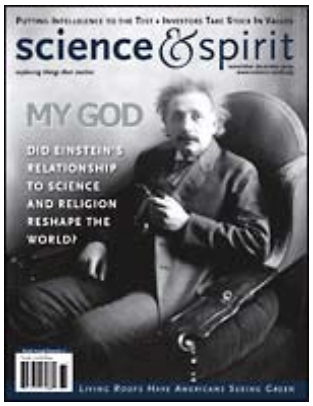

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Nature Hits the Roof

An emerging trend for environmental, religious, and aesthetic reasons, green roofs can create an urban canopy sensitive to the intersection of architecture and landscape.

by Trey Popp

Nestled against the western flank of the Wasatch mountain range, about twenty miles from the Great Salt Lake, the capital city of both Utah and Mormondom spreads over the arid plateau in an orderly matrix of uncommonly large city blocks. At the center of the grid stands the Salt Lake Temple. Six white towers rise amid a cluster of even taller modern buildings that form the heart of the downtown district. And right in the thick of that tightly woven urban fabric is a sight that fools the eye from almost any angle: an enormous, 21,000- seat convention center covered with what looks like a vast mountain meadow.

The Church of Jesus Christ of Latter-day Saints, or LDS, is unique among the Christian religious traditions by dint of its theological connection to North America. With an origin in the nineteenth-century United States, Mormonism is inseparable from the particular places that shaped its history and that continue to serve as sites of pilgrimage. Salt Lake City is its current epicenter. Around the year 2000, it became clear to the LDS hierarchy that the growth of its congregation, which is expanding as rapidly as any other major sect in the world, necessitated a vast new facility near its headquarters. It had to be capable of hosting the tens of thousands of Mormons who would attend the biannual conventions there, yet architecturally deferential to the temple and sensitive to the urban setting it would be altering.

“A building that big, unless it looked like a big basketball arena with a big arena roof, was going to compete very strongly with the natural landscape of the Wasatch mountains,” says the Olin Partnership’s Susan Weiler, the landscape architect hired to complete the project. “So very early on, the idea was to integrate architecture and landscape— to merge them to be complementary and to take advantage of the natural setting, and not to be competitive or overpower the natural landscape.”

The solution was a green roof—or “environmental overstructure,” as Weiler prefers to call it—that would generate a raft of benefits beyond the aesthetic. Traditional asphalt and concrete roofs keep the people underneath them dry, but that’s just about where the advantages end. They soak up heat during the daytime, only to radiate it back into the

rooftop, where more volunteers planted each one by hand. “The gigantic effort produced in two weekends what would in nature have taken a generation or two,” Weiler observes. It also catapulted LDS to the forefront of the green roofing phenomenon, in which the synthesis of building systems and landscape architecture has become arguably the hottest trend in environmental design.

Although vegetation has been incorporated into buildings since the Hanging Gardens of Babylon, modern green roofs can be fairly sophisticated. Typically, one or several waterproofing layers lie beneath a drainage system, which is topped with a substrate of engineered soil composed of organic and inorganic material and an outer layer of “growing soil” that nurtures certain grasses, mosses, flowering herbs, sedums, and other succulents. Plants with high water content minimize the risk of fire while providing natural insulation. Evapotranspiration, or the release of water to the air, generates a local atmospheric cooling effect. And replacing asphalt with vegetation provides a habitat that can be attractive to migrating birds and smaller creatures.

Although some countries in northern Europe—especially Germany—have been installing green roofs for decades, only lately has North America begun to catch up. A lot of this newfound interest stems from the growing availability of high-quality research in English (most of the scientific literature on green roofing is in German). David Beattie is the director of the Center for Green Roof Research at Pennsylvania State University, whose mission is focused specifically on investigating and adapting the technology for the northeastern United States. He says the main selling point for green roofs is storm water runoff amelioration, which is a particularly pressing issue east of the Mississippi River, where most cities have combined storm water and sewage systems.

“If you look around the eastern part of the country, there isn’t a single big city that’s not facing storm water problems,” Beattie says. “Cleveland; Pittsburgh; Cincinnati; Washington, D.C.; New York—they all have problems, and the former solution has been to install a bigger pipe. Well, those pipes are so expensive now that we’re talking about costs that exceed a billion dollars. If you can get people to install green roofs, it’s more of an ecological solution than an engineering solution.” Beattie cites some encouraging research: “Depending on the time of the year, we can hold 100 percent of water in some small rains. On an annual basis, we’re talking about fifty percent of rainfall will be held on the roof. The remainder will be slowed down as it leaves.”

That’s important because when municipal water systems are overwhelmed, sewage can spill into nearby lakes, rivers, and streams.

“Governments are starting to realize that storm water management is a serious issue,” says Steven Skinner of American Hydrotech, the leading U.S. provider of green roof assemblies. Skinner points to cities like Minneapolis, which has responded to the challenge of storm water runoff by mandating all new construction projects that receive public funds must include green roofs. That kind of integrated approach to environmental issues and zoning laws—one of the forces driving the popularity of green roofs in Germany—has begun to pay off in Chicago, where the tops of dozens of big buildings, including City Hall, are literally blooming.

The market for green roofs has grown by leaps and bounds since the LDS convention center picked up a design merit award from the American Society of Landscape Architects in 2003. Despite the added front-end cost (green roofs in the United States start at about fourteen dollars per square foot, while in Germany, economies of scale have cut that price by half or more), green roofs can be a sensible investment. They decrease energy costs, and their life spans are two to three times

longer than those of conventional models. “In the last two years, growth has been exponential,” says Skinner. “We’ve gone from doing a handful to [doing] 130. … We’re seeing tremendous interest from the federal government. The armed forces are looking at it. It’s becoming much more mainstream.”

While green roofs are certainly gaining popularity in the commercial real estate market, the residential market is a different ballgame. Karin Payson is a San Francisco-based architect who installed the first residential green roof in that city in 2003, when she converted the top of a garage into a thicket of flowering herbs. “I was troubled by the fact that the clients had so little green space behind their building,” she says. “They were on this really steep hill, and you looked down into this bowl and saw everyone else’s roofs. I thought: Wouldn’t it be cool to look out and see your garden stretching out instead? It turned out to be a great sell to the neighborhood group.”

It may have been a great sell, but it wasn’t easy. Most homeowners aren’t motivated by issues like storm water runoff—and between a client’s fear of water penetration and an architect’s fear of litigation, replacing shingles with a miniature ecosystem can seem like a headache. “But if they see this as something that looks great and would improve their heating and cooling load, and that it’s affordable and not a pain to maintain, I think that would improve the market,” says Payson. “It’s a joy to see that kind of roof. I really wish people would use them [more]. I think garages are a great application for the interested but timid.”

Green roof proponents are fond of reeling off the documented benefits, but in the end, the satisfaction of creating a garden is what really moves them. “When you look at all of the functions of a green roof, you can probably replace most of them in some other way. But, green roofs serve all of those functions in one technology,” says Beattie.

When asked to name his favorite example, Beattie shifts into a more spiritual mode, singling out the Alzheimer’s floor of a local retirement home. Afflicted by dementia and unable to create new memories, the patients there are seldom allowed to wander the grounds. Partly to sooth people who have lost the names of their children and whose mental handicap has enclosed them in a physical prison, the facility installed a green roof the patients could use. “It allows the residents to actually come out and be close enough to that roof to touch it,” Beattie says. “Think about the aesthetic effect and the personal feelings that you would have about being that close to vegetation again.”

And at a fundamental level, that’s what green roofs are about: No matter who we are or where we live, they can help us restore our connection with nature.

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atmosphere during what should be cooler hours; they increase the volume of storm water runoff, overtaxing municipal waterworks; they insulate poorly against temperature extremes; and their naked exposure to sun and rain can make repair and replacement costs prohibitive.

The LDS leadership's decision to install a green roof is beginning to look like the leading edge of a deeper religious trend. Recent years have seen the formation of an alliance between environmentalists and evangelical Christians who see "dominion over the earth" as a sacred responsibility. Last September, the National Association of Evangelicals laid out its commitment to environmental principles in clear terms. "We affirm that God-given dominion is a sacred responsibility to steward the earth and not a license to abuse the creation of which we are a part. We are not the owners of creation, but its stewards, summoned by God to 'watch over and care for it' (Gen. 2:15). This implies the principle of sustainability: our uses of the Earth must be designed to conserve and renew the Earth rather than to deplete or destroy it."

Current LDS ground service manager Eldon Cannon believes building a living roof over the new LDS convention center—one that would incorporate a diverse ecology of grasses, annuals, and perennials—was an attractive option for several reasons. "It was a desire for us to see what we could do to be conscious of the heat sink we have here in Salt Lake City ... where the roof is just generating an awful lot of heat," he says, adding that because the roof of the convention center was so large, and because a significant amount of grass would be displaced in the construction process, there was great potential for dramatically increasing the volume of storm water runoff as well. "Temple Square is also an area people visit," Cannon says. "We have a message we want to share with them— [we want] to show them a different way of managing the roof of a building."

Considering that many of those visitors come from rural areas—with a sizable contingent settled in communities that line the Wasatch front—church leaders worked with Weiler to emphasize the local landscape and ecology. "In our mountain valleys, we have some August bloom times where flowers are just gorgeous up there, and that was the inspiration. They wanted the feeling of a mountain meadow," Cannon says.

In most architectural relationships, the client is king, but Weiler also felt a responsibility to the broader community, which is one reason she intentionally excluded overt religious imagery. Instead, her design was built around natural themes that accommodate a plurality of interpretations. After all, Salt Lake City houses more communities than just the Mormons, and the LDS hierarchy recognized the advantage of creating something with broad appeal.

"As you come up through the site, water and plants and vegetation are very important," Weiler says. "The idea of moving through these exterior stairs and waterfalls, fountains and runnels, is that you have the sound of water—essentially in the desert—the idea of water, and the refreshingness of it. And as you come to the very top of the site, the idea was to allow people to view the mountains as if they were right there. You look over the meadow from the top, and you're looking directly at the mountains, and you'd never ever think you were standing on top of 21,000 seats."

The Church's commitment to incorporate ecologically sensitive design principles into its new facility was underscored by the participation of local members. Once construction of the building was completed, more than 1,000 rank-and-file Mormons assembled in a giant bucket brigade, ferrying every plant and plug of grass from the street to the