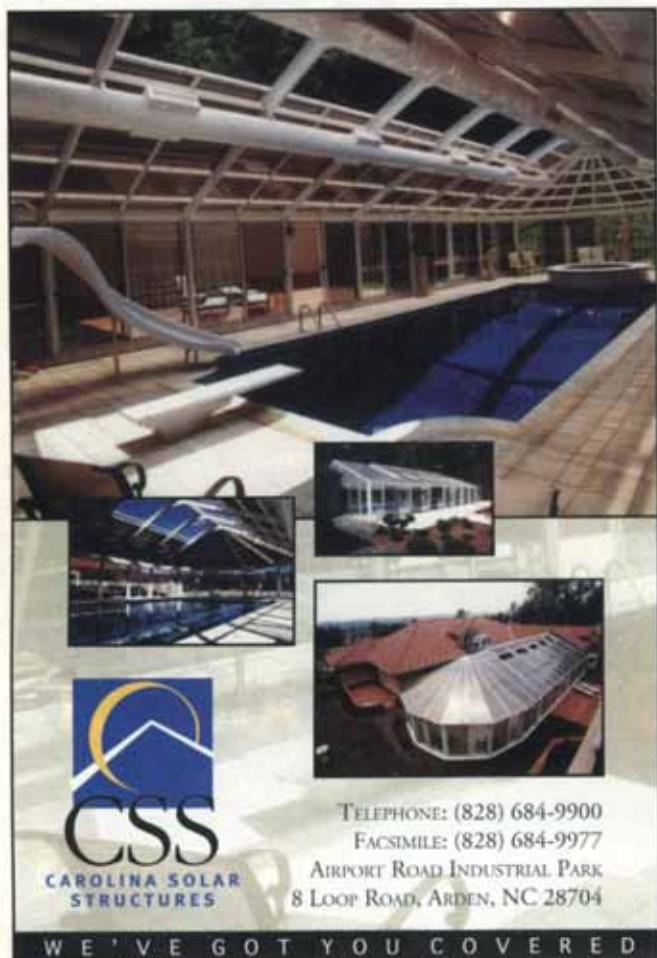
Below the bamboo, we planted three unusual tropical specimens – one variegated, one Bromeliad with

red leaves and a yellow flower, and one an *Asplenium bulbiferum* (Mother Fern). Coral Bells (*Heuchera sanguinea*) and Baby Tears (*Soleirolia soleiroliae*) were added for ground cover. The Coral Bells will produce a profusion of tiny red flowers, while the Baby Tears will spread throughout and help keep the soil moist.

On the ledges, we placed pots with smaller Bromeliads with purple and orange flowers, Needlepoint Ivies and variegated Creeping Fig. The final touch was adding air plants to the crevices we left in the wall. These plants thrive on moist air, which is plentiful in this atrium.

Unfortunately, the plants must be watered by hand to avoid splashing the insides of the atrium windows. So we combined hand watering with a bit of misting to achieve the humidity necessary for these plants to be at their best.

Continued on page 21



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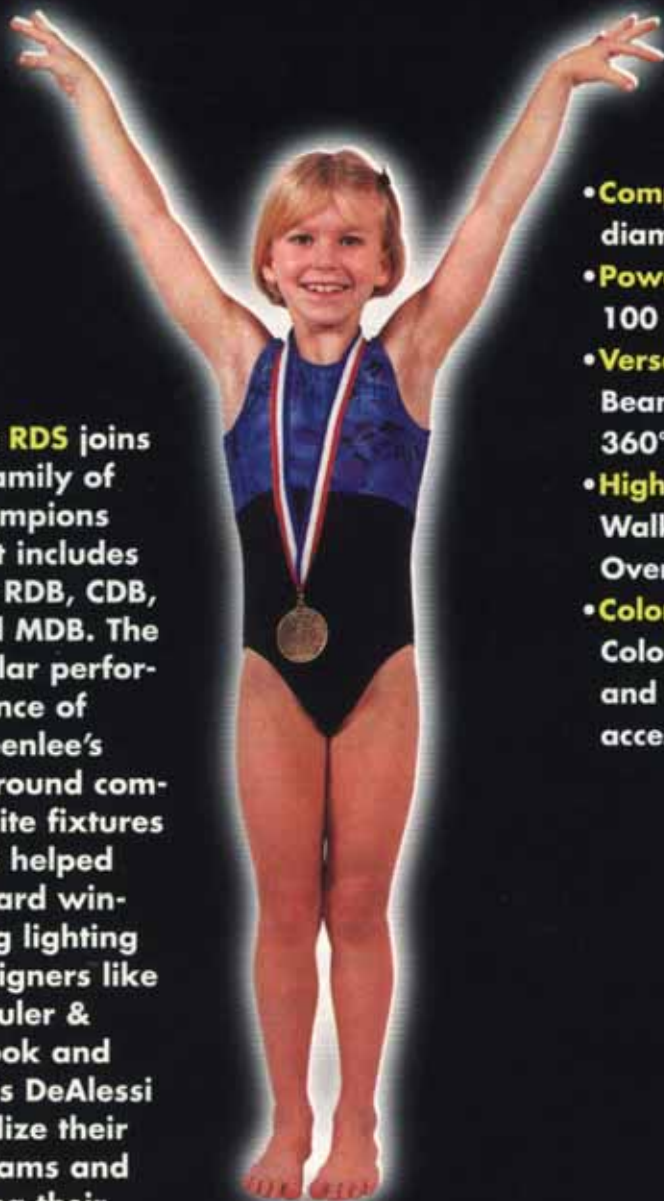
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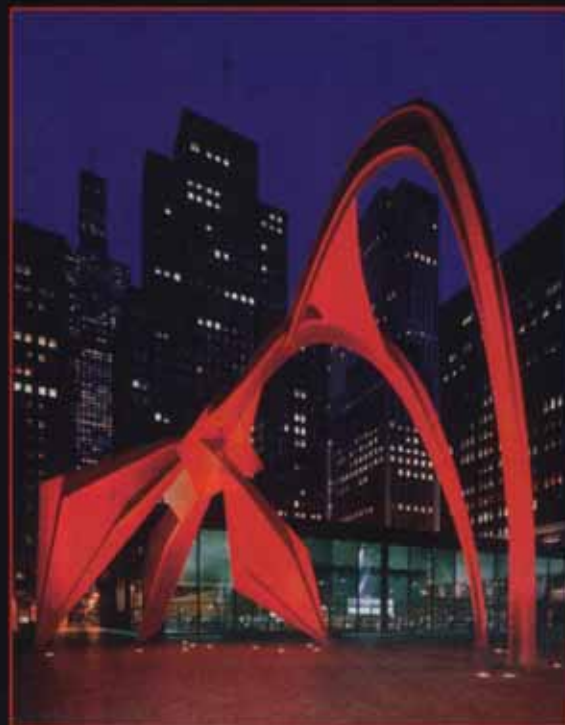


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Calder's "Flamingo"- Federal Plaza, Chicago, IL
Lighting Design- Schuler & Shook
Photographer - Steinkamp-Ballogg ©



Easily seen from every adjoining room, it's easy to understand why the homeowners wanted this odd little atrium to be much more a focal point and much less an eyesore! The space offered real design challenges – and a golden opportunity to "think small."

The small watershape juts out of a ledgered wall pierced by a large window. Note the way in which large, flat stones have been turned on end to break any potential monotony of the ledgering and how some of the ledgers have been set up as sills for small plants.



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FINAL TOUCHES

The final look of this pocket garden/watershape encompasses our homeowners' love of fossils, earthy materials and naturally occurring creations. Every square foot of the atrium wall has something different and interesting to look at.

Even though they were thrilled with the final product, which took almost a year to complete, the husband still felt that there was something missing: He'd always had the desire to raise an exotic reptile and thought this atrium was now the perfect environment for the beast to occupy.

After hearing a few "over my dead bodies" during their discussions of this matter, I decided to step in and remedy the situation. Lo mein (short for "low maintenance") now lives very happily in the bamboo in the atrium. He is a reincarnation of Iggy, a much-beloved Beanie Baby. The husband was so amused by the sight of this creature in the tree that he acquiesced and agreed that this was the best solution.

Did you think we were finished? So did we. One Sunday morning about 6 months after we completed the atrium, however, the wife wandered out into the family room to spend some leisurely time with the morning newspaper. As she entered the room, she thought she was hallucinating when she caught sight of a toad the size of her fist.

Her mother is fond of frogs and had placed many miniature statues of these amphibians in the atrium. The homeowner therefore thought this was a joke — until the frog jumped! She chased the critter around the family room (I wish I had been there to see it), unable to capture it, when it suddenly dashed into the atrium and, with lightning speed, buried itself in the soil.

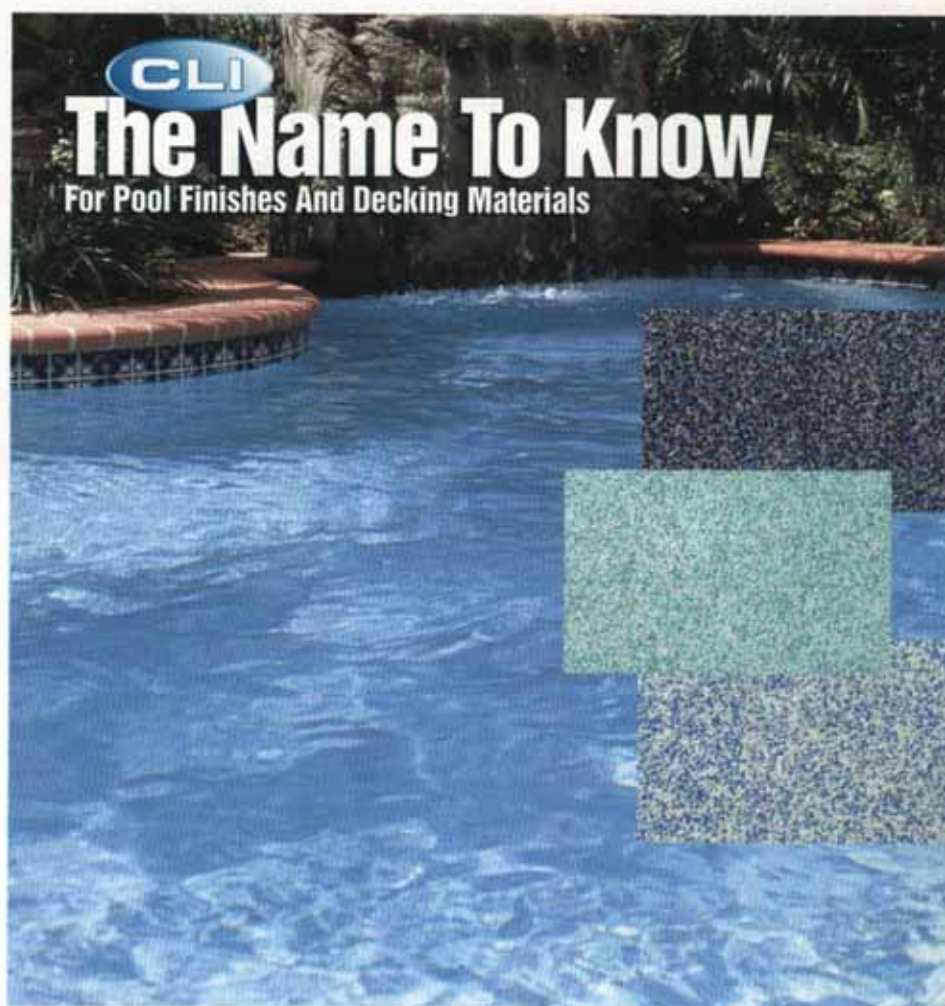
So far, the toad has not been given a name, but it's been sighted on many occasions by various family members, one of whom was heard to say, "It wasn't the size of a fist — it was the size of my foot!"

As the saga continues, everyone seems to have settled into the reality

that a live creature exists in the atrium. If you have any clever names you would like to contribute, we'd love to hear them!

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 this season in four episodes of "The Surprise Gardener," airing Tuesday evenings on HGTV.



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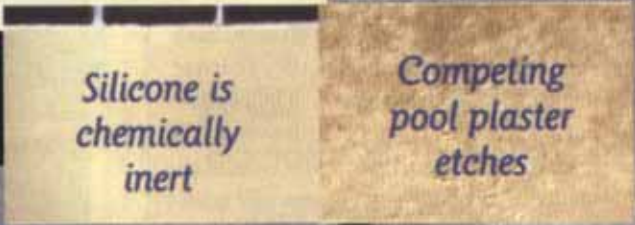
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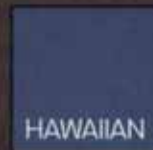
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Night Visions

By Mike Hersman

When do you think about the exterior lighting for your watershapes and their surroundings? Is it an afterthought, or part of your plan from the beginning? In his experience, says veteran lighting designer Mike Hersman, the former is too commonly the case – and that's a bad habit this designer and installer of lighting systems would like to change because of the visual wonders that can be unveiled once the sun goes down.

It's a simple fact: No matter where you are on the globe, ultimately it's dark exactly half the time. So no matter how beautiful your watershapes may be, if you don't fully consider lighting as a key component of your projects, you may be robbing your work of half its potential for pleasing your clients.

That makes it a bottom-line issue, because lighting adds real value to most any watershape installation with a long list of benefits. For starters, it extends the time a watershape can be used beyond daylight hours. It also adds depth, width and height that are otherwise lost in the dark; draws attention to specific features to an extent that can't be achieved in daylight; produces reflective surfaces for natural and man-made features; enhances safety; and adds a measure of security.

Yes, you can cobble this list of benefits together after the fact, but all of these benefits are maximized at the least possible cost when you develop your lighting plan as part of the initial design process. At that stage, you can consider the way the space in and around the watershape will be used, get your clients involved in defining spaces and create the

Continued on page 26







Seen in daylight and illuminated at night, this garden urn shows the distinctly different quality of light the designer can manipulate once the sun goes down. The urn looks great day and night, but careful night-lighting adds a sense of drama and even mystery to the scene.



Continued from page 24

sort of visual excitement that will build their satisfaction with the project through years to come.

To illustrate this point, let's see what emerges when the lighting is considered right from the start.

AFTER HOURS

With lighting, the basic function of illumination drives the design, especially when it comes to two fundamental benefits: the extension of time and the definition of space.

Simply by illuminating exterior walkways, steps, patios, spas, pools, ponds, waterfalls, fountains, statuary, architecture, garden furniture and plantings, you invite clients and guests to step out and enjoy exterior spaces after dark. This benefit alone often makes it easier to explain the value of lighting and of making certain a good lighting plan is part of the budget.

That budgeting consideration is a key point, because many clients (and builders) take lighting for granted and few give it any thought at all as they seek out designers and express their ideas. All it takes on the designer's part is a few questions about lifestyle, about time spent away from home and about entertaining to get clients interested in stretching the time they'll be able to spend outside – and truly excited when they see the range of lighting and

control options available these days.

