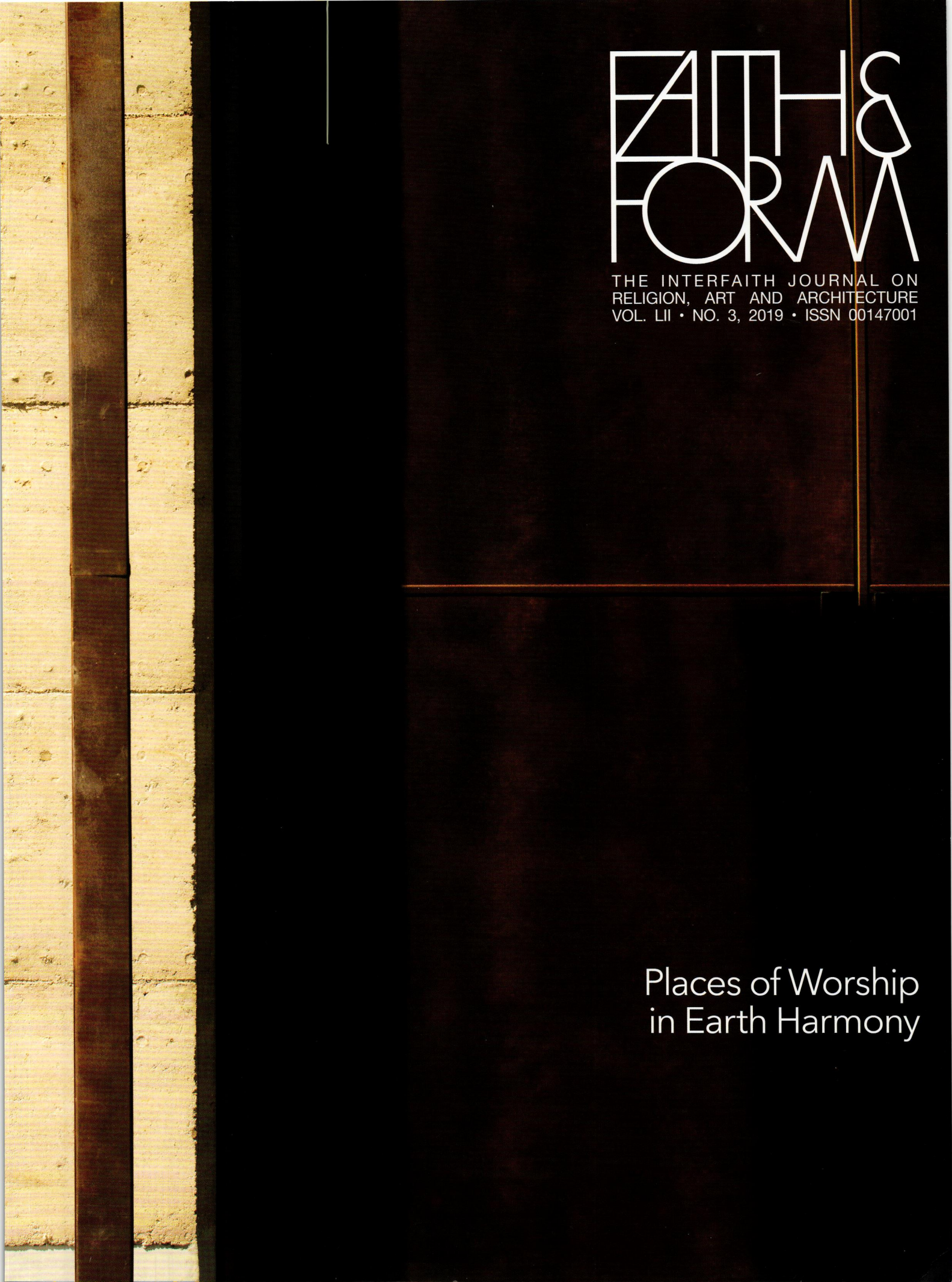


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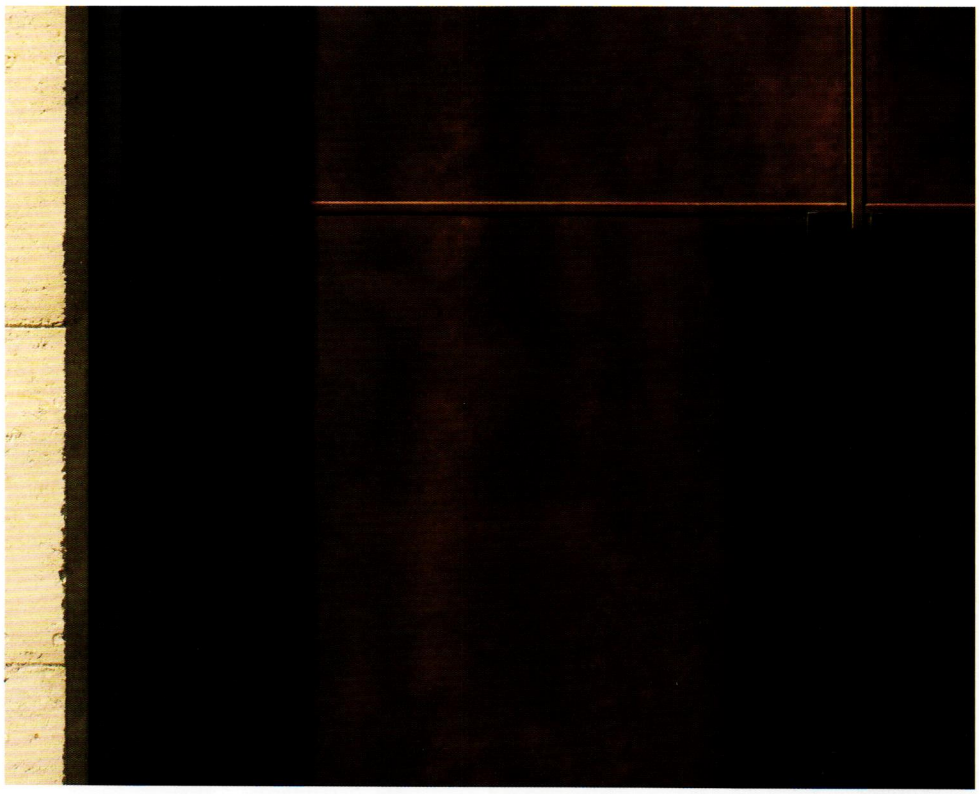
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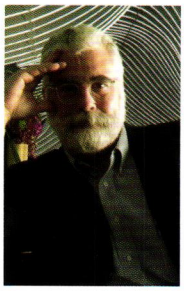
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Detail of the Bushey Cemetery expansion designed by Waugh Thistleton Architects. *(article begins on page 19).* Photo: Lewis Kahn

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Practicing a 'Sacred Art'

While many in architecture have embraced sustainability, their efforts are reactionary. All are attempts to mend the mess we've made of the planet. However, the impetus for sustainability in faith communities is *not* reactionary. For many people of faith, the green impulse is a direct expression of their embrace of God's creation. The decision to be green is simply not a matter of choice, but rather an integral part of their religious beliefs. Pope John Paul II posited that our environmental crisis is also a spiritual crisis: two sides of the same coin, recognition that we are stewards of this creation, that sustainability is a form of praise.

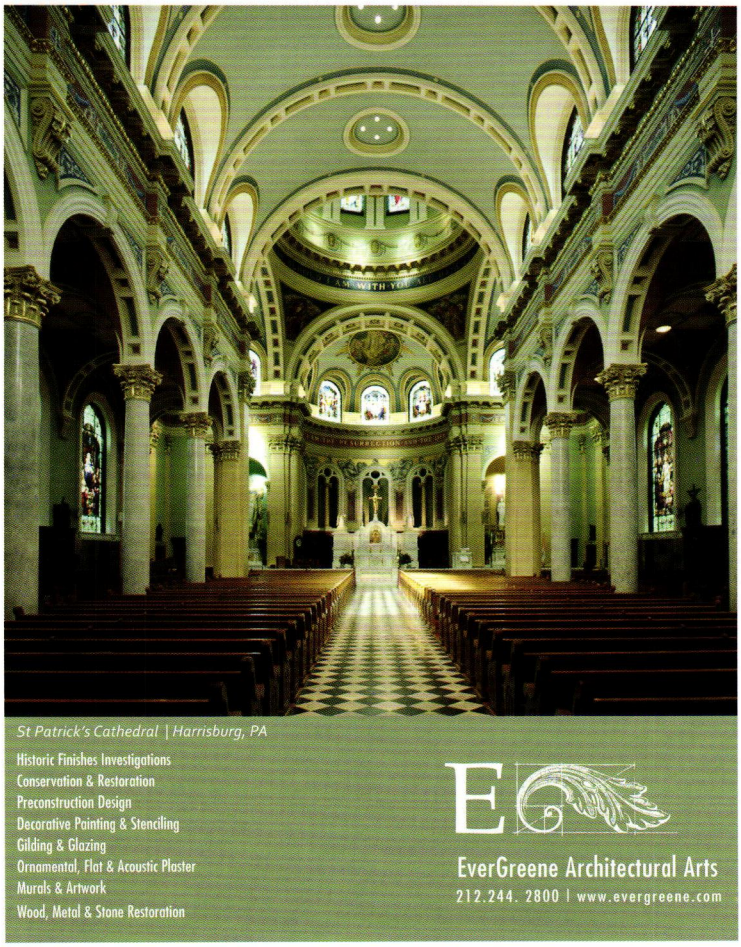
Architecture that is spiritual does not necessarily need to be devoted to religious purposes. In fact, many of our contemporary religious buildings lack spirituality. They do not invite us to a higher plane. Evidence of architectural spirituality can be found in a museum, a retreat in the woods, or in the depths of a library. A spiritual dimension is often found in architecture that has a sense of timelessness—natural materials and natural light: these are just two of the most important tools used by architects to create buildings that invite us to leave our daily lives behind and to reside (if only for a short time) in the realm of the ethereal. Spiritual architecture is the architecture of the sublime.

Spirituality and sustainability appear to be mutually supportive elements in architecture today. In fact, sustainability is nurtured by spiritual architecture's very fabric. Natural materials promote sustainability by reducing the energy expended to produce and finish them. In the grain of wood, in the swirling patterns of stone heaved up from the earth, in these and other products of God's own creation, we see evidence of the maker. Natural light saves energy—which makes it a sustainable choice. But it also gives architecture something else. The sun's changing pattern on walls and floors, the evidence of the passage of the day that plays upon architecture's surface, or a room bathed in the light of the moon, all locate us on the face of the earth, imparting a cosmology in which architecture plays a part. Most importantly, spirituality in architecture conveys a sense of "place" that is more than just "space." Space is location. Place is location with meaning.

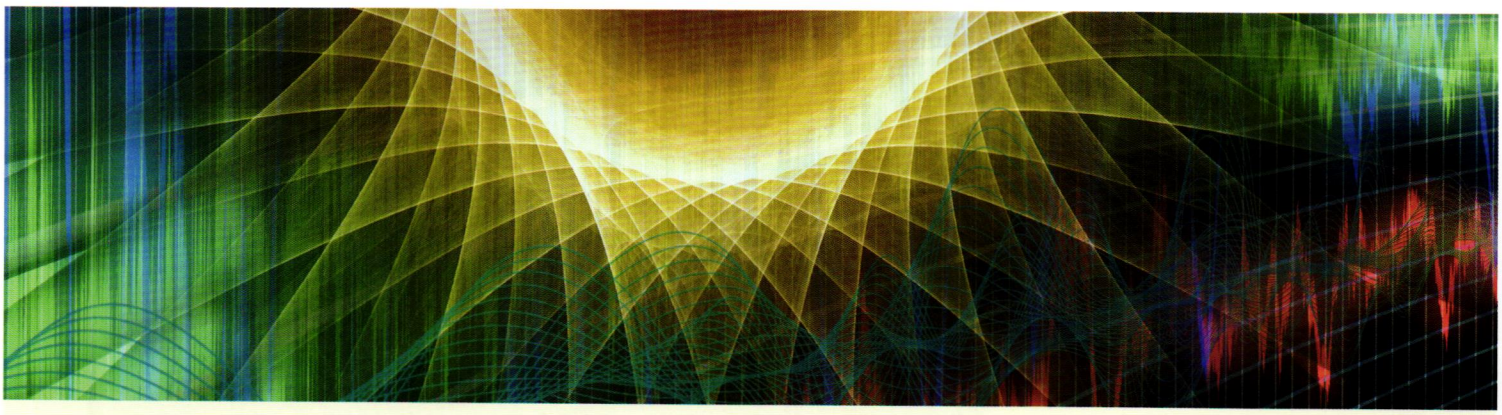
There are scriptural precedents as well for communities of faith choosing to practice a green theology. Biblical scholar Ellen Davis has written for this journal about the connection between the sacred places we build within the larger context of God's creation. Davis notes that the bible offers detailed descriptions of only two construction projects, both of which are for worship: the portable tabernacle erected during the years of wandering in the wilderness and Solomon's Temple in Jerusalem. Davis observes that if these Old Testament writers were interested in the creation of sacred space, "beyond all other forms of material or cultural production," it is because "they understood that a place for worship is not like other things that people design and create." Davis notes that a sanctuary has a kind of creative capacity to shape the people who spend time there, to form us as believers.

Davis believes that, when religious architecture is actually practiced as a sacred art, "…it elevates our hearts and minds toward God and at the same time roots us in the created order. Through stone, brick, wood, glass, and space, religious architecture articulates a holy knowledge of the world that is, properly speaking, ecological."

Michael J. Crosbie is the Editor-in-Chief of *Faith & Form* and can be reached by email at mcrosbie@faithandform.com







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The Response of Eco-theology to Climate Change

By Richard S. Vosko

In 1962 Rachel Carson wrote *Silent Spring*. It was one of the first scientific publications to raise awareness about the harm being done to the environment by the use of synthetic pesticides. Her research helped spark the modern environmental movement. Because of the ongoing contributions of the scientific community we know that climate change is now the paramount problem. We also realize that if something is not done, life on Earth will become increasingly impossible, especially for more vulnerable species.

Why write about this topic in this journal? Ever since *Faith & Form* was inaugurated in 1967 the editors have stressed the vital relationships between art, architecture, and religion. The interfaith dimension of *Faith & Form* has been a distinctive characteristic of this magazine from its inception. This article is about the efforts that two disciplines—architecture and theology—are making to respond to the climate change crisis.



Photo: Michael Coghlan/flickr, CC BY-SA 2.0

The Issues Before Us

Today, like all designers and builders, those who specialize in religious projects of one kind or another know that they must utilize methods that address environmental protection, energy efficiency, and sustainability. The underlying concern is to maintain an ecological balance and to avoid the depletion of natural resources. The 2018 toolkit of the American Institute of Architects' Committee on the Environment (COTE) lists reasons why this is an urgent matter. Forty percent of the buildings in the US are constructed using raw materials. The structures cause 45 percent of the greenhouse gases (GHG) in the atmosphere. They consume 75 percent of electricity and 80 percent of municipal water supplies. Clearly buildings contribute to the climate change crisis. However, according to COTE, the "ability to achieve deeply sustainable projects" in fact must be part of the solution. To make this happen, principles of sustainable design must be applied during the conceptual and planning phases of every project.

While the challenges of climate change are critical to the work of all of us who work in the design and building professions, at its root climate change is an anthropogenic problem. Responsibility for caring for the environment ultimately belongs to every human being. One solution is to address municipal power demands without resorting to fossil fuels. Today, the primary sources—crude oil, coal, and natural gas—produce the chemical energy that meets more than 85 percent of the world's energy demands. Electricity, a secondary source, is generated from the primary ones. A smart alternative is to use renewable, carbon neutral, and clean energy sources quickly enough to halt the global catastrophic concern. Wind and solar power utilities are already in use in many regions of the world.

But the real solution begins with a transformation of societal and personal behavioral patterns. We are extremely dependent on products made from petroleum. Many of us know that our continued use of gasoline, plastic water bottles, and shopping bags is harmful to the planet, but it is hard to change our habitual dependence on these products. Other detrimental commodities are less known to most of us. The United States Energy Information Administration (EIA) has a long list that includes (among other things) tires, footballs, golf balls, aspirin, candles, vitamin capsules, nail polish, crayons, and the ink in our printers.

How many of us are negligent about recycling products? Who are the chief executives and board members of corporations who favor profit margins over the common good? What of the collusion between lawmakers and lobbyists, so much so that big business is writing legislation that harms the environment?

Damage to the environment and dangerous changes in the climate have stirred up religious responses worldwide. In the past, the main concern was the outmoded interpretation of various ancient texts about humanity's dominion over nature. We still worry about how we can survive nature's often-unpredictable fury. But now we realize as religious communities there are more systemic problems around the globe. They include population growth, affordable housing, land degradation, deforestation, and food and water insecurity.

There is only so much land on this planet that can be used to meet human needs. Some estimates suggest that the world's population will reach about nine billion by 2050 and that, today, only 10.5 million square miles is farmable. Most of this land is in Africa and Central and South America, where dictatorial regimes and corrupt land owners only exacerbates the problem. Consequently, people are risking their lives to escape insufferable living conditions in their homelands. The migrations can be traced in large part to climate change, the lack of jobs, and the paucity of government programs and regulations designed to alleviate the problems. The current polarizations over immigration policies in many nations stem from these predicaments. Predictably, many people who are wealthy, who foolishly believe their lives are beyond the reach of the climate crisis, lack empathy for those who live in poverty and struggle to survive.

The writer is a member of the *Faith & Form* editorial advisory committee. He has worked as a liturgical design consultant since 1970 and is a priest in the Roman Catholic Diocese of Albany.

The Response of Faith Communities

Religious groups are responding by uniting with an ever-growing coalition of social environmental activists. Some faith traditions have been involved for decades. They continue to be advocates of what is now described as a matter of social justice. Members of the clergy who were present at the G20 Interfaith Forum in Argentina in 2018, called upon people of faith to be "a moral compass to the world." The reason for the involvement of religion in global affairs is deeply linked to the traditional concern for the dignity and worth of all facets of creation. Activist Erica Evans noted that "religious values shape people's actions and give purpose to their lives in a way secular incentives often cannot." All faiths, in some way, adhere to codes of behavior that sustain the age-old agenda to protect and sustain the welfare of human beings, plant life, and animals.

Although there are people of faith who doubt the scientific facts regarding climate change, most religions across the globe have issued formal statements concerning care for the planet. Many religious leaders and their congregations also are developing strategies to become more active in environmental issues. The discipline at the root of this faith-driven responsibility is known as "eco-theology." This branch of religious studies concerns the relationships between religion and nature especially with regard to environmental concerns. The word "eco" is taken from "*oikos*" the Greek word for household. This theology began toward the end of the 20th century when it became clearer that there was an environmental crisis that would affect the future of human life on earth. For many people a more holistic spirituality is replacing a dualistic perspective. It calls attention to the undeniable interdependent bond between nature, animal life, plant life, and human beings.

One needs only to search the Internet to view countless sites that deal with climate change and the religious responses to the dilemma. Here is a brief summary of just some of the statements compiled from different sources. All declarations address the troubles caused by climate change. Although they are similar in their rationales and resolutions, there are some subtle differences. I have gathered this review into groups based on their strongest assertions: 1) integral ecology, 2) moral responsibility, 3) a challenge to governments and corporations and 4) caution.

Integral Ecology: In 2014, the bishops of the Anglican Church of Canada, The Episcopal Church (USA), the Evangelical Lutheran Church in America, and the Evangelical Lutheran Church in Canada wrote *A Pastoral Message on Climate Change*. Building on a concern for the well being of "our neighbors and of God's good creation" the bishops wrote "we need not surrender to political ideologies and other modern mythologies that would divide us into partisan factions—deserving and undeserving, powerless victims and godless oppressors. In Christ we have the promise of a life where God has reconciled the human community." In the concluding remarks the authors expressed "hope for an agreement in 2015 that will move toward reduction of carbon emissions, development of low carbon technologies, and assistance to populations most vulnerable to the effects of a changing climate."



Photo: Denis Apel/Wiimedia Commons, CC BY-SA 2.0

In his 2015 encyclical *Laudato Si'* (Praise Be to You) Pope Francis urged the world's 1.2 billion Roman Catholics to join others in the fight against climate change. The pope used the phrase "integral ecology" to address every aspect of the environmental crisis by including the human and social dimensions of the problem (#137). He wrote: "... a sober look at our world shows that the degree of human intervention, often in the service of business interests and consumerism, is actually making our earth less rich and beautiful, ever more limited and grey, even as technological advances and consumer goods continue to abound limitlessly (#37)."

In a display of concordance in 2017, Pope Francis and the Orthodox Ecumenical Patriarch Bartholomew acknowledged that human and natural environments are deteriorating, affecting the most vulnerable of human beings. They named the dominant problem: "We no longer respect nature as a shared gift; instead, we regard it as a private possession." They urged those in power to support and respond to the "consensus of the world for the healing of our wounded creation."

Moral Responsibility: The problem of climate change as an ethical issue was clearly addressed in one way or another by every religious group. Some examples include the following. The Unitarian Universalist 2006 *Statement of Conscience* regarding the threat of global warming/climate change starts with the claim that the "earth is our home ... we are part of this world and its destiny is our own.... Unless we embrace new practices, ethics and values to guide our lives...." the planet will be forever harmed. The document cites the scientific consensus that earth's climate is changing because of fossil fuels. The Unitarian Seventh Principle calls its members to "affirm and promote respect for the interdependent web of all existence of which we are a part." This *Statement*, like others, closes with a call to action to ground their missions and ministries "in reverence for this earth and responsibility to it."

The Buddhist *Declaration on Climate Change, The Time to Act is Now*, was issued in 2015. "We have reached a critical juncture in our biological and social evolution. There has never been a more important time in history to bring the resources of Buddhism to bear on behalf of all living beings." The *Declaration* used strong language to emphasize that the disasters "stem from the human

mind, and therefore require profound changes within our minds … we suffer from a sense of self that feels disconnected not only from other people but from the Earth itself." The statement reminded Buddhists that the three poisons--greed, ill will, and delusion--that affect personal suffering also "afflicts us on a collective scale."

At the 2015 International Islamic Climate Change Symposium held in Istanbul, Islamic leaders called on 1.6 billion Muslims to take action in halting climate change. In the *Islamic Declaration of Climate Change* several points were outlined. There is scientific consensus on climate change, there is a need to set clear targets with monitoring systems, otherwise there will be dire consequences if we do nothing. The responsibility of Muslims to act is on behalf of humanity "leading the rest of us to a new way of relating to God's earth."

Also in 2015, Quakers recognized the link between environmental issues and humanity in terms of a moral duty. *A Shared Quaker Statement: Facing the Challenge of Climate Change* is a call to all Quaker leaders to "make the radical decisions needed to create a fair, sufficient and effective international climate change agreement." In words also used by other faith groups, it referred to the collective and personal responsibility to make sure that the "poorest and most vulnerable peoples now, and all our future generations, do not suffer as a consequence of our actions… It is a moral duty to cherish Creation for future generations." In the conclusion the Statement identifies the earth as our only home, and a gift that supports life.

And just this past July, at its General Assembly, the United Church of Christ (UCC) overwhelmingly passed a resolution called *Let Justice Roll Down—Declaring Support for the Green New Deal and Affirming the Intersectionality of Climate Justice with all Justice Issues*. The UCC said Christian communities have an opportunity to "bear witness to the sacredness of God's creation and the urgent call to preserve it."

Challenge to Governments and Corporations: Several Jewish organizations, regardless of movements (Reconstructionist, Orthodox, Conservative, Reform) have emerged to counter the climate change problem. One branch, the Union for Reform Judaism, adopted its resolution on *Climate Change and Energy* in 2009. The authors called attention to a "need for comprehensive and progressive energy policies that protect all people and increase our national security and that of our allies." In a practical way it explains that a cap-and-trade system and a carbon tax are two ways to approach the greenhouse gas emission crisis. In addition, the statement calls climate change a fundamental social justice issue that "marries our mandate to be good stewards of the earth with our call to care for the least among us." This resolution ended with support for US and Canadian policies that address the greenhouse gas crisis. It concludes by offering ways for congregations and individuals to take action. (The Orthodox and Conservative denominations have issued their own statements.)

In 2009 the Presbyterian Church (USA) adopted the resolution, *The Power to Change: U.S. Energy Policy and Global Warming*. The document states: "the truth of our need to change our energy 'footprint' has become increasingly, even grievously apparent." Urging stronger witness from its membership, the document "supports comprehensive, mandatory, and aggressive emission reductions that aim to limit the increase in Earth's temperature to 2 degrees Celsius or less from pre-industrial levels." The resolution includes ethical principles and suggestions for church members. It calls for "taxation, cap-and-trade, and 'polluter pays' approaches to shift subsidies and incentives toward renewable energy sources."

The United Methodist *Book of Discipline* (2016) states: "The adverse impacts of global climate change disproportionately affect individuals and nations least responsible for the emissions. We therefore support efforts of all governments to require mandatory reductions in greenhouse gas emissions and call on individuals, congregations, businesses, industries, and communities to reduce their emissions."

Caution: The Southern Baptist Convention, the largest Protestant denomination in the US, took a more circumspect stand. In 2007 it passed a resolution that urged discretion about the climate change debate due to "conflicting research." It referred to the reduction of greenhouse gas emissions as a costly measure, ineffective and dangerous, especially *if* [emphasis added] "humans are not the principal cause of global warming." Nevertheless, the statement urged governments to take steps to protect vulnerable communities and regions from the effects of "inevitable continued cycles of warming and cooling that have occurred throughout geologic history." In the end, the resolution affirmed a God-given responsibility "to care for the earth by remaining environmentally conscious and making an individual and collective effort to reduce pollution, decrease waste, and improve the environment in tangible and effective ways."

Conclusions for a Green Future

These examples offer a sampling of the widespread commitments made by faith groups to urge their members to take action on personal and congregational levels. Other than the cautious statement from the Southern Baptist Convention, the declarations and resolutions from these religions concur that climate change is a reality and a grave danger to the planet and people. They agree not only so their memberships would challenge governments and corporations to take action, but because responding to climate change is a moral responsibility. The common theme is the principle of "integral ecology"—caring for the planet and its resources is inextricably linked to caring for human beings.

It is reassuring to know that, in different ways, planners, designers, architects, engineers, and diverse faith traditions are responding to climate change with constructive statements and strategies. Perhaps these varied groups have become aware of each other's commitments and resolutions. As individuals we must support this interdisciplinary and organizational *tour de force*. To be effective in the long term, each of us must use sustainable products and materials in our everyday lives. We should also convey our concerns to elected officials as well as those campaigning for office. All human beings everywhere, wealthy and poor, have a right to live with dignity and without fear far into the future. It is a matter of justice.

Cathedral of Sustainability

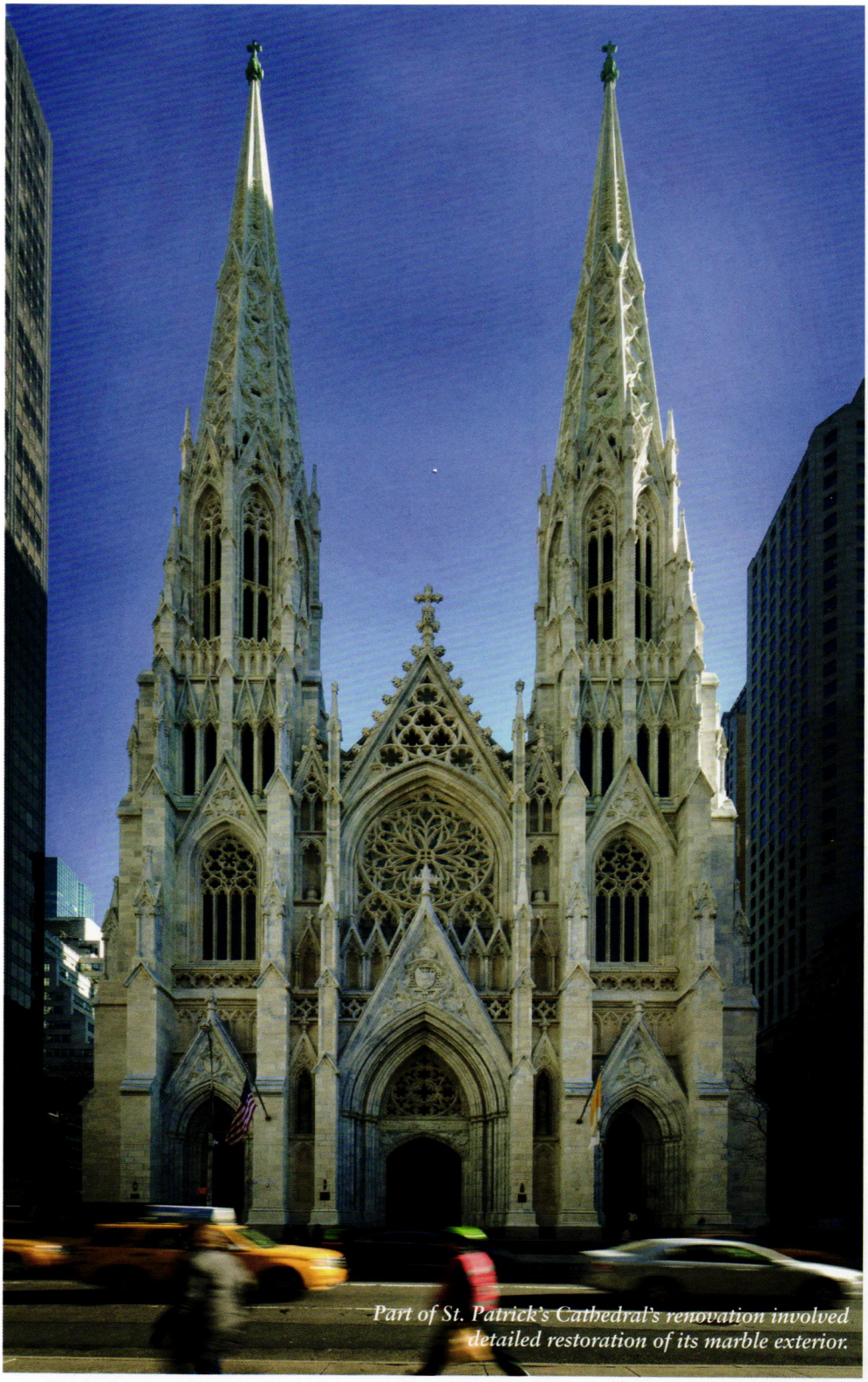
St. Patrick's in New York adopts state-of-the-art geothermal efficiency while preserving history.

By Jeffrey Murphy, FAIA

Light is an essential religious metaphor and also an elemental ally in architecture, revealing the intricacies of color, space, and form. An extensive renovation of New York's St. Patrick's Cathedral, completed in 2017 (and this year celebrated with national honors from the American Institute of Architects), illuminates how faith and architecture become two hands joined in prayer. Leading a world-class team of experts, our firm MBB (Murphy Burnham & Buttrick Architects) shared a common purpose with the trustees of St. Patrick's: restoring the iconic architectural work as a global symbol of the Catholic faith while at the same time establishing its modern operations at the vanguard of sustainability.

The story begins in the mid-1800s with John Hughes, the first Archbishop of the Archdiocese of New York, who hired James Renwick, Jr. to design a cathedral on Fifth Avenue that would elevate his brethren to God. At its completion, St. Patrick's Cathedral stood as the tallest building on Manhattan Island. Today, the building's spires reach only modest heights in Midtown, yet the landmark's loftiness has been renewed following its all-encompassing, $177-million-dollar renovation.

Diocesan leaders, workling closely with us, identified a range of significant needs and laid out their comprehensive conservation campaign by 2006. Plaster was peeling. Spalling and joint failure in the masonry were visible, and the roof was leaking. Interior and exterior surfaces were darkened by pollutants, sunlight could barely penetrate the cathedral's famous but dirty stained-glass windows and oxidized protective glazing. On top of that, an array of new opportunities in worship, visitor experience, and programming were considered desirable aspects for the future of this faith community.



Part of St. Patrick's Cathedral's renovation involved detailed restoration of its marble exterior.

Photo: John Baer

Yet as historic structures often impose, more complications faced the project team. The original architectural plans were incomplete and undigitized, and the existing drawing sets did not accurately describe the finished cathedral. To plan effectively before undertaking the renovation design, the design team undertook a months-long research and documentation process employing laser technology to generate an accurate survey of St. Patrick's Cathedral as it had been built and improved over the decades. This fairly unobtrusive process revealed a further and (as it turned out) most important challenge: Accommodating in one of America's best-known houses of worship five million annual visitors, all enjoying an open-door policy.

THE AUTHOR IS A PRACTITIONER IN CULTURAL, CIVIC, AND INSTITUTIONAL ARCHITECTURE. HE IS A PARTNER AT MBB (MURPHY BURNHAM & BUTTRICK ARCHITECTS, MBBARCH.COM), AN INTERNATIONAL AWARD-WINNING ARCHITECTURE FIRM BASED IN NEW YORK CITY.



Photo: Elizabeth Felicella

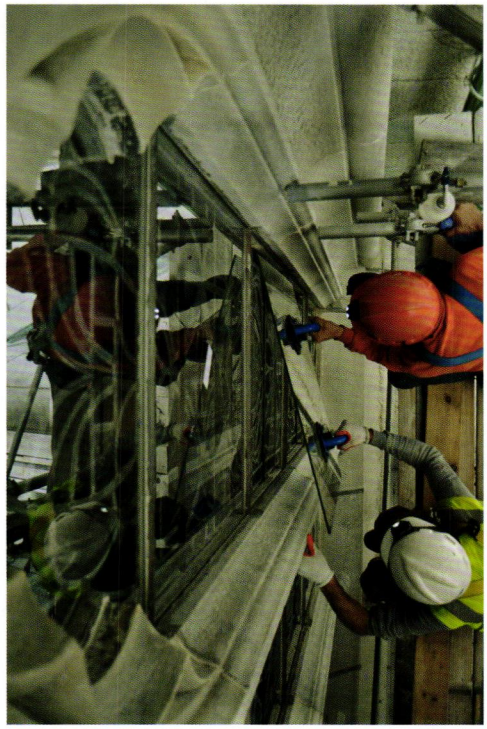


Photo: Courtesy of the architect

Above: Glazing was installed over releaded stained-glass windows to tighten the building envelope and reduce filtration.

Left: New sliding-glass doors in the cathedral's main portals keep noise and pollution out of the interior while welcoming visitors and increasing natural lighting.

Worship First

As a design prerogative, worship enhancement was a core objective of the archdiocese leadership. The renovation concepts were focused on making the worship experience more functional, inspiring, and liturgically current. Collaborating with clergy leadership, our firm faced the tasks of preserving the exquisite marble, slate, metalwork, ornamental plasterwork, decorative woodwork, cast stone, and stained glass. In a miraculous merging of mission and function, these highest-order goals also supported a long-term aspiration for the archdiocese: to make its operations less costly, more efficient, and even a model of resilient, sustainable design for the decades to come.

For example, repairing the masonry structure and eliminating fenestration gaps set the stage for incorporating passive design principles that would minimize moisture infiltration and improve thermal performance. But certain building elements had to be replaced, such as original Tuckahoe marble that the design team ultimately sourced from residential backyards in nearby Westchester County.

Other design initiatives seem less obvious for a historic landmark but proved equally important. For example, in service to the cathedral's role as a beacon of welcome, openness, and sanctity the design team conceived glass entry doors to couple with massive bronze portals opening the main entrance to Fifth Avenue. The minimalist, quiet sliding doors allow ample visual connection to the exterior while reducing outdoor noise indoors by 80 percent and dramatically increasing interior daylight. Moreover, this retrofit avoids the past practice of leaving the portals open, cutting energy losses and the infiltration of exterior pollutants.

Daylight now floods the interiors thanks to various improvements. The project team added skylights above all side chapels, which significantly illuminate the aisles. Monumental structural glass walls now acoustically enclose

the Lady Chapel--an intimate worship space added to the original building that had seen its serene atmosphere diminished by noise from the heavily trafficked nave. Restorations of the magnificent stained glass by leading conservators returned them to their original intended functionality, admitting more filtered and colored daylight inside.

Once the conservation experts repointed the light marble, repaired and repainted the plaster ceiling, and restored new daylighting sources in key areas, light filled the cathedral revealing original details that had long been obscured. Cleaning the interior, restoring the original paint palette, and enhancing daylight in the space returned the look and feel of the lightness described in the *New York Times* when the cathedral first opened in 1879.

Transformative Task

In parallel with this work, a mini-revolution was taking place in the conception of St. Patrick's Cathedral as a place of comfort and as a user of energy. At the project's 2006 inception, the Trustees tasked us with organizing a full evaluation of the existing heating, ventilation, and air-conditioning (HVAC), and plumbing systems. We saw an opportunity to do this with an eye towards improving facility performance and resiliency, and encouraging leadership in long-term sustainability. During this needs-and-conditions assessment, it became clear that the 1960s-vintage air-conditioning equipment was outdated and beyond its useful life. So too were existing steam heating pipes that clanked during cold mornings, providing inconsistent performance.

A holistic and comprehensive solution was the ultimate objective, with the added challenge that any proposed solution would have to avoid disrupting the historic fabric or daily worship. These were paramount design goals. Yet the team also considered aesthetics, longevity, redundancy, total cost of operations, and green-building opportunities. Ultimately, it became clear that a geothermal system offered the most benefits and the best overall solution, even as it raised thorny questions: Could the wells be drilled on the grounds of this historical landmark? How would the retrofit impact the community and cathedral operations? Could enough redundancy be built into the system in order to ensure performance throughout the year (at the time, only a few established institutions were employing large geothermal systems in the New York metropolitan area)?

The answers looked promising and the potential benefits of this approach became quite clear. For example, a conventional HVAC approach would have necessitated a large fan wall next to the cardinal's residence on Madison Avenue, exposing mechanical elements to the public and clergy alike. Such an installation would also mean modifying the cathedral architecture, further complicating the city's Landmarks Preservation Commission's approvals process. Most concerning, the conventional HVAC changeout would negatively impact the daily experience of millions of visitors.

So with a profound sense of broad-mindedness and foresight, the archdiocesan leadership elected to integrate geothermal technology into the restoration of the cathedral. In conjunction with construction manager Structure

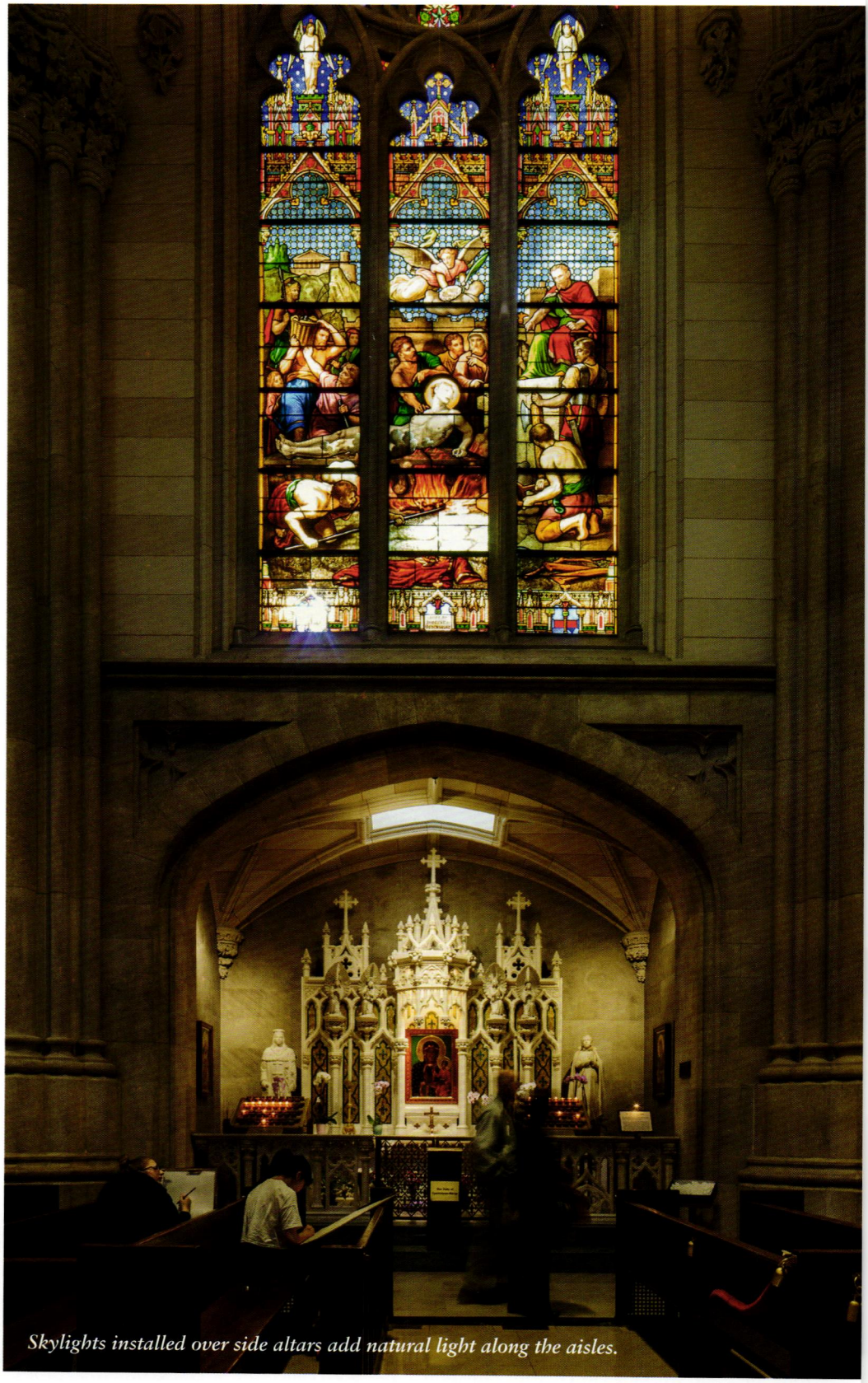
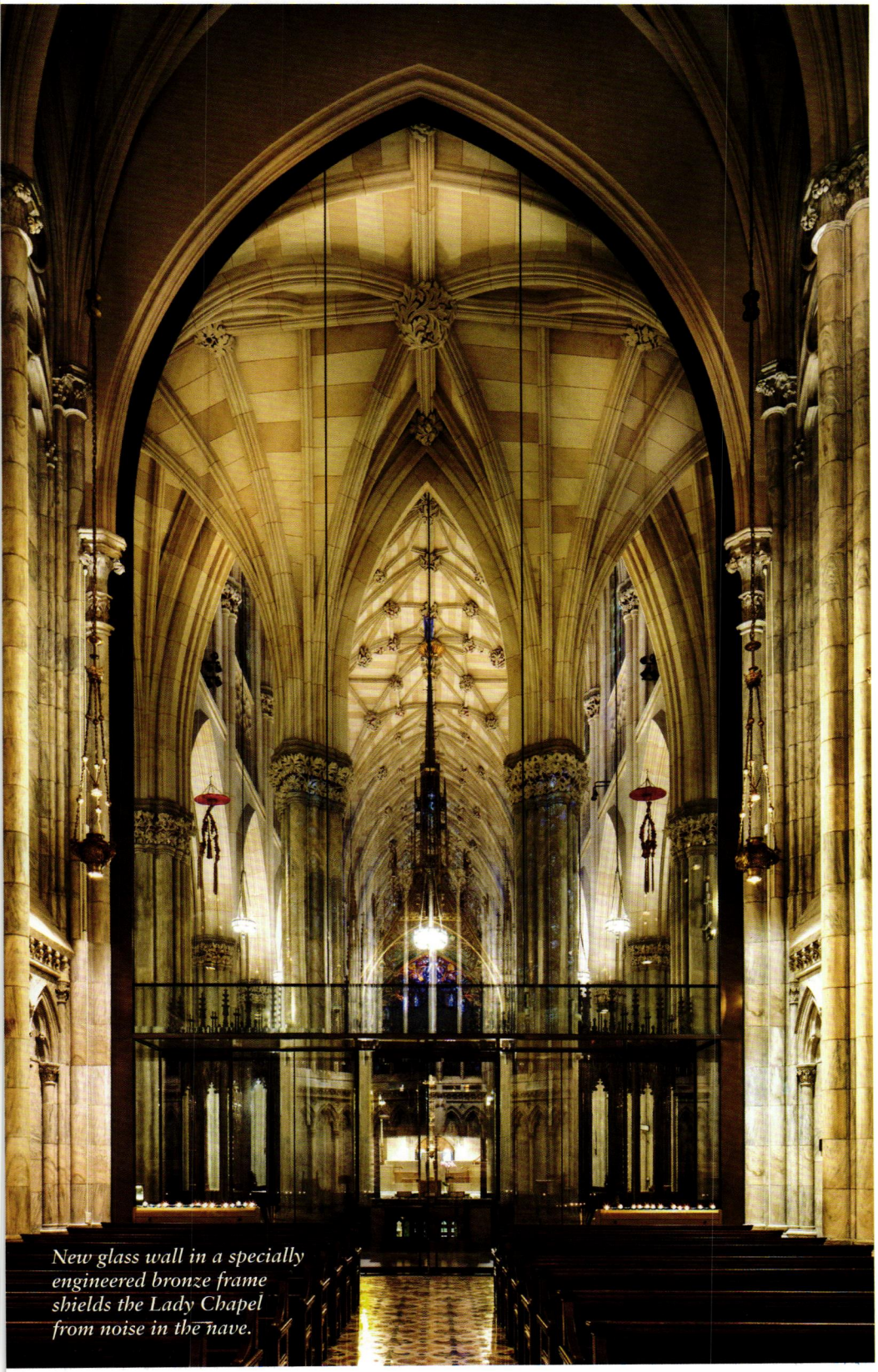


Photo: Elizabeth Felicella

Skylights installed over side altars add natural light along the aisles.



New glass wall in a specially engineered bronze frame shields the Lady Chapel from noise in the nave.

Photo: Elizabeth Felicella

Tone, Inc., and working closely with Zubatkin Owner Representation, we and our engineers undertook a detailed feasibility study examining costs, cathedral activities, and the municipal approvals processes. In the end, the trustees and clergy leadership, local community groups and officials, and the Landmarks Preservation Commission supported the design and construction of what has been called the largest geothermal project ever built in Manhattan. Furthermore, this decision reflects a long view of architectural stewardship: Geothermal systems are not only sustainable and resilient, but quiet, low-impact, and promote efficient space allocation. For a long-term owner, they have a low total cost of operation. With an installation cost of $35 million, the investment was deemed appropriate for an institution anticipating its needs for the next 150 years.

The geothermal system also became a key ally in earning a 30 percent reduction in the building's annual energy use and a variety of honors for design and sustainability achievements, including a recent COTE Top Ten Award from AIA, its most prestigious sustainable design award. The completed system has the capacity to generate 240 tons of air conditioning and 3.2 million BTUs per hour of heating.

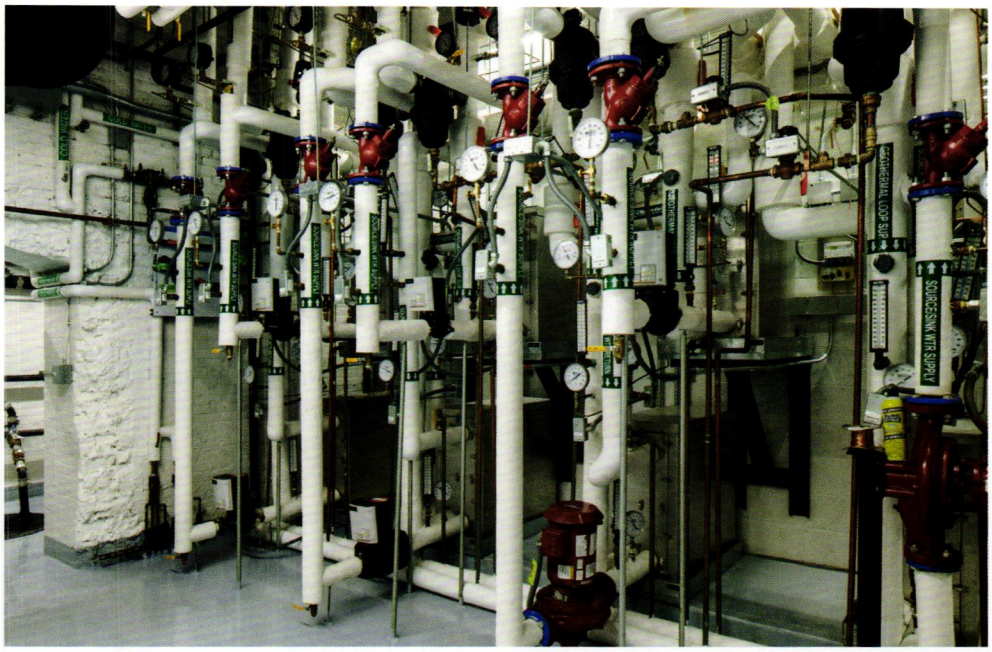
Geothermal and Water Conservation

Within this thoughtful, long-range framework of preservation, improvements, and operations, creative construction sequencing helped deliver the work efficiently while reducing up-front costs. A rolling scaffold supported the restoration of stained glass and the plaster ceiling. The nave was always kept clear to allow for 18 weekly masses and other activities.

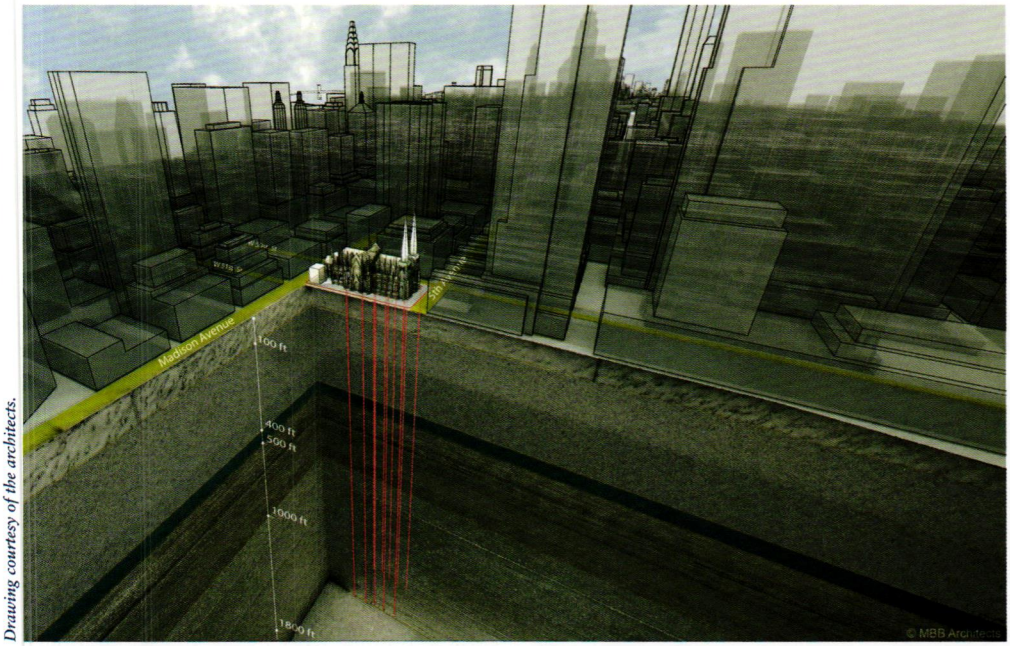
The geothermal work was designed and staged to minimize impact during and after the work: On both sides of the cathedral, well consultants P.W. Grosser directed drillers Stothoff Engineering to drill 9-inch-diameter spaced boreholes. The ten wells descend to a maximum of 2,250 feet into Manhattan bedrock. Running pipes through the undercroft and unused crawl spaces increased the utility of existing interiors without disturbing historic detailing, millwork, and stone, and important sightlines throughout the spaces. Equally important, the geothermal system designers, Landmark Facilities Group, seamlessly integrated 14 large-coil air-handling units behind custom grilles in the triforium gallery, near the south transept and one of two organs.

Efficient use of both space and energy were critical. Repurposing the former basement boiler room created enough clearance for the geothermal plant's pumps and compressors. A computer system controls numerous independent thermostats that heat and cool different zones. Moreover, a backup system of gas-fired boilers and an evaporative fluid cooler can supplement the system at peak demand. Component selection reflects a long view of high performance: stainless-steel pumps and high-density polyethylene (HDPE) ground loops mitigate corrosion. Durable titanium-plate heat exchangers and a modular design allow individual units to be taken offline to facilitate easy maintenance and contribute to longevity and resiliency of the equipment.

Since coming online, the geothermal system has been so effective at heating and cooling the cathedral that the backup system has never engaged. Annual energy savings are



A $35 million geothermal plant reduced the cathedral's annual energy consumption by 30 percent.



Drawing courtesy of the architects.

Ten geothermal wells were drilled to a maximum of 2,250 feet into Manhattan bedrock.

equivalent to 1.7 million tons of CO2, according to actual utility records. As a secondary benefit, the closed-loop geothermal and mechanical systems also conserve water. The cathedral's system uses only 300 gallons a year, while a cooling tower, if selected, would have required about 3.8 million gallons of makeup water. A bleeding geothermal system would have used 1.3 million gallons. Impressively, ground-source heat eliminates the condensate losses inherent in district steam. Furthermore, the cathedral's closed-loop system reduces water requirements and minimizes impacts on groundwater, achieved by a dedicated chiller that cools wells during peak demand.

Other water conservation measures further green the cathedral, including newly efficient domestic water and plumbing systems and sustainable improvements to the buiilding's surrounding landscape and urban habitat. Working with RKLA on a plan for the landscape architecture during the geothermal well drilling, the team removed the compacted soils and dense ivy in the exterior gardens. In their place, improved soils and native plantings and trees were added, creating a new and lush site that needs minimal irrigation and absorbs hardscape runoff. A 600-square-foot green roof on a utility entry structure was added, and bluestone walkways and curbs aid pedestrian access. It's an entire city block with planted perimeter areas of interest to tourists and horticulturalists alike, with varied blooming species, berry shrubs, and seven mature Hornbeam trees. Varied seasonal blooms, a tree canopy that covers 40 percent of the garden area, and fruit production maximize ecological sustainability and attract sparrows, warblers, and robins. The new gardens offer home for squirrels and a healthy, diverse insect population.

Historic Labors

History came first in every decision for the St. Patrick's Cathedral landscape, restoration, and even its new, state-of-the-art mechanical systems, with every effort made to honor Renwick's original vision and the unique legacy of the landmark's life (such as rejointing the Tuckahoe marble with mortar matched to the original). One of 18 small altars within the cathedral depicts St. Joseph, patron saint of laborers. Symbolic of the thousands of people who built, improved, and restored this cathedral, this pious figure also recalls how inspired institutional leadership can harness technology and sustainable architecture in stewardship: The results serve more people and undergird an enduring symbol of the faith for years to come. In more current thinking, the work reinforces the Catholic belief in the sanctity of the planet, as Pope Francis has described: "The entire material universe speaks of God's love, his boundless affection for us. Soil, water, mountains – everything is, as it were, a caress of God." What humans create also represents an outgrowth of nature, and St. Patrick's teaches spirituality, theology, justice, and also lessons in sustainability.

On one of the 75 restored stained-glass windows, the architect Renwick is illustrated handing his architectural plans to Archbishop Hughes. It is a wonderful metaphor of how faith and form are like those hands joined in prayer. In this way, the cathedral creates "a tangible sense of the beyond, of the transcendent, of the reverent," said his Eminence Edward Cardinal Egan, the late Cardinal and Archbishop Emeritus of New York. Along with a successful architectural and engineering solution to serve contemporary needs, visitors and cathedral staff alike might find themselves closer to their inspirations and more comforted in worship. Indeed, this cathedral that was built to give light and comfort to its flock now better illuminates the world's architectural heritage, too, one that reaches up to the sky as it embraces the earth.

'Substance and Sustenance'

The Cambridge Central Mosque in earth harmony

Text and Photos by Ashraf M. Salama





Left: The exterior embodies elements of traditional forms of Islamic Architecture while speaking of contemporary architecture.

Below: Prayer hall structure in the Cambridge Central Mosque, features digitally fabricated tree-timber columns supporting the roof structure.

Right: Floor plan

The author is the head of the school of architecture at the University of Strathclyde, Glasgow, United Kingdom, and the 2017 recipient of the UIA Jean Tschumi Prize for Excellence in Architectural Education and Criticism of the International Union of Architects.

As a "place of prostration," the term mosque originates from the Arabic word *masjid* to denote a religious space or a place of worship for Muslims. The mosque in a non-Muslim context is a symbol, a point of reference that provides a framework under which people of a common belief can unite and interact. Representing a unique or unusual building type, it can be viewed as a construct; a stimulus for developing community spirit and a promoter of collective vigor. Primarily, though, it is considered a container in which universal human values and religious traditions and norms of appropriate human behavior and code of conduct are imparted towards implementation into a wider routine of ethical and moral practices within the everyday social environment.

Muslim communities in Western cultures have evolved into diverse sophisticated groups that range from migrant or expatriate skilled professionals to unskilled low-paid labor. They represent different cultural backgrounds, diverse education levels, and various age groups, and (in principle) form a clientele for mosque architecture that did not exist until a few decades ago. While mosques are designed and built to satisfy the religious needs of these communities, they are also perceived as non-verbal statements that convey messages of presence and a collective psyche. This adds a complex layer to the already acknowledged challenges that constrain the design of mosques in non-Muslim contexts which involve: establishing relevance to the physical and socio-cultural contexts, responsiveness to resistance or pressures from the local community, compliance with building bylaws and regulations of the local city council, and instituting references to symbols and visual traditions of regions where these communities come from. Consequently, the challenge of designing a mosque in a non-Muslim setting is to strike a balance between these aspects. The Cambridge Central Mosque is no exception, as it addresses such complexity into unique landmark that speaks to its physical and cultural context, contributes a positive dialogue within the wider east-west perspectives, and reminds us of the primacy in Muslim belief of harmony with nature.



Cambridge, the Site, and the Mosque

The city of Cambridge is home to the second oldest university in the English-speaking world (1209). Over the past decade the city's estimated 6,000 Muslims have had to pray in turns at smaller, overcrowded Islamic centers and some converted properties. Strikingly, Cambridge's perceived rival, the city of Oxford that holds the oldest university in the English-speaking world (1167), has four well-established, purpose-built mosques. Cambridge needed to respond to the growing local student and international Muslim population. This is coupled with the global multi-cultural nature of the city where people from all corners of the world live, work, and study and where the Muslim community includes people from Africa, the Middle East, the Indian sub-continent, South-East Asia, and China.

The site is in the Romsey area of Mill Road, which is historically recognized as a place for Cambridge radicals and as the most famous street outside the university area. Over the years, everything that was undesired (functionally and visually) by the university and the council was located here–from the cemetery to the railway, from workhouses to the hospital for infectious diseases. While eclectic in nature, the Mill Road grew to house workers in terraces that form a community characterized by cohesion and socialist beliefs. While the road is seen as a thriving refuge of bohemianism, cultural diversity, and independent traders, it is unfairly depicted as an example of urban decay labeled as "the street of fear." Over the past decade certain parts of the road have acquired a new distinctive image where quality, purpose-built student housing replaced dilapidated sites.

Enlightened Clients and Committed Architects

To generate a vision for the Cambridge Central Mosque, the Muslim Academic Trust–formed of a group of city Muslims, community activists, university academics, and religious figures–came together to fund raise, purchase land, and shape the program. Yusuf Islam (better known internationally as the distinguished folk-musician Cat Stevens) is one of the key figures of the trust. The effort was led by Timothy Winter (a convert to Islam also known as Abdal Hakim Murad) who is an Islamic religious scholar with a background in architecture. It was Winter's charge to help foment a vision for the mosque.

The Muslim community raised £4 million to purchase the one-acre site. The £23 million construction project has been funded by more than 10,000 donations by diverse donors, ranging from individuals to governments, without special demands for specific religious affiliation, spiritual orientation, or selection of the Imams. Three key architectural offices (Marks Barfield Architects, Mangera Yvars Architects, the 5th Studio) were invited in 2009 to contribute their concepts.

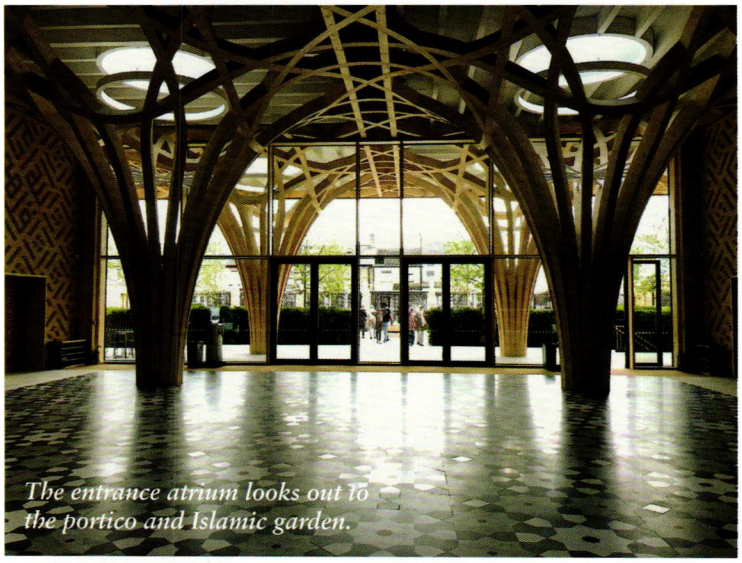


Detail of portico columns at the main entrance.

The entries were varied. One employed a cubic arrangement to strike a balance between Cambridge and Victorian Styles on one hand and Islamic courtyard typology on the other. Another used Brutalist concrete and grey brick facades to develop a contemporary language for British mosque architecture. The winning scheme by Marks Barfield Architects originates from the spatial traditions and symbolic norms of Islamic architecture and also speaks to contemporary architecture, sacred form re-interpretation, and materiality. The late David Marks, a Jewish architect who along with his wife, architect Julia Barfield, designed the iconic London Eye and other landmark projects in the UK and worldwide, was the driving force behind the concept: to create a British mosque that was not a copy or pastiche of something from Islamic tradition. But he would not see the mosque's completion. The trust released a statement: "We came to him with an ambitious project that would satisfy a religious community living in a minority setting within a historic English city, and he gave us a solution that was both daring and delightful."

Project Concept and Key Design Features

The program includes a generous portico, an atrium or a congregation gathering space, a prayer hall for 1,000 worshippers, teaching spaces, meeting rooms, ablution areas, serene outdoor garden space, underground parking. The mosque was to possess architecture in true earth harmony. According to the architects, it was to be "truly inclusive, sustainable, safe, secure, and respectful of its neighborhood." The design features a grid of dramatic spruce timber structural columns introduced throughout the main spaces and a façade cladded with bricks in a manner that complements the character of the area.



The entrance atrium looks out to the portico and Islamic garden.



View into the prayer hall with low moveable partitions at the back of the hall.



Light penetrating the timber tree ribs into the space.



Among decorative details are window screens with Islamic floral ornaments.

A sequential hierarchy of spaces and attuned thresholds direct the visitor gradually to the primary space—the prayer hall, passing through the lobby space. Secondary spaces (teaching and meeting rooms, ablution areas) are located on the two sides of the axis of movement. The 30 digitally fabricated tree-timber columns supporting the impressive roof structure represent the primary architectural concept. The theme reminds us of the design of the mosque and Islamic cultural center of Rome by Sami Mousawi, an Iraqi architect based in Manchester; Paolo Porteghesi, Italian architect and historian; and Vittorio Gigliotti, Italian structural engineer, where unifying elements of structural columns were utilized to curve outwards at the top, suggesting a four-branched tree.

The design emphasizes approachability, accessibility, and inclusivity, aiming to create a whole, which is non-sectarian, non-denominational, and multi-ethnic. An integral part of the spatial organization is to appeal to both males and females. While there are different entrances dedicated to each gender, the female prayer space is separated by intricately carved, moveable wooden screens to address privacy. Yet there is



Garden's flourishing plants engage the mosque building with nature.



Male ablution facilities with plants separating movement from washing areas.

also an upper level prayer area for females. Therefore, any female from any tradition should be able to find a prayer space within which she feels tranquil. This also enables flexibility for expanding or contracting prayer spaces for women based on the number of worshippers.

The prayer hall is surrounded by solid walls with openings above eye level to foster calmness, focus, and contemplation. These openings together with the skylights interwoven within the timber trees introduce prudently calculated daylight. The entrance areas are inviting and welcoming. This is manifested through visual transparency achieved by the glass walls separating the atrium from the garden while introducing a magnificent portico–a colonnade-like shaded/covered open space in between. The outdoor garden includes two key spaces: a community green space directly facing onto Mill Road, and a more formal garden with trees and water, whose spatial organization follows Islamic architectural traditions.

Reflections on Substance and Sustenance

The role that the architecture of the mosque should play as substance and sustenance is underscored when considering the key design aspects. While substance involves both tangible and intangible aspects related to its meaning and essence, sustenance is intended to signify the act of sustaining and nourishment. As substance and sustenance, the design of the mosque is uniquely rich.

Intangibly, the substance is reflected in the story behind the mosque, where tolerance prevails, where the efforts of a Muslim community led by an academic Muslim convert integrate with the skills of a Jewish architect to create a place situated in a Christian context. In 2011, anonymous flyers were posted in the neighborhood urging people to object to the project on grounds of traffic congestion. The city council affirmed that it received 50 letters opposing the mosque, but more than 200 from local non-Muslims in full support. In principle, this is a representation of sustenance where opportunities for interfaith dialogue, understating, and appreciation are nurtured.

Tangibly, substance and sustenance are manifested in the design, which is a true reflection of the notion of "stewardship" as emphasized in the Qur'an: "The servants of [Allah] All Merciful are they who tread gently upon the earth with humility" (Qur'an - al-Furqan, 25:63). The religion commands its followers to be stewards of the earth, and actions that further this are deemed positive. Stewardship includes the protection of the environment and heritage, both natural and constructed. Being sensible with natural and constructed capital invigorates this notion of safeguarding them for future generations. A substantial number of sustainable design strategies are employed including energy management system, cross ventilation, green roofs, heat recovery system, durable materials, off-site construction and reduction of construction waste, shading and overhangs, water attenuation, water-saving fixtures, energy-efficient appliances, and a highly insulated building envelop.

It is palpable that substance and sustenance are reflected in terms of how the design speaks to and respect the context, the community, and the user while addressing both functional and spiritual requirements. The mosque sits serenely in the midst of a low-rise residential context, and in a very subtle manner. It does not publicize its presence stridently. Admiring the visual and cultural context, it gently conveys a message of welcome to the visitor through the hierarchy of spaces, defined boundaries, and acclimatized thresholds, commencing at the road's edge with a vibrant, yet peaceful, Islamic garden which epitomizes paradise, which leads to a portico, then to an atrium leading onto a hallway, and then to the prayer hall, the position of which shifts slightly to address *Makkah*. This hierarchy of spaces engages the worshipper in a short journey from the outside world into the sacred and the spiritual.

Departing from the tradition of gender exclusivity that characterizes the spatial organization of many mosques, the design engages with the sharing of spaces by both genders where all spaces are collectively used up to the point of prayer space entry. Men and women both use the



Water fountain occupies a prominent, central place in the Islamic garden.

same prayer hall, with carved wooden screens that balance privacy and visual transparency. Engaging the community with openness to visitors of other faiths, the portico and atrium include a cafe area for up to 300 visitors.

As both substance and sustenance, the project nurtures and promotes the nature and essence of architecture as a trans-disciplinary practice. The architects collaborated with professionals from a wide spectrum of disciplinary backgrounds including Islamic art and geometry specialists, landscape architects, timber engineers, acoustics and fire consultants, project management, including Keith Critchlow, an expert in sacred architecture. Together, they sought to develop a contemporary, local mosque design rooted in both Islamic and British sacred architecture traditions.

The geometric patterns, manually developed by Critchlow, are demonstrated throughout the design, from planning and designing the overall building mass to façade treatments and interior wall details and the atrium floor. Conceivably, the most thoughtful embodiment of these geometries is in the magnificent timber trees, which allow for quiet contemplation. While they establish an architectural visual discourse between Islamic traditions and the recall of the proportions of Gothic arches, they emphasize spatial spirituality and simulate nature emerging from the ground and sprouting upwards and outwards to reach the heavens. Each timber tree culminates in an oculus skylight that allows light to penetrate between the timber ribs and into the space. Islamic garden design expert Emma Clark, together with the Urquhart & Hunt Landscape Design Studio drew on Qur'anic interpretations of paradise to create a contemplative refuge as a connection between the building and the community.

The Cambridge Central Mosque is a contemporary mosque in a non-Muslim setting. Indeed, in socio-cultural and spiritual-symbolic terms, it signifies a conscious articulation towards redefining the mosque typology for the 21st century in an urban landscape. It can be seen as a teaching tool for the architectural community as it cultivates human principles relevant to tolerance, engagement, collaboration, as well as interdisciplinary collaboration. The project should be celebrated for the skillful integration of advanced digital fabrication to pursue passive environmental technology and sustainable design strategies while inculcating a deep respect for and a deliberate interpretation of Islamic geometries and architectural heritage and traditions.

NOTES

1. Adrian Curtis, "Stunning views of Cambridge's £23m mosque," 24 January 2019.
2. Catherine Galloway, "From the General Strike to the campaign to ban Sainsbury's, Mill Road has long provided a home to Cambridge's radicals," https://www.cam.ac.uk/radicalmillroad - For more information, see research from the Mill Road History Society, capturingcambridge.org, and millroadhistory.org.uk.
3. See Mangera Yvars Architects: http://www.myaa.eu/projects/cambridge-community-centre/ and the 5th Studio: http://www.5thstudio.co.uk/projects/mill-road-mosque-cambridge/
4. Ashraf M. Salama, "A Peaceful Fusion of Cultures," *Faith & Form*, 37 (2): 2004.
5. Tammy Gaber, "Gendered Mosque Spaces: Cultural, Religious, or Accessibility Issue?" *Faith & Form*, 48 (1): 2015.
6. Project team: The Cambridge Mosque Trust (client); Marks Barfield Architects (architect); Bidwells (project manager and planning consultant); Price & Myers (structural engineer, construction); Jacobs (structural engineer, planning); Blumer Lehmann (timber engineer); Skelly & Couch (building services engineer); Emma Clark with Urquhart & Hunt (landscape architect); Keith Critchlow (Islamic geometer); Faithful & Gould (quantity surveyor, principal designer); Ramboll (acoustic consultant); Harris TPS (fire consultant); MLM (approved inspector); Gilbert-Ash (main contractor).
7. See Ike Ijeh, "Cambridge Mosque," *Building UK*, 13 March 2019; and Jason Dibbs, "Cambridge Central Mosque / Marks Barfield Architects," *arcspace*, 16 March 2019.
8. Emma Clark – *Islamic Garden Design*: http://emma-clark.com/

Dust to Dirt to Dust

By Brian Carter

The expanded cemetery's new prayer halls are sensitively located in a remote corner of the site.

A cemetery in England presents a notable example of how a faith community can take action in response to environmental concerns, underline the theology of Earth stewardship, and seek inspiration in history and religious traditions.

The Bushey Cemetery expansion, designed by Waugh Thistleton Architects of London, was commissioned by United Synagogues and is situated in the town of Hertfordshire on the outskirts of London in the city's Green Belt. The 16-acre site, located in an area of outstanding natural beauty, is adjacent to an existing cemetery that had recently reached capacity. The site plan seeks to respect the existing natural setting by retaining established trees that now define key points and frame views within the new development, while also introducing additional planting to underline the character of the site. A belt of trees, set within rough grassland, defines a network of paths while a sequence of newly created reed beds consisting of ponds, weirs, and swales facilitates water attenuation, accommodates increased rainwater run-off, and enhances bio-diversity. These carefully planned interventions signal the client's commitment to the responsible stewardship of the land while also referencing this particular religious community's commitment to simplicity.

These landscapes create the setting for a small group of new buildings. Located discretely in one corner of the site, they include two prayer halls linked by a cloistered colonnade that together provide a sequence of dignified spaces for mourners and places where visitors can gather.

The facilities provide a total of 6,930 square feet of enclosed space and consist of two distinctly different types of buildings. The walls of the prayer halls walls are constructed of rammed earth from the site. The use of this highly symbolic and expressive material, together with the adoption of traditional building techniques, reflects thoughtful consideration of faith, history, and the environment. The design also recognizes that, once this cemetery is filled, these buildings and the earth from which they are made can be returned—dust to dust—to the ground from which they came.

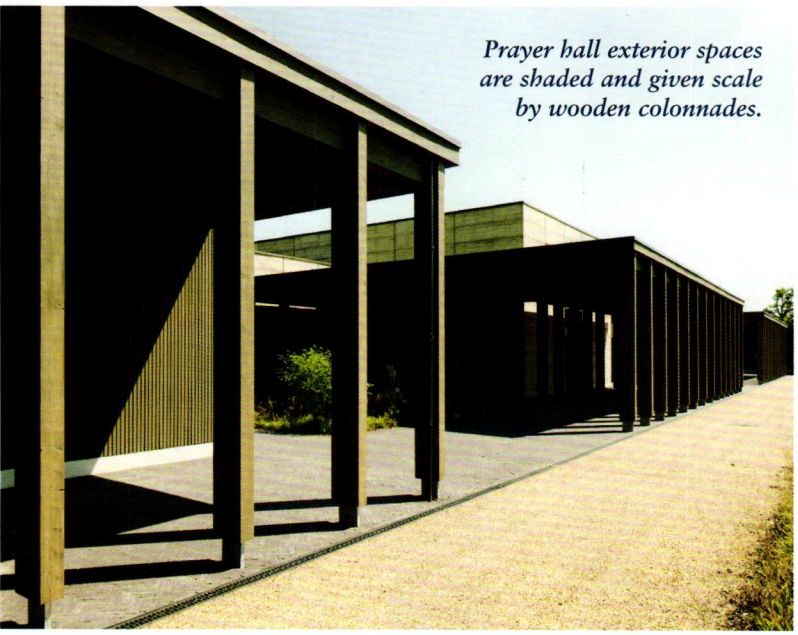


Photo: Lewis Kahn

View of the facility from the northwest access road.

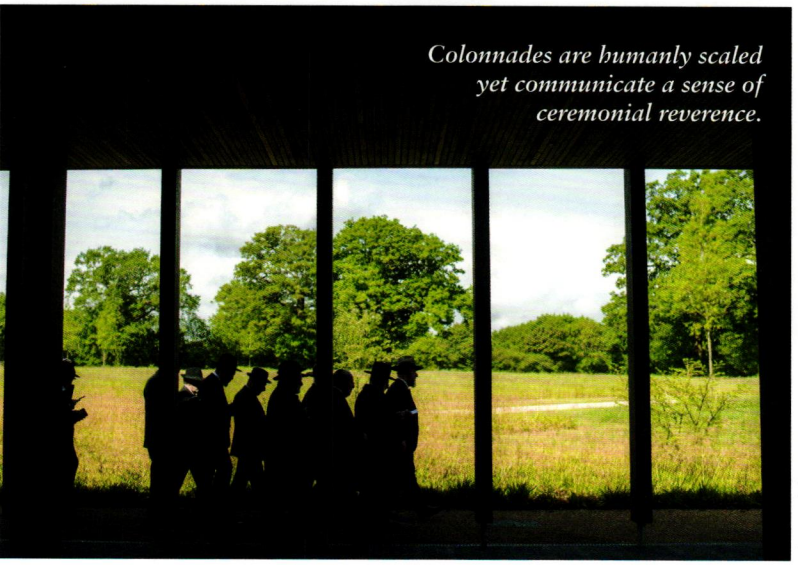
The tall rammed-earth walls define austere yet dignified spaces where funeral services are held. The materiality of the walls and the gridded pattern derived from the metal formwork construction technique are both clearly expressed. Within these spaces, the palette of natural materials is expanded with the addition of an inner lining of English Oak that, together with a tiled floor that gently ramps

The author is a registered architect who practiced in London prior to his appointment as chair of architecture at the University of Michigan. He subsequently served as dean of the School of Architecture and Planning at the University at Buffalo, where he is currently an architecture professor.



Prayer hall exterior spaces are shaded and given scale by wooden colonnades.

Photo: Lewis Kahn



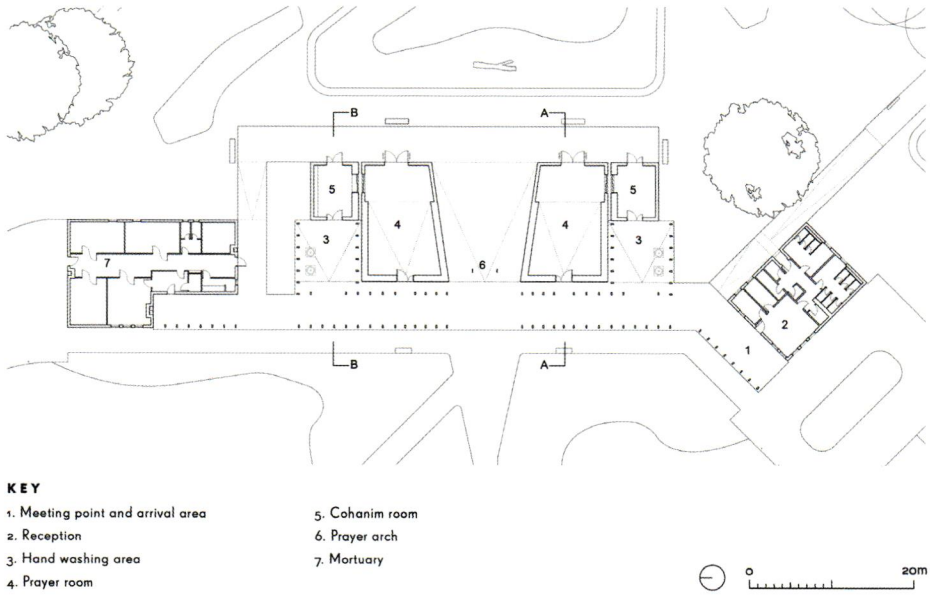
Colonnades are humanly scaled yet communicate a sense of ceremonial reverence.

Photo: Blake Ezra



Doors and protective canopies express the passage of time in their oxidizing steel materials.





Site plan and prayer hall plans



Photo: Lewis Kahn

Wall construction is of rammed earth formed under pressure against metal formwork.

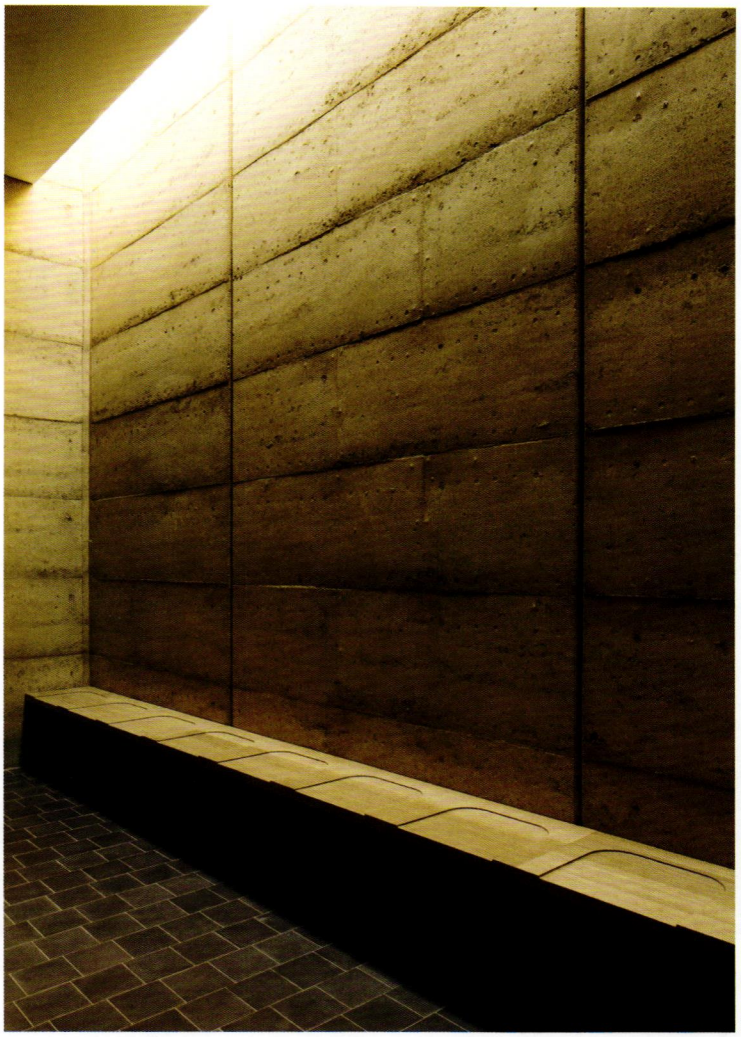


Photo: Lewis Kahn

Interior materials of rammed earth walls, oak woodwork, and encaustic tile floors are muted yet connect back to the earth.

down from the entrance, defines a distinct space within the prayer hall that faces toward east and overlooks water.

The interiors of the prayer halls are lit from above, where a series of openings capture the changing light throughout the seasons. The entrance doors to each of these spaces are made of Cor-Ten steel – a proprietary material that oxidizes and evocatively changes color and texture as it weathers over time.

The two prayer halls are connected by an elegantly detailed colonnade built of wood, which provides a covered route for mourners and creates a series of spaces where people can gather before and after funeral services. Seating, designed as an integral part of this timber colonnade, provides places for rest and contemplation. And while the architectural typologies for these kinds of buildings may be vague, both site and buildings here have been conceived to create clearly legible routes and spaces that are supportive for visitors who may be grieving.

The careful consideration of the natural landscape, together with thoughtful design and sensitive choice of materials for new buildings, combine to reduce the carbon footprint of this cemetery. They also reflect a commitment to environmental stewardship and a desire by the client, congregation, and architect alike to create a place of worship that is in harmony with the Earth.

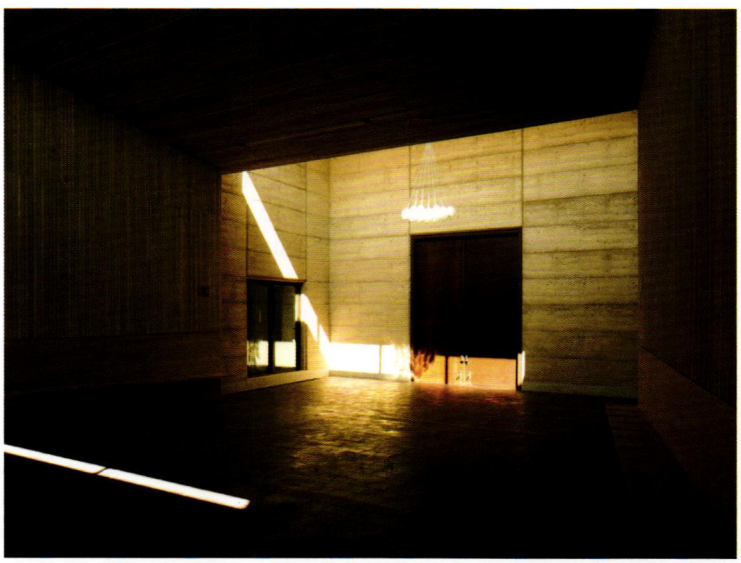
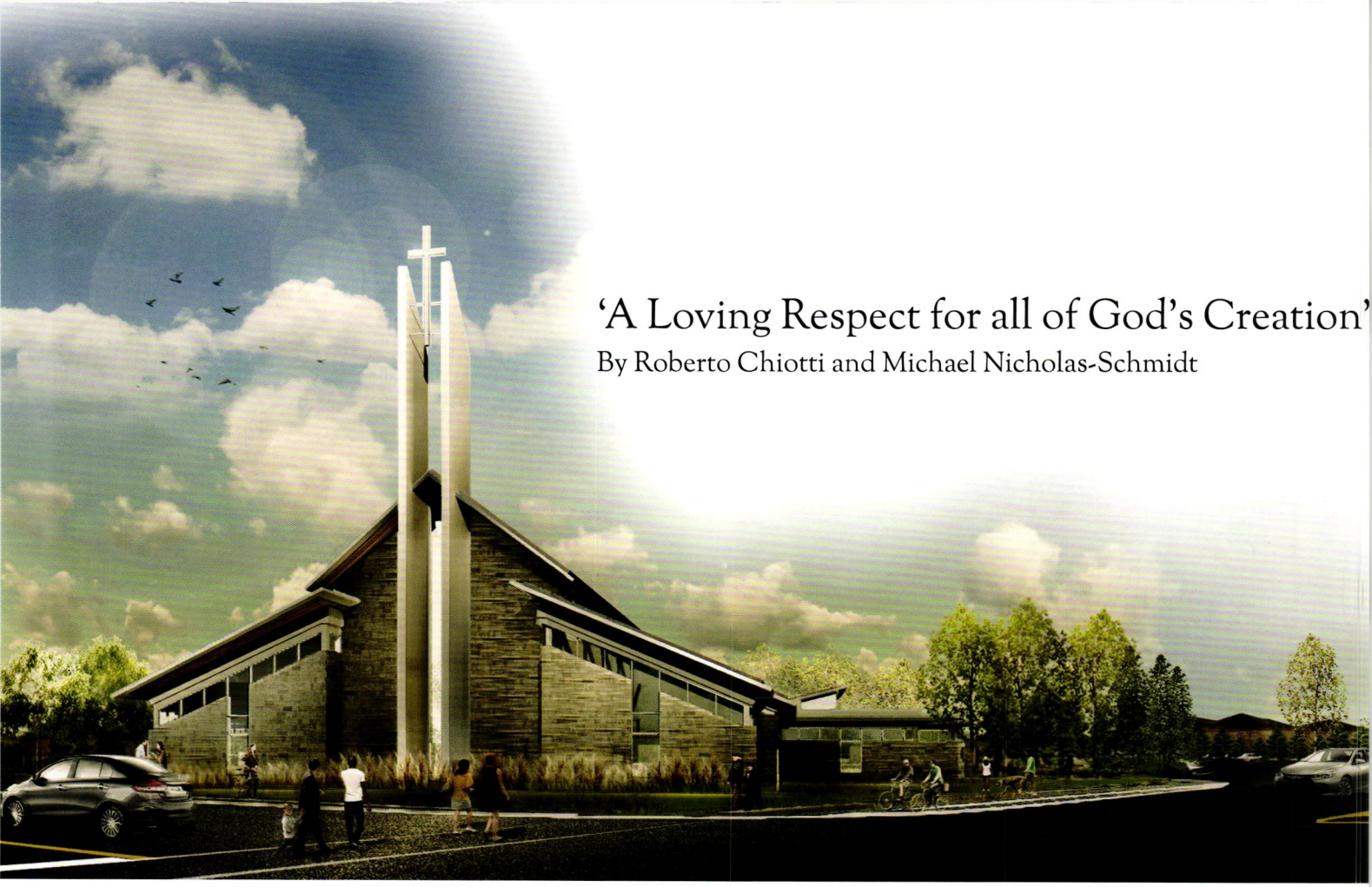


Photo: Lewis Kahn

Prayer rooms bring in light from above.



'A Loving Respect for all of God's Creation'

By Roberto Chiotti and Michael Nicholas-Schmidt

Design for exterior of Saint Benedict Church incorporates a landmark concrete spire combined with natural material.

Saint Benedict Parish was established in 2012 to serve the growing community of Milton, Ontario, Canada. Guided by the teachings of the Roman Catholic Church, and formed under the charism of Saint Benedict, the parish building committee engaged our firm, Larkin Architect Limited, in late 2015 to begin the visioning process for a new church and community space facility. What emerged from meetings and stakeholder workshops over several weeks were a number of guiding principles that embodied the *Rule of Saint Benedict* and strove to reflect the enduring values of the Roman Catholic faith in our contemporary culture.

Design by the *Rule* and *Laudato Si*

Rule 53 of the *Rule of Saint Benedict* instructs: "All guests who present themselves are to be welcomed as Christ," citing Matthew 25:35, "I was a stranger and you welcomed me." According to the pastor, Reverend James Petrie, the demographics of the parish is comprised of 40 percent South Asians, 30 percent Filipinos, with the remaining 30 percent from Europe, the Americas, and Africa. As an ethnically diverse congregation of immigrants that bring with them their traditional forms of faith, piety, and devotion, it was of primary importance that the new church design be welcoming, familiar, and comforting to all members of the gathered faith community. It became apparent that there was a strong, traditionally conservative element within the Saint Benedict congregation. The parishioners wanted the new church building to be a beacon of their faith, a recognizable and prominent element within the community of south Milton. It was their desire that the form and expression of the building clearly express to the surrounding suburban neighborhood the unique history and tradition of the Catholic Church within a modern context.

One of the dominant themes that emerged from the visioning process was the affirmation that the members of Saint Benedict parish were very much an Easter people. "The joy of the resurrection and the promise of the Paschal mystery inspire us to reflect hope and optimism to the world." Saint Benedict's Rule 49 regarding the observance of Lent instructs that we should "look forward to Holy Easter with joy and spiritual longing." It was felt that the building, through its vibrancy, expression, brightness, and finishes, must embody this joyful reality that Jesus Christ is alive and well in the world.

The community further expressed that the church architecture should support their belief in living a legacy passed. As bearers of a rich Catholic tradition, they strove to embody the enduring values of their faith in our contemporary culture. It was therefore desired that the building should reflect this rich tradition in a manner relevant to the present, prophetic of a hopeful future. It should express their unique faith in ways that are accessible and engaging to their youth and the many generations that will follow.

The building committee made it clear that they believed they were grace-filled and that the experience of the new building should express the transcendent awe of being in the presence of a God, "my light and my salvation" (Psalm 27). Through the person of Jesus Christ, they know God who is also immanent. And by the grace of the Holy Spirit they know they are "on Holy Ground" (Exodus 3).

Core to the *Rule of Saint Benedict* is a daily pattern of prayer as expressed by the Liturgy of the Hours. Each and every day is shaped by the prayerful orientation to God as center. It was determined that the new building should therefore reflect this spiritual tradition, and

The authors are principals of Larkin Architect Limited, based in Toronto.



Photo: courtesy of Larkin Architecture Limited

Construction underway on the church, which will incorporate the landmark spire.

support a prayerful, restorative, and healing environment for all who enter.

In addition, there was a loving respect for all of God's creation, a deeply rooted acknowledgement that as humans, we are part of it, interrelated and inextricably interconnected. The summer before the parish committee and our design team commenced the visioning process, Pope Francis had promulgated his famous encyclical, *Laudato Si: On Care for our Common Home*. In it, the Holy Father reminds us that the universe in all of its diversity and interconnectedness acts as a form of sacred scripture in and of itself. We are all part of God's creation and as such, it is necessary for us to embrace an "integral ecology" leading to right relationships that can only be achieved when we see the interconnectedness and interdependence between our environmental, economic, and social ecologies. (137-139) In its wisdom, the parish felt compelled to embrace this imperative in the design of the new church. The parish believes that the building must support this understanding of right relationships and interconnectedness in its materiality, views, and orientation; that it must serve as a form of catechesis, in and of itself, teaching these foundational principles of right relationships with all of God's creation, inspiring transformation from an exploitive to a more benign and nurturing relationship with our Earth home.

Choosing Sustainability

With this vision in hand, we set about the iterative design process to arrive at a traditional church design, formed by the charism of Saint Benedict, rooted in church history, yet reinterpreted for a time when climate change and environmental degradation are of great concern.

Because buildings significantly contribute to greenhouse gas emissions in their construction and ongoing operation, it was decided that one of the best ways the congregation could embody good stewardship of God's creation was with architecture built of local natural materials, that generates as much energy as it consumes, and avoids emitting carbon dioxide into the atmosphere. The design team was challenged to consider every design decision from first principles.

Knowing that some sustainable design strategies come at a cost premium, every increase in capital cost had to be justified with a sound business case. We discovered that as long-term building owners and operators, Saint Benedict parish responded positively to design decisions that would net considerable savings in ongoing energy, maintenance, and operating costs for a modest increase in initial capital expenditure. For example, the case was easily made to use geothermal energy to heat and cool the building when it was demonstrated that the return on investment for this system would conservatively provide the parish with an estimated $1.5 million in savings over the next 50 years--precious financial resources that could be re-directed to support parish ministries and those in need.

Green Materials and Design Features

The building is situated within view of the Niagara Escarpment, a dominant natural rock outcrop that literally divides southern Ontario in two from the shores of Lake Erie in the south, up to Georgian Bay and Lake Huron in the north. Locally quarried escarpment stone was therefore the natural choice to clad the building exterior and the interior of its major rooms, such as the narthex and worship space. This enabled the new church to be "anchored" within its surrounding natural context and the *genius loci* or spirit of its place. Maximizing insulation within these heavy, massive stone-walls ensured a reduction in heating and cooling loads while providing improved comfort for building occupants.

To embody the sense of being an Easter people focused on the resurrection of Jesus Christ, movement towards the transcendent within the worship space was manifest with a continuous band of energy efficient, triple-glazed



Interior of the sanctuary is flooded with natural light.



Narthex space will welcome all with natural materials and abundant light.

windows surrounding the entire perimeter of the building, further emphasized with a linear clerestory from the narthex to the sanctuary that floods the building with natural light. The strong directional axis from entrance to the sanctuary, framed with twin wood trusses, culminates in a back-lit, onyx reredos supporting the central crucifix and tabernacle. A contemporary exterior tower beyond serves as a beacon of Catholic presence to the surrounding neighborhood. At the opposite end of the nave, the rose window hosts the only stained glass in the church, a design by a local artist inspired by the charism of Saint Benedict.

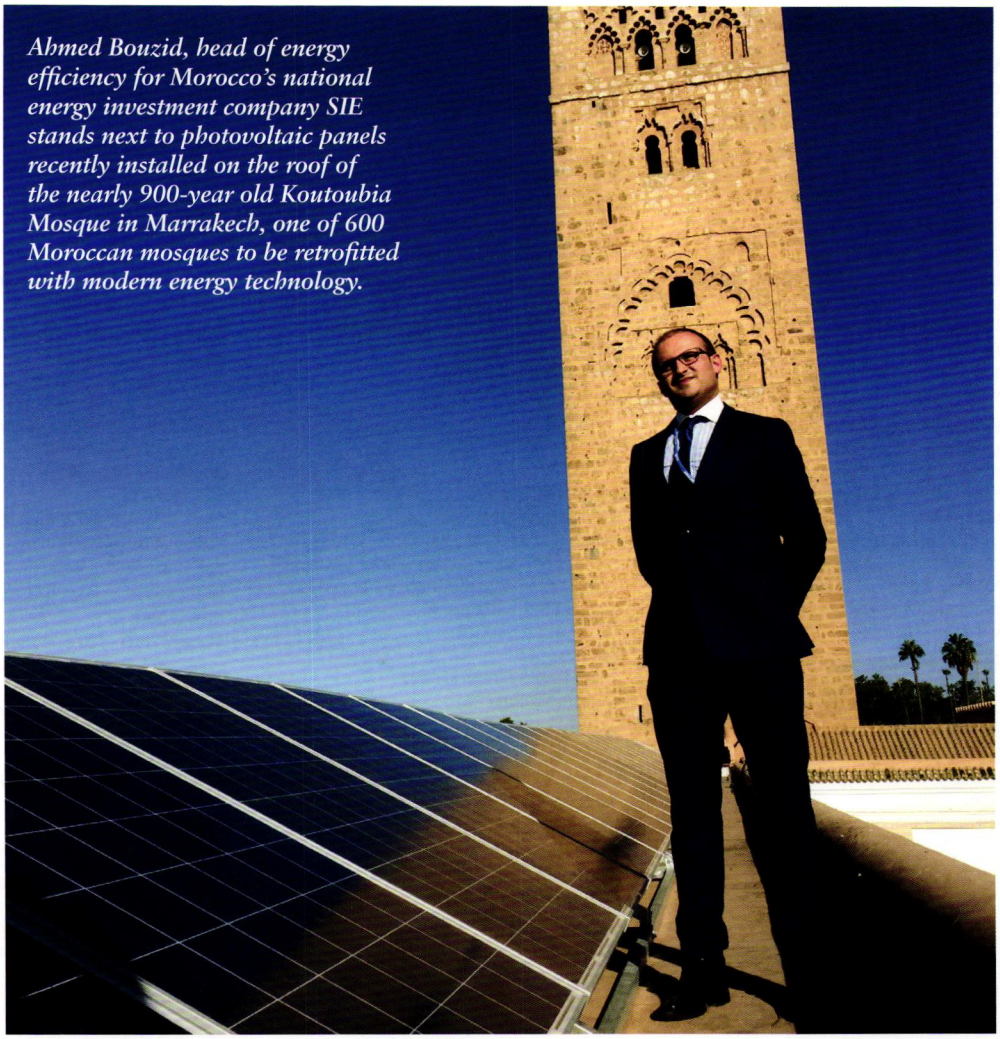
The supporting structure of the soaring roofline, which appears to hover above the building, is made of Western Canadian Douglas Fir, a natural material which helps to reduce energy expended in processing and continues to sequester carbon throughout the life of the building. The roof cladding is of locally sourced and fabricated steel, in support of the community-based economy. The roofing material is robust, durable, and ultimately recyclable at the end of its expected service life.

Outside, the landscaping is dominated by an extended linear garden that begins at the north end with a shrine to Saint Benedict and welcomes those arriving by car, leading them to the sheltered gathering space of the entrance courtyard. The imposing wooden front doors symbolize the threshold to the sacred space beyond and Christ as the gateway to the heavenly realm.

Several electric vehicle charