Inside: Brain Van Bower on Plan Reading

WaterShapes

Design • Engineering • Construction

Volume 5
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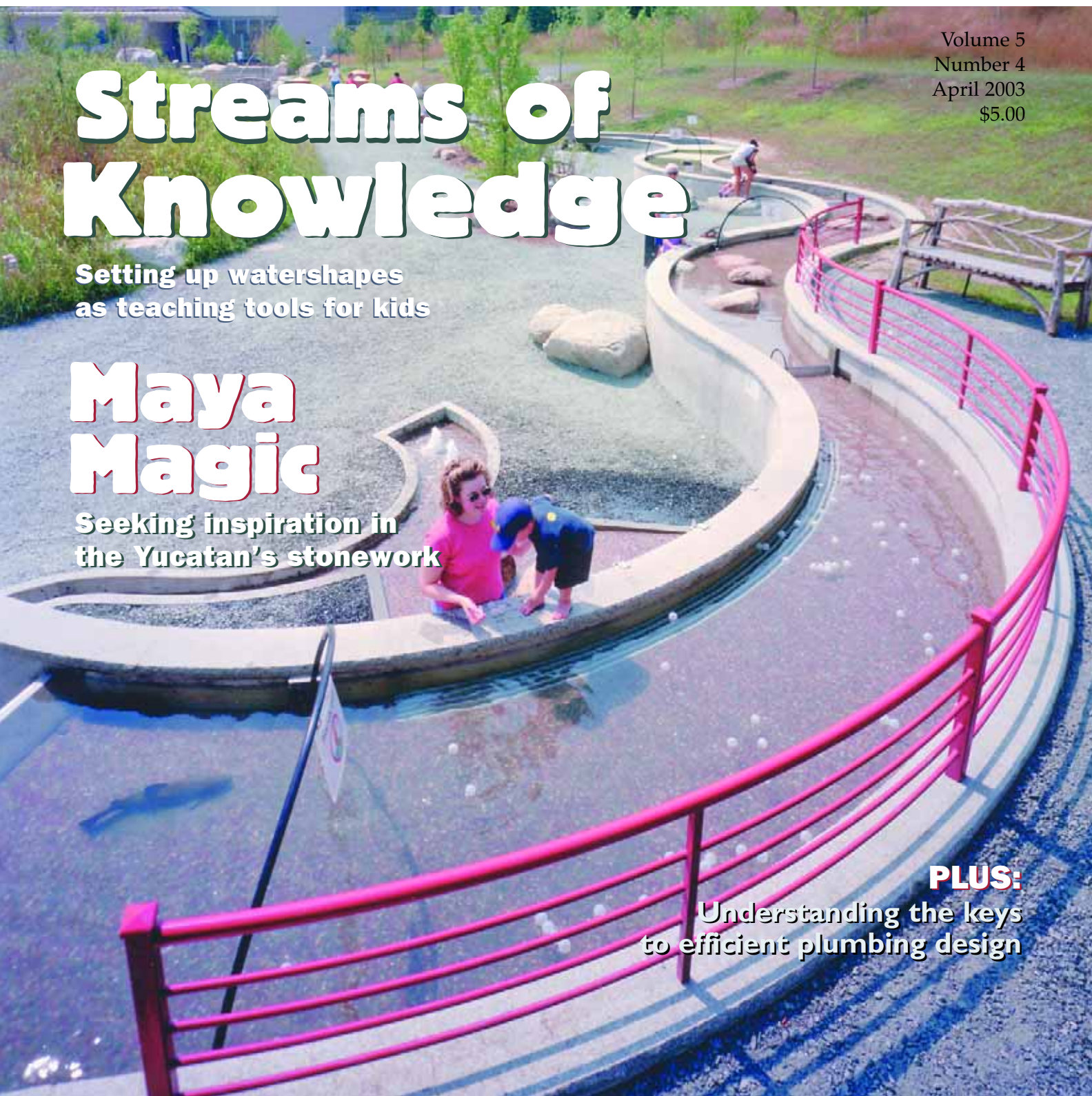
$5.00



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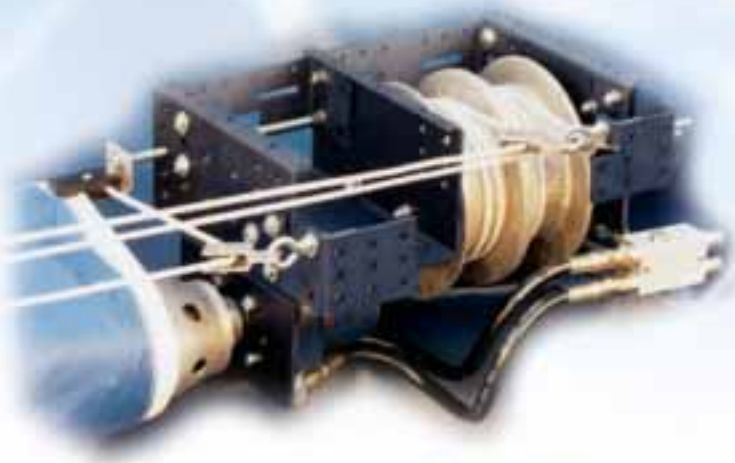

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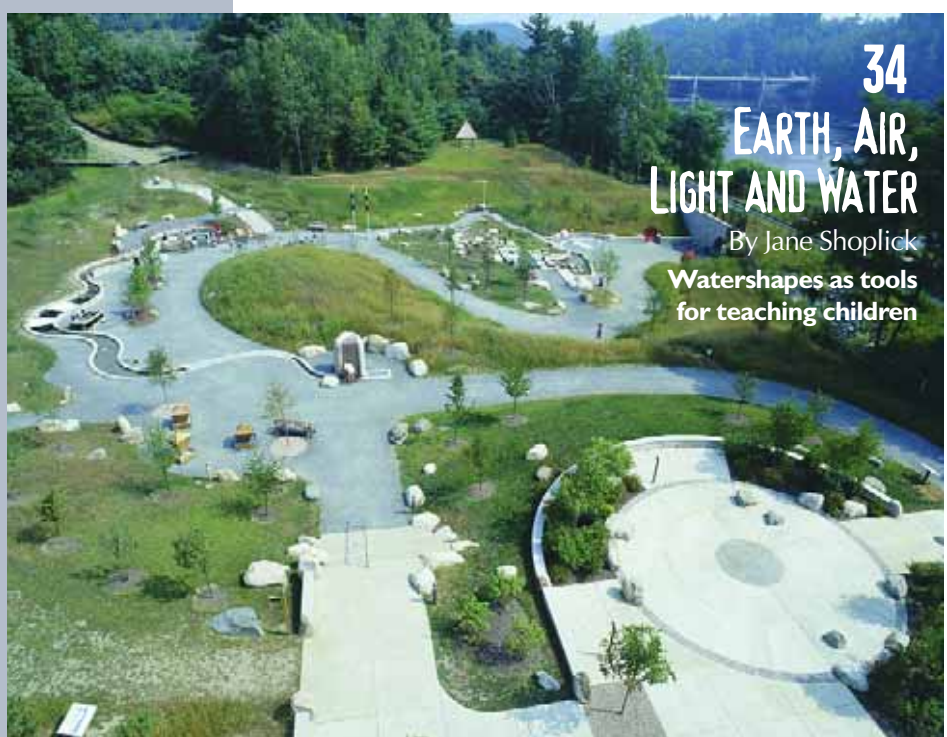

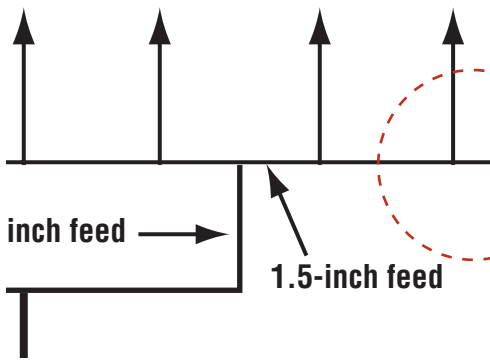

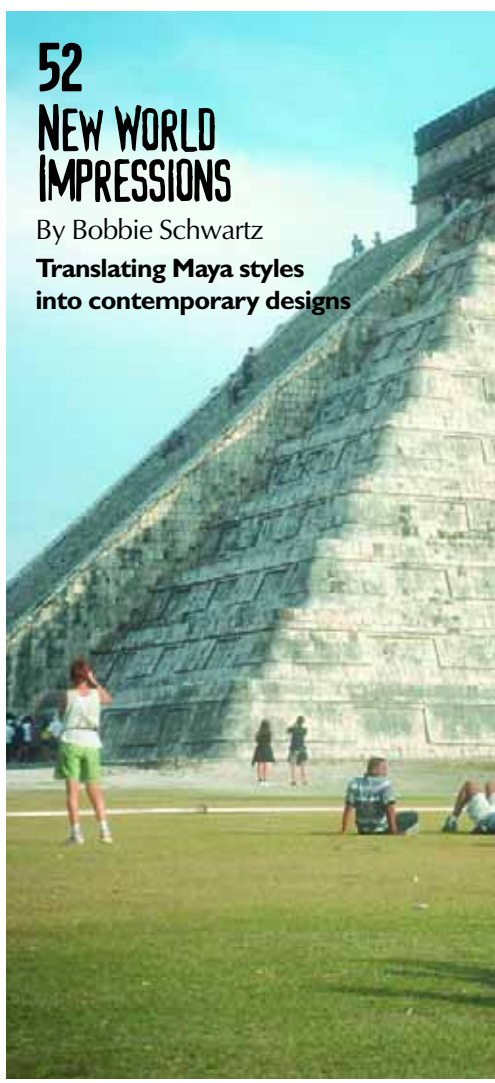

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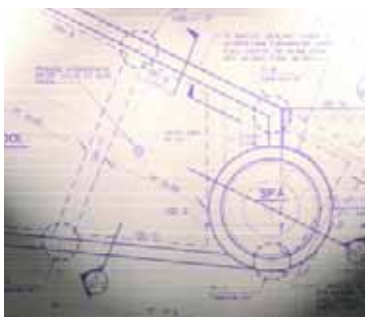
COLUMNS



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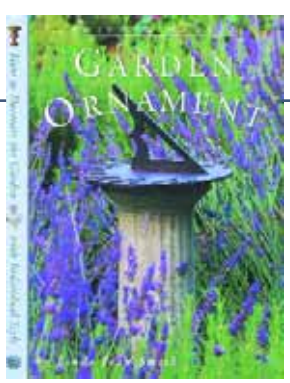

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By Steve Gutai

An inside look at flow and line velocity

DEPARTMENTS

On the cover:
Photo courtesy Copley Wolff Design Group, Boston.

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Higher Purposes

Lately I've noticed a fascinating trend among the projects we've been approached to publish – a string of articles about watershapes that, for want of a better term, have been designed with "higher purposes" in mind.

The projects have all been different in scope and scale and have come from across the spectrum of the markets we serve, but there's been an unmistakable common theme present, one in which the art of watershaping is applied in an important and unusual way for the purpose of education.

In our January 2003 issue, for one, we ran a fascinating story by Seattle-area landscape architect Sandra Hasegawa Ingalls ("A Clear, Clean Public Service," page 58) in which she described the installation of a watershape for the headquarters of a rural water district. In addition to beautifying the grounds, the stated purpose of the stream was to make a clear, responsible statement about management of the local watershed and how healthy soils and plant life lead to clean water – good for wildlife and the district's customers alike.

There was another quite different but equally compelling example of this educational tendency in our March 2003 issue, where, in "Helping Habitats" (page 34), Mike Fowler described the installation of a filtration system for a pool designed to house convalescing marine mammals. A large part of the story had to do with the way in which the entire aquarium facility is used as a venue for public education about the environment and about the plight of dolphins, whales and other marine animals.

Now we come to the current issue and landscape architect Jane Shoplick's description of the crafting of a fascinating watershape for the Montshire Museum of Science in Norwich, Vt. On page 34, she tells that tale of a wonderful stream that offers a variety of interactive exhibits designed to teach children about the processes of erosion, hydraulics and public water distribution, among many other things.

In all three cases, we see vastly different examples of how watershapes can be used to educate and inform. It might seem a stretch to link them in the way I have, but I keep coming back to the fact that all three stories include accounts of the powerful reactions the public has had in each case – and compelling testimony from the authors about the pride they've felt in becoming involved in such ambitious and worthwhile projects.

This all may just be a coincidence and these projects simply unusual rather than representative of a trend, but it is clear at a minimum that each of these projects makes a statement about its community and about the mindsets of the watershapers who've brought them into operation. In each case, these facilities are being used to accomplish the important mission of raising public awareness about key issues of nature, science and the environment – and have engaged the watershapers in thinking about what they do in a singularly important way.

We all know that watershapes are often beautiful by design, and certainly they are almost all created to delight the senses and provide interesting recreational or visual experiences. In many respects, those same things are true of the three projects just mentioned. What we see in these situations, however, is an additive quality that pushes the envelope of possibilities even further.

Are we ready to add "the power to teach" to the already considerable list of things watershapes can do? Time will tell, but I think it's a done deal.

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Jane Shoplick is a project manager for Copley Wolff Design Group, a Boston-based landscape architecture firm. A registered landscape architect in the Commonwealth of Massachusetts, she has nearly 20 years of experience in open-space design and planning. She holds a masters degree in landscape architecture from the Harvard Graduate School of Design and has designed and managed a variety of greenway, schoolyard and park projects in Colorado and Massachusetts. She has served in her current role at Copley Wolff Design Group since 1996.

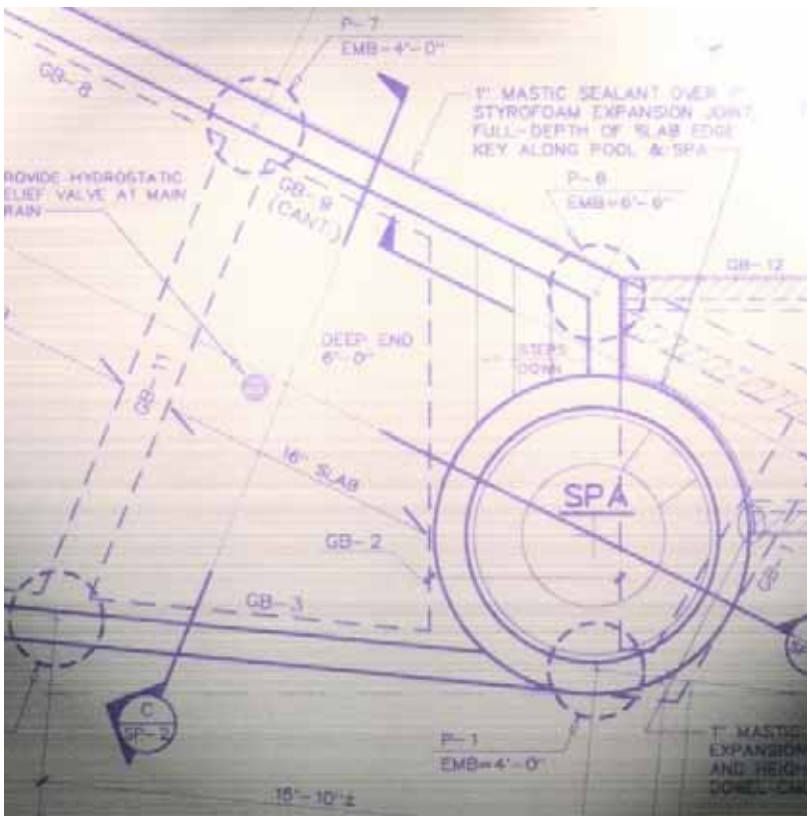
Lou Downes is co-founder and president of Downes Swimming Pool Co. in Wheeling, Ill. For more than 33 years, the firm has provided gunite pools, spas and waterfeatures for homes and clients throughout Illinois, Wisconsin and Indiana. Downes also consults with architects, pool builders and landscape architects on a nationwide basis, and his company has won several national design awards and hundreds of regional and local design awards from the National Spa & Pool Institute.

Steve Gutai is product manager for pumps, filters and valves with Jandy/Laars Products, a division of WaterPik Technologies of Petaluma, Calif. Gutai is a veteran of the swimming pool industry, having spent more than 13 years as an

independent service and repair technician and subcontractor in the Los Angeles area. He spent three more years as a technical service manager and outside sales representative for Waterway Plastics in Oxnard, Calif. Gutai joined Laars & Jandy in 2000 and now works directly with contractors and engineers in designing circulation systems for pools, spas and other watershapes. He teaches hydraulics at trade shows throughout the United States and is the featured hydraulics instructor for Genesis 3's Level 1 schools.

Bobbie Schwartz is a landscape designer, consultant, lecturer and writer – professions that have made her well traveled in pursuit of excellence in garden and watershape design. She founded her full-service design business, Bobbie's Green Thumb, in 1977, and her residential, institutional and commercial designs have been recognized by awards from the Perennial Plant Association, the Ohio Nursery & Landscape Association, the Ohio Landscapers Association and the Cleveland Botanical Garden/ASLA. Schwartz participates in several trade associations on the national, state and local levels and currently chairs the Certification Committee for the Association of Professional Landscape Designers.

BY BRIAN VAN BOWER



Devils in the Details

Why is it that, on the pool/spa side of the watershaping business, it's so difficult to find much by way of truly workable plans and specifications?

In residential work, of course, the tone is set by local building inspectors and plan checkers, whose needs seem to vary tremendously from place to place. But that's no excuse for the fact that the plans used in a great many residential projects are grossly inadequate – especially when compared to the far more detailed and precise plans and specifications required by some of those same building officials for commercial projects.

My point is simple: As watershapes become increasingly complex, I'd argue that those working mostly or entirely in the residential market should strive for something close to the commercial standard when it comes to the documents we draft and use. What depresses me today is knowing, in most cases, that this objective is really nowhere in sight among either contractors or engineers.

My own consciousness on this issue has been raised in recent years because of my role as a design consultant. Knowing that someone else must read, interpret and apply the designs I generate has filled me with an appreciation and understanding of the need for detailed plans and specifications – and this is just as true for my simple backyard pools as it is for the more complex residential and commercial projects in which I get involved.

Knowing that someone else must read, interpret and apply the designs I generate has filled me with an appreciation and understanding of the need for detailed plans and specifications.

Risky Business

Early in my career as a pool contractor, I'll readily concede that I used inadequate drawings that left much to be determined on site. Frankly, I was part of the problem on this front, and I am the first to admit that I had the wrong mindset.

In the time since, my thinking in this respect has evolved considerably. My personal ambition to work to a higher standard and to increase the sophistication and complexity of what I've been able to offer my clients has been a huge motivator. In addition, as the list of places I've worked has grown through the years, I've been exposed to local authorities and contractors who set very high standards indeed for documentation.

In recent columns, for instance, I've mentioned several projects I'm working on in Bermuda. The architects and building officials there require *extreme* detail. For one project, in fact, I've been asked to rework existing plans generated by a local company that knows the local situation well: The plans were deemed inadequate by the architects, and I know for a fact they would be *more* than passable in many stateside jurisdictions.

And as I mentioned above, this problem isn't limited to contractors. With the so-called "cookie-cutter" class of swimming pool, for example, engineers seldom do more than work from templates. To be sure, these standardized construction details are not a bad thing if the engineering is reliable and the design truly follows the template. But this one-plan-fits-all approach falls well short of adequate when the design incorporates any deviation from the template. I've seen many situations where the upshot of a design wrinkle on a basic pool is a complete lack of *any* documentation to support that variation.

Continued on page 12

So the responsibility here is distributed across many shoulders: on those of the engineers who don't provide high levels of detail, of the inspectors who don't require it and of the contractors who might not read or understand it if it were there. It doesn't take much to see potential problems that take root in this situation. Indeed, I think it's safe to say that this is a big reason that backyard pool projects have spawned so many lawsuits through the years – and why so many pools don't function properly or fall prey to structural failures.

While I can see how this has all come to pass, I'm shocked by the collective ability of these professionals to let this terrible situation continue.

Going Awry

I'm currently involved in a project in Jupiter, Fla., in which it appears that the pool contractor is bound and determined to make trouble for himself by basically ignoring the plans and specifications that came with the job.

It's a custom backyard pool I designed and features, among other things, an elevated perimeter-overflow system, remote controls, deck-mounted spray jets, heat pumps and a surge tank with an automatic water-leveling system. I was hired to design the pool and generate a set of conceptual plans and written specifications that were to be used as the basis for project bids.

Given the crucial nature of the edge details in particular, I was very thorough and precise and included isometric drawings of the plumbing scheme with indications of pipe sizes and various other details. I also included specific plan details for the deck-mounted brass jets and cross-sections of the perimeter's edge treatment. The specifications left little to chance, listing specific equipment selections right down to manufacturers and model numbers. In certain cases, I even listed contact names for technical support.

Conscientious contractors tend to be open-minded and are able to expand their own bases of knowledge by paying close attention to details that are new to them.

With the remote-control system, I specified not only the system but also the surge protector for the AC power. With the automatic water-leveling system for the surge tank, I detailed the location of the sensors and called out the solenoid used to open the valve that adds water to the tank. I also described how the upper-level sensor would trigger the perimeter-overflow pump when the tank's water reached a pre-determined level.

In addition, the specifications clearly stated that any deviation from the equipment list or construction details

must be pre-approved by the client and the design consultant. It all seemed categorical enough to me.

Unfortunately, the clients selected the low bidder to do the job, and he elected to deliberately ignore or simply failed to read that part of the documentation. I'm not sure *why* he did so, but I do know that the contractor replaced many specified models with less expensive products and ignored a variety of specifics including the surge protector and the layout of the water-leveling system. The upshot of the equipment substitutions is that the perimeter-overflow system is not functioning properly and that the edge has a number of dry spots.

This builder is probably not going to fare too well when the client compels him to bring the project in compliance with the specifications. If the substitutions he'd made had offered the same performance as the ones specified, no problem. But in failing to communicate about the changes, the contractor stepped right into a sequence of what will prove to be costly assumptions.

Wouldn't reading the plans before bidding the job have been a better path? I may be an easygoing person, but I really can't muster much sympathy for such cavalier attitudes.

The Flip Side

I'm happy to report that such problems do not always arise. In fact, my experience as a design consultant has been

Space Relations

When an engineer is designing the plumbing layout for a backyard swimming pool, all too often he or she will use standard symbols to indicate equipment locations. The problem is that these equipment icons say nothing about the actual physical space required to house that equipment.

Obviously, as projects become more and more complex, equipment pads need to accommodate more than icons and need to be larger than they were even a few years ago. The result on projects with space limitations is that you'll find equipment areas that are far too small.

I ran into this situation recently with an underground equipment room that was grossly undersized – but had already been built. Fortunately, we were able to move some of the equipment into an adjacent sub-grade corridor, so the outcome wasn't traumatic. Still, this was something that wouldn't have happened had the engineering plans been as detailed as they should have been – and the equipment room made big enough to hold everything it should have been designed to hold.

– B.V.B.

that about half the contractors I see are truly interested in doing the right thing and base their pricing closely on the plans and specifications. When these contractors are the successful bidders – which, thank goodness, they often are – the results are very different from those currently unfolding in the scenario just described.

For starters, contractors who conform to the plans and specifications do not expose themselves to the same level of risk as those who try to slide by. Their projects tend to be far more trouble-free – and when there *are* problems, the issues tend to be more isolated and manageable. And perhaps best of all, conscientious contractors tend also to be open-minded and are able to expand their own bases of knowledge by paying close attention to details that are new to them.

As I continue to learn and grow as a designer, the documentation I provide tends to offer greater and greater amounts of information and levels of detail.

I'm also, for example, working in north central Florida's affluent enclave of Lecanto – another upscale project with a long vanishing-edge detail and an overall aesthetic scheme closely integrated with the architecture and interior design of the home.

This is one of those special projects in which there are all sorts of levels of collaboration and interaction among the architect, interior designer, watershape design consultant, watershape contractor and the homeowners. The interior designer, for instance, is interested in the tumbled marble we're using for the coping; the general contractor is concerned about the drainage on the patio; and the architect, among other things, was involved in integrating the pool with an indoor/outdoor structure called a *ramada* located at one end of the swimming pool.

It's a relatively complex project, and the pool contractor has been extremely conscientious from the outset, raising questions before bidding and keeping the lines of communication open through all phases of construction. This level of interaction builds trust and a rapport between designer and builder – qualities of a relationship that can be tremendously significant when unexpected issues arise.

In this case, for example, there was a question about the pool structure relative to the foundation of the ramada, which is located immediately adjacent to one end of the pool. The ramada was built on a perfectly square, heavy-duty foundation (we called it the "elevator shaft"), and the general contractor was convinced

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The more complex the plumbing scheme, the more important it is for builders to be able to read and understand plans and construction documents. Otherwise, there's the risk a complicated watershape's hydraulic system will perform as limply as a tangled bowl of overcooked spaghetti.

that the pool builder should use the near wall of the foundation as a structural wall for the swimming pool itself. Working with the builder, we developed a plan in which we constructed the pool shell inside the foundation of the ramada and expanded the floor of the ramada to encompass the pool's wall. This kept the pool structurally separate from the ramada – without compromising their visual integration.

These decisions and others all required interaction among the general contractor, the pool builder and me. Had this particular pool builder taken the less careful approach of the gentleman I described above, who knows where this project would be right now?

Always Evolving

As I continue to learn and grow as a designer, the documentation I provide tends to offer greater and greater amounts of information and levels of detail. I find myself including more information on components such as conduits and electrical boxes for control systems or lighting, for example, or specific recommendations for plumbing configurations that support waterfeatures or water-in-transit effects. And my plans include ever more precise instructions about aesthetics, including materials selections.

My point in all of this is not to deride those who are doing things in a less strenuous way, but rather to highlight the value and importance of pursuing and adhering to high standards when it comes to plans and specifications – even in localities where building officials don't require it. The benefits of doing so will pay dividends in reduced hassles, greater customer satisfaction and in your ability to control the devilish details that can make all the difference in determining the success of a project. WS

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. He can be reached at bvanbower@aol.com.

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BY STEPHANIE ROSE

A Natural Assist

Fertilizers provide nutrients for plants that the soil and water alone cannot supply, and they come in hundreds of variations designed to offer the correct nutrients for just about any type of plant. Knowing the basics will help you choose the right ones for your clients' gardens.

Let's continue the examination of soils we began last time, shifting our focus this time to fertilizers and the ways they can be used to tailor soil to the specific needs of the plants you and/or your clients have chosen.

Fertilizing is important, because placing a plant in the ground and providing it with ample sunlight and adequate water in the proper location is only part of the battle. True, plants may thrive under those ambient conditions, but treat them to even minimal amounts of fertilizer and those same plants will show their gratitude with a beautiful display of foliage, blooms, fruit and other wonderful things.

Fertilizers provide nutrients for plants that the soil and water alone cannot supply, and they come in hundreds of variations designed to offer the correct nutrients for just about any type of plant. Knowing the basics will help you choose the right ones for your clients' gardens.

Before you begin, however, it's important to recognize that soils *do* tend to provide *some* nutrients, which means you need to determine which type of soil you have and what nutrients it will naturally provide. As discussed last month, this can be determined through simple texture tests (wet the soil, let dry for one day, pick up a handful and squeeze some in your hand) and/or with commercial soils tests. Once you have determined soil texture and type, it's time to move on to choosing the best fertilizer for your site.

The Lowdown on Fertilizers

With so many to choose from, it can be daunting to enter the fertilizer section at a good-sized nursery or garden center. How do you know which one to select?

The first thing you need to know is that every bag or can is labeled with three digits known in the trade as *N-P-K numbers*. N is nitrogen, P is phosphorus and K is potassium, and these are the macronutrients contained within the fertilizers.

They are always listed in that N-P-K order, and the number itself represents the percentage of the given macronutrient contained within the fertilizer. A product labeled as 10-20-6, for example, will contain 10% nitrogen, 20% phosphorus and 6% potassium.

Nitrogen works primarily to aid leaf and overall plant growth, while phosphorus mainly promotes flowering and fruit growth. For its part, potassium mostly helps build the strength of plants through strong stems and root systems. That's oversimplifying things quite a bit, but these are the main functions of the three components.

You can purchase either a complete fertilizer that contains all three of the macronutrients, or you can buy one with only the macronutrient your plants specifically need. Many gardens, for instance, lack sufficient quantities of nitrogen, which means picking up a fertilizer labeled as 10-0-0 might be just the ticket. (This product type is known as a *simple fertilizer* because it contains only one of the three macronutrients.)

Once you know what nutrients a given set of plants needs, there's another decision to be made – this one about the type of fertilizer you'll use. Many gardeners are simply con-

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cerned with getting enough of the right food to their plants and don't much care about whether the products they pull off the shelf are all-natural, but it matters to some and must be considered.

There are two primary choices here, either for *chemical* or *natural* fertilizers. Chemical fertilizers generally contain higher levels of the nutrients, are typically faster acting and cost less. The disadvantage of these fertilizers is that if they are applied too heavily, they can burn root systems and permanently injure plants.

For those who prefer a more natural solution, there are organic fertilizers. These derive from such sources as animal manures, blood or bones, fish and other sources, including worms. These fertilizers release nutrients as they decompose naturally into the soil and tend to be more benign than their chemical cousins.

Once you know what nutrients a given set of plants needs, there's another decision to be made – this one about the type of fertilizer you'll use.

What Form?

No matter whether you and your clients opt for chemical or natural approaches, fertilizers generally come in liquid or solid form.

I know many people who swear by liquid forms, but my preference has always been for solid fertilizers because I find them easier to apply. They also tend to release their nutrients into the soil more gradually, allowing the plants to be fed over a longer period of time. By contrast, liquid fertilizers tend to leach out of the soil fairly quickly with regular watering – their main advantage being that they work very well when you need an extremely quick fix with a single plant.

There are also "time-release" fertilizers, such as spikes. I haven't had tremendous luck with these and still prefer a regular program designed to put fresh nutrients in the soil at regular intervals. Basically, these are matters of personal preference – and of the amount of personal attention you or your clients want to pay to their gardens to keep the plants thriving.

My own approach is the result of having toiled in this industry for 14 years – a time during which I've witnessed my share of plant suicides as well as plant murders that I committed at the behest of clients who wanted to have the most spectacular garden in the neighborhood.

After much heartbreak (and expense), I grabbed the bull by the horns and devoted myself to learning what I needed to know about fertilizers and proper approaches to fertilizing. The foundation

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of my education was provided by an elderly nurseryman who imparted to me, I'm sure, only a fraction of his wealth of knowledge on the subject.

After four or five half-hour sessions with him over a period of a few months (his teaching method: buy something, go home and try it, come back in six weeks), I learned what worked and what didn't. I also learned that fertilizing is basically a school of hard knocks for both ego and wallet.

In the time since those valuable lessons, I have settled into a sensible frame of mind about fertilizing, one that leads me to offer plants regular, consistent, nutritious feeding of the kind one might offer a child. There's no junk food or special diets or rolling with the latest trends: It's just a sensible approach that works. And while I'd like to say my approach is totally organic, it isn't – for reasons mentioned below.

Among the many important things the nurseryman conveyed to me, one of the most important was about patience. Fertilizers work best in warm, moist soils and so will act more slowly during the winter months. Be patient, he said, and don't overfeed!

Making Choices

Through the years, I've developed definite preferences among the products I find on my local garden center's shelves.

- For **lawns**, I like Bandini Super Green. It comes in a white pellet form that dissolves quickly and can green up a lawn within a couple of weeks.

- For **foliage** and **overall plant growth**, I use Blood Meal or Grow Power Plus. A while ago, I tried to stay organic, so I only used the blood meal and consequently learned an important lesson at my dog's expense: Do not use blood meal in a yard where there are pets!

My dog was quite attracted to the fragrance of the blood meal and ate as much of it as she could. Let's not get graphic and say simply that her digestive system eventually rebelled, after which I switched over to Grow Power Plus and found she had no interest in it whatsoever. I could still use the blood meal on my front yard, of course, but

I've found that it's easier just to buy one product.

◗ For **flower production**, Bandini Rose & Flower Food works quite well. I also like Nurserymen's brand, but I've had difficulty finding it consistently at the nurseries I frequent. Bandini also makes an acid-rich fertilizer specifically for camellias and azaleas. It's best to use these specialty products instead of the general-purpose rose and flower food for any acid-loving plants.

◗ For **overall plant health**, I use compost – usually Bandini Soil Builder – as a top dressing over any other fertilizers.

◗ For **systemic fertilizing** – that is, to give plants what they need to get rid of pests and diseases while providing them with some nutrients at the same time – I often use a product called Wormgold. This stuff is made of worm castings and has only been around a few years, but it works like a miracle drug on plants infested with white fly and is a great fertilizer in addition to its healing properties.

Obviously, I use lots of Bandini products, but any other brand can be substituted so long as you pay attention to the N-P-K numbers and make certain your clients' plants are getting what they need.

Applying Fertilizers

I prefer to do things in the easiest possible manner. When it comes to such routine tasks as fertilizing, my goal is to get my clients to apply consistent, ample nutrients to their gardens.

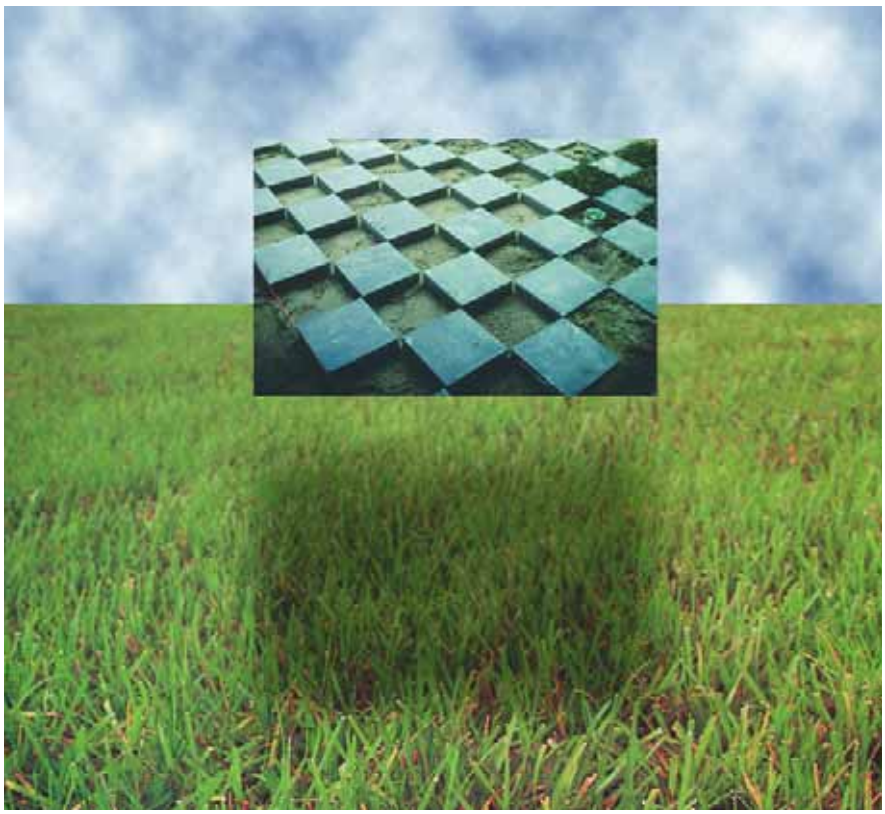
As a rule – and given the fact that I work in southern Califonia – I recommend fertilizing three times a year – on March 1, June 1 and September 1. I'll sprinkle on some Grow Power Plus and Bandini Rose & Flower Food, just as one might sprinkle salt and pepper on food, moving methodically around the garden and working with one plant at a time. I'll water lightly, then cover the whole garden (lawn excluded!) with Soil Builder. This layer aids the process by keeping moisture in the soil.

From that point on – until the next cycle – I water normally and regularly, depending upon the time of year and the weather. I don't work the fertilizers into the soil, as experience has taught me that the slow leaching of nutrients over time is more beneficial to the plants than getting them to the roots immediately.

As I've also learned, there's a distinct benefit to going easy on the fertilizer – everything in moderation! WS

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

BY DAVID TISHERMAN



Changes Hit the Deck

In many ways, our ability as watershapers to adapt and adjust midstream is at the heart of what we do – and no one says it's easy!

It's impossible to know why some people change their minds the way they do or to predict exactly when it might happen, but in working with opinionated clients who demand the extraordinary, it's a fact that accommodating their changes in direction can come to define and redefine a project more than once as you move from start to finish.

In many ways, our ability as watershapers to adapt and adjust midstream is at the heart of what we do – and no one says it's easy!

The Malibu Colony project I've been writing about in several recent columns is absolutely a case in point. In fact, this project saw far more than the usual share of project-altering discoveries and shifts in direction along the way. And from beginning to near the very end, it was never quite certain just what sort of deck treatment would eventually grace the spectacular courtyard – a tale of negotiation, rethinking and complexity we'll cover in this column.

From Stone to Grass

It's easy to look back on the outcome and laugh about the process, but the story of how this deck came to be was no simple matter.

Our first idea was that the entire deck would be covered in bluestone, with two feet of bluestone coping wrapped around the dramatic, wavy contour of the pool. Indeed, that was how the project was originally designed, engineered and permitted. Not long after, however, the clients decided they wanted to keep the coping, but have a lawn in the rest of the courtyard.

As I mentioned in my discussion of the coping a couple of issues back, the clients changed their minds again, this time paring the coping back to a one-foot width along with the lawn. Then we doubled back on the idea of a complete bluestone deck – this time to be installed atop an underground vault that might house a wine cellar. Then, if you'll recall, we discovered that the house itself was in imminent danger of falling down.

Eventually, the underground vault fell by the wayside. The grade-beam system that would have been required was extremely complicated and incredibly expensive, and there was also a fairly simple question about how we could have created access to the space. And then there was the fact that creating the vault would have made it difficult to set up the system of laminar jets that were to be installed flush in the deck adjacent to the pool. We knew that whatever the deck treatment was, we would have to make it work with this highly advanced system of flush-mounted jets and lights.

I'm reviewing all of this to make a point: As this whole issue of the deck treatment kept changing, it had rippling effects on many other details of the project. In other words, none of these changes we were contemplating was isolated because of the way the whole environment had to work together visually, structurally, mechani-

cally and electrically.

And the thing of it is that the customers, while demanding, weren't being all that unreasonable. As the project took shape, their thinking about the space and how it would be used kept evolving, and they really did like the idea of walking out into a courtyard filled with greenery. We might have been able to do that easily had the house been built as it should, with proper concrete retaining walls as boundaries of the courtyard.

As it turns out, however, a huge mistake in construction of exposing its wood foundation directly to the soil not only threatened to topple the house, it also set the stage for all these changes in direction when it came to finishing off the courtyard. And for clients accustomed to having unlimited choices and to getting exactly what they want, the fact that their options were limited might have triggered all these rounds of give and take.

A Checkered Approach

Eventually, the concept of a lawn won the day, and for a time I thought we were in the clear.

Things became complicated again, however, when the client brought in a landscape designer who suggested a checker-

Stepping Outside

The give and take that was involved in developing and fine-tuning the checkerboard approach to the courtyard is more or less typical of the kind of extended creative process you can become involved with when it comes to major projects for intelligent clients with refined tastes.

When confronted by each others' ideas and comments, we tended to push those concepts around rather than allowing ourselves to get trapped by conventional thinking or by the seeming impossibility of developing a new approach to a difficult challenge.

Ever since my days at design school, I've called this process "Lish Thinking" – pronounced "leash" for reasons I can't quite explain – and it's something perhaps best described as a tendency, when challenged, to think outside the box.

Without lish thinking in this courtyard, I might have simply told the clients that what they wanted was impossible (or impossibly expensive) and done the courtyard in a more conventional way – or in the way I'd done some other courtyard in some other backyard.

As it stands, the checkerboard courtyard is a spectacular deviation from conventional thinking – and another creative solution to a significant challenge in a project that was filled with them from wall to wall.

– D.T.

board pattern in the courtyard, one that alternated one-foot squares of select bluestone with one-foot-square patches of grass. I wasn't involved in the discussions that led to this choice and was in fact 3,000 miles away when this idea emerged – and was surprised and somewhat dismayed by what I heard when I returned.

In theory, it wasn't a bad idea – and we ultimately made it work with spectacular results. Rather, the problem was that this design had been conjured without much consideration of scale, of maintaining the small patches of grass, or of how the deck was to be built and brought into line with key visual elements of the home itself. Specifically, the customer wanted the "grout" joints of the checkerboard to line up with the grout joints of the slate tiles used as flooring inside the home.

Again, not a bad idea given that inside is visible from outside (and vice versa) through plate glass windows that surround the courtyard. Yet while there was nothing wrong with the idea, the reality was that we ran into a huge number of small inconsistencies with the interior tile pattern that caused problems in projecting its grid out onto the courtyard. The simple fact was that the inside tile had been cut and laid out with only the interior space in mind and not with the thought of lining it up with anything outside the house.

Once the three palms, the four boxes for the laminar jets and the drain lines were all set, we were ready to bring in material to bring the grade to the desired level and begin the process of laying out the checkerboard deck.

But the die was cast, and it was now up to us to match up often irregular lines and

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make everything fit with the shape of the pool, the laminar jets, the lighting system and three palm trees that were to line up alongside the pool. Add in the fact that the pattern had to line up in two directions, and the notion of making the checkerboard work became daunting, to say the least.

We also had to work with and around the laminar jets, another key feature of the design. I'll discuss this part of the project in detail next time, but what the checkerboard meant was that we had to move forward immediately with the installation of pads and custom-made boxes for the jets and light assemblies and their requisite plumbing and conduits – all without the benefit of knowing if they would be located in grass or in bluestone.

They couldn't be moved, because they'd been placed to offset the radiuses of the pool's outer edge – yet another complicating factor pertaining to one of the key elements of the entire design, and one we wouldn't be able to figure out completely until we actually laid out the checkerboard.

Before the select bluestone decking squares were brought on site, the edges of the concrete had been colored a compatible gray-green color and attached to the bluestone with thinset.

Building It

We established the precise layout of the checkerboard pattern using a grid of guide strings we set up to cover the entire courtyard area. It took a great deal of measuring, re-positioning, re-measuring and a little bit of luck, but ultimately we were able to set up a one-by-one exterior grid that very closely aligned with the interior tile's grid.

Laying it out was one thing, but actually constructing this pattern was anoth-

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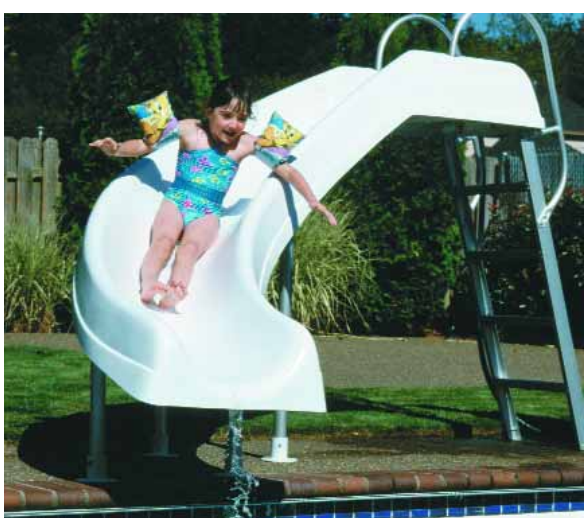

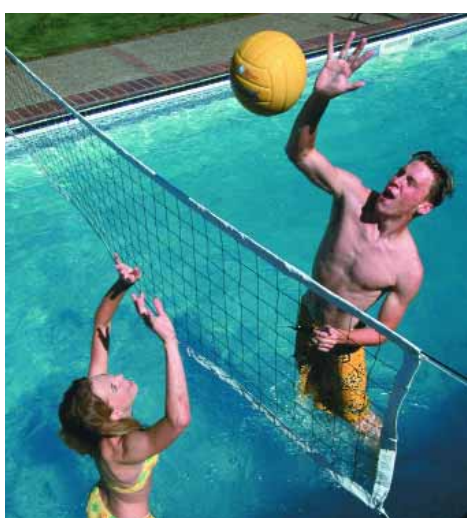

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er matter. For starters, we knew that there was no good way to build forms and pour individual one-foot-square slabs to support the select bluestone: Each corner had to touch, so there would be no space to allow for the forms themselves around the corners. All the options here were outrageously expensive, even for these clients. So for a while we considered setting the bluestone directly on grade. But that wasn't a good option, because the gauged material we were using was just three-quarters of an inch thick and we were worried about its durability and stability.

I decided instead to get around most of the stability problem by attaching the 11-3/4-by-11-3/4-inch squares of bluestone (sized to match the dimensions of the tile inside the house) on pre-cast, one-foot-square concrete pads – the sort of stepping stones you can buy for a couple of bucks apiece at any home center.

After trimming the pads to size, we attached the bluestone using thinset and put the squares in their places using our grid of strings as a guide. (Before we laid them down, we painted the sides of the concrete a gray-green color that harmonized with both the bluestone and the grass so that, if exposed, the pads would not be visually disruptive.)

The whole affair was set down on a compacted-sand base. The pre-cast pads lent their thickness to the select bluestone and we now had enough depth that the squares were locked into place by the topsoil and squares of sod we set in place. We know with time there might be some movement of individual stones, but they gain additional stability by virtue of the fact that they are also locked in place

Setting up the grid was complicated by the fact that everything had to be brought into alignment, outside and in. All in all, it was a delicate operation with adjustments made in tiny, visually unnoticeable fractions of inches.

between the pool structure and the retaining wall/ziggurat we set up at the foundation of the house. At this point, ten months after the installation, nothing has moved and the grass is still growing.

Also key to the look of the courtyard are the three palm trees that lived in pots all through the construction process. We placed them at the water's edge in positions alternating with the laminar jets. Rounding out the landscaping, black bamboo was planted against the wall that looms over the outside edge of the pool.

When all is said and done, the checkerboard deck works beautifully in concert with the other visual elements within the courtyard – the pool, the palms, the surrounding interiors and the big wall that flanks the pool – and everything is tied together by way of lighting.

Great Walls

From the outset, I'd planned to use that flanking wall as a reflective canvas that would capture the dancing play of light off the water's surface. Even with the laminar jets in operation, this would draw attention away from the water and provide an entirely separate visual element that would be even more visible than the pool from a

On-Site Dramatics

The situation I ran into with this project, with all the changes that had rippling effects that led to adjustments in other parts of the project, is not an uncommon one so far as high-end designs go.

This is quite distinct from the issues that arise with projects at any level where a nice concept on paper falls completely apart because nobody in the loop has any idea of how to build it. You can fudge dimensions on a pencil drawing, but when you get out to the field in full scale, real trouble will result if you don't have the technical skills and know-how required to turn the drawing into something that works, mechanically and aesthetically.

Working at half-inch or quarter-inch scale on a piece of paper is often very different from being on site and finding out that being off line by half an inch at one spot is compounded by another half inch in another – and by several inches by the time all the kinks unfold.

In the case of laying out the checkerboard decking described in the accompanying text, any inconsistencies would be amplified by the repetition of the pattern. Here, there was no option other than thinking everything through ahead of time and avoiding even the slight chance that we'd be surprised by anything we encountered once we started laying down the bluestone squares.

– D. T.

variety of locations inside the house.

The lighting actually begins with the laminar jets themselves, which are illuminated by a fiberoptic lighting system that enable the ultra-smooth jets to change colors and create a variety of visual effects as they arc into the water. This in turn creates a fascinating reflection on the wall.

There are also four lights in the pool that have been programmed to change colors in sequence with the jets to set up lighting effects that play against the glittering glass-tile surface of the pool's interior. The palm trees are lit as well with low-voltage lights that caress their trunks and fronds.

This elaborate lighting program stands in stark contrast to the courtyard's original lighting scheme of overhead floodlights and the single light in the deep end of the original pool. Now we see black bamboo climbing the wall above the water's surface, a bronze sculpture representing a pattern of leaves on the wall above the pool, and an amazing play of light dancing on all surfaces.

In the midst of all this, the contours of the pool attract the eye and give a sense of movement and drama to the space – truly a thing of beauty, but one that was not at all easy in the making! WS

Working the checkerboard pattern out to the wave contour of the coping was an extremely involved process because we all knew that this was a key visual focus for the entire courtyard – and a place where our work would need to stand up to special scrutiny.

David Tisherman operates David Tisherman's Visuals, a design and construction firm based in Manhattan Beach, Calif., with offices in Marlton, N.J. He is co-founder and principle instructor for Genesis 3, A Design Group, which offers education aimed at top-of-the-line performance in aquatic design and construction.

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Earth, Air, Light and Water

Watershapes intended to teach children (and their adult companions) about basic forces of nature stand at the heart of an innovative landscape program on the campus of the Montshire Museum of Science in Norwich, Vt. Designed by Boston's Copley Wolff Design Group, the grounds around the museum now feature an array of unique water effects that are beautiful, entertaining, informative and delightful.

By Jane Shoplick

Teaching children about the science associated with the natural elements of earth, air, light and water in an imaginative, fun and engaging way is one of the key missions of modern museums of science. Conveying those concepts through a *landscape*, however, is a unique and ambitious goal – one we suggested to the directors of Montshire Museum of Science of Norwich, Vt., as a way of transforming the museum's grounds from ordinary exhibit space into a true laboratory for learning.

During all of the early discussions of types of natural phenomena Montshire wanted us to explore, museum representatives always seemed most excited about those associated with water. They agreed with us that water exhibits could teach children about wonders as diverse as stream erosion and deposition, the reflection and absorption of light, how the pattern of water currents and flow velocities are affected by the size and shape of the water's container, how the pressure of water increases as its depth increases, and how the air cools as one approaches bodies of water.

Opened to the public in July 2002, the resulting watershapes all serve to demonstrate processes that shape the natural world and are, we believe, unique in the way they serve as a physical and conceptual transition to the verdant grounds and nature trails that await visitors who venture beyond the museum's formal bounds.

Trails to Learning

For many years, children, their parents and a variety of school groups have flocked to the museum to learn about science – particularly ecology and other natural sciences – through the facility's collection of engaging, hands-on exhibits. It's the perfect setting: Located on 110 acres, the facility sits in a long, narrow valley at the foot of a steep mountain near the west bank of the Connecticut River.

The beautiful landscape was formed, as is the case for the

From the museum plaza down to the underpass leading to the riverfront trails, the new Science Park follows the contours we imposed on the hill to offer a range of spaces for exhibits and hands-on fun.

topography of much of New England, by receding glaciers that dredged great valleys between ridges of bedrock along a north/south axis. The museum takes advantage of its environment by focusing many of its special exhibits on local geology, hydrology, flora and fauna.

Montshire, as it is commonly known, recently expanded to include a building that serves as a National Fish & Wildlife Visitor Center. The center specializes in exhibits having to do with the watershed of the Connecticut River. The most recent phase of the museum's growth has focused on the grounds surrounding the buildings – a space now known as Science Park.

As is described in detail in the sidebar on page 39, Science Park was conceived in part as a way to manage a spatial and educational transition between the museum's existing interior spaces and a system of nature trails that had been set up on the banks of the Connecticut River.

The list of lessons the museum wanted to convey in that transitional space was ambitious, including not only water but also light, air and earth. In a couple of cases, the need for exhibits was met with pre-packaged displays brought in from outside. In others, exhibits were to be planned and built by the museum or by local artisans. We at Copley Wolff Design Group worked with all of the exhibit designers then on board, coming to understand each exhibit's lesson as well as its

overall spatial needs as we developed the overall landscape plan.

We quickly noticed that many of the pre-fabricated exhibits were of similar size, about ten feet wide, deep and high. While placing these smallish exhibits in thematic groups might work indoors, we knew that this approach would not translate so successfully to the great outdoors.

Our challenge was to organize the overall landscape to accommodate the exhibits in a way that would be clearly understood and enjoyed by visitors. To accomplish this, we knew that Science Park needed to incorporate larger, landscape-scaled exhibits – spaces set up on very different scales from the museum's familiar ten-by-ten-by-ten cubes. These larger exhibits needed not only to structure the space but also to tell Science Park's story, thereby lending a meaningful cohesiveness to the visitor's experience.

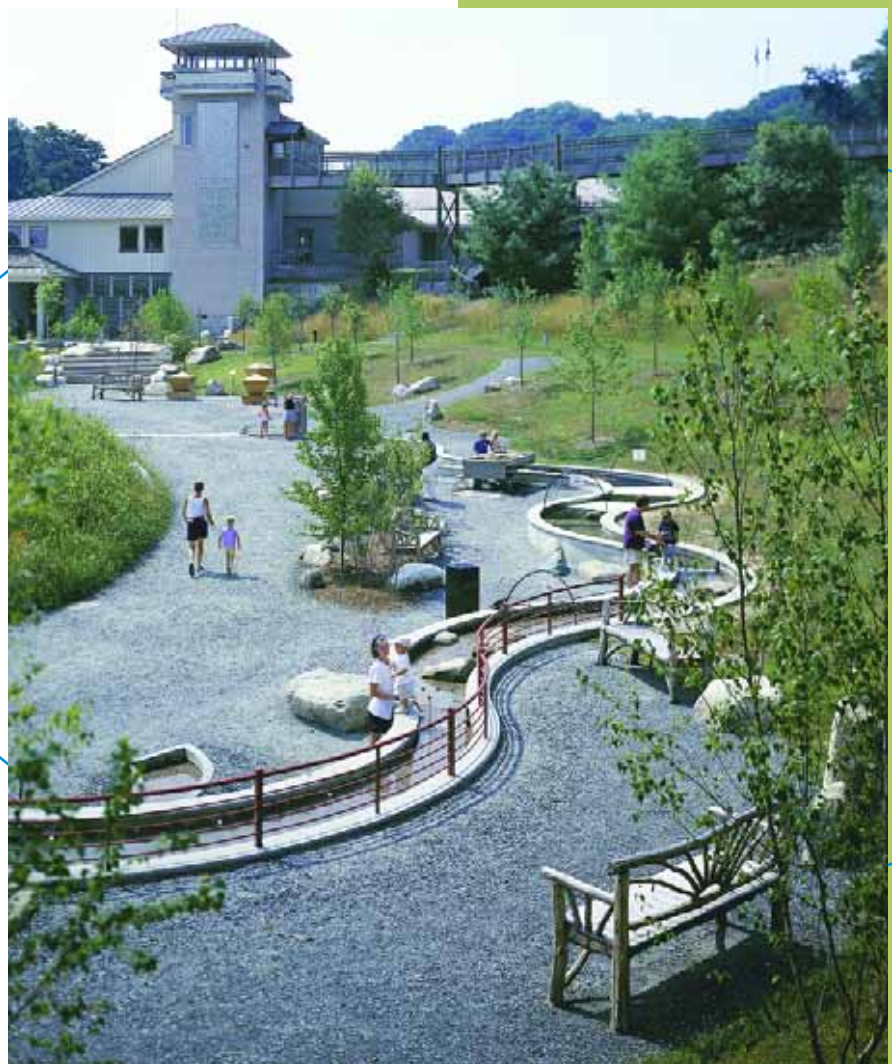
Balancing all of those needs took time and a great deal of discussion. Ultimately, we used watershapes to organize the space, provide structure to the experience and convey the overall themes the museum and its design team wanted to communicate.

Liquid Metaphors

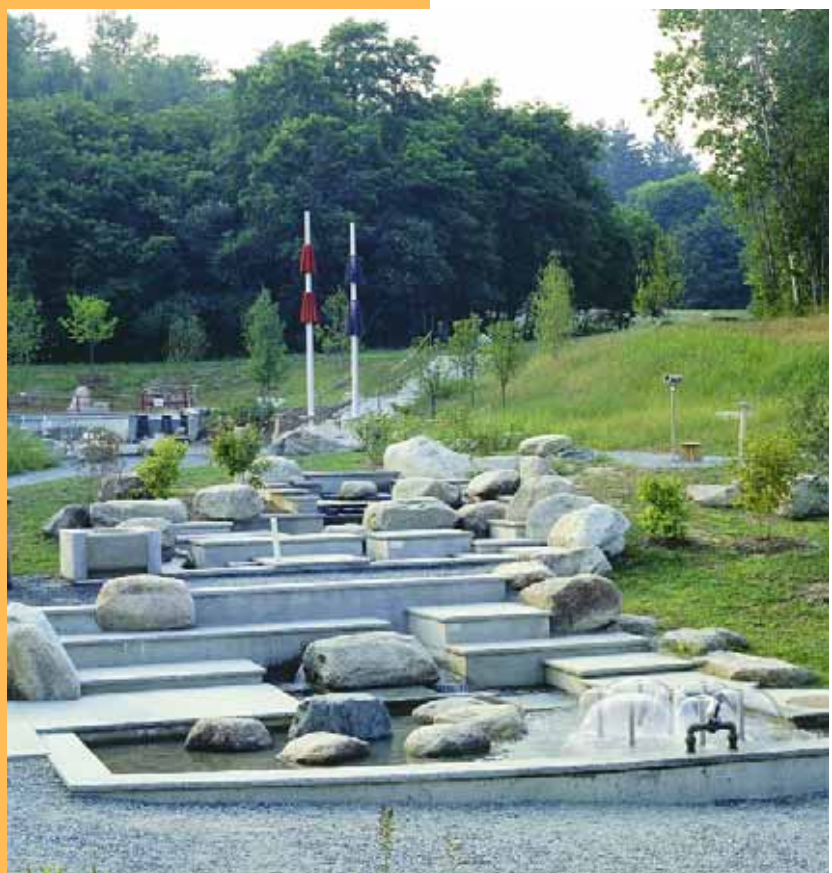
We decided to use the journey of a drop of water as it flows downhill and gains momentum as a metaphor to guide the design of Science Park's water system.

The facility's remade topography provided plenty of elevation change and the opportunity to build large displays along the waterway. The water starts at the Headwater Stone, an eight-foot-tall by five-foot-wide by-five-foot-deep piece of rose-colored granite placed directly across from the steps leading to the terrace. With water welling up as if from a mountain spring, a thin sheet emanates from the top of the stone and softly spills down its polished face.

A poem by Leonardo da Vinci is inscribed in the face of the Headwater Stone. It describes the changing qualities that water assumes as it travels through different places – an appropriate prologue to the displays that visitors are about to



The Rill is the largest of the site's watershapes, snaking its way from the museum's entrance plaza all the way down to a terminus just across from the railway underpass. By dropping balls into the head of the waterway and following them down the hill, children learn about the behavior of streams and objects caught in their currents.



The water effects end with the Granite Cascade – a noisy, roiling space filled with displays designed to get children and their parents involved with the water. The structures are great for splashing, but they're also there to teach some basic principles of hydrodynamics, from whirlpool formation to surface tension.

experience. The water spills from the Headwater Stone into the 200-foot long Rill, a watercourse in which the flow picks up momentum and power before culminating in the Granite Cascade, just opposite the mouth of the tunnel. Guests can walk over a covered portion of the Rill, where they hear the sounds of water rushing beneath their feet. When the Rill re-emerges, it widens and then constricts in a series of curves. Several exhibits have been set up along this waterway: For starters, by dropping a ball at its beginning and following its course, children discover the current patterns created by the Rill's shape and how the current is affected by dams, holes and rock obstructions. They watch how

the ball's velocity quickens as it speeds through narrow sections, and then slows as the Rill widens.

By damming water in one segment, kids make the water level rise and spill into three pipes that disappear into the Rill's floor, with the flow then reappearing at their feet. The water from the three bubblers gurgles away in a small six-by-six-inch runnel, where it is joined by water draining from the Pressure & Depth display. This exhibit features nine spouts mounted in the Rill's walls at three different heights: The pattern in which the water sprays varies according to the height of the hole in the wall, with the lower holes spewing water out farther as a result of the higher pressure of the deeper water.

Natural Progressions

The watershed metaphor carries through the entire length of the waterway with several more educational stops along the way.

The Rill itself ends at the Eye-Level Waterfall, where water sheets over a smooth, level edge and drops three feet into a basin below. Kids plunge their hands through the glassy sheet to find a dry, polished concrete wall embedded with bronze "fossils." Here's where they also reclaim the balls they dropped in the water at the top of the waterway and deposit them in a container. From the Eye-Level Waterfall, the water momentarily disappears under the path, then pops up again at the Pressure Fountain.

In the park's "water story," the Pressure Fountain is an abstraction of a city, representing human intervention in the water drop's journey to the sea. The exhibit consists of five vertical steel pipes onto which kids can attach PVC plumbing pieces and build outrageous structures that aim the jetting water in various directions. Here, they learn that restricting or stopping the water flow of one or more of the pipes will cause the water to spout higher from the others.

The water display culminates at the Granite Cascade: Built into an east-facing slope opposite the mouth of the tunnel, the water rushes over and around a series of boulders and concrete walls topped by granite slabs. As is the case with the Rill, the floor of the Granite Cascade is covered with an exposed-aggregate finish. But unlike the smooth, snaky form of the Rill, the shape of the Granite Cascade is rectilinear and stepped – and its currents, velocities and resulting water effects are faster, louder, and whiter than those of the Rill.

At the top of the display, guests can use moveable dams to divert water into a

Crossing Paths

Before hiring Boston-based Copley Wolff Design Group, the Montshire Museum of Science had already incorporated the outdoors into visitors' experience via a system of trails that led them to exhibits covering such phenomena as decomposition and life on bark and in tree canopies.

Part of the museum's longer-term plan called for expanding the trail system to property it owned along the Connecticut River. There was, however, one large problem: An active railroad line cut between the museum and the river, preventing safe pedestrian access to the waterfront land.

Our program for Science Park imaginatively resolved the access issues. We spent long hours examining a variety of tunnel and bridge alternatives, bearing in mind that the spatial configuration of Science Park would affect the types of exhibits that would be housed within the space. Ultimately, we and the museum's directors decided that the best solution would be to build a tunnel under the railroad tracks as a gateway to the riverfront.

Instead of connecting Montshire's back door directly to the tunnel with a straight and steep path – the level drops by about 22 feet in that span – we sculpted the flat field outside the door and set up a curving, 560-foot-long path (gently sloped to allow universal access) that would put dramatic landforms on display with different slopes, orientations and exposures.

The resulting mini-environments – north facing slopes and exposed promontories, for instance – naturally lent themselves to exhibits exploring microclimates, light, shadow, temperature and other natural phenomena. Moreover, the pathway serves as a spine off of which groups of exhibits, outdoor classrooms and trail connections could be placed, thereby choreographing the visitor's overall experience of Science Park. Particular exhibits can be revealed to visitors as they round bends and enter new "rooms" in their descent to and through the tunnel.

It must be added that water – an element we came back to again and again as we assembled the overall landscape design – was used throughout this remarkable space as a recurring visual and educational theme.

– J. S.

whirlpool, for example, or to adjust the flow around boulders. At the base of the Granite Cascade, the water collects in a large pool that contains six Water Bells. Standing at the edge of the pool, visitors turn knobs on the granite coping to increase or decrease the volume of water going to the bells, changing their shape from fat and round to skinny and wavering.

Design Expression

Given the museum's rural setting and its emphasis on education in the natural sciences, we at Copley Wolff Design Group were initially concerned that the museum might want the Science Park's water displays to be naturalistic and take on the look of the property's naturally occurring brooks and streams.

This was an aesthetic that we did *not* want to mimic, because it was our sense that Science Park was a constructed artifact and, as such, shouldn't be confused with nature or attempt to replicate or compete with it.

As a result, we advocated making the water structures, shapes and materials as clean and simple as possible and avoided adorning them with fussy, pebbled edges and pockets of plants. Our intent was to make bold sculptural structures that would accentuate the landforms and encourage a clear reading of the exhibits and the scientific principles they were demonstrating. We also intended the spaces and their watershapes to be flexible enough that the museum could seamlessly add new exhibits and alter existing ones.

This philosophy led us to use concrete in building not only the water structures, but also the other large structures on site, including an amphitheater for outdoor demonstrations and classes as well as a terrace that transfers visitors from the museum's interior to Science Park.

No special liners or finishes were used with the concrete structures, but quarried granite caps were mortared to the tops of concrete walls and platforms. Contrasting with the clean, regular lines of the concrete and granite, we distributed more than 150 native boulders throughout the site – some freestanding; others built into or mortared onto the faces of concrete walls.

Through the entire project, we felt that by understanding how natural processes work ourselves, we would be better able to create conditions that reveal the science associated with those processes. For example, the "oxbow" river pattern created by natural processes of erosion and deposition served to inspire the Rill's sinuous shape. Kids see what this all means in floating balls down the stream, watching as the ball moves from the outside of an upstream curve (scouring earth away) and toward the inside of a downstream curve (depositing the silt).

Positive Flow

Obviously, the interactive designs for Science Park required a great deal of hydraulic engineering and planning. We at Copley Wolff Design Group worked closely with Dan Euser of Dan Euser Water Architecture of Ontario, Canada; he was invaluable with his careful specification of both the water displays and the overall circulation system.

That circulation system is actually rather simple: The water is held in a concrete reservoir under the lower basin of the Granite Cascade, where a submersible pump sends the water up to a pump room located below grade and accessed from a lower level of the museum. The water is filtered and treated with chlorine in the pump room before it enters the system.

– J. S.

Time for Fun

Of course, given the fact that children are the primary targets of the educational effort, Science Park is much more than a set of lessons in ecology and the natural order.

To be sure, the key is the water-display system at Montshire, from the Headwater Stone to the Rill, down to the Pressure Fountain and Granite Cascade as the waterway weaves back and forth across the path and creates focal points for a child's experience of Science Park. But this is where the medium- and smaller-size stand-alone exhibits come into play.

These exhibits, including Rock Music, Xylophone Steps, Humming Stones, Whisper Tubes, the Resonant Pendulum and a device known as an Octoscope, let children explore sound, light, and motion and are all artfully integrated into the landscape, making a subtle, yet profound statement about the role these physical principles play in the natural environment.

The result of the playful and colorful placement of exhibits within a sculpted landform, all accentuated by dynamic water displays, is a park that interprets science in a way that one child recently summed up as "Awesome!"

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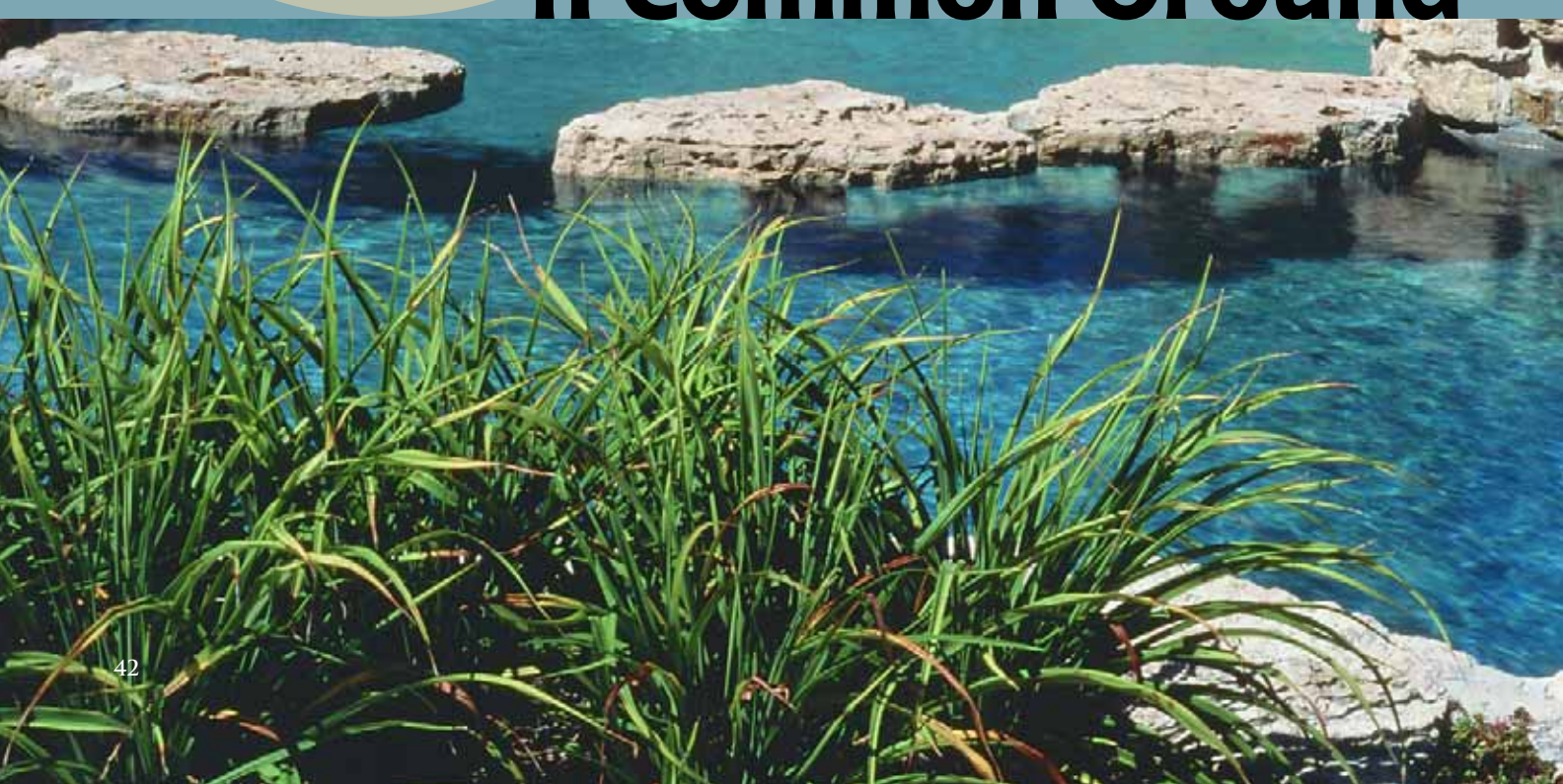
By Lou Downes

When a homeowner in suburban Chicago asked for a water-feature and swimming pool that were aesthetically linked to one another and their surroundings, watershaper Lou Downes knew that close collaboration with the landscape architect would be crucial. The resulting composition offers a perfect testimonial to the value of getting client, designer and contractor all squarely on the same page.

On Common Ground



One advantage of building pools in the affluent Chicago suburb of Lake Forest is that many of our prospects have seen inspiring landscapes, pools and waterfeatures in neighboring backyards or at quality resorts around the world – and, as a result, come to the design process with plenty of ideas. With all of that experience and thoughtful exposure to the possibilities of water, quite often they're already visualizing the way they want their backyards to look.

Such was certainly the case with the project seen in this article: The homeowner came to us with an armload of photographs and knew exactly what she wanted from the outset. And the canvas for her imagination was plenty big, with a backyard measuring more than two acres and including a pond shared with an adjacent property.

Working carefully with that spaciousness was important, because the family included two small children and she was obviously concerned with their safety. She was also after a sense of privacy in the space and had the desire to integrate everything with the look of their five-year-old home.

Balancing all of these issues was important from the design phase through to finish work. The key in all of this was the relationship we at Downes Swimming Pool Co. of Wheeling, Ill., forged with Daniel Horvat, principal of the Horvat Design Group, who developed a spectacular design for the sprawling space – one that freed us to create a watershape worthy of the setting.

Separate Synergy

In thinking through the space, we kept our focus on the homeowner's three big issues:

- Given the fact that her pond-sharing neighbors to the west could easily view her entire backyard, the orientation of the pool and the landscaping design needed to create an area with a sense of seclusion – that is, a space that would be cut off visually from next door.
- Local highway noise was noticeable in the backyard, and the homeowner wanted to use the soothing sounds of running water to offset the constant rumble of traffic and make the ample exterior space more enjoyable.

One key early decision was to separate the pool and waterfeature hydraulically. Where most watershapes of this sort can be

run off single recirculating systems, the plans for the rockwork and its high-volume cascades made such simplicity impractical.

w The homeowner wanted the pool and waterfeature to appear as though they belonged together – and fit seamlessly within the woods and prairies found in and around Lake Forest as well.

Ultimately, the design accommodated all three points at once through careful orienting of the project; altering lines of sight by setting up a large rockwork structure to obstruct the view from the other yard; planning for a lively, high-volume waterfeature; and following a skilled landscape architect's approach to contours, textures and finish details to the letter.

One key early decision was to separate the pool and waterfeature hydraulically. Where most watershapes of this sort can be run off single recirculating systems, the plans for the rockwork and its high-volume cascades made such simplicity impractical.

The rationale for a dual-system approach mainly has to do with the fact that the 120 gallon-per-minute flow rate required by a waterfeature of this size would be throttled considerably by running it though a residential-sized pool filter and heater. The 950-square-foot pool is large by residential standards, but the design team didn't think it warranted the use of larger, commercial-grade equipment – and another considerable jump in costs that upgrading would have entailed.

To be sure, this decision raised the costs of support equipment, installation and long-term maintenance, but in the long run those costs are largely offset by long-term energy savings realized by not redundantly heating and filtering water drawn from the pool area to feed the waterfeature. We estimate that this saves approximately 10% on annual heating costs.

As designed and built, the waterfeature now consists of a detailed rock hardscape – one of Horvat's many specialties – placed in such a way that its five-foot-tall profile and accompanying foliage com-

A big part of the design had to do with surrounding the pool and waterfeature with details that tied individual components together visually and created a sense that everything had been in place for a very long time indeed. Setting large rocks and planters at the water's edge was crucial in making it seem as though the deck had been placed in and around natural formations and outcroppings.

The main waterfall lends a substantial visual core to the design, but its appeal is more than aesthetic. For one, its noise significantly masks surrounding commuter traffic noises. For another, its robust flow gives a soothing neck-and-shoulder massage to bathers who enter the grotto area.

pletely block any views of pool activities from the common pond area. Addressing the safety issue, the watershapes have been positioned so they can easily be supervised from any part of the entertainment-oriented patio adjacent to the house.

Setting the Scene

One of Horvat's guiding principles in waterfeature design is naturalism. As he puts it, "I don't build volcanoes. It all has to look natural."

I've seen enough of his firm's work to know that he means what he says – and that this project was particularly successful in meeting his high standards. The rockwork is dense with pockets deep enough to hold soil and perennial flowers, and they've been planted with flowing blue-rug junipers and rock cotton-Easters. In the spring, the flowers and colors are vibrant and lend beautiful contrasts to the rocks.

And this is far from a simple stack of rocks: Horvat's goal here was to make the waterfeature look "lived in," like a natural outcropping and spring that had been there for hundreds or thousands of years.

His planting plan was an important means of conveying this impression. Keeping foliage in and around a large rock formation such as this requires water. The trick is to provide it in subtle ways that do not distract from the natural look we were after. There are two basic ways of going about this: Plants and soil either can absorb moisture from underground irrigation systems, or they can capture excess moisture as it trickles down rocks from irrigation-line pop-ups. We used a combination of these strategies.

Not all plants receive ample water in rock settings no matter how water is introduced to the system, however, so Horvat also used a variety of sedums as a water-sheltering ground cover along with the flowering plants. And where the gaps created in the rockwork were too small for plants in containers, he pulled the plants out and set their root balls into various nooks and crannies, again using ground covers to retain moisture.

Another important step in making the overall pool/waterfeature combination look natural involved setting up several planters

About the Interior

As we considered the interior finish of the pool and, specifically, its color, the owner went on record with her desire for a dark hue to enhance the pond-like appearance of the watershape.

Ultimately, however, we compromised with a lighter, French-gray shade out of concern for depth perception and the safety of children entering and playing in the pool. In the upshot, the chosen gray finish is actually dark enough to yield a profound pond-like impression – and blends beautifully with the surrounding stonework as well.

– L.D.

The lower cascade adds to the impression that the rock formation is natural and that water flows over it via random, multiple pathways – a key in the landscape architect's ambition to avoid the "volcano" look. Furthering the impression is a small stream that flows around from the back of the structure before easing its way into the grotto area.

in and around the pool's perimeter. Horvat's extensive experience with pools and adjacent plantings was critical here.

He filled the poolside planters with indigenous natural grasses – including miscanthus and gracillis, which are particularly resistant to pool chemicals and the effects of splash-out. These natural grasses were combined with the homeowner's choice of flowering plants. Knowing that plants can't thrive on intermittent pool-water spillage, Horvat ran take-offs from the backyard's central irrigation lines directly to each planter.

He also broke up any sense of uniformity at the water's edge by using natural rock material in place of sections of decking to create a sense of transition from the open deck areas, through the planters and beyond the free-form pool into the waterfeature. Inside the pool, a French-gray Hydrazzo finish helps reinforce a pond-like impression.

System Split

In addition to working on aesthetics that draw everything together, we at Downes Swimming Pool Co. placed some of our focus on keeping

things *apart*. On the one hand, the circulation system for the pool was quite straightforward; on the other, however, the waterfeature's system was a different story.

Hydraulics for waterfeatures such as this one are always crucial, because you need to set things up so that just the right amount of water flows over and through the installation. Too little flow results in an anemic drizzle, where too much water flow can create gushing effects that ruin the natural impression. What we were after here was a system that operated comfortably between those extremes, with actuator valves that give the family the opportunity to control the flow and the mood created by the water effects.

The actuators don't change the flow rate, which holds at a constant 120 gpm. Rather, they control where the water is introduced to the cascades via manifolds set up to deliver water to the top and/or the middle of the rockwork structure.

Achieving a perfect sheer fall was important in the central area because we included a two-person love seat under the main waterfall that offers a grotto-like setting. It was also important to hide the sources of the water. (There are actually two – a pair of two-inch lines recessed and invisible in the rock formation.)

Given the 120-gpm circulation system, the suction side of the system presented a potential for suction entrapment – an issue we defused by using two main drains covered with 12-by-12-inch grilles. Both main drains use three-inch piping that returns the water to the waterfeature via a three-horsepower pump.

The entire system is controlled automatically by a Jandy system mounted about 200 feet from the pool at the equipment pad next to the house. While activation of the waterfeature and pool functions with the supplied remote control can easily be accomplished from any point on the pool deck, the homeowner wanted to be able to control the waterfeature from the far reaches of the property, surpassing the radio-frequency range of the remote control.

To solve the problem, we "extended" the antenna of the receiver by wiring it to a nearby downspout, thereby transforming the home's metallic gutter system into one large antenna.

Subtle Solutions

Another issue in the design process had to do with managing a transition from the existing patio to the deck/pool/waterfeature area beyond.

Horvat worked through this problem skillfully, extending the free-form shape of the watershapes to its decking and curving it into a concave portion of the original kidney-shaped deck and pavers. A group of rock steps leading up to the patio not only accommodates a one-foot elevation change between pool deck and patio, but also acts as a transition between the new project's rock formations and the brick patio.

The rocks are used throughout the space to tie everything together. In fact, Horvat used the same types in the steps and other garden areas as he had used in the waterfeature, decking and planters, thus bridging the gaps between old and new construction.

Safety concerns also led to inclusion of a five-foot-high wrought-iron fence around the pool area. This way, the children can play in the rest of the large yard unsupervised, without getting into the pool area. The fact that the yard slopes down and away from the house worked in everyone's favor: She can sit on the patio and see into the far corners of the backyard right over the fence.

With the issues of privacy and visual integration fully addressed, it was gratifying to find, when the system came on line and the water started to flow, that we'd also succeeded completely in addressing the noise issue. The constant motion of the waterfalls covers the sounds of the nearby highway, and the calm is preserved even when speeding commuter trains pass through the area every 20 minutes or so.

It's with no small measure of pride that we look back on this job, knowing that the client is completely satisfied with the results of our collaboration with her and the landscape architect. In this case, the aesthetic touches and the overall system design now work in a collaboration of their own, providing the family with a reliable watershape in an uncommonly beautiful design and setting.

Floating Rocks

An interesting touch for this project was the inclusion of "floating" rock steps that look natural while serving to separate the waterfeature/grotto area from the main pool and providing easy passage from side to side of the large expanse of water. The challenge of building these floating rocks was in ensuring their longevity. We knew that any freeze/thaw cycle worth its name could snap the rocks right off their supports if they were poorly mounted.

This is the kind of consideration that leads to design conservatism – that is, a fear of taking chances – and it's something we avoid by knowing all about the materials we use and how to install them to last. (In this case, our own practical experience came into play: We'd installed something similar in 1995, and those floating rocks have withstood the test of many Chicago winters thus far because of the extra strength we designed into them and their support structures.)

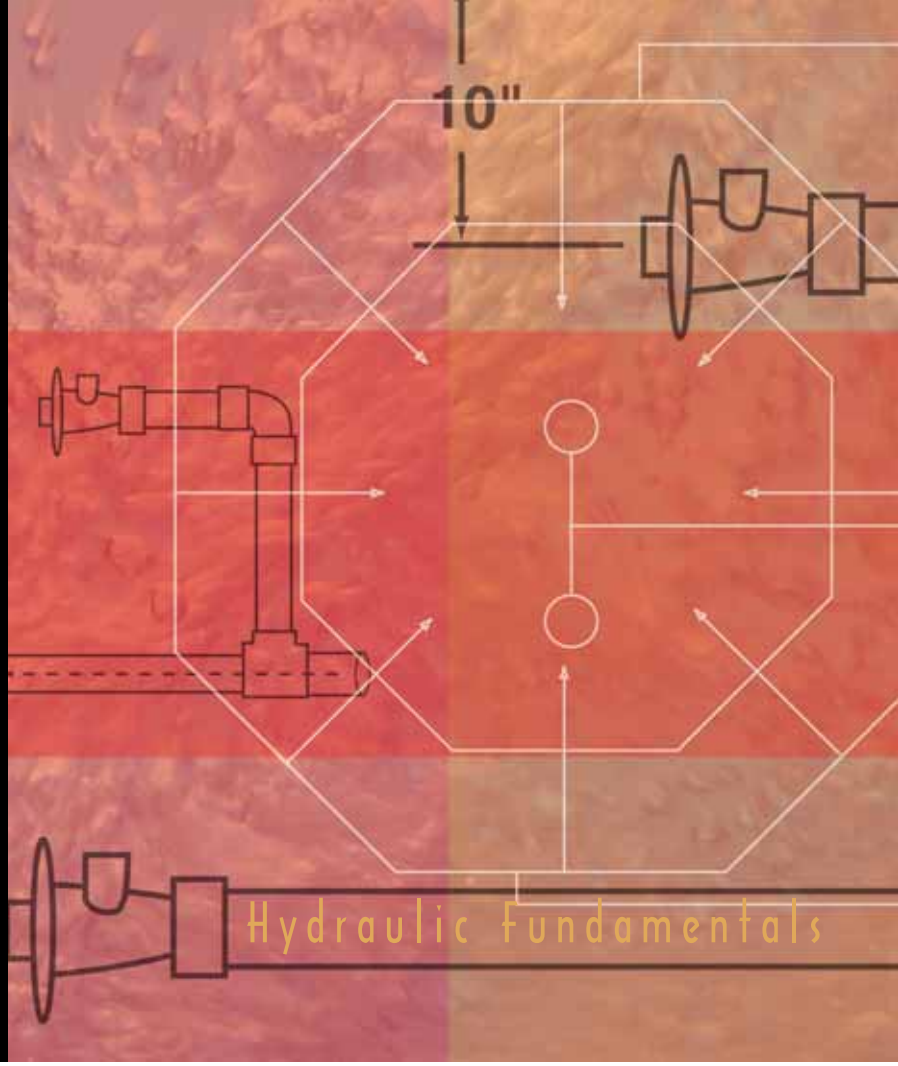
In setting up the steel cage, we positioned vertical rises for the rock step's 12-inch-diameter piers and tied them into the floor's steel to make the structure monolithic once shotcrete was applied. We notched the rocks for snug fits on the piers, then core-drilled completely through the rocks down 12 inches into the piers. We then inserted coarse-threaded rods that we'd notched for better holding power, securing them with hydraulic cement.

– L.D.

Water Under Pressure

By Steve Gutai

Successful plumbing design for watershapes all boils down to a need to understand the relationship between water flow and line velocity, says hydraulics expert Steve Gutai. Once you have a good grasp of these fundamental factors, he observes, selecting the right pipes for the job and designing an efficient piping system that will drive your pool, spa or fountain is simply a matter of reading charts and paying attention to details.



Of all the concepts of hydraulic-system design, there are few that have more importance than the correlation between *water flow* (that is, capacity expressed as gallons per minute) and *line velocity* (the speed at which the water travels).

As water travels through a pipe, its increase in speed (that is, its line velocity) results in an increase in resistance (expressed as feet of head) and in a reduction of end pressure, which is measured in pounds per square inch (psi). In other words, an increase in friction losses and a drop in pressure is the result of increased water velocity at a given flow.

If that makes sense to you without further explanation, then you know much of what you need to know when it comes to selecting pipes and fittings and setting up a watershape's plumbing system. If it doesn't, this article will cover the basics – from selecting pipes and sizing lines to plumbing in downsized manifolds and setting up loops – all with a goal of designing plumbing networks with even flows and pressures.

But before we begin, we need to recognize that *discharge* lines are not sized the same way as are *suction* lines. In other words, there are two sets of calculations you must develop for each watershape's plumbing system. This time, we'll cover only the discharge side of the system – that is, the plumbing immediately downstream from the pump.

From Pump to Pool

An important point to recognize from the outset is that there is generally a right way to plumb any given watershape. There is a correct pipe size, there are proper fittings, there is a right pump size, and it's all a matter of thinking things through and making the right choices.

A good place to start is with the piping itself. You're probably most familiar with schedule 40 PVC piping, but it's likely you've also had some exposure to schedule 80 PVC as well as CPVC and different grades of copper piping and perhaps even steel piping.

The most common material for residential pool plumbing is schedule 40 PVC. For the most part, you don't get into other piping materials unless you are involved in commercial work, where the distinctions have to do mostly with a given material's ability to handle heat, its durability and its cost.

The main point here is that each of these materials has its own friction flow chart, reflecting the fact that each creates resistance to flow at different levels. Once you choose a material, you can choose the water's velocity – a key bit of information you need to size up a plumbing network.

The Hydraulic Institute's and the National Spa & Pool Institute's standards for maximum line velocity in schedule 40 pipe are set at 10 feet per second (fps) on the discharge side, 8 fps on the suction side. If you select pipe and fittings that do not operate to these parameters, the result will be a system with reduced efficiency.

Using a friction/flow chart (Figure 1), you find a set flow in gpm at a specific water velocity, with the friction loss expressed

Figure 1: A friction/flow chart for Schedule 40 rigid PVC pipe, indicating friction loss of water in feet per 100-foot lengths of pipe.

U.S. Gals. per Min.	3/4" Pipe Vel. Ft. per Sec.	3/4" Pipe Loss in Feet	1" Pipe Vel. Ft. per Sec.	1" Pipe Loss in Feet	1 1/4" Pipe Vel. Ft. per Sec.	1 1/4" Pipe Loss in Feet	1 1/2" Pipe Vel. Ft. per Sec.	1 1/2" Pipe Loss in Feet	2" Pipe Vel. Ft. per Sec.	2" Pipe Loss in Feet	2 1/2" Pipe Vel. Ft. per Sec.	2 1/2" Pipe Loss in Feet	3" Pipe Vel. Ft. per Sec.	3" Pipe Loss in Feet	4" Pipe Vel. Ft. per Sec.	4" Pipe Loss in Feet	6" Pipe Vel. Ft. per Sec.	6" Pipe Loss in Feet	U.S. Gals. per Min.
1	0.6	0.25	0.37	0.07															1
2	1.2	0.9	0.74	0.28	0.43	0.07													2
3	1.8	1.92	1.11	0.6	0.64	0.16	0.47	0.07											3
4	2.41	3.28	1.48	1.02	0.86	0.25	0.63	0.12											4
5	3.01	5.8	1.86	1.52	1.07	0.39	0.79	0.18											5
6	3.61	7	2.33	2.15	1.29	0.55	0.95	0.25	0.57	0.07									6
8	4.81	11.8	2.97	3.6	1.72	0.97	1.25	0.46	0.76	0.14	0.54	0.05							8
10	6.02	17.9	3.71	5.5	2.15	1.46	1.58	0.69	0.96	0.21	0.67	0.09							10
15	9.02	37.8	5.57	11.7	3.22	3.07	2.36	1.45	1.43	0.44	1.01	0.18	0.65	0.07					15
20			7.42	19.9	7.29	4.2	3.15	2.47	1.91	0.74	1.34	0.3	0.87	0.12					20
25			9.28	30	5.36	7.9	3.94	3.8	2.39	1.11	1.67	0.46	1.08	0.16					25
30		U.S	11.14	42	6.43	11.1	4.73	5.2	2.87	1.55	2.01	0.65	1.3	0.23					30
35		GAL.			7.51	14.7	5.52	7	3.35	2.06	2.35	0.88	1.52	0.3	0.88	0.07			35
40		PER	8" PIPE		8.58	18.9	6.3	8.9	3.82	2.63	2.64	1.11	1.73	0.39	1.01	0.09			40
45		MIN.			9.65	23.5	7.09	11.1	4.3	3.28	3.01	1.39	1.95	0.48	1.13	0.12			45
50		700	4.37	0.66	10.72	28.5	7.88	13.5	4.78	4	3.35	1.69	2.17	0.58	1.26	0.16			50
60		750	4.7	0.75			9.46	18.9	5.74	5.6	4.02	2.36	2.6	0.81	1.51	0.21			60
70		800	4.99	0.82			11.03	25.1	6.69	7.4	4.69	3.14	3.04	1.09	1.76	0.28			70
80		850	5.37	0.95					7.65	9.5	5.35	4	3.47	1.39	2.02	0.37			80
90		900	5.64	1.06					8.6	11.8	6.03	5	3.91	1.73	2.27	0.46			90
100		950	5.94	1.23					9.56	14.4	6.7	6.1	4.34	2.1	2.52	0.55	1.11	0.07	100
125		1000	6.25	1.28		U.S			11.95	21.8	8.38	9.2	5.42	3.19	3.15	0.85	1.39	0.12	125
150		1050	6.57	1.4		GAL.					10.05	12.8	6.51	4.5	3.78	1.18	1.67	0.16	150
175		1100	6.89	1.51		PER	10" PIPE						7.59	5.9	4.41	1.57	1.94	0.21	175
200		1150	7.2	1.65		MIN.							8.68	7.9	5.04	2.08	2.22	0.28	200
225		1200	7.51	1.79		1500	5.99	0.92					9.76	9.4	5.67	2.52	2.5	0.35	225
250		1250	7.82	1.94		1600	6.4	1.03					10.85	11.5	6.3	3.05	2.78	0.42	250
275		1300	8.13	2.09		1700	6.8	1.15							6.93	3.6	3.05	0.48	275
300		1350	8.45	2.23		1800	7.2	1.27							7.56	4.3	3.33	0.58	300
325		1400	8.77	2.37		1900	7.6	1.41							8.19	5	3.61	0.67	325
350		1450	9.08	2.53		2000	7.99	1.54							8.82	5.7	3.89	0.79	350
375		1500	9.39	2.68		2100	8.39	1.68							9.45	6.5	4.17	0.88	375
400		1550	9.7	2.85		2200	8.8	1.82							10.08	7.3	4.44	0.99	400
425		1600	10	3.01		2300	9.2	1.99									4.72	1.11	425
450		1650	10.32	3.21		2400	9.6	2.17									5	1.22	450
475		1700	10.64	3.4		2500	10	2.34									5.28	1.36	475
500		1750	10.96	3.59		2600	10.4	2.5									5.55	1.5	500
550		1800	11.27	3.78		2700	10.79	2.69									6.11	1.8	550
600		1850	11.58	3.98		2800	11.18	2.88									6.67	2.1	600
650		1900	11.89	4.19		2900	11.59	3.08									7.22	2.44	650
700		1950	12.21	4.4		3000	11.99	3.28									7.78	3.79	700
750		2000	12.52	4.61		3100	12.39	3.32									8.33	3.19	750
800						3200	12.79	3.35									8.89	3.6	800

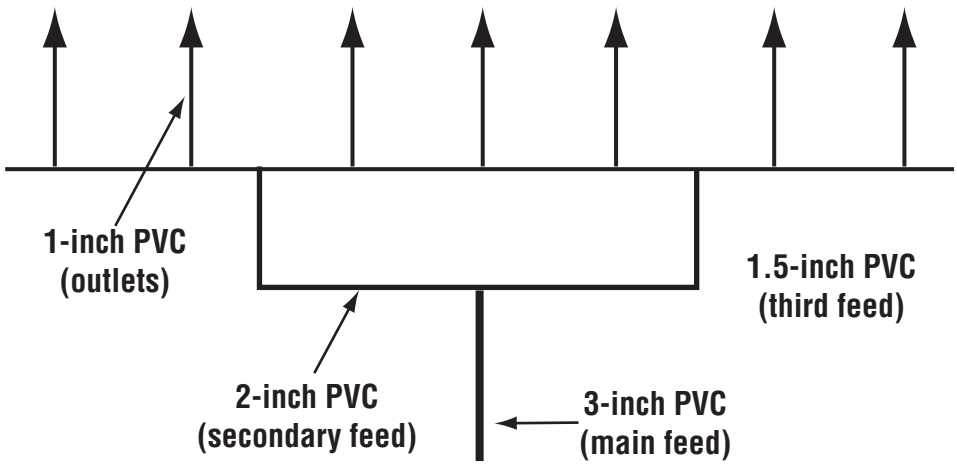


Figure 2: Basic manifold plumbing, in accordance with the friction/flow chart found in Figure 1

in feet of head or the pressure loss that results. Once the flow requirements are set, the water velocity is the determining criterion. So using the chart and focusing on the discharge side of the system, we can set our velocity at 6 fps – a reasonable spot below the maximum allowable velocity and a common target for pool plumbing.

Referring to the chart, 3-inch schedule 40 PVC will yield 140 gpm at 6 fps. This is the main feed line into the manifold shown in the schematic (Figure 2). Now we take the 3-inch line and split the flow in half to determine the next pipe size. If we do this, we have 70 gpm, which steps us down to 2-inch pipe, which, according to the chart, lets 70 gpm flow at about 6 fps.

At this transition, we should use a 3-inch tee fitting, because dropping all the way down to a 2-inch tee would cause unnecessary resistance. Further down the line, we split the 2-inch line, cutting the 70 gpm flow in half, and resize the pipe according to the desired 6-fps flow. This gives us 1.5-inch pipe that allows for a potential flow of 40 gpm at 6 fps. At this transition, we should use a 2-inch tee.

At the next tee fitting, we split the flow in half again to 20 gpm with a 1.5-inch tee and reduce the pipe size to 1 inch at 6 fps. From pump to pool, we used pipe sizes and tees that maintained the flow at a constant 6 fps.

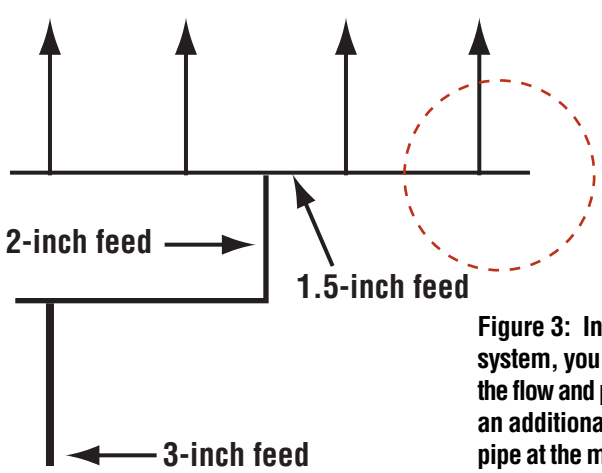


Figure 3: In a basic manifold system, you can help even out the flow and pressure by adding an additional 6 to 12 inches of pipe at the manifold's end (see the highlighted area of the schematic) instead of completing it with a 90-degree elbow leading to an outlet.

Reductions

There's a key message that comes through in the discussion just above: All transitional fittings and tees should be from the larger pipe size and down to the next pipe size.

With a 3-inch tee, for example, the branch side accommodates a 3-inch pipe, while the through sides of the tee are reduced with bushings down to 2 inches each. This simple approach takes much of the guesswork out of fitting selection and reflects the fact that using water velocity as the deciding criterion keeps pointing us in the right direction toward a plumbing system that has even water flow and avoids the accumulation of resistance or loss of pressure.

The key to setting up this sort of even, balanced discharge piping is keeping the water velocity at a constant level of 6 fps – and the same basics apply whether you want the flow at 6 or 8 or 10 fps.

Beyond these simple piping selection and sizing principles, there are two special piping configurations that can help you in evening out a system's flow and pressure.

One is the use of an additional tee fitting at the end of a manifold run at a point 6 to 12 inches past the last feed line (Figure 3). If this is done instead of using a 90-degree elbow to terminate a run, the flow at the manifold's end will be more consistent with the flow found at other discharge points.

The other velocity-leveling approach has to do with setting up plumbing loops in which the last branch of piping before the water discharges is tied together (Figure 4). As a rule, I'd suggest looping plumbing whenever possible. With this configuration, the water flow and pressure become very even at all discharge points, and it all works in accordance with the basic manifold-downsizing plan just discussed – but with one difference.

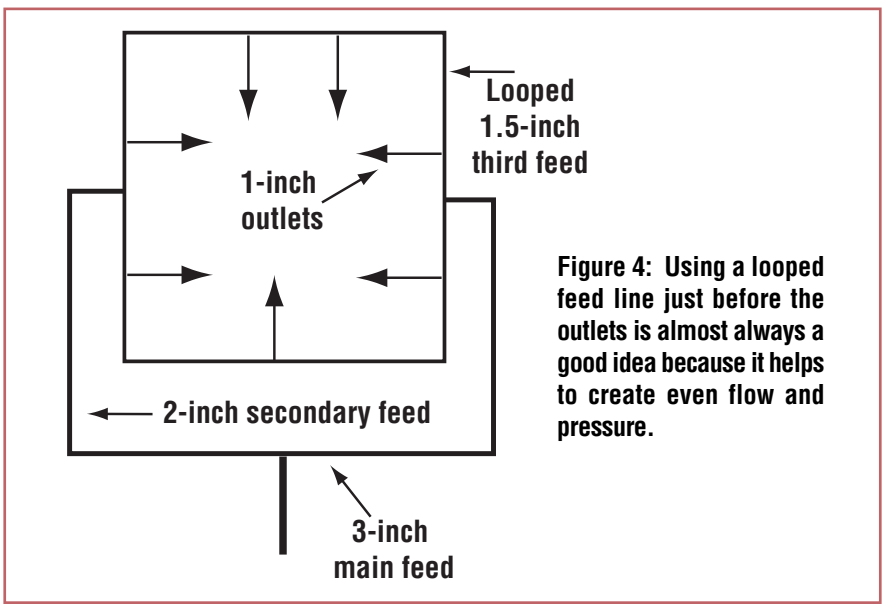


Figure 4: Using a looped feed line just before the outlets is almost always a good idea because it helps to create even flow and pressure.

As shown in Figure 4, the last feed before our discharge points is where the pipe should be tied together to create a loop. The water's flow and pressure will equalize as a result of the ends being tied together.

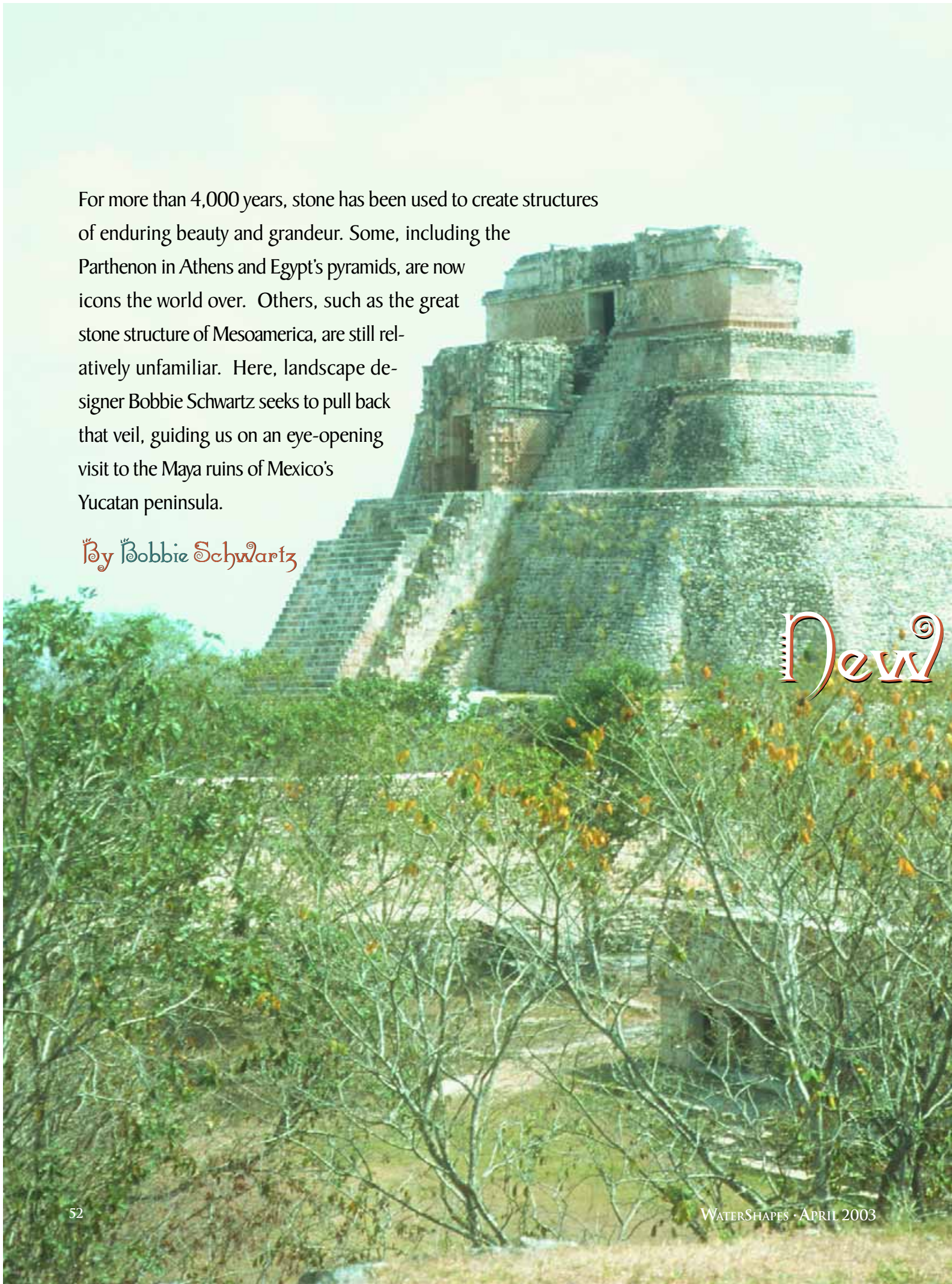
This looping technique works especially well for discharge lines used for spa jets, fountains, in-floor cleaners or any application in which the water is discharged in a vertical column or where you want even flow and pressure from all points of discharge.

Next, we'll take a look at the suction side of the system.

For more than 4,000 years, stone has been used to create structures of enduring beauty and grandeur. Some, including the Parthenon in Athens and Egypt's pyramids, are now icons the world over. Others, such as the great stone structure of Mesoamerica, are still relatively unfamiliar. Here, landscape designer Bobbie Schwartz seeks to pull back that veil, guiding us on an eye-opening visit to the Maya ruins of Mexico's Yucatan peninsula.

By Bobbie Schwartz

New



Impressions of Worlds

The people who once inhabited modern-day Mexico's Yucatan peninsula were remarkably sophisticated. Their civilization was based on a deep-rooted knowledge of astronomy, mathematics, hydraulics and engineering. They quarried stone and moved it hundreds of miles on rollers, using this raw material and incorporating it into highly refined buildings, temples, roads and monumental works of art that rival those of the better-known cultures of ancient Europe, Africa and Asia.

In 2001, I traveled extensively in the Yucatan to experience the region's culture and view masterworks from many centuries past. What I found was a sense of form, line and pattern in the ruins of what archeologists call Mesoamerica (roughly the space covered today by Mexico, Guatemala, Honduras and Belize) that revealed these designers, engineers and builders – known as the Maya – as a rich source of inspiration and specific ideas for our work today.

As with almost any foray onto ancient ground, visiting these ruins offers even the most casual of visitors an enriching and eye-opening experience. But when you stop to consider them from the deliberate standpoint of a designer seeking to create interest in hardscape structures, a vast and remarkably sophisticated tapestry unfolds.

A Land of Mystery

Maya civilization flourished from approximately 600 B.C. to 1200 A.D. – and exactly why they vanished is one of the world's enduring mysteries.

Westerners did not truly rediscover the stone relics the Maya left behind until the 1800s, although Spanish conquistadors were certainly aware of some of their splendor after invading Mexico in the 16th Century. Perhaps because of their mostly remote locations and enigmatic demise, the architecture and culture of the Maya has for too long been hidden from much of the rest of the world.

In traveling widely through Mexico, however, I found that Maya style has had a significant effect on *local* architecture and decorative design. In viewing the ways in which modern builders in areas once populated by the Maya have made use of these striking forms, we see the potential for application in our own work.

The most familiar form of Maya architecture is the stepped pyramid. Personally, I find these structures, including the one depicted at the opening of this article, to be every bit as amazing as the Egyptian pyramids, although the latter are infinitely more famous. The Maya's stepped structures are rugged, precise and geometric, yet harmonious with surrounding natural forms. And to be sure, they're a challenging climb!

Although these magnificent pyramids are emblematic of Mesoamerican architecture, even greater distinction can be found in more common structures – including walls.

Most of the patterns the Maya used for wall construction are quite different from those found in the Old World. While the classical styles of Europe are very formal in nature, the work of Mayan artisans is less so – and could lend itself, for example, to a far less formal and more rustic "xeriscapic" style of modern landscape design.

The Maya legacy of wall building is evident throughout the Yucatan. While driving from Cancun to Merida, I saw old dry-laid stone walls that demonstrate the beauty of the stone they used (Figure 1). At the Hacienda Chichen near Chichen Itza I also saw a new wall of irregular, rough stone similar to a Maya original – but it had been capped with square blocks of stone (Figure 2). Either approach would work well in everything from a modern xeriscape to a lush, tropical-style garden.

Detailed Simplicity

At the ruins of Kinich Kokmo on the outskirts of Izamal, I spotted an interesting juxtaposition of an old Maya wall and a more recent one. The older wall, only partially reconstructed, shows infinitely more care in the selection of the stone faces and their placements. This is not so amazing when one recognizes that the Mayan society was rich and deployed thousands of slaves to build carefully and well.

The level of detail they achieved is incredible. At the Temple of the Warriors in Chichen Itza, you see alternating layers of carved and plain stone separated by rows of stones that jut out to cast dramatic shadows (Figure 3). This idea of breaking the wall's plane with a protruding layer of stone is also found in other walls, some with relatively flat stones built into layers of varying height and separated by the protruding rows. This pattern makes a strong impression and attracts the eye, even from a distance.

By contrast, some patterns are created by the deft use of plain stones, demonstrating a great attention to detail in executing simple forms. On the walls of the Nun's Quadrangle at Uxmal, for example, the stones are the same height and laid either all vertically or horizontally in rows (Figure 4). A restored wall at Uxmal suggests another pattern we might apply today, alternating large patches of smooth stones with patches of smaller, rougher stones (Figure 5).

A very different wall pattern can be found at the partially reconstructed city of Dzibilchaltun, where small pieces of stone were set on end into the mortar between roughly rectangular pieces of large and medium size (Figure 6). Thirty miles south of Dzibilchaltun, in the vibrant city of Merida, the walls of a church school are similar, except that the larger rectangular pieces of stone were used to form the lintels of the windows and doors (Figure 7).

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Back in Izamal, a modern interpretation of the pattern at Dzibilchaltun was used on the façade of a shopping mall, but the small stones were aligned on the diagonal as they were set into the mortar (Figure 8). At the Hacienda Chichen, a cruder and more random version of this pattern can be found in a low wall that encloses a small courtyard (Figure 9).

As mentioned earlier, many of the Maya walls are composed of a series of layers, some embellished with carvings, others decorated with another common form of Mesoamerican architecture, the column. In Kabah, the walls of the first level of the Great Palace are inset with round, simply carved columns at regular intervals (Figure 10). Eight miles away, this pattern is repeated almost exactly in the Palace of the North at Sayil, except that the columns either form a section of wall or stand alone to provide access to the interior of the palace.

By contrast, the columns of the courtyard wall at Uxmal are made of stacked round stones and are not set into the wall itself, instead providing openings in the walls (Figure 11). Here I found myself wondering whether or not Sir Edwin Luytens had read about Uxmal, given the similar design of his columns at Hestercombe in England.

Forged by Conquest

When the Spanish colonized Mexico, they enslaved the natives to speed construction of their walls, homes and churches. As a result, the methods and patterns reflect the Maya heritage of the builders but incorporate Spanish motifs as well.

At Hacienda Chichen, for example, the designer combined the rounded arches of Spanish architecture with the round, stacked-stone columns of the Maya in setting up a large veranda (Figure 12). I saw the same concept used in a modern pergola in Merida, the only difference being that the stacked-stone columns were square rather than round.

For all the colonial cross-pollination, there are features of Maya architecture that seem unique – including their treatment of elements as commonplace as foundations. At the Great Palace of Kabah, for instance, cylindrical stones are placed side by side as the unusually compelling base of the wall (Figure 13).

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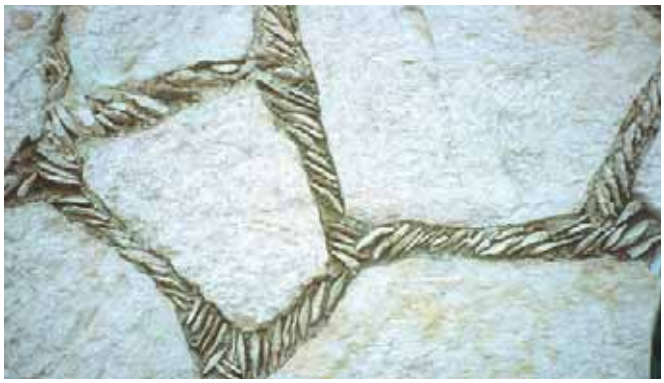

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More striking still is the Mayan use of projecting panels called *talus* to echo the angle of staircases (Figure 14). At Kukulcan – the great pyramid at Chichen Itza – we see a series of taluses built atop each other with a grand staircase on each side. Entrances also have a deliberate style. Often, the access points to Maya buildings are carefully framed with plain stones on the sides and as the lintel above (Figure 15).

One of the architectural elements continually repeated in the construction of the Maya, regardless of period, is the vaulted arch – basically an upside-down "V" set into a wall as an opening or as an inset in which the force of gravity supports the stones.

The Maya used the vaulted arch in each of their cities, but in different forms. At Government House in Uxmal, for example, some vaults are set into the wall as a decorative feature and appear to be supported by extra horizontal walls at the back of the vault (Figure 16). Elsewhere in the same city, we see the vault used as an entrance over and over again.

In one instance, after walking through a vault that is perfectly centered on an entrance behind it, one proceeds up a staircase to that rectangular building's portal. At Kabah, there's a vault that serves as the symbolic starting place for the causeway that connected Kabah to Uxmal and other communities. And at Tulum, there is a primitive vault that functions as one of the few entrances to this old walled city on the Caribbean.

Ascending Steps

If one is fortunate enough to be able to design a structure for a wide, gentle slope, the opportunity to create a staircase arises. When it comes to staircases, the Maya can be of tremendous usefulness to the designer looking to create transitions and accessways of great interest and beauty.

The long entry staircase to the reconstructed buildings at Uxmal, for instance, consists of huge slabs of stone with a riser of two inches and a tread of approximately two feet, all edged with long, narrow stones (Figure 17). Its gradual rise eases the ascent for everyone, but especially for those who are older or may be short of breath.

An interesting and unusual pattern of tread and riser can be seen at Uxmal: The treads consist of large stone slabs, but the risers are rectangular pieces of stone set on the vertical, side by side (Figure 18). I can easily imagine creating stairs today using this pattern in brick or clay tile – or even in concrete carved before it set completely.

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A Modern Marvel

It's interesting to note that one of the most recognizable watershapes in the world, the "Mayan Temple Slide" at the famous Atlantis, Paradise Island, Bahamas, is based on the pyramids of the Maya. The originals were supposedly built for the study of astronomy, but the resort seems to have something quite a bit different in mind.

– B.S.

The Maya also placed great importance on symbols, many of which had religious connotations. Indeed, religion was the inseparable core of their civilization. The Maya artisans expressed their religion in stone – including sculptures of sacred jaguars, turtles and serpents. At Chichen Itza, for example, carved serpent heads (symbolizing the god Kukulcan) protrude from the walls of the Platform of Eagles and Jaguars and on the base of the Great Pyramid (Figure 19).

At times, however, Maya carvings take on a random appearance – but frequently the randomness establishes beautiful wall patterns of the sort found at the Governor's House in Uxmal (Figure 20). In fact, after visiting several partially reconstructed Maya ruins, I began to see a tendency toward repetition in carving, with series of arcs or vertical lines or spirals or zigzags creating an overall impression.

Given modern time constraints (not to mention budget considerations), achieving such looks might seem out of reach to today's designers. But why couldn't these old patterns be used as templates for polymer or resin reproductions? These patterns could also be painted directly onto walls or fences – not entirely inauthentic, given that archeologists have found traces of paint indicating that these carvings were brightly colored in shades of red, blue and yellow.

It's not surprising, given the amount of attention artisans paid to their creation, that Maya carvings are more than decorative. In fact, at the Temple of the Warriors at Chichen Itza, the carvings on square, stacked columns were used to tell stories. Adjacent to the Temple of the Warriors is the Plaza of the Thousand Columns. Here, round columns are composed of stones graduated from large to small as the column rises from bottom to top (Figure 21), with small stones embedded in the mortar between them in a way similar to the wall pattern seen in Figure 6.

Archeologists theorize that these columns supported thatched roofs (Figure 22) – an unusual use of stone rather than wood that makes sense in a rainy climate, where the wood might begin to rot after a short period of time. While I'm not suggesting that we duplicate these columns in modern landscapes (unless, of course, that's what the client wants and can afford), I can only imagine the visual impact such a structure would have in the right setting.

My visit to the Yucatan was all too brief, but even in my quick sojourn, the stonework of the Maya prodded me to think about a host of new approaches I can use to delight and inspire my own clients. Specifically, I saw on my visit the value of looking beyond Europe and Asia for inspiration and have a new-found desire to seek design solutions right here in our own hemisphere.

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Rough Edges

As a designer, I'm always looking for ways I can make my new installations look old and established and as though they've been around for a while.

Along those lines, one of the simplest and easiest ways I've ever seen to achieve that look is by imitating the Maya approach to path edging – that is, by using stone to line cement paths that have been divided into squares or rectangles. Rough cutting the seams of the concrete and edging the path with rough-cut, narrow rectangular stones will definitely enhance the sense of great old age.

– B.S.

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Maya Watershapes

The pools (or *cenotes*) at Maya sites were natural wells fed by underground streams and were usually surrounded by layered stone. It is difficult to tell whether the stone was added to aid access or was already there, but, either way, the look is profoundly natural and makes these features worthy of study by anyone designing with water in mind.

– B.S.

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The following information has been provided to WaterShapes by product suppliers. To find out how to contact these companies, look for the Product Information Card located on page 68.

FILTRATION FOR LARGE PONDS

Circle 125 on Reader Service Card

EMPEROR AQUATICS offers the HydraScape skid-mounted filter system for ponds holding more than 15,000 gallons. Designed to rid the water of algae problems and leave it crystal clear, the pre-packaged system features a pump, a 36-inch dual-lateral Plastic Sinking Pellet (PSP) Filter, a programmable backwash valve and a 150-watt high-output UV sterilizer – all on a small footprint. **Emperor Aquatics**, Pottstown, PA.

STAIN-PREVENTING SYSTEM

Circle 126 on Reader Service Card

JACK'S MAGIC PRODUCTS has introduced Jack in a Box, a system designed to prevent staining and discoloration in swimming pools. The product is used once a week, with no mixing or diluting, and works with chlorine, bromine or biguanide systems. If the pool develops a stain or discoloration related to metals, scum-line or algae, the company will treat the problem, free of charge. **Jack's Magic Products**, Clearwater, FL.

HAND-PAINTED TILE

Circle 127 on Reader Service Card

LATIN ACCENTS offers a comprehensive line of hand-painted Talavera tiles in a range of classic, colonial and baroque styles. Strong and durable, all cataloged tiles come in 2-, 4- and 6-inch sizes, and additional sizes and custom designs are available. Trim pieces – quarter rounds, beaks, V-caps, chair rails and more – are stocked in five solid colors, or tile designs can be applied to most of them. **Latin Accents**, Danville, CA.

COLORS FOR IN-FLOOR CLEANERS

Circle 128 on Reader Service Card

PARAMOUNT POOL & SPA SYSTEMS has introduced Pool Valet Retro, a system designed to make the repair, remodeling or upgrading of in-floor cleaning systems easier, faster and, in some cases, possible where it wasn't before. The new system's adapters fit into existing Pool Valet bodies and come in eight colors, thus expanding design options and allowing for new color schemes. **Paramount Pool & Spa Systems**, Tempe, AZ.

Pool Safety Brochure

Circle 129 on Reader Service Card

POOL SAFETY ALLIANCE has released a brochure called "The Beauty of Safety" as a means of spreading the word about the availability of layers of protection for backyard pools and spas that don't compromise project aesthetics. Assembled by a group of concerned builders, suppliers, health-care officials and safety advocates, the brochures offer practical guidance without preaching about danger. **Pool Safety Alliance**, Seal Beach, CA.

Bronze Fountains and Sculptures

Circle 130 on Reader Service Card

PESCARA has published a catalog on its line of bronze sculptures and fountains. The 30-page, full-color booklet describes the "lost wax" process by which the sculptures are made, then displays dozens of lifelike animals and human figurines set up as piped waterfeatures, self-contained fountains and garden statuary. The sculptures come in a number of sizes, patinas and color schemes. **Pescara, Studio City**, CA.

In-Pool Lounges

Circle 131 on Reader Service Card

S.R. SMITH has introduced ThePoolBar, a pair of seats with an umbrella table and four recessed drink holders. The seats and table attach easily with a thermoset pad – the only part that comes in contact with the pool – that will not harm decks or pool walls. The whole assembly folds up and out of the water to avoid entanglement with cleaning equipment and comes with a folding 72-inch sunbrella. **S.R. Smith**, Canby, OR.

Concrete Colorant

Circle 132 on Reader Service Card

L.M. SCOFIELD offers Chromix admixtures for coloring cast-in-place and pre-cast concrete. Available in a range of earth tones from rich grays and warm reds to sand-colored buffs, the material is also available in custom colors. Permanent and non-fading, the admixture increases workability and concrete strength at all ages, reduces efflorescence and features complete batch-to-batch uniformity. **L.M. Scofield**, Los Angeles, CA.

Circle 45 on Postage Free Card

AERATION/OZONATION SYSTEM

Circle 133 on Reader Service Card

E P AERATION offers EP-LK 2001, a bottom-laid aeration and ozonation system for lakes, large ponds and other outdoor waterfeatures. Featuring a high (21%) oxygen-transfer rate and an efficient ozone-generation module, the system does not disturb the sludge layer as it creates a gentle flow of bubbles to encourage desirable flora and fauna to compete with algae, bacteria and pathogens. **E P Aeration**, San Luis Obispo, CA.

EARTH-MOVING EQUIPMENT CATALOG

Circle 134 on Reader Service Card

BOBCAT has published a buyer's guide/catalog highlighting its complete line of skid-steer loaders, all-wheel steer loaders, compact and mini-track loaders, excavators, loader backhoes, compactors and utility products as well as accessories, portable power systems and more than five dozen attachments. The 48-page, full-color booklet also covers parts and service as well as financing options. **Bobcat**, West Fargo, ND.

COBBLESTONE

Circle 135 on Reader Service Card

EUROCOBBLE offers authentic European cobblestone. Quarried in the Italian Alps and pre-assembled in modular form to facilitate transport and installation, the stone comes in a range of colors in porphyry and select species of granite. The modules are available in squares, as fan shapes or in curves, and the installed product offers superior durability even at extreme temperatures. **Eurocobble**, Studio City, CA.

POOL SAFETY COVERS

Circle 136 on Reader Service Card

AUTOMATIC POOL COVERS offers the AutoGuard series of safety covers for swimming pools. Made with a durable, coated vinyl fabric and commercial-grade hardware in both under-track and top-track models, the system meets or exceeds all applicable standards, operates at the turn of a key, has been designed to fit pools of almost any shape and is fast, durable and warranted to last. **Automatic Pool Covers**, Fishers, IN.

Retaining-Wall Systems

Circle 137 on Reader Service Card

RISI STONE SYSTEMS offers RisiStone retaining walls in a variety of stone sizes, textures and colors. Walls are stacked for assembly; no mortar or mechanical fasteners are required. All units use a shear connection that makes them self-aligning and self-bettering and creates a strong, uniform interlock throughout the wall. Four product families are available in nine basic systems. **Risi Stone Systems**, Thornhill, Ontario, Canada.

Dual-Diffuser Aerator

Circle 138 on Reader Service Card

AQUAMASTER FOUNTAINS & AERATORS introduces AquaAir, a system designed to provide lakes, ponds and marinas with superior aeration, circulation and de-stratification. The system's bottom-mounted dual diffusers, which entrain bottom water and lift it to the surface, are connected via hoses to a shore-mounted air compressor, so there are no moving parts in the water. **Aquamaster Fountains & Aerators**, Kiel, WI.

Safety Play Surface

Circle 139 on Reader Service Card

SAFE GUARD SURFACING manufactures a special blend of EPDM rubber granules mixed with a polyurethane binder in making poured-in-place, shock-absorbing surfaces that reduce the potential for injuries resulting from falls in play areas. The non-slip surface is monolithic, so no parts can come loose, and offers superior drainage that lets water flow freely. **Safe Guard Surfacing**, St. James, NY.

Bird-Attracting Waterfeature

Circle 140 on Reader Service Card

AVIAN AQUATICS has published a catalog of misters, drippers, waterfalls, creeks and ponds designed to attract birds. The systems are installed at ground level or slight elevations, mimicking natural settings and featuring the fresh, moving water that attracts more species than common feeders or elevated bird-baths. The catalog also covers a range of accessories, including de-icers, filters and more. **Avian Aquatics**, Milton, DE.

CONCRETE-JOINT SEALANT

Circle 141 on Reader Service Card

W.R. MEADOWS offers Deck-O-Seal, a two-part, polysulfide-based joint sealant for caulking and sealing joints subject to concrete movement. Ideal for sealing joints around watershapes, the pourable, self-leveling material forms a firm, flexible, weather-tight seal and cures at ambient temperatures. The product comes packaged with the proper ratio of the two components for ease of use. **W.R. Meadows**, Hampshire, IL.

LANDSCAPE LIGHTING CATALOG

Circle 142 on Reader Service Card

KICHLER LANDSCAPE LIGHTING offers a 74-page, full-color catalog covering its full line of landscape lighting products. Newly formatted, the brochure includes a special finish-sample page showing all of the looks available for the fixtures as well as a variety of application photos showing many of them in use. Also included are details on transformers and lamp photometrics. **Kichler Landscape Lighting**, Cleveland, OH.

QUIET POOL PUMP

Circle 143 on Reader Service Card

PENTAIR POOL PRODUCTS offers the WhisperFlo pool pump, a high-performance, heavy-duty unit that quietly circulates water more quickly than other pumps while using less energy and lowering operating costs. Featuring a unique diffuser, a high-efficiency impeller, thermoplastic construction and a commercial-grade frame, the pumps are available in single- and two-speed models. **Pentair Pool Products**, Sanford, NC.

STONE PRODUCTS

Circle 144 on Reader Service Card

STONE CENTER offers imported and domestic stone for patios, walkways, hearths, pool decks and coping and a variety of other architectural applications. Flagstone pieces are generally one-inch thick and are available in a range of sizes – from 12 by 12 inches up to 24 by 36 inches. Treads and coping stones are also available – all in a variety of colors and with sawn or cleft appearances. **Stone Center**, Bridgewater, NJ.

Two- and Three-Way Valve

Circle 145 on Reader Service Card

VALTERRA offers easy-turning two- and three-way valves for residential and commercial applications. Recommended for use at working pressures of 60 psi and positive-seal back pressures of 50 psi – but they're built of tough, chemically resistant, high temperature PVC to withstand pressures up to 240 psi, making them ideal for use where higher pressures may be encountered. **Valterra Products**, Mission Hills, CA.

Decorative Concrete Surfaces

Circle 146 on Reader Service Card

SEAMCO LABORATORIES offers the Design Template System, a concrete coloring and texturing program that offers a stamped look in about half the time. Ideal for pool decks, patios, drives and walkways, the system adjusts to minor elevation changes, allows for use of elegant (and multiple) colors and uses the original concrete as "grout" or allows for colored grout lines. **Seamco Laboratories**, Tampa, FL.

Salt-Water Chlorinator

Circle 147 on Reader Service Card

POOL TECHNOLOGY has introduced PoolSquad, a system in which salt-water chlorination is combined with pH regulation to maintain recreational water in optimal conditions. A probe monitors pH and sends information to a controller that controls pH-correcting fluid as well as the system's electrolysis cell – a combination designed to simplify maintenance routines for pools of every size. **Pool Technology**, Indianapolis, IN.

High-Efficiency Pool Heater

Circle 148 on Reader Service Card

LOCHINVAR offers the Copper-Fin II, a next-generation pool-heating system designed for high efficiency and superior heater reliability. The system features a gasketless heat exchanger, dual independent ignition systems, seven venting options, pre-assembled multi-stack frames and referenced gas valves – all set up in a service-friendly design for faster installation and easier maintenance. **Lochinvar**, Lebanon, TN.

Product Information Card

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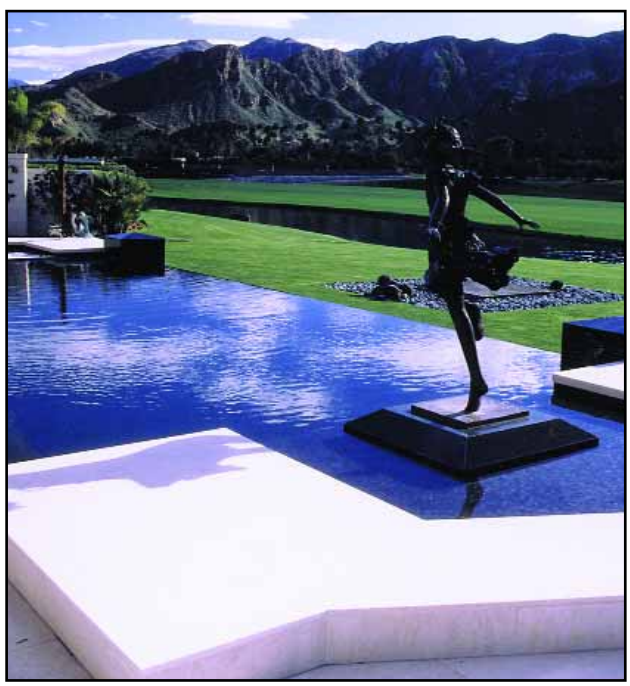
GENESIS 3 A DESIGN GROUP

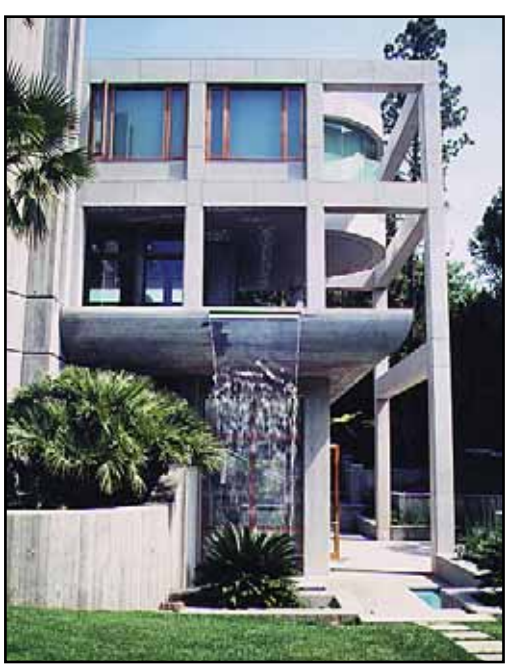
How Good Do You Want To Be?

In the coming months, David Tisherman, Skip Phillips and Brian Van Bower are hosting two very special Genesis 3 events: The group's next Level 1 School and the latest Level 2 School.

November 12-16, 2003
Morro Bay, California
Genesis Level I School

The flagship school in the Genesis 3 program, this school focuses on design, engineering and construction of watershapes, drawing techniques and the Genesis 3 philosophy. Open to all applicants, this is the access point to advanced Genesis Family programs and demonstrates what it takes to operate at the highest level of expertise – including up-close and personal familiarity with the lifestyles of high-end clients.



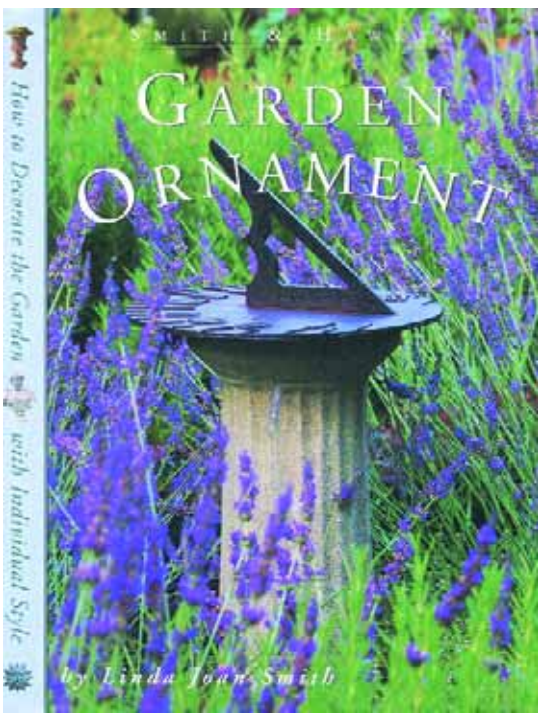


November 17-20, 2003
Morro Bay, California
Genesis Level 2 School

Expanding on concepts explored in Level 1, the Level 2 School brings participants face to face with design professionals who advance the state of the art with each project they tackle. From architecture and lighting design to landscape architecture and concrete color, stains and details, students will get a first-hand look at creative processes on the highest level. Open to all applicants, the school will immediately follow the fall 2003 Level 1 School in Morro Bay.

For more information, contact the Genesis 3 office, toll-free, at (877) 513-5800 — or visit our website: www.genesis3.com

BY MIKE FARLEY



Art of the Ornament

When properly selected and placed, garden ornaments can transform the garden experience by adding character and vibrancy to these spaces, lending them a sense of uniqueness and thus giving the designer a powerful set of tools with which to draw the client into the process.

So often it's the finest or most delicate touches that make or break backyard projects – and exploring the constituents of those touches is what *Garden Ornament* by Linda Joan Smith (Workman Publishing, 1998) is really all about.

This beautifully illustrated, 136-page book tackles head-on the often overlooked subject of garden ornamentation and, in doing so, pulls back the veil on a remarkably rich set of design touches and specific objects you can use to lend interest to your projects, generate enthusiasm among your clients and, ultimately, give your projects real visual energy.

That set of ideas includes items that can be used to add beauty and even sentimental value to any outdoor setting, such as statuary of all kinds, pots, ceramic pieces, fountains, birdhouses and birdbaths, sconces, sundials, obelisks, scarecrows, totem poles, wood carvings and a broad range of antiquities, from old farm equipment and wheelbarrows to family heirlooms.

From the opening pages, Smith argues that these items, when properly selected and placed, can transform the garden experience by adding character and vibrancy to these spaces, lending them a sense of uniqueness and thus giving the designer a powerful set of tools with which to draw the client into the process. On each page, she offers beautiful photos that serve on their own as a catalog of ideas – many of which I've found enormously useful in developing my own designs.

Smith digs sensibly and deep, offering a chapter on the history of garden ornamentation; another on managing placement, setting and the use of ornaments to create movement and surprise; and yet another on how certain types of ornaments work visually through the four seasons.

I've long been particularly impressed by her smart discussion of the regional character of certain ornaments – and with her informative treatment of the differing characteristics of raw materials such as bronze, ceramics and plastic resins. Her suggestions on strategies for weaving items of sentimental value to clients into decorative settings are also first-rate and valuable.

What all of this ultimately leads to, at least from the perspective of a watershape designer, is that these decorative items should never be treated as afterthoughts and should instead be considered, as are so many other features of the finest projects, as integral to the design from the start. She advocates, for example, designing walls and patio areas with pedestals for pots, statues or other decorative objects: By planning for the placement of these items in the garden design from the outset, she believes you can maximize their effects.

Smith also includes a wonderfully helpful and comprehensive resource guide, giving her readers direct entrée to many of the objects she covers in her book.

With perfect candor, I must say that I've always held back on covering *Garden Ornament* in "Book Notes." It's long been a favorite of mine, and I know I'm sharing a private resource that's always inspired me to seek creative ways to personalize the aesthetics of the spaces I design. It has certainly led me to open up my thinking about garden ornaments, and I encourage anyone engaged in the art of watershaping or garden design to pick up this book and do the same. WS

Mike Farley is a landscape architect with 20 years of experience and is currently a design/project manager for Leisure Living Pools of Frisco, Texas. He holds a degree in landscape architecture from Texas Tech University and has worked as a watershaper in both California and Texas.

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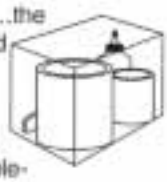

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