And the nice thing with today's control systems is that lighting is easily integrated into an overall system designed specifically to control a watershape. On one extreme, automatically controlled landscape lighting welcomes a family home at the end of a long day; on the other, even a

simple manual switch gives clients immediate access to an inviting, relaxing outdoor space.

But there's more to lighting than just the extension of useable time: Lighting may be used to add depth, width and height to a scene through complete or partial illumination of walls, trees, palms,

Step into the Light

I've always been surprised that more watershapers don't focus on lighting, partly because light and water make for powerful visual and aesthetic combinations, but even more because most watershape clients are rarely home during the daylight hours.

These upscale clients leave for work at sunrise and return after sunset, and even weekends are filled down to dusk with errands and activities that carry them away from home. By making certain our projects engage our clients during the hours they are most likely to be home, we enhance enjoyment, increase satisfaction and, lest we forget, create a literal extension of their living space.

Rather than being last on the list of considerations (and the first to go if the budget tightens), I'd argue that lighting should

be among the first. The reason it's not – and I've spent years forming this conclusion – is that many designers and builders think of lighting as so elementary that they make a false assumption that there's really nothing to it.

But it's not so simple, even in terms of basic installation – and it only gets harder if it's an afterthought. In fact, the incorporation of lighting calls for conduits or open wiring runs, fixture placements and power service that should be included in every job from the point of conception.

And the results can be glorious. The watershape, landscape, hardscape, statuary and structures can all be enhanced if you attend to the clients' needs for atmosphere, beauty, tranquility and relaxation – *after dark*.

– M.H.

rocks, plantings and watershapes. In other words, lighting can be used to *define space*, creating a nighttime environment that is remarkably different from what clients will experience during daylight hours.

Consider perimeter lighting, for example: Just by staggering the depth of illumination, you add interest and can create the impression of a far greater space. (It's much easier to fool the eye at night than it is during the day.)

Must this kind of exterior lighting treatment be included in initial planning? Look at it this way: If you haven't set up a receptacle at the property's back line for a span of perimeter lights, you'll need to set up cabling runs, work through flower beds, cut across lawns, tunnel under or cut through decks, move around obstacles and go to a lot more work and expense than would otherwise be necessary. And if trenching is shared with other lines, the more the better.

Those savings are even greater in and around watershapes. Illuminating moving water and boulders is an extremely effective way to satisfy clients' after-hours needs, and it can be done much more efficiently if the watershape itself is designed and wired to create hiding places for lighting equipment. Prior planning in these cases can simplify backlighting, shield viewers' eyes from light sources by letting you build niches into walls or rockwork or planters – and make you look like a genius while saving the clients' money.

THE COLOR OF NIGHT

A while ago, I mentioned a key feature of lighting that makes it superior to natural lighting when it comes to creating a sense of depth, drama and interest in a backyard: The fact that lighting fixtures can be directed to highlight specific rocks, specific flows of water, specific trees and specific plantings gives you the opportunity to act as a set designer, manipulating the space to create theatrical effects.

Lighting design truly does put you in control, letting you highlight the canopy of a huge tree, the surface of a particularly craggy rock or the rushing of a particularly well-realized section of a stream or cascade. With more items to view, more places to explore, more scenes to take in,



Careful lighting around watershapes creates specially inviting settings after dark, when the water, either calm as in this image here or gently rippled as it is in the photograph on the opening pages of this article, sets up unique reflections of the lit background. Again, it's a means of adding drama to the outdoor setting that only happens this way after dark.

the whole backyard becomes more interesting and inviting.

And if you complement the grander features with careful illumination of seat-

ing areas, walks, statuary, fountains and privacy areas, you draw people into the garden and reward them with compelling views and viewing points. Seen from the

Lighting the Way

Beyond the aesthetic concerns discussed in the accompanying article, safety and security are major reasons to plan ahead for exterior lighting.

- *Safety* means that someone interacting with an environment can move through the space with the same visual confidence as they do during daylight hours. If the person walking through the area has to struggle to see where he or she is stepping, then he or she is not going to be sufficiently at ease to enjoy the surroundings.

This does not, however, mean that the solution is to saturate the area with light. In fact, this is one of those situations where less is more.

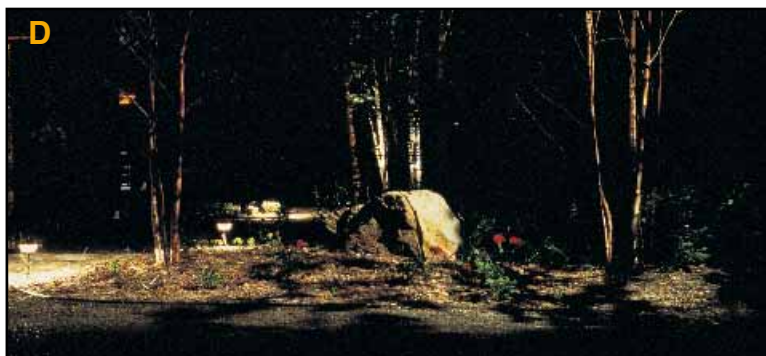
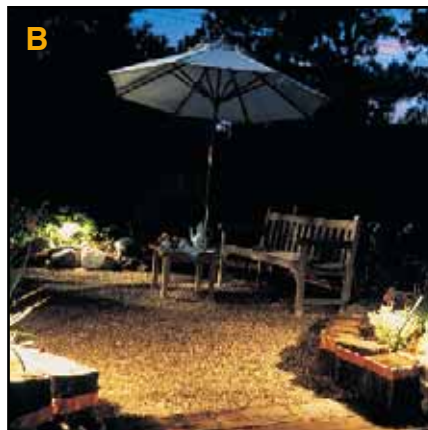
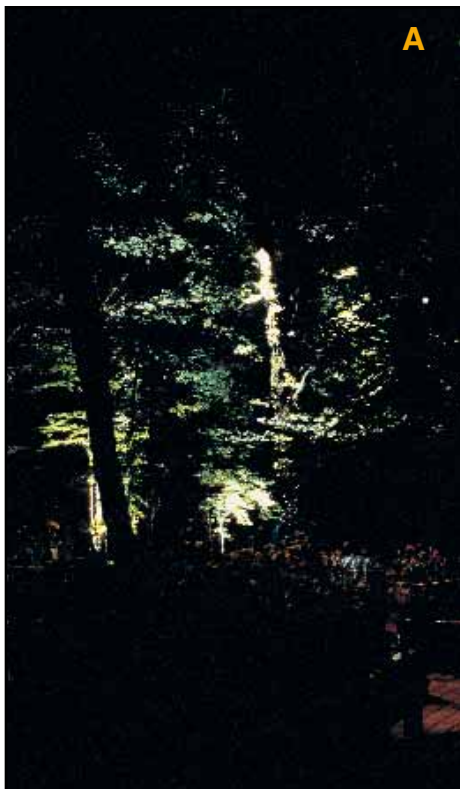
Projecting big beams of light over a pool, deck, patio, flower bed, walkway or steps will often blind people as they move through the yard – or distract them as they sit and talk with others. This “floodlight mentality” often obliterates any sense of beauty or relaxation. The key, I believe, is to distribute light over the area using smaller, more localized fixtures.

- *Security* means that the area is not conducive to intrusion and aligns with the thought that a well-lit home is the first line of defense.

Security in this context is often considered to be the job of the floodlight-on-the-eave approach to backyard lighting – an approach I don't recommend because it creates blind spots and strong shadows and therefore gaps in coverage.

Instead, I recommend placing lights at perimeter locations, at lawn edges and around hedges, bushes and trees: Anyone moving through the space will be seen much more easily than would be the case with building-mounted, high-wattage floodlights.

– M.H.



In their own ways, these five images show up the limitations of illuminated nighttime photography: Cameras do not “see” light the way people do, so these images are more than a little distorted. Even so, they show something important, that is, the way a bit of up-lighting or downlighting creates highlights and adds interest to illuminated spaces.

Whether it’s the trunk of a tree in the background (A), low shrubs demarcating a seating area (B), an interesting specimen in the landscape (C), intriguing vertical lines set up by tree trunks and structures (D) or thoughtful accenting of a portal (E), the lighting attracts attention, sets a mood and invites people to venture forth from indoor spaces to enjoy their surroundings in the way few dark spaces ever could.

inside, these spaces become powerful draws. Unilluminated, however, the view out the window is, for the most part, lost exactly half the time.

These illuminated nighttime views can be remarkably subtle, with colors far more vibrant than they are under the bright sun. A statue or tree silhouetted against a daytime sky is quite beautiful; that same statue or tree at night can be made the center of a backyard universe, a gem against a black background. In daylight, the poolside palm is a picture of serenity. Up-lit at night, the same palm takes on a whole different character as a dedicated lamp emphasizes the textures of the trunk, the fronds and their colors.

To achieve these effects, I generally use low-voltage halogen lamps, which are recognized as the best-available tool for almost exact color rendition of watershapes, plants and architectural features. With the possibility of controlled beams of light, these lamps can also produce a refined and defined illumination that other luminaire types can’t touch.

I have worked with household-voltage halogen lights, but control is easier with low-voltage systems. Incandescent floodlights throw uncontrolled light patterns and cast a yellowish light (or blue with mercury vapor lamps, green with metal halide lamps) and develop excessive, distracting and unnatural reflections.

Sodium lamps and their orange light simply do not belong in the garden because of the poor color rendition they offer.

Does that mean you shouldn’t use powerful colored lights? Of course not, and lights of each type can be used to great effect so long as you plan for the widespread light patterns and power the incandescents provide. For my money (and my clients’, more to the point), the best way to achieve the effects I’m after is with low-voltage halogen systems.

AT THE SOURCE

The big issue in lighting, of course, is placement. Most pool builders, for instance, know to place the main pool light

so that it doesn't shine right into the clients' windows at night. Exterior lighting also has its rules of thumb, a few basic principles I find myself using over and over again.

- *Get up close and personal.* If you are targeting a waterfall or a piece of statuary or a fountain, the installer who hasn't given lighting much thought will tend to place lighting fixtures at a considerable distance from the object because that is where last-minute installation is easiest. This means that an excessive amount of light will spill over onto less important surrounding items. The impact of the target is lost; it may even recede into a pale, light-washed background.

My preference is to get up close with as contained a beam as necessary and light the focal object from as many angles as are needed to show it off, isolate it and truly target it. The light sources should always be hidden – protected by a lens, set behind foliage or buried below grade. So long as you are mindful of glare and plan accordingly, this approach will win out over a long-distance wall-of-light approach anytime.

- *Accentuate the positive.* Accent lights provide helpful illumination of walks, drives, steps, patios or any garden or watershape detail you can think to target – and in mostly unobtrusive ways. Set up the fixtures approximately 24 inches above almost any low-lying item as a hidden source of light that directs, leads, hints, suggests, illuminates and emphasizes.

- *Guarantee your access.* A key point of this article is the value of preplanning, but what I'm addressing here is practical planning for the unanticipated. All you need to do is ask the subcontractors who are laying decks or installing driveways or setting pavers to run 2-inch PVC lines under their work to reduce to a minimum any possibility that you'll have to tear it up. More than most things, this can make you a hero later on.

- *Plan ahead.* I couldn't resist making this point one more time. Planning ahead with the overall picture in mind will offer the designer an opportunity to emphasize the most important items and allow for approaches from uplighting to perfect placement of hidden sources of light.



More than any other image included with this article, this one captures the value of getting close and using uplighting to set off objects in landscapes. The afterthought approach so often used would have flooded the entire area with light. In this case, uplighting illuminates the water and the fountain, leaving the surrounding space in dramatic shadows and half-light. Such compelling effects are relatively easy and inexpensive to achieve – but only if lighting design is incorporated in a project in the very first stages of development!

High or Low?

What's the difference between low-voltage lighting and systems run on what is typically referred to as "household current"? There are lots of ways to answer this question.

The main point to consider is that 110/120V systems can kill you, which is why these systems are enclosed in their own conduits and junction boxes in accordance with strict provisions of the *National Electric Code*. (For reliable technical discussions of these issues, I strongly recommend reading Jim McNicol's "Things Electric" in every issue of *WaterShapes*.)

Low-voltage lighting still involves electricity as well as the *NEC* and must be treated with respect, but it has key advantages because of its operating principles. As the name implies, these are systems that run using voltages far lower than those required to run household appliances. The systems are available in two levels: under 30 volts and under 15 volts. Most landscape lighting systems are in the under-15-volts category, typically at 12 volts.

The power for a low-voltage system is derived from the standard 120-volt service; a transformer connects to the service and reduces the voltage to 12 volts. Exterior low-voltage systems contain at least one circuit breaker and often a timer of some sort, but they don't carry the same sort of *NEC* requirements for conduits and junction boxes, instead using direct burial or open-plenum cable in place of conduit. The cable connects to leads from the fixtures without the use of junction boxes.

There is one requirement that applies to both household- and low-voltage systems: Both must be protected by a ground-fault circuit interrupter (GFCI) if the potential for water exposure exists – which is certainly the case in any exterior application.

As I mentioned, the *NEC* governs all of these systems, and all components used are to be "listed," which means that the equipment has been tested and has passed the tests performed by a certified testing laboratory. Only listed equipment should ever be used!

– M.H.

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FINDING ADVICE

Absolutely, you don't have to be a lighting expert to include top-notch illumination in your projects. Many landscape designers and architects specialize in lighting and want to be involved – particularly if they can do so from the start. If you're observant, you'll learn a lot, come to appreciate the subtle effects that can be achieved and be better prepared to tackle your own lighting needs.

Often, effects that truly dazzle clients require relatively few fixtures and are probably not as expensive as might be assumed – especially when the construction end of the installation is handled while the whole yard is torn up. The bottom line for the customers is 24-hour-a-day access to their backyard; for you, it's the satisfaction of knowing how much more beautiful your work can be after the sun sets slowly in the West.

On the Beam

In looking at the aesthetic differences between household-voltage systems and low-voltage systems, the main difference boils down to the beam of light generated. A beam of light is typically defined as light with a concentration that may be directed toward a limited area.

Household-voltage systems rely on familiar incandescent lamps, which spread light in a wide, often 360-degree pattern. Floods that are often used under building overhangs typically have beams that spread out to about 90 degrees around a brighter, focused area of about 40 degrees of maximum illumination. In lighting-design terms, this is an overdose of light in most applications.

By way of contrast, low-voltage lamps often use built-in reflectors that can be set to direct a beam of light to a relatively precise area in anywhere from 5 to 40 degree spreads – without significant spill beyond the designated field. This is a key advantage to low-voltage systems, but there are others, including long lamp life, consistent light output over the lifetime of the lamp, smaller lamp size, easy installation and safety.

For me, it's low-voltage all the way.

—M.H.



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F

rom expansive commercial installations to small backyard waterfeatures, artificial rockwork has become a mainstay for many watershapers – and for good

reason: It allows the builder to achieve looks that might not have been possible otherwise, and to do so at reasonable cost. In this feature, experienced faux-rock designer and installer Ken Macaire covers some of the principles he applies in selecting formations and in creating rockworks that dazzle the eye while looking truly ‘natural.’

The most important use of faux rock is to make a geological statement – to provide an important accent or focal point in a landscape where none exists. My goal is to create rock formations that complement and enhance the natural setting and fit in harmoniously with their surroundings.

That’s a point builders who use artificial rock sometimes fail to grasp. They’ll execute an ambitious scheme with lots of interesting, well-crafted rockwork, but it ultimately looks unnatural because the rocks they’ve created have no logical relationship to any indigenous formations or anything else in the surrounding space.

I approach things in a different way – one that embraces the site and all of its features. I select, form and install faux rocks that, together, create interesting and beautiful statements in the overall landscape design. As I work, I make my installations to stand up to the question, “Is this rock formation believable?”

Let’s take a look at what’s involved in meeting that lofty standard.

FINDING ‘BELIEVABLE’ ROCKS

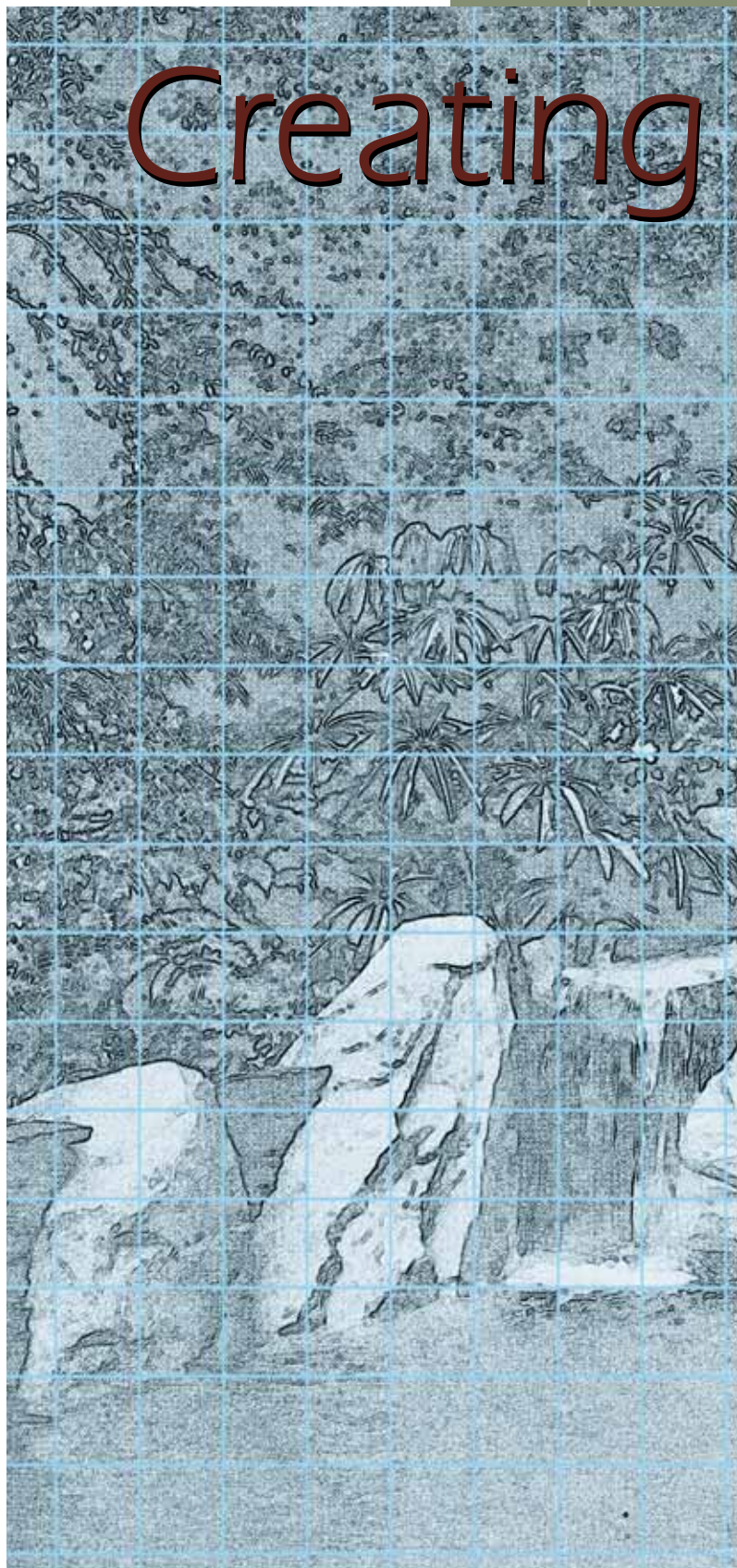
In this context, “believable” does not mean random duplication and placement in a landscape of any rock you happen to have run across in nature. The fact is, most rocks in nature aren’t particularly what I’m looking for as a landscape accent: I’m interested only in the most aesthetic formations I can find.

Think about it: Rock formations are simply combinations of rocks clustered together, and lots of the component rocks are pretty ordinary – too random to be used as the focal point of a residential or commercial watershape.

The ones that seem to impress us are those that fit together with others in patterns that make rugged, powerful and/or dramatic statements. These are the formations that find their ways onto picture postcards, structures that present distinct

Continued on page 34

Creating





Good Impressions

By Ken Macaire

This hillside rock formation includes three main waterways flowing into a swimming pool and has been designed and created with faux rock to create the impression that the pool had been built to incorporate an existing set of rock structures.



This giant geode-like structure, set up as a Japanese well with spillover edges, adds a touch of serenity to a circular drive in front of a hospital. It also serves to show that, in creative hands, faux rock can serve a wide range of sculptural and design purposes.

Continued from page 32
shapes and patterns that catch the eye and create lasting impressions.

Used in a residential or commercial landscape design, these same rock formations can be equally extraordinary. In effect, you have the opportunity to take the very best of nature's creations and duplicate them.

With every job we do, I come to the site believing that, by borrowing eye-catch-

ing formations from Mother Nature and recreating them as well-formed and finished rock formations, my work can make all the difference between the mundane and the dazzling.

That's because good rockwork can make an impressive statement like few other materials. In fact, I've seen rockwork create emotional responses in even the most stoic clients, who often become

Rock vs. Architectural Design

There's a perception in the design community that architectural design and faux rockwork don't go together. Actually, I believe that any style of architecture can be enhanced with the appropriate use of faux rock, provided the goal is to unite nature with structure.

The key, as always, is *believability*. Rockwork that appears to have been part of the site and has been accommodated by the architectural design is going to be believable. Rockwork that sticks out like a sore (or extra) thumb will not.

Not long ago, for example, an architect asked me to create a rock formation emerging from the wall of a mostly sub-

so inspired that they start asking for more rockwork to be placed strategically throughout the installation.

All that's required to reach this level of customer approval is observing and recreating the most aesthetically pleasing forms that nature has to offer – and the key is getting out into the wide world with eyes open and alert to the possibilities. Selecting real rocks from which to take a casting is an extremely exciting part of the work; actually seeing them duplicated as castings is also satisfying because we know that our inventory of authentic forms expands each time we take new molds. As we've progressed, we have more and more forms to use in our work.

But it's not all about amassing a collection of forms: Rock formations must be informed by what you've observed and studied and recorded in the field – or you surely will miss the mark in your clients' backyards no matter how many great rocks you've copied.

TIME-TESTED TECHNIQUES

That's not to say that getting a good casting isn't important! As do many in the trade, we get our castings by first latexing and fiberglassing real rocks, then making glass-fiber reinforced concrete

terranean living room. I built a highly detailed, stratified rockwork at a 45 degree angle along the majority of the below-grade wall and incorporated the windows between the top of the grade and the roof.

The effect was that of a house built around the rock rather than a rock set up inside the house: The living room looked like it was constructed against the rock formation in the tradition of Frank Lloyd Wright's Fallingwater. The owner loved the raw, organic look of the rock against the smooth, white plaster of the interior walls – and the contrast worked because the rock looked like it *belonged*.

– K.M.

(GFRC) castings from the resulting molds. These castings are direct duplications of the real thing, which gives our rockwork its authenticity – but that's only part of what's going on.

The real secret to the work our company does is that it pleases the senses because it is what I call "geologically correct." People tell us all the time that they cannot tell that our rocks are faux, and I know it's definitely *not* because of the authenticity of details in our castings. Instead, it has much more to do with how we assemble and combine individual castings on site.

How is this done? The fact of the matter is that we play god. We take the time and energy to arrange the castings until they, *in combination*, make an artistic statement that effectively mimics an attention-grabbing rock formation we've seen before. We definitely don't do this by simply grouting castings together in random patterns. This would result in a formation that might be authentic in detail but that would make absolutely no sense geologically.

In playing this creative role, I ask myself: "What would Mother Nature do if those same rocks appeared in that particular environment?" More important, perhaps, I follow that up by asking: "What would she do to make those same rocks



Here's a study in contrasts that demonstrate the versatility of faux rock. In one case, cliff-like sedimentary stones set up behind a spa create a grotto hemmed in by waterfalls (A). In another, smooth stones provide ample seating space around a peaceful pond (B). Finding model stones for projects as diverse as these is a fun part of each project.

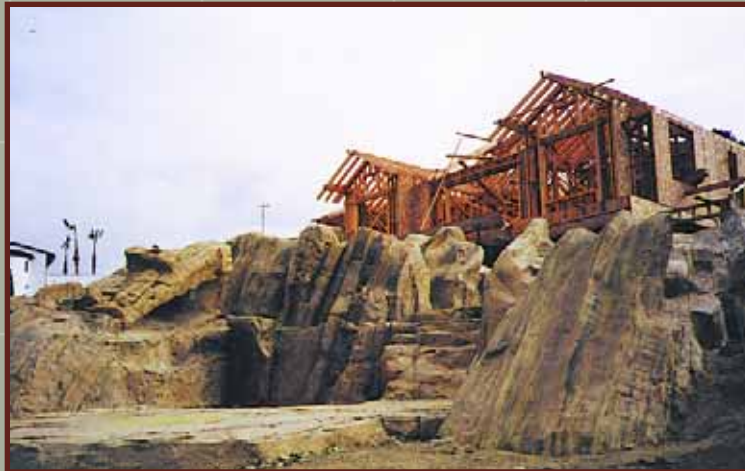
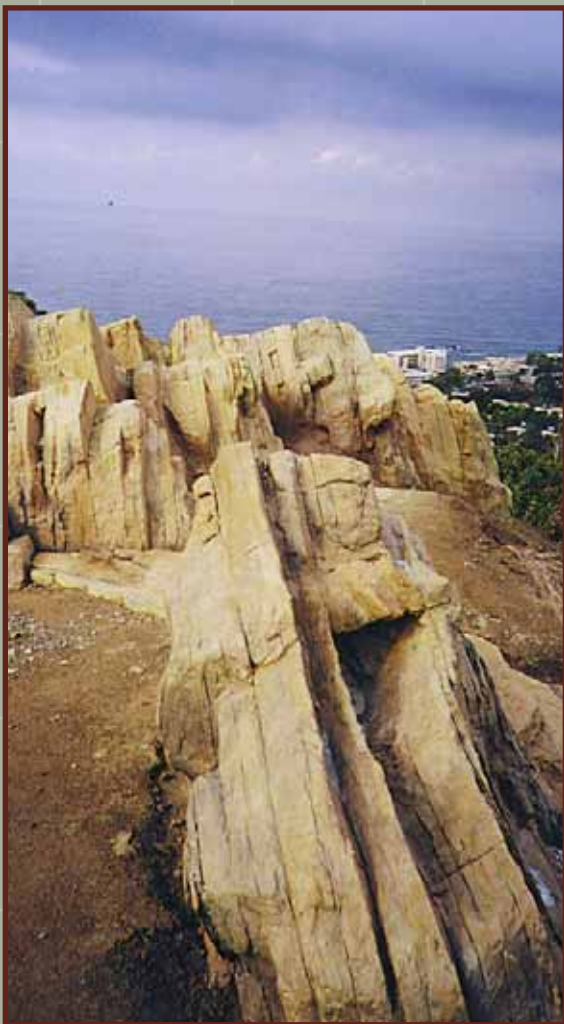
result in an arrangement that was so aesthetically pleasing that we would feel compelled to take a picture of it?"

To reach this lofty goal, we chop and hack, angle and manipulate our stores of existing castings, adding and configuring until we achieve the formation we're after. This is not a process that should be hurried!

No matter how we combine old and new, we proceed knowing that the forms alone make no "statement." It's only through the process of assimilating existing and new forms and assembling them in eye-catching ways that we create rock formations that are not only believable, but rival nature's best.

Continued on page 37





Real Walls, Faux Rock

Retaining walls tend to be monuments to structural austerity, especially in Southern California, where so many of the homes we work on are cut into hillsides.

The problem of hiding or at least softening stark retaining walls comes up often, and the usual solutions are stone facings, plant materials or some other type of “veneer.”

I’d like to suggest that faux rock be used in sections of the retainer to create both interest and dramatic effect. When used this way, the retaining wall is made to look like it was built up to the rock, further validating rock outcroppings. Indeed, a stark wall punctuated here and there with rugged rock outcroppings makes an impressive statement.

Another possibility is to maintain the natural contour of the hillside by totally covering the wall with faux-rock formations, as seen, for example, in the photographs here. This greatly minimizes abrupt, severe transitions often seen with retaining walls and gives the landscape designer the opportunity to completely integrate the wall into the surrounding landscape – right down to planter pockets that easily can be included throughout the rockwork.

–K.M.

WORKING WITH CLIENTS

Of course, the fact that you’re bent on achieving spectacular results means nothing if you can’t sell your clients on your ideas. In a rockscape, you’re working in three dimensions. A simple plot plan might be enough to fire *your* imagination, but many customers need more.

But we usually start from a plan, typically beginning by recommending a rock type from our portfolio and suggesting that some new molds will complement the forms the customers select. We’ll guide and offer ideas, but we always listen carefully to make certain we’re working with rocks the clients really want. Once some basic decisions about size and type and quantity are made, we’ll often take the pre-selected

elements and do most of the designing on site.

At this stage, however, clients sometimes want a rendering or even a clay model – either of which we’ll create for a price. This need arises when the customer can’t visualize the project well enough to make the purchase decision, but, more often, clay models in particular come into play when needed to guide the efforts of a crew from another company. They give the installer an exact pattern to follow – an absolute necessity in the absence of an on-site designer.

The negative effect of using a rendering or a model, of course, is that using a plan can take what should be a personalized installation – one inspired by its surroundings – and make it purely automatic. Given that caution, however, models are an excellent idea unless you’re fortunate enough to be dealing with an outside rockwork company that also happens to like designing various combinations of rock forms on site.

In my book, on-site design is the only way to go: It lets you work effectively with the topography and any existing or planned structures or landscaping. You *cannot* get the precise lay of the land, see the exact eye-level views and accurately take in all the

Working on sharply sloped sites in Southern California or anywhere else gives the faux rock designer ample opportunity to integrate spaces – rockscape, landscape, watershape – in ways that probably would not be possible otherwise. That makes the work both challenging and deeply satisfying.

lines of sight with a plan and/or model: You lose touch with the environment and lose sight of the total picture.

And my preference for designing on site extends even to large commercial projects. Models may be an expedient way of communicating with a large production crew, but to me, there's no replacement for an on-site designer who is familiar with how to arrange, alter and interpret rock formations and anticipate what the results will look like once everything is finished.

MORE SOPHISTICATION

Lots of builders nowadays are familiar with the possibilities of faux rock. I suspect that others have tried and for any number of reasons haven't been completely satisfied with the results. If you're among these skeptics, I encourage you to take a second look because faux rock has come a long way.

Indeed, there's a growing recognition that, like so many other aspects of the watershaping game, the ability to use exist-

ing rock forms and create new formations is a true art form, one that requires time spent studying natural rock formations and in learning how to apply those shapes in manmade environments. In other words, there's no shortcut to excellence whether you use real rock, faux rock or both. It's hard, sweaty work that calls nonetheless for sensitivity and a designer's guiding touch.

By declaring faux rockwork an art form, I don't mean to imply that all faux-rock installations need to mimic the contours of the Grand Canyon or Garden of the Gods (outside Colorado Springs) to be effective. In fact, faux rock is as effective on a small scale in small installations as it can be in large ones. The key is to keep in mind that the job of the designer is to arrange the forms being used to create an impression that is believable, that makes visual sense and *belongs*.

If you settle for less, after all, you're selling the rocks you've used as your models short.

Private and Public

I've always found that there's a distinct difference between commercial and private rockwork projects – and it's not all about scale. In fact, it's about detail – and the fact that there's less of a need for it in the commercial realm.

Think about it: Most often, these projects are viewed from distance or perhaps while speeding by in an automobile or on a roller-coaster car. So for some (but certainly not all!) of these projects, the customer is after rockwork that merely *suggests* natural formations and that serves, basically, as a theatrical prop. As in a movie or a play, the viewer is asked temporarily to suspend disbelief.

Conversely, private rockwork needs to be believable. It needs to be the kind of work that literally fools the senses. As described in the accompanying story, this believability relies not only on authentic detail in individual castings, but also on overall compositions that present maximum artistic beauty.

– K.M.

Rugged angular formations overhang a koi pond and spa in this faux-rock formation. Seen here at high flow, the cascades also can be reduced to create an array of subtle effects using multiple spillways.

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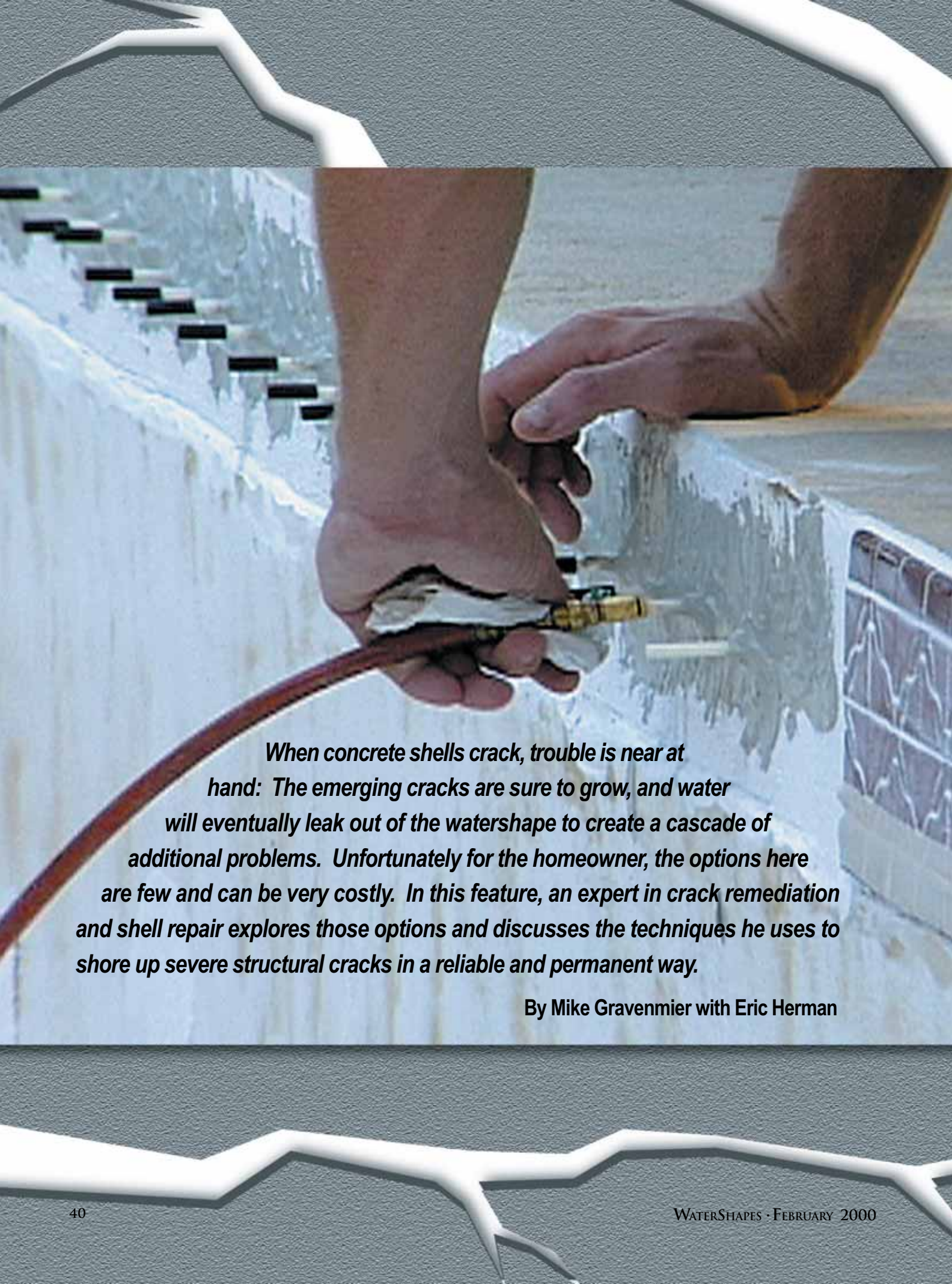


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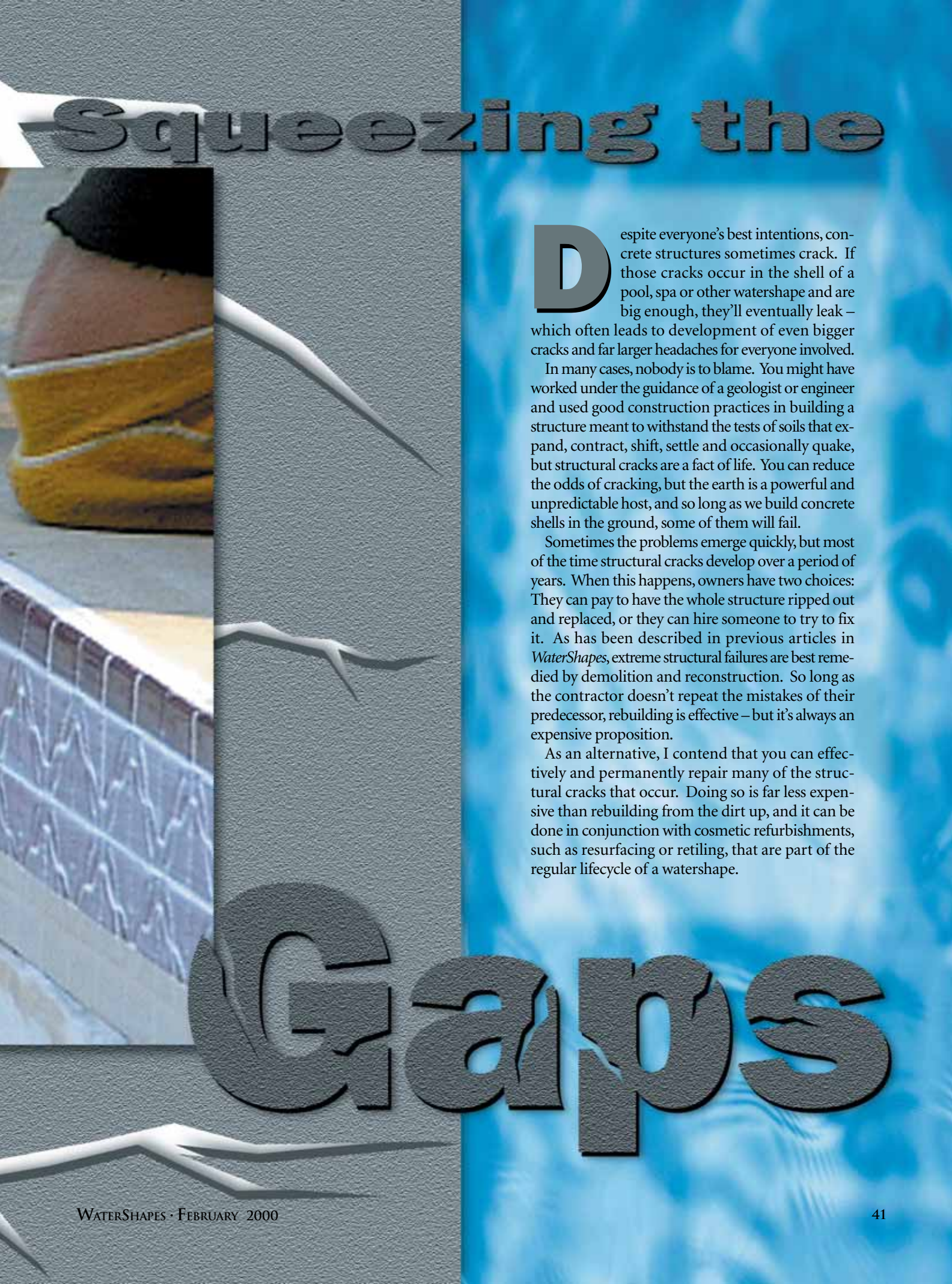
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When concrete shells crack, trouble is near at hand: The emerging cracks are sure to grow, and water will eventually leak out of the watershape to create a cascade of additional problems. Unfortunately for the homeowner, the options here are few and can be very costly. In this feature, an expert in crack remediation and shell repair explores those options and discusses the techniques he uses to shore up severe structural cracks in a reliable and permanent way.

By Mike Gravenmier with Eric Herman



Squeezing the

Despite everyone's best intentions, concrete structures sometimes crack. If those cracks occur in the shell of a pool, spa or other watershape and are big enough, they'll eventually leak – which often leads to development of even bigger cracks and far larger headaches for everyone involved.

In many cases, nobody is to blame. You might have worked under the guidance of a geologist or engineer and used good construction practices in building a structure meant to withstand the tests of soils that expand, contract, shift, settle and occasionally quake, but structural cracks are a fact of life. You can reduce the odds of cracking, but the earth is a powerful and unpredictable host, and so long as we build concrete shells in the ground, some of them will fail.

Sometimes the problems emerge quickly, but most of the time structural cracks develop over a period of years. When this happens, owners have two choices: They can pay to have the whole structure ripped out and replaced, or they can hire someone to try to fix it. As has been described in previous articles in *WaterShapes*, extreme structural failures are best remedied by demolition and reconstruction. So long as the contractor doesn't repeat the mistakes of their predecessor, rebuilding is effective – but it's always an expensive proposition.

As an alternative, I contend that you can effectively and permanently repair many of the structural cracks that occur. Doing so is far less expensive than rebuilding from the dirt up, and it can be done in conjunction with cosmetic refurbishments, such as resurfacing or retiling, that are part of the regular lifecycle of a watershape.

Cracks

EPOXY MOXIE

The method I use in repairing shells is a specially designed epoxy-injection process. In concept, it's simple: Once I've done as much as I can to stabilize the structure, I inject super-strong epoxy resins into the structural cracks under pressure; the material fills the gap and hardens to create an extremely durable bond.

For years now, I (and other proponents of this technique) have made the case that the bond created by these epoxy resins is stronger than the concrete itself. Recent studies have shown this to be true to an extent far beyond our most optimistic appraisals of epoxy's strength (see the sidebar on page 45 for further discussion of epoxy's strength).

There are several keys to creating this bond. First, you must determine which among the many available types of epoxy to use – a decision made during the initial damage assessment.

We use a wide range of two-part epoxy products that require the on-site, last-minute mixing of a resin and a catalyst (typically known as parts A and B). These products are formulated to provide a wide range of viscosities and bond strengths. The trick to achieving a maximal bond in a crack in concrete is to select an epoxy product with a viscosity that enables you to *completely* fill the void.

Wide cracks, especially those on vertical surfaces, require higher viscosity epoxies than do smaller cracks. In other words, you need a thicker material that will adequately fill gaps and stay in place as it hardens. By contrast, smaller cracks can be bridged by thinner materials that are able to penetrate into hairline crevices without the use of tremendous pressure.

Epoxy manufacturers offer products that meet these needs. We use products ranging in viscosity from 25 to 600 centipoises (cps). (*Centipoise* is the unit of measure for adhesive viscosity.) The lower-viscosity epoxies – that is, those we'd use for hairline cracks – have about the same viscosity as water: That's a *really* thin resin. For big vertical cracks, we use the 600 cps epoxies, which is about as thick as molasses on a cool day.

Perhaps the biggest advance in epoxy



Figure 1: If the crack is large enough, placing the injection ports at six-inch intervals along the crack is easy. In many cases, however, you need to drill out a hole for the port.

injection in recent years has come with the advent of ultra-thin, very-low-viscosity materials that enable you to fill cracks you can barely see. This has enabled companies like ours to repair “cosmetic” cracks before they become structural problems.

Whether you're dealing with large gaps or small ones, deciding which epoxy to use for what size crack is a real trick, one

that requires both experience and a feel for each job.

SQUEEZING IN

Once you've sized up the situation and chosen an epoxy in this *selection* phase, the project is ready to enter its second phase: *preparation*.

The first step here involves creating a special patch over the crack. This patch



Figure 2: Once the ports are in place, a patch made with a very-high-viscosity epoxy is buttered over the crack both to seal the ports in place and to keep the injected epoxy from flowing out of the crack.

holds special “injection ports” – small plastic tubes inserted into the cracks and through which the epoxy eventually will be squeezed into the voids (Figure 1). As important, the patch keeps the epoxy from settling out of the crack after it’s been applied.

Remember that epoxy injection uses some pressure to get the job done. If you use too much pressure to inject epoxy that’s too thick for the crack you’re trying to fill, you’ll blow out your patch and injection ports and have to start all over.

Depending upon the size of the cracks (width, depth and length), we choose between two different pumping systems: one for small jobs with small cracks that will be filled with low-viscosity epoxy; another for larger jobs with big cracks that will be filled with high-viscosity epoxy. For small jobs, we use a hand-held, piston-pump system. For larger jobs, we bring in an electric-powered, pressurized pumping system.

The small pump draws epoxy, pre-mixed and placed in a reservoir, through a hose and into a cylinder contained in

the hand-held applicator gun. The operator pulls a lever, a drop-valve opens and the epoxy is injected into the void via the injection ports. The large, powered pump has two reservoirs, one for the resin, the other for the catalyst, and automatically mixes them in a spiral tube before the material is pumped into the injection ports through a hose.

My powered unit has an adjustable psi setting. I typically pump the epoxy into the cracks at about 30 to 50 psi, while some hairline cracks require pressures up to 200 to 300 psi.

But I’m getting ahead of myself here: As I mentioned at the outset, in addition to deciding which epoxy to use and what system to inject it with, our initial inspections include an examination of the cause or causes of failure. In the flatlands of the Southeast, which is where I work, I see lots of unanticipated settlement of sandy soils.

Needless to say, I don’t want to be called back to visit another set of cracks and a disillusioned client, so I do what I need to do at this point to stabilize the situa-

tion and set the shell up for years of trouble-free performance. (There’s a lot to say about this aspect of the overall repair job; see the sidebar below for some of these details.)

READYING THE VOIDS

Now work begins on the crack itself.

The first step is to rid the crack of any loose material or debris. This is really important, because you don’t want your epoxy bonding to anything other than a clean concrete surface. To get this job done, I use a combination of pressure washing and vacuuming to be sure that we’re good to go. If necessary, I’ll remove tile and even coping to clean out voids wherever I find them.

One thing to look out for here is water leaking back into the vessel through cracks. If the flow is obvious from staining or some other clue, you know right away that you’ll have to take steps to evacuate the surrounding soil of ground water. But be on the lookout for small trickles or seepage: These will be much less obvious and perhaps even more troublesome.



Ground Work

As mentioned in the accompanying text, it's important in repairing a cracked concrete shell to understand what caused it to fail in the first place.

On many jobs, I bring in a geologist or engineer to examine the site and make recommendations about soil remediation procedures. Oftentimes in my area, which is plagued by settlement of sandy soils, the experts will recommend a procedure known as *pressure grouting* or *compaction grouting*. This is used where settlement has created voids next to or beneath the concrete structure; in turn, the voids allow for movement and cracking.

In pressure grouting, we will install pipes at various locations and depths and then inject concrete into the voids in order to stabilize the soil immediately around the shell. In effect, this increases the load-bearing capacity of the soil by creating a sub-base that is better able to support the weight of the concrete shell. It's like backfilling an unstable shell with concrete to make it sound.

Compared to the epoxy-injection technique, pressure grouting is more specialized and requires considerably more training and experience, basically because so many variables and such a wide range of soil conditions can be involved.

In our area, for example, we run into a lot of gravelly and sandy soil that simplifies pressure grouting. More often than not, we're able to inject pressurized concrete and stabilize the structure. In areas with expansive clay soils, by contrast, grouting is much harder. In either case, I would only recommend taking this serious remediation step with the advice and approval of a geologist or soils engineer.

—M.G.



Figure 3: Starting at the bottom of vertically oriented cracks, we inject epoxy until it starts coming out of the hole above, then cap the current hole and move up the row. With a powered injector, this process goes smoothly and quickly.



Figure 4: Once the epoxy has cured, we go back and clean up the surface of the repair. The first step is cutting off the epoxy-filled injection ports. If there's any doubt about the toughness of the repair materials, this operation is best performed with a heavy-duty chisel mounted on a hammer drill.



Figure 5: The last step in the repair process before the vessel is replastered or the tile is reapplied involves grinding away the patch and leveling the repaired area with the surrounding concrete.

Keeping water out of the cracks is very important because it keeps the epoxy from fully penetrating the crack. The water doesn't affect the epoxy chemically, but it keeps it away from the voids where it's needed the most. As a result, when I do observe water, I'll often insert a well line into the ground to pump ground water out of the area while we're working.

The next step is to insert the injection ports into the cracks. These will vary in length a bit, but usually ports I've cut to three inches will do the trick. Obviously, you can vary the diameter of the ports as well. And in some special applications, you may even need to drill out a crack so you can insert ports to a greater depth. On a typical swimming pool job, I'll insert ports at approximately six-inch intervals over the full length of the crack.

With the injection ports in place, it's time to create the all-important patch, which I do by spreading a quick-setting epoxy over the top of the crack (Figure 2 on page 42). This is really thick stuff, far too viscous to penetrate and actually fill any gaps. Instead, this patch forms a bridge across the top of the crack that seals it and, as mentioned above, holds the ports in place for the epoxy-injection process. This patch material usually takes 20 minutes or so to set up, depending upon the air temperature.

When it's had time to set, I inspect the patch and the injection ports to make sure that everything is sealed and tightly in place. Now it's time to get out the epoxy and the injection equipment and go to work pumping the material into the void.

FILLING THE GAP

No matter whether I'm using the hand-held pump or the electric pumping unit, it's finally time to inject the epoxy into the crack. I start at the injection port on one end of the crack, filling until epoxy begins to flow out of the next port in line (Figure 3). Now I back off, cap the injection port I've been using, and move on to the next port, repeating this process until I'm done.

It's important to begin at one end of the crack and proceed continuously to the other. (If the crack has a vertical ori-

entation, I'll always begin at the lowest point and work my way up.) Once the cracks are filled, I let the epoxy cure overnight. The next morning, I roughly cut off the injection ports with a chisel mounted in a hammer drill (Figure 4), then use a power grinder to level the patch and injection ports flush with the surface of the concrete (Figure 5). (The injection ports are filled with hardened epoxy and so become part of the repair.)

I've been using this technique for more than 20 years now and have invested a lot of time and energy in teaching the method to others. Through the years, I've found that epoxy injection offers support to builders faced with cracked shells – and to homeowners who simply want things to be right with their watershapes. Nobody wants shells to fail: This is a way to fix them.

Once I've ground away the patch, the watershape is ready to hold water. And experience tells me that these cracks will not reopen.

Heavy Pressure

I have long stood by the claim that epoxy injection makes for a bond that exceeds the strength of the concrete itself. That's a big statement, and I don't blame anyone unfamiliar with the process for being skeptical.

I'd like to offer proof in two forms – one anecdotal, the other scientific.

A couple of years ago, I was brought in to help NASA determine how to deal with cracks on its launch pads at Cape Canaveral. After dozens of years and countless launches, these massive, reinforced-concrete slabs had begun to crack. After seeing data on the strength of epoxy injection, officials at NASA gave my company a call – and a contract to repair the launch pads.

It's been a challenge. We've had to develop techniques for injecting epoxy resins deep into the slabs to fill miniscule cracks and fissures. We've spent months at the Cape shoring up the launch pads in advance of Space Shuttle and satellite lift-offs. So far, our patches have withstood the tremendous heat, pressure and vibration delivered by what are among the most powerful machines ever built.

Of course, NASA wouldn't have agreed to use epoxy injection if we couldn't prove that it provides a strong bond. Studies conducted over the past three years by independent laboratories have made that case for us.

Using the same techniques for testing the compression strength of gunite, core samples that cut across large epoxy-filled cracks have been taken and placed under a hydraulic press in the laboratory. (This is the same procedure used to test whether or not concrete meets the psi standard defined by engineers.)

In every test, the core sample containing the epoxy patch resisted more than 5,500 psi before breaking. And on those samples, researchers noted that the patched portion of the sample held fast while the adjoining concrete broke away. Suffice to say, epoxy properly injected in a structural crack is tough stuff!

—M.G.

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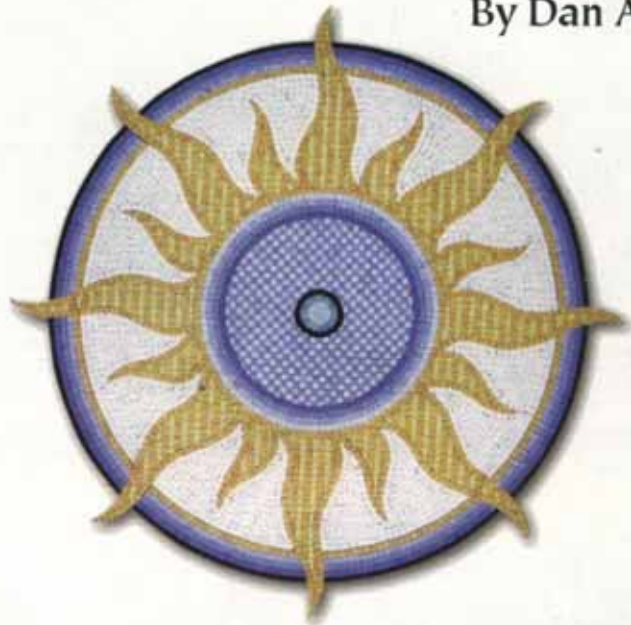
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A

Real Glass Act

By Dan Andrews



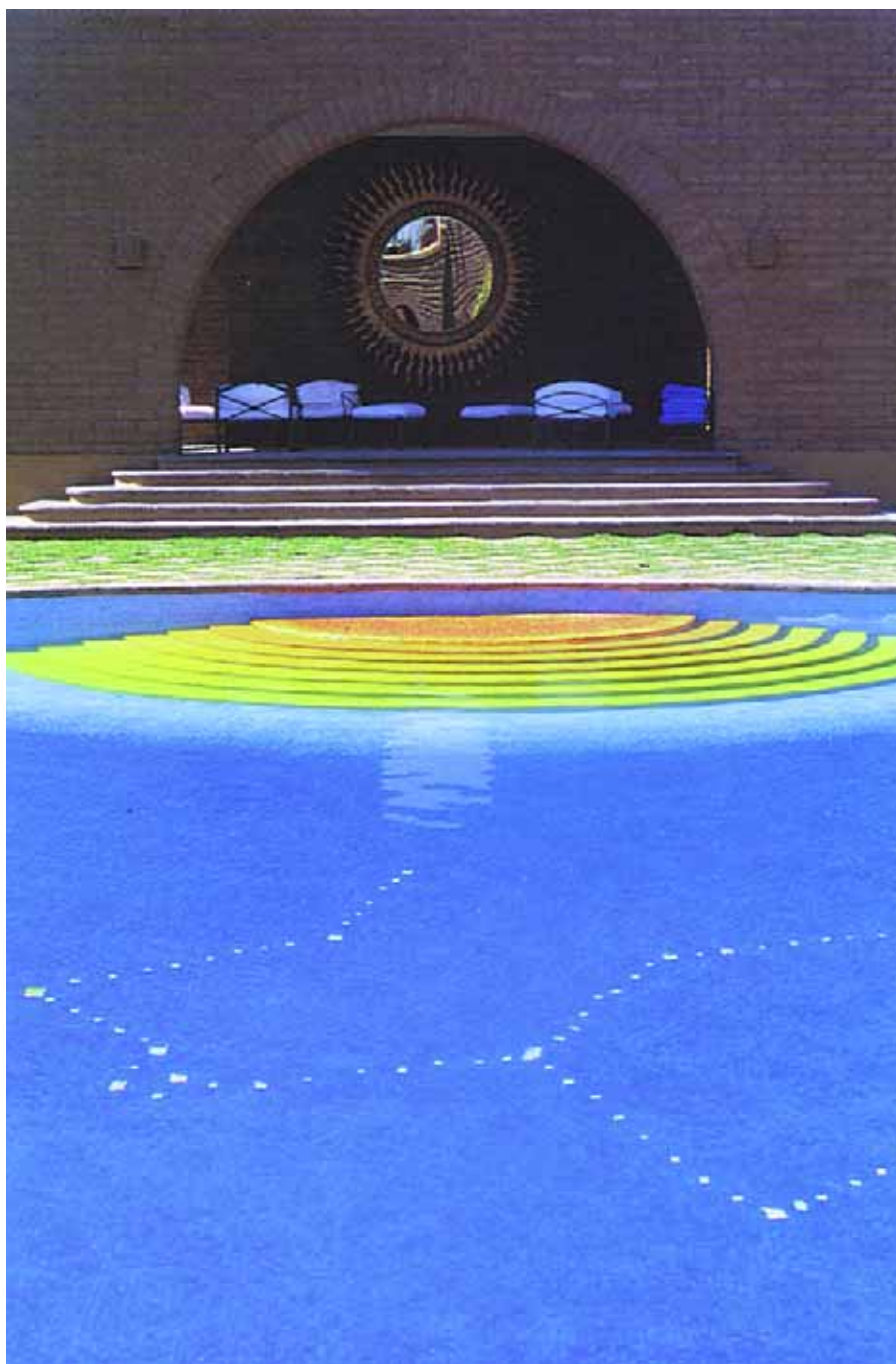
As clients demand more and more creativity and aesthetic value in their watershapes, an increasing number of professionals are turning to the installation of prefabricated or custom-designed mosaics as a way to add elegance, complexity and sometimes even humor to their work. Here, tile expert Dan Andrews surveys this trend and takes us on a tour through the possibilities of a form of artistic expression with a long, long history.

It's an art form that connects modern craftspeople to those of the distant past.

In fact, the roots of mosaic tiling can be traced to Mesopotamia in the third millennium B.C., where temple walls were decorated with simple earthenware fragments. Centuries later, the ancient Greeks decorated their courtyards with large and small pebble mosaics, and sophisticated examples of mosaic work are found later in everything from Turkish mosques to Italian basilicas.

The Romans, however, probably pushed mosaics about as far as any culture could in the first few centuries A.D. They adorned baths, pools, spas, floors and walls of important buildings as well as humbler residences with intricate mosaics made up of ceramic, stone, glass and marble.

Recent years may have seen a revival of this ancient artistic technique, but as can be seen in the accompanying photographs, what many of today's designers are doing with classic forms is a real step forward – a departure from tradition that has made



today's mosaics a thoroughly modern form of expression.

A VARIED PALETTE

The installer of a glass mosaic has lots of options in today's marketplace. To help you through the basics, let me start by defining specific characteristics of available types and styles of glass:

❑ **Venetian Glass Tile.** In one common form, this tile is produced in squares ranging from 3/4 of an inch to 2 inches

and are paper-face-mounted on individual, foot-square sheets. These sheets are used to cover large expanses of swimming pools, spas or fountains (Figure 1). More important in the context of this article, Venetian tiles also are produced in smaller, 3/8-inch squares that are ideal for use in creating either standard or custom-made figures, designs and decorative murals (Figure 2).

In order to have good, clear resolution of the design, figures created using the

smaller Venetian glass tiles must cover a minimum area of about six square feet. If the design is smaller than that (and therefore too small to be rendered by a computer using these tiles), then the use of Byzantine glass (see below) may be the best option.

❑ **Byzantine Glass Mosaics.** Where Venetian tiles are cut square, Byzantine glass consists of irregular, hand-cut glass tiles that measure (about) 3/8-inch "square." This is the classic material used for architectural mosaics and is generally what you see in murals, signs and custom mosaic designs (Figure 3 on page 50). The size and versatility of Byzantine glass lends itself to the creation and application of intricately detailed medallions, suns, flowers, logos, borders, marine figures and the full range of custom designs.

We in the mosaic business also have two classifications that have less to do with the glass used than with the fact that they are categories in which much of the business is commissioned:

❑ **Logotypes.** These aren't necessarily corporate logos (although they are often a subject for mosaics); rather, they are symbols or images that define or capture the nature of a place – a golf ball, for example, used to promote a golf club or monogrammed initials to represent a company or a person. This is a highly individualized area of the business and the list of possible applications is virtually endless.

❑ **Marine Figures.** These figures are so popular in conjunction with watershapes that they bear mentioning as a category unto themselves. Colorful, attractive reef fishes and mammals, for example, are available in numerous prefabricated, pre-assembled designs (as seen in Figure 2), and installation is easy: The whole assembly is simply affixed to the pre-laid mortar on the watershape's surface. Customers looking for a bit of whimsy with an aquatic feel often opt for these mosaics, which run from relatively small to rather large.

GOING CUSTOM

While many clients feel more comfort-
Continued on page 51



Figure 1

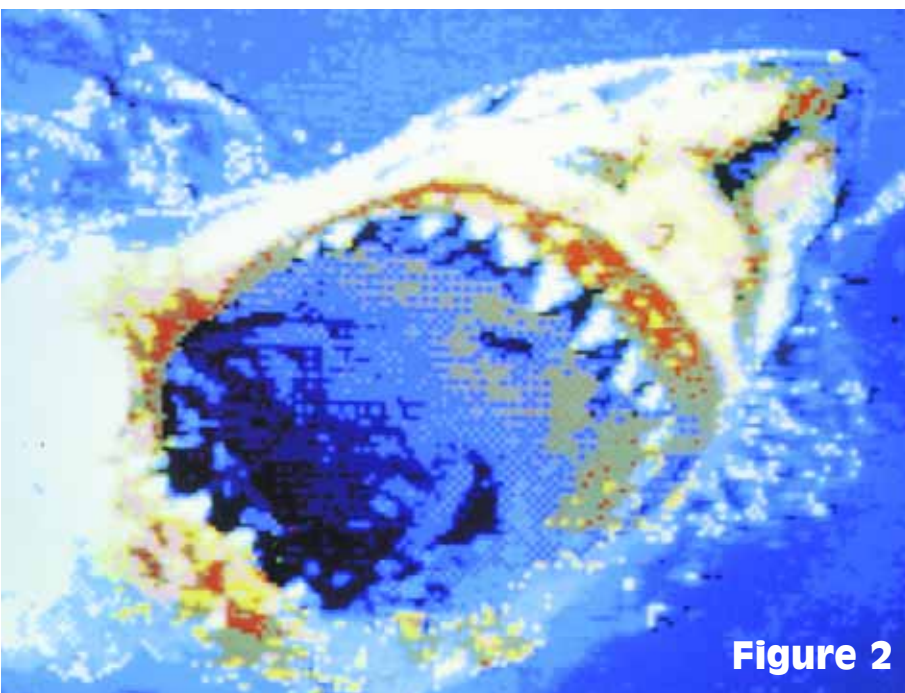


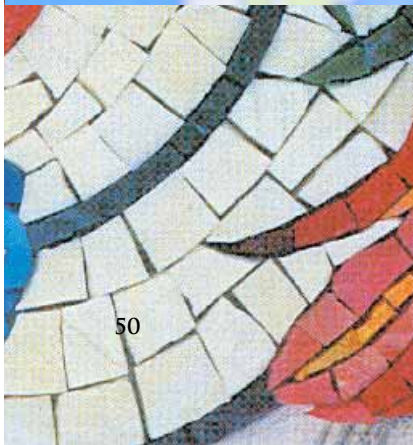
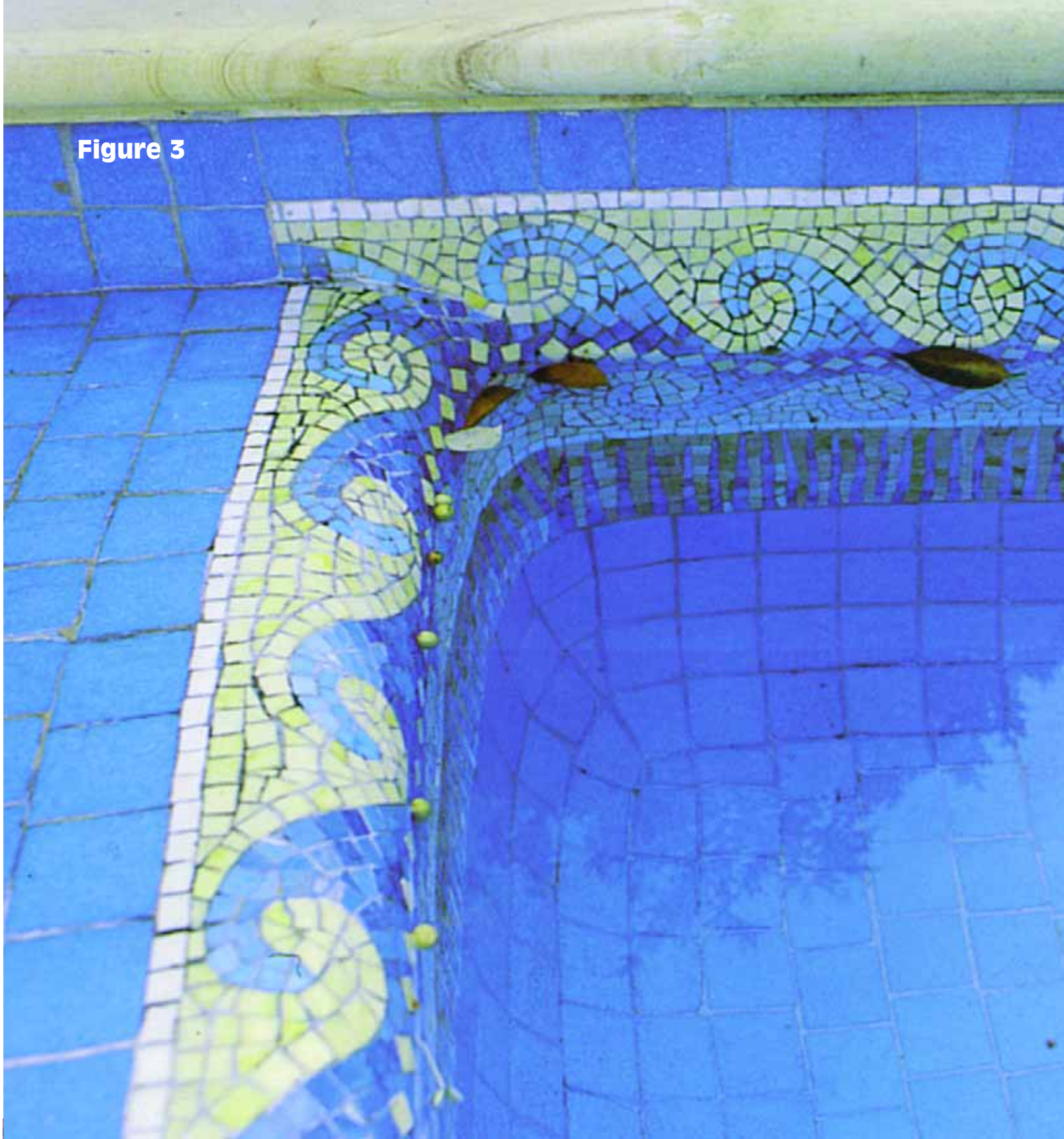
Figure 2

(Figure 1)
Venetian glass
tile is often used as foot-
square sheets to introduce a
shimmering effect throughout
a pool.

(Figure 2)
In smaller size,
Venetian glass may be used
to create unique (and, as in
this case, carnivorous) images
and effects.

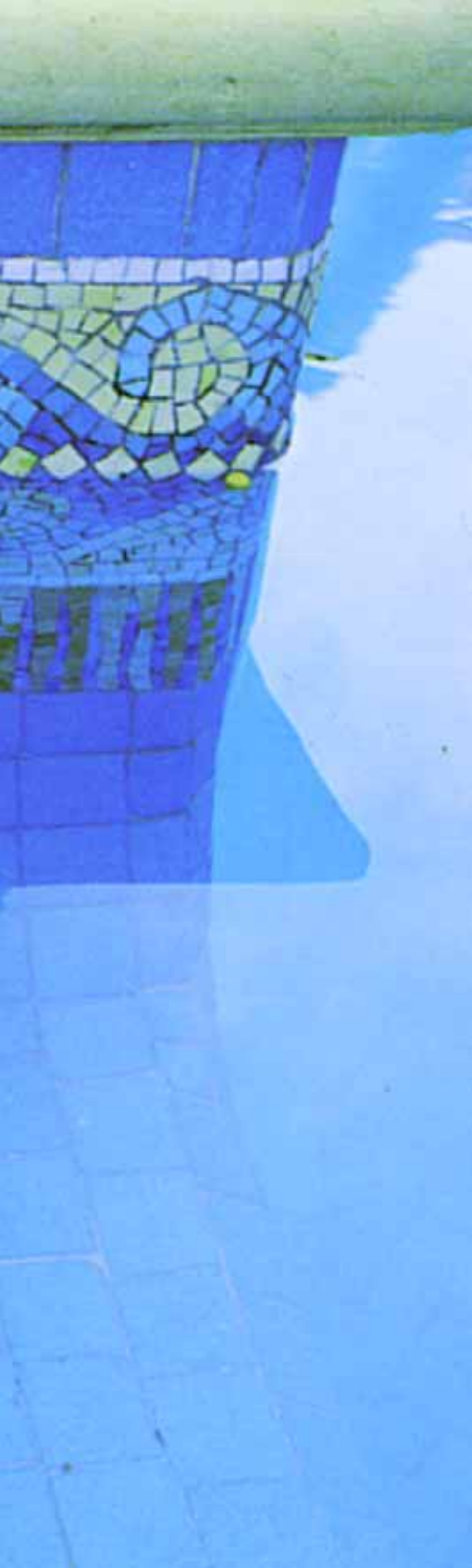


Figure 3



(Figure 3)

The irregular shapes and edges of Byzantine glass makes it well-suited to achieving mosaics with tight contours and sweeping curves.



able ordering a mosaic design from a catalog, today's suppliers also offer custom design services that can bring a mosaic of virtually any design to a watershape.

When a mosaic studio like ours at Mosaicos Venecianos de Mexico receives a drawing for a customized project (as was the case with many of the designs illustrated in this article), the work is quoted according to size, intricacy and colors.

But this isn't just a quick sketch: To execute a mosaic, we need a true rendering that offers the client/viewer a close, initial impression of the finished mural, figure or logo that will be applied to a vessel's surface. A good full-color rendering helps artists in the studio create a computer-generated rendering that closely mirrors the clients' vision.

In approaching a project, everyone involved should bear in mind that the magic of mosaics is not only in the practicality and durability of the glass itself, but also in the look of the watershape as

the colors, patterns and reflective sheens of the mosaic alter and enhance the contours and textures of the vessel. This is why we place so much emphasis on making the rendering as full and accurate a representation of the ultimate mosaic as possible.

As you can see in the images on pages 50 and 51, for example, the artists have been able to capture rich highlights, subtle gradations or sharp contrasts in defining edges of physical features such as steps and in making unique facets of these designs stand out. This isn't something where you want lots of change orders: Everyone involved wants to get things right from the start!

We also can't lose sight of the fact that the rendering helps builders and architects sell the sizzle: In itself, it creates an added value for clients that is compounded when they are offered a mosaic that fulfills their vision – and also delivers all of the practical advantages of glass tile.



Gorgeous Glass

One distinction of contemporary work in mosaics is the artisans' use of glass as their material of choice in preference to the other classic mosaic materials: ceramic, stone or marble. In addition to glass mosaics' imperviousness to wear and ability to stand up to any weather conditions, today's artisans prize glass for the way it reflects and refracts light and shifts colors depending on angle of view and illumination.

Those qualities are particularly valued by watershapers looking for something different to offer their upscale clientele. As pool, spa and fountain design evolves from the strictly utilitarian to the more monumental or personal – and as contemporary buyers become more aware of the pleasures of the ancient art of mosaic tiling – we are seeing more and more projects in which mosaics are used to lighten, liven and add interest and value.

The liveliness and interest come from the fact that glass mosaics have nearly 5,000 years of history and tradition behind them. They also offer varied visual textures, from flat, matte looks achieved through sandblasting to smooth, shiny looks in everything from bold primary colors to pale translucent hues. They even offer metallic accents, including copper, silver or even 24-karat gold layered onto or sandwiched within the glass.

This variety and shading of appearance are part and parcel of the manufacturing process. Glass tiles are made from combinations of fired sands, silica and various minerals (added for color). The resulting material is very thin and translucent, but a heating and cooling process called *annealing* makes the tile stronger than ordinary glass. The result is a lustrous, opalized glass that comes in brilliant, luminescent colors.

The rich look of glass tile is something people are accustomed to seeing on murals in public places or in fountains or pools that seem more like works of art than bodies of water. These materials are supplied by companies in Latin America and Italy; our company, Mosaicos Venecianos de Mexico, is based in Mexico, for instance, and distributes its glass tiles throughout the world.

The manufacturing processes are far from simple, but the art is in assembly of the pieces of mosaic glass into patterns that dazzle the eye. These artists spend years acquiring their skills; for those who want to offer their customers the beauty and appeal of these mosaics without becoming a master in the arts of design, cutting and assembly, a handful of suppliers prepare complete mosaics for installation, either as off-the-shelf designs or on a custom basis.

–D.A.

There's another benefit to the rendering process that shouldn't be overlooked: Depending upon complexity, these custom-look renderings can be created by a builder, a designer or a graphic artist, but the inspiration usually springs from the customers' desires. What a rendering does in this context is enable designers and clients to explore the visual sensibilities of a vessel and work through all of the details that will make the overall watershape just perfect in the clients' eyes.

WORKING WITH THE STUDIO

The rendering sent by a builder or architect to a mosaic studio is scanned to create a digital version of the rendering. If the clients' vision is matched by the studio's computer rendering, the project can advance to the next stage. If the computer-generated rendering needs adjustment, it's an opportunity for clients to get further involved in developing their vision. (See the sidebar on page 53 to see what this style of rendering entails.)

Once the final rendering is completed, our firm sends a quotation to the client and, upon approval, follows that up with a small-scale sample or section of the work. This gives clients an opportunity to see how their desires are being interpreted – and a chance to see the colors



selected by our artists.

Once the sample is approved, the studio's artists draw the design to scale on Kraft paper. Once that's finished, the drawing is numbered and cut into jigsaw-patterned sheets approximately 15 inches square to be distributed among different artists. This division of labor is known as the *studio method* and involves a chronological *lofting plan* that will guide the installer on site.

As for installation, the art work is first set paper-side down on the floor next to the work area, with the sheets matched up to ensure that the art is complete. Now the installer simply follows the lofting plan and the supplier's recommended installation procedures (or those of the Ceramic Tile Institute).

All of the work here, from rendering and negotiating to studio work and installation, has its price, but when completed, glass mosaics offer real value, true beauty – and a look that has endured through the centuries.



A Computer Assist

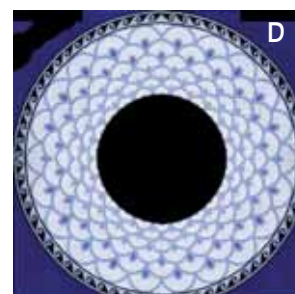
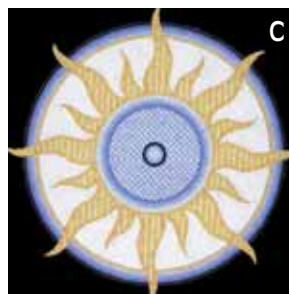
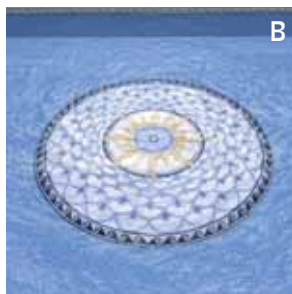
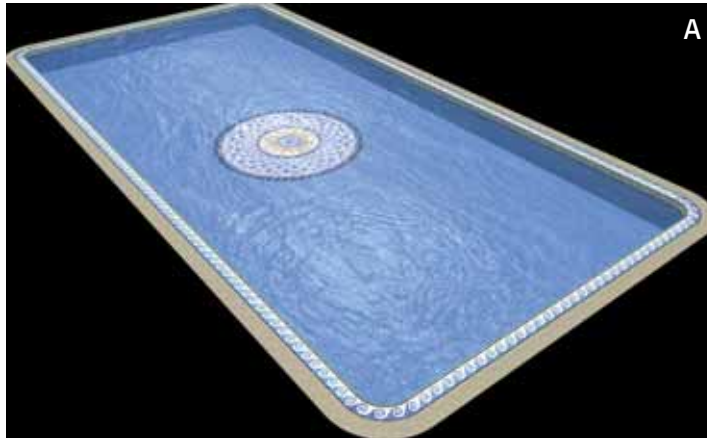
The process of generating a large mosaic for placement in a swimming pool can be a complex one, starting from the designer's drawings and going through various stages of computer manipulation in the mosaic supplier's studio.

In this case, we at Mosaicos Venecianos de Mexico took the designer's plans for this medallion and set it up with computer-generated views from several angles, distances and lines of sight (A, B). This step ensures overall satisfaction with size and placement.

We also use computers to break the images into their component parts. This helps us get the details right; it also breaks the overall task into components that flow smoothly through our studio. In this case, we see the solar medallion (C) and, separately, its surrounding corona (D).

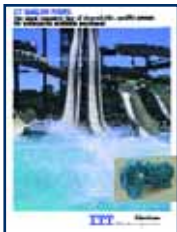
They say the devil's in the details, and this is the best way we've found to keep everything straight, clear and manageable.

—D.A.



LEAFLET ON PUMPS FOR WATERPARKS

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DECKING SUPPLIES HIGHLIGHTED IN CATALOG

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STEGMEIER CORP. has issued its 2000 Catalog, a 68-page resource for cantilever forms, fiberoptic receivers, renovation supplies, deck drains, expansion/control joints and more. The catalog's cover includes a full-color fold-out guide to Frontier Desert Deck materials as well as profiles for cantilever forms and other products. A full-page map guides access to the company's network of sales representatives. **Stegmeier Corp.**, Arlington, TX.



LANDSCAPING LIGHTING CD AVAILABLE

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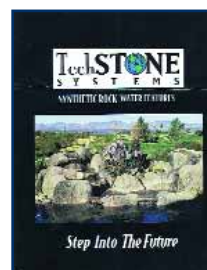


NIGHTSCAPING has prepared a new sales tool: The CD-ROM "Discover the Possibilities" serves the contractor by supplying color images, sound, animation and interactive features for client presentations on exterior lighting systems. The disk displays beautifully lit homes and property while providing warranty information, testimonials and a complete list of the benefits of the company's product lines — a great on-the-spot educational tool. **Nightscaping**, Redlands, CA.

BROCHURE ON SYNTHETIC ROCK WATERFEATURES

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TECHSTONE SYSTEMS has published a brochure highlighting its capabilities in fabricating synthetic rockwork for a variety of purposes, moods and projects. Illustrations cover applications with pools, spas, ponds, waterfalls and streambeds with textures from craggy to smooth. The brochure also describes the process by which the synthetic rocks are made and defines their insulating characteristics as well as their finishes. **Techstone Systems**, Phoenix, AZ.



POOL TILE CATALOG FOR 2000

Circle 104 on Reader Service Card

NATIONAL POOL TILE has released its 2000 catalog, highlighting the merged capabilities of Cozad & O'Hara, Quality Pool Tile and Thompson Tile in serving builders nationwide. The 48-page, full-color catalog covers a wide range of print tiles and 1-by-1-in., 2-by-2-in., 3-by-3-in. and 6-by-6-in. tiles. The catalog also covers accessories, from scuppers and hand holds to depth markers, brickwork and mosaics. **National Pool Tile Group**, Anaheim, CA.



CERAMIC-COATED AGGREGATES

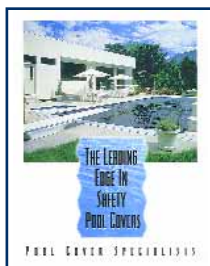
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TXI CONTOUR has released a flyer on its Cercoso line of colored, ceramic-coated aggregates for interior pool and spa finishes. The ceramic technology assures color consistency, chemical stability and resistance to mechanical wear, fading, etching and bleeding. As more Cercoso is exposed at the surface, plaster exposure and any potential for mottling are reduced. Comes in six standard colors, but custom color mixes are available. **TXI Contour**, Dallas, TX.



HIGHLIGHTS ON SAFETY-COVER LINE

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POOL COVER SPECIALISTS offers information on its capabilities in safety pool covers. The six-page, full-color brochure defines the benefits and describes covers designed to meet every need and budget, from automatic, track-mounted Infinity systems to decktop Trak systems that operate with the power of a hand-held electric drill. The brochure also discusses materials and technologies used in these state-of-the-art cover systems. **Pool Cover Specialists**, West Jordan, UT.

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DURA ART STONE has introduced an extensive new collection of cast-stone garden and outdoor furnishings, including classical urns, planters and bowls as well as column details, outdoor benches, statuary and animal sculptures. The company also offers custom services: Working from drawings, staff will sculpt, model, mold and cast a finished piece. All products are available in a choice among 18 colors and a range of finishes. **Dura Art Stone**, Fontana, CA.



Continued on page 58

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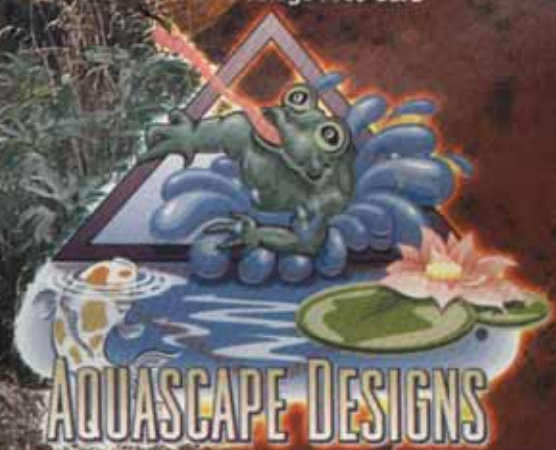
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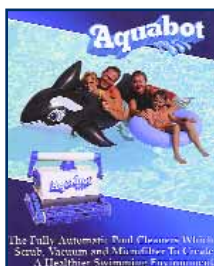
- A ☐ Filters, pumps, motors
B ☐ Heaters (fossil fuel, solar)
C ☐ Valves, fittings, plumbing
D ☐ Cleaning systems

- E ☐ Chemical treatments
F ☐ Lighting systems
G ☐ Control systems
H ☐ Covers, enclosures
I ☐ Landscape materials
J ☐ Aquatic flora, fauna
K ☐ Construction, excavating equipment
L ☐ Interior finishes
M ☐ Decking
O ☐ Other _____

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FILTERING POOL CLEANERS HIGHLIGHTED

Circle 108 on Reader Service Card



AQUA PRODUCTS offers a four-page, full-color brochure on its Aquabots, fully automatic pool cleaners that scrub, vacuum and microfilter surfaces to create a healthier swimming environment. Three models are highlighted: the Aquabot, Aquabot Turbo, which operates at twice the speed as Aquabot, and Aquabot Turbo Remote Control, which allows the user to direct the cleaner to areas that may require extra cleaning attention. All units are pre-programmed for efficient cleaning. **Aqua Products**, Cedar Grove, NJ.

TOUGH, NATURAL POOL FINISHES

Circle 109 on Reader Service Card

SOUTHERN GROUTS & MORTARS offers a pamphlet on its River Rok interior pool finishes. Designed to provide a tougher, time-resistant surface, this new technology includes natural stones tumbled and premixed with specially formulated cement at the factory, so the style you choose remains consistent during application. Featuring six basic colors, the finish is non-abrasive, resists algae and comes with a five-year warranty.

Southern Grouts & Mortars, Pompano Beach, FL.



BROCHURE ON CARTRIDGE FILTERS

Circle 110 on Reader Service Card



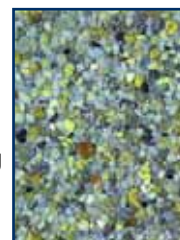
LAARS/JANDY POOL PRODUCTS offers literature on its line of ProEdge cartridge filters. The full-color brochure describes filtering action, maintenance procedures, economical operation and a 10-year warranty. Tall-tank varieties are available with 50-, 75- and 100-sq-ft. filter areas; C Series units offer 200-, 300- and 400-sq-ft. filter areas. All models feature ProEdge "Total Line-Up" product integration, one-call tech support and training programs.

Laars/Jandy Pool Products, Novato, CA.

PEBBLE-TYPE FINISHES HIGHLIGHTED

Circle 111 on Reader Service Card

CRS SYSTEMS has released an eight-page, full-color brochure depicting the Mother of Pearl line of surface products. Designed to stimulate the senses with colors and textures that come alive, the finishes are made up of specially selected, naturally polished river rock combined with water-enhancing cement colored in blues, greens or browns for looks from the tranquil to the breathtaking. All finishes can be used above the waterline to create beach entries, vanishing edges, waterfalls and natural waterlines. **CRS Systems**, Fort Mill, SC



BIOLOGICAL SYSTEMS BROCHURE

Circle 112 on Reader Service Card



POND SUPPLIES OF AMERICA has literature on its Super-Pond kits, which match filters, pumps and piping combinations for perfect fits with pond sizes of your choice. Each kit includes complete installation directions as well as an owner's guide; detailed installation videos are also available. The full-color brochure highlights the kits' four-function pump systems in two configurations: a waterfall-mounted system and a skimmer system. **Pond Supplies of America**, Yorkville, IL.

STAINLESS, BRASS AND ALUMINUM RAILINGS

Circle 113 on Reader Service Card

TUBULAR SPECIALTIES MFG. offers details on its full line of stainless steel, brass and aluminum rail goods for residential and commercial applications. The four-page pamphlet summarizes the company's custom and standard railings for interior and exterior architectural and landscape use as well as ladders and rails for use in pools and spas. All products are guaranteed for one year from shipping date; a complete, 44-page catalog is available. **Tubular Specialties Mfg.**, Los Angeles, CA.



DETAILS ON NATURAL STONE FINISHES

Circle 114 on Reader Service Card



MASON MART offers literature on the Brookstone line of natural stone finishes. Strong, attractive and color-true throughout, the material is a premixed, exposed-aggregate interior pool finish that is highly resistant to chemical deterioration and provides a natural "hide factor" that masks most common types of stains. The product is offered in six basic colors and four specialty colors and comes with a seven-year warranty on the cementitious binders matrix and a lifetime warranty on the pebble components. **Mason Mart**, Phoenix, AZ.

FRESHWATER AERATORS FOR PONDS AND LAKES

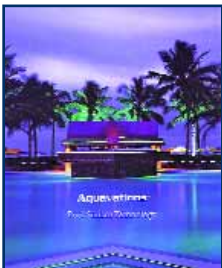
Circle 115 on Reader Service Card

AEROMIX announces the availability of the complete line of AquaScope freshwater aerators. Designed for use in ponds, lakes, municipal parks and a range of commercial applications, the systems include floating fountains, surface aerators, submersible aerators, diffused-air systems and bio-augmentation systems used to improve water quality, control algae, help foster aquatic life, prevent fish kill, reduce bottom muck and beautify bodies of water. **Aeromix**, Minneapolis, MN.



BROCHURE ON POOL FINISHES

Circle 116 on Reader Service Card



AQUAVATIONS offers literature defining its role as a leader in pool-finishing systems. Included in the full-color, eight-page brochure is information on Hydrazzo, a polished-aggregate finish available in unique colors and offering a uniquely smooth, non-skid, strong and virtually impermeable surface. Also featured is the SunStone line of pre-blended exposed aggregate finishes, offering non-fading color with a silky texture. **Aquavations**, Coral Gables, FL.

MOSAIC TILES AND MURALS

Circle 117 on Reader Service Card



DAL-TILE is the U.S. distributor of glass tile and mosaics created by the factory and studios of Mosaicos Venecianos de Mexico. The mural studio can create mosaic murals and logos from submitted artwork or designs. They also offer a range of beautifully detailed marine figures – in stock and ready for quick shipment through nearly 200 showrooms nationwide. **Dal-Tile**, Dallas, TX.

NEW POND SUPPLY CATALOG

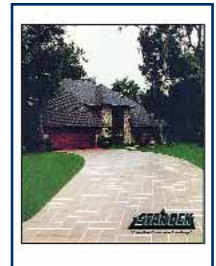
Circle 118 on Reader Service Card



SPECK PUMPS has released its 2000 Product Catalog. The 20-page, full-color booklet outlines the features and provides performance curves and technical data on eight pumps as well as detailed descriptions of the capabilities of the company's sand and cartridge filters, skimmers and equipment packs. Also included is complete information on three styles of swim jets. **Speck Pumps**, Jacksonville, FL.

CONCRETE COATINGS HIGHLIGHTED

Circle 119 on Reader Service Card



COLOR-CROWN CORP. offers a brochure on the StarDek system. Not a paint or stain – and designed to be slip resistant and cooler than concrete – the coating uses tough acrylics, color pigments and cementitious materials to achieve a colorful, textured finish with staying power. The brochure carries technical specifications as well as photographs of various watershape-related installations in commercial and residential settings. **Color-Crown Corp.**, Tampa, FL.

SOLAR HEATING FOR POOLS

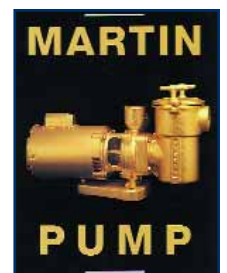
Circle 120 on Reader Service Card



HARTER INDUSTRIES provides literature on its roof-mounted and in-deck solar pool-heating systems. The roof-mounted Hi-Tec system combines tube-on-fin solar absorbers with injection-molded headers to provide high levels of heating and low maintenance. For sites with decking areas at least twice as large as a pool's surface area, the company also offers its Pool Deck heating system – a completely concealed solar heater. **Harter Industries**, Holmdel, NJ.

BRONZE-ALLOY POOL PUMP

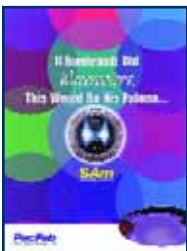
Circle 121 on Reader Service Card



MARTIN PUMP introduces its 100 Series of pumps, made using a special bronze alloy offering high quality at low cost. Self-priming, durable, resistant to chemicals and corrosion, the pumps come in four models ranging from .75 to 2 hp and feature 56-frame, industrial-quality motors, bronze impellers and drip-proof seals. Literature includes performance curves and specifications. **Martin Pump**, Torrance, CA.

UNDERWATER LIGHTING SYSTEMS

Circle 122 on Reader Service Card



PACFAB offers a brochure on its pool-lighting products, focusing on SAM, its Spectrum Amerlite line of colored underwater lights. Featuring twin-tungsten halogen bulbs, this system gives the homeowner freedom to choose from an almost infinite range of colors and combinations at the flip of a switch. In addition, multiple lights can be synchronized. SAM retrofits into any full-size American, PacFab or Purex fixtures and complements fiberoptic lighting for truly dazzling effects. **PacFab**, Sanford, NC.

IN-FLOOR POOL CLEANING SYSTEM

Circle 123 on Reader Service Card



CARETAKER SYSTEMS has published a leaflet on its Caretaker 99 Plus in-floor cleaning system. Designed for use in consumer education, the sheet outlines the benefits of these systems, including guaranteed 99% cleaning, reduced monthly maintenance expenses through improved circulation and a lifetime warranty on the entire system. **Caretaker Systems**, Scottsdale, AZ.



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WATER SHAPES

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OZONE-BASED WATER PURIFICATION SYSTEM

Circle 120 on Reader Service Card



PROZONE INTERNATIONAL has released a 12-page, full-color brochure outlining all of the benefits and advantages of UV-based ozone purification systems designed to make pools and spas drinking-water pure. The literature describes four spa ozonators, three models designed for use with residential pools and other models intended for use with large-volume commercial pools and spas. **Prozone International**, Huntsville, AL.

POOL PLASTERING EQUIPMENT

Circle 122 on Reader Service Card



MACALITE EQUIPMENT offers information on its full line of plastering equipment. With products ranging from trowels, step tools and rubber gloves to hoses, couplings and plaster pumps and mixers, the company provides a one-stop shopping resource. It also has a research and development program that is reflected in developments such as larger fittings that reduce back-pressure on pumps as well as larger nozzles for pebble application. **Macalite Equipment**, Phoenix, AZ.

FLYER ON TIME CONTROLS

Circle 124 on Reader Service Card



PARAGON ELECTRICAL PRODUCTS has released a sheet on its 4000 Series of traditional, 24-hour time controls. Available in non-metallic, metallic and steel enclosures, the device allows for up to seven on/off actions of 90-minute-minimum durations. UL and CSA listed and rated at 40 amps per pole. The flyer also provides specifications on the full series, including typical wiring diagrams. Some models also have a skip-a-day feature for enhanced programming flexibility. **Paragon Electrical Products**, Two Rivers, WI.

DURABLE POOL FINISHES HIGHLIGHTED

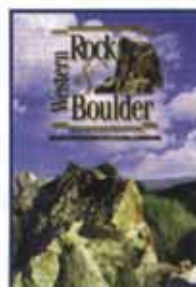
Circle 121 on Reader Service Card



ULTRA POOL COATINGS has released literature on its Ultra Plus line of premium pool finishes. A unique blend of ingredients provides durability, smoothness and reliability while offering a brighter, more reflective surface. The finish comes with a seven-year warranty against discoloration, etching or delaminating and is available with colored particles that stand out clearly against the bright background of the base finish. **Ultra Pool Coatings**, Woodbridge, Ontario, Canada.

ROCKS AND BOULDERS FOR WATERSHAPES

Circle 123 on Reader Service Card



WESTERN ROCK & BOULDER has published a brochure on the availability of mineral-rich, colorful and beautifully textured rocks for use in landscape and watershape installations. With a specialty in monumental and decorative rocks and boulders, the company ships nationwide – and the price as quoted includes delivery to the designated site. **Western Rock & Boulder**, Fallon, NV.

COMPACT CARTRIDGE FILTERS

Circle 125 on Reader Service Card



WATERCO USA has published a flyer on its Trimline Cartridge Filters. Offering versatile filtration in a compact unit, these filters feature one-piece molded construction from high-impact polypropylene as well as filtration elements made from heavy-duty, easy-to-clean polyester fabric. Non-corrosive construction makes these filters suitable for application with either fresh or salt water. Eight models range in filter area from 25 to 150 sq ft. **Waterco USA**, Scottsdale, AZ.

great when you have the stream or river nearby, laid out by Mother Nature in the proper physical relationship to make it work. Windmills also work quite well – when the wind is blowing.

But the horse wheel is a different story altogether. Picture as many as four large horses tethered to a horizontal bar pivoted at one end: They can walk in an endless circle, transferring their energy through some mechanism that can be made to do all sorts of things.

Savery noted that for each horse tethered to the bar, two additional horses were required in the background to ensure that a continuous source of horseflesh was available. I can only assume that one of the spare horses was eating while the other was relaxing, digesting his meal and contemplating his next shift at the bar.

When he sold an engine that did the same amount of work as one horse walking the circle, he called it a *three horsepower* unit because the engine would operate nonstop, 24 hours a day, thereby replacing three live horses. The larger engines he called “six horsepower,” “nine horsepower” and “12 horsepower.”

Without ever actually defining *horsepower*, Savery sold many engines. And remember, this is in 1690 – barely out of the Dark Ages. I wonder what line of business Mr. Savery might have chosen and what sales pitch he might have used in 1990?

BEYOND THE STABLE

Not much more time passed before the first really successful steam engine was developed by Thomas Newcomen early in the 1700s. It was far superior to Savery’s unit, but Savery had obtained a broad patent on his design that prohibited Newcomen from building and selling his units.

Eventually, Newcomen overcame this hurdle by entering into a partnership with Savery. By 1712, the Newcomen-design engines began to take over the industry. (Keep in mind that the primary use of all these steam engines was still to lift water from mineshafts or to lift the coal or other ore from the mine.)

The next 100 years saw tremendous change. The Industrial Revolution was

under way in England. Manufacturing was changing from mom-and-pop home crafts to factory-based mass production. And along came Mr. James Watt.

By 1764, when Watt was in his 28th year, he was recognized as an expert instrument maker and had a cushy job at Glasgow University. He also maintained the university’s working models and, in the course of those duties, was asked to look at a working model of a Newcomen steam engine that had never acted properly. After a thorough examination of the unit, Watt came to the conclusion that the contraption didn’t work well not simply because it had gotten out of adjustment but rather because of basic design flaws.

This led to his first and greatest invention: the improvement of the Newcomen engine. Unfortunately, Watt was not able to benefit from his insights for several years and still had to work at other things to make a living. In fact, it took four years for him to accumulate the necessary cash to apply for a patent, which he did in 1769. Soon he was issued a strong patent covering not only the primary improvement to the Newcomen design, but several other features and improvements as well.

Watt finally got it all together in 1775, when he entered into a partnership with Mathew Boulton – just the sort of businessperson with whom he needed to associate. Now demonstration engines were sent out and inquiries began to flow in from mine owners, who desperately wanted to get rid of all those horses and were aware that the Newcomen engines they had tried actually cost them more to operate than the horses!

The vastly superior engines began to roll out of the Boulton & Watt factory. And now Watt was faced with the same task that Thomas Savery had wrestled with 85 years before: how best to describe the amount of work that his engines could do.

PICK A NUMBER

With consequences we still can’t shake more than 200 years later, Watt reasoned that because the horse was still the primary source of power for the mine owners, he should attempt to tie

his product to those horses in some easily understood, meaningful way. So he went to the mines and looked at the horses. He looked at big horses, small horses, young horses and old horses.

He then calculated the amount of weight the horses were lifting up the mineshaft, satisfying himself that an “average” horse could continue to work for several hours while raising one hundredweight to a height of 196 feet in one minute. Don’t let the unusual math spook you: A *hundredweight* is a British measure weighing 112 pounds, so it figures out to 21,952 pounds ($112 \times 196 = 21,952$) raised one foot in one minute, which is the more customary way to express these figures.

Watt rounded his calculation to 22,000 foot pounds per minute. Then comes the best part of the story: To make absolutely sure that none of his engine customers could ever complain about not getting the power they expected from a Watt steam engine, he arbitrarily increased the number from 22,000 foot pounds per minute to 33,000 foot pounds per minute!

From that point onward, every Watt steam engine rated at one horsepower was capable of doing 33,000 foot pounds of work per minute (which can also be expressed as 550 foot pounds per second ($33,000/60 = 550$)).

Everyone had to follow suit, of course. Through the years, several attempts have been made to replace this slippery definition of horsepower with someone else’s current fancy, but to no avail. In the vast majority of the English-speaking world this is still, after more than 200 years, the customary definition of horsepower.

But what of all those horses? What happened to the tens of thousands of those animals? If they had turned them all loose, would they have simply walked in endless circles? Did they know how to turn right, or to walk straight ahead?

Research!

Jim McNicol is a technical consultant to the swimming pool, jetted bath and spa industries. He works from a base in Orange, Calif.

Horses to Engines

By Jim McNicol

When I first begin to do research for a column, I really have little control over the direction I might take.

If it's a cut-and-dried technical subject where I'll be dealing primarily with solid, scientific facts, the task is relatively simple. Using my own textbooks, two local libraries and the Internet, I look for my subject matter in a minimum of three separate sources. If the information is identical in each selected source, I feel pretty confident that I can use the data in an article.

It isn't always so easy, however, and that's nobody's fault but my own.

I'm a sucker for the intricate detail. As an example, several months ago this column was dedicated to the flow of electrons. I had known that Benjamin Franklin was a significant contributor in this area, but my research turned up far more information than I had expected – and I ended up reading most of two biographies and Franklin's Autobiography as well as dozens of technical articles about things electric.

I was faced with the internal struggle of keeping the article on track as a flow of electrons piece, or letting it become a Benjamin Franklin piece.

STEAMING AHEAD

To make a long story short, I'm into the thick of things all over again. In spades.

I have wanted to do an article on James Watt and horsepower for a long time. Through the years, my research has taken me down a strange collection of paths, alleys, roadways and boulevards, and I've always been driven onward by my desire to share some of this stuff with you. Now's the time – so let me jump right into it.

The closest thing that can be called “the inven-



tion of the steam engine” is attributed to Thomas Savery in England. He received a patent in 1698 for a steam-powered contraption that had only one purpose – to pump water from the shafts of coal mines.

He sold a bunch of the devices to mine owners throughout Britain, and it was easy to compare one of these engines with another: If Engine A pumped 100 gallons per minute from a depth of 300 feet and Engine B pumped 200 gallons per minute from the same depth, it's clear that Engine B was doing twice the work. The comparisons are logical and easy.

It wasn't long, however, before these engines were pressed into service doing other tasks – many of them not as cyclical or repeatable as the simple lifting of water from a mineshaft. How then, to compare them?

Well, before the advent of steam engines, rotary power was generated by water wheels, windmills or horse wheels. Water wheels are

Continued on page 61

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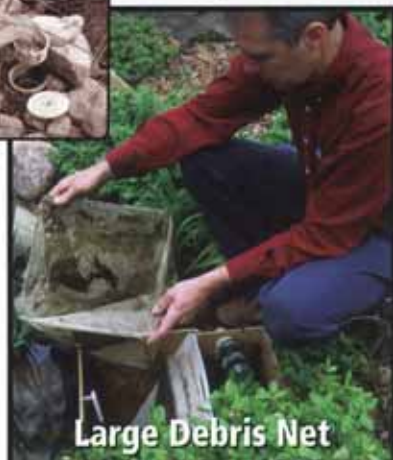
Old Swimming Pool Filters with Tiny Baskets



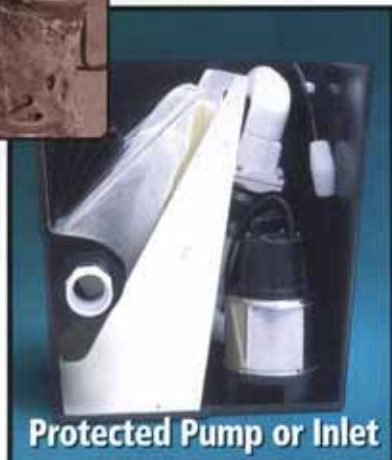
Clogged In-Pond Pumps & Pump Inlets the Old Way



Continual Manual Skimming the Old Way



Large Debris Net

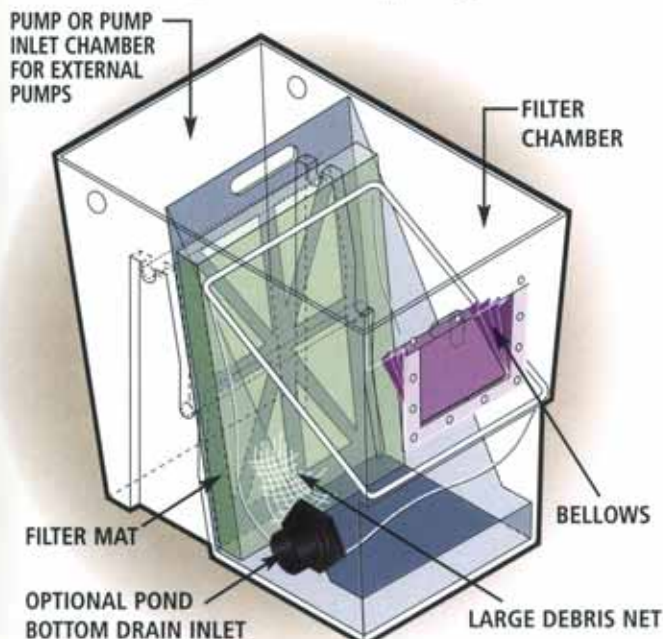


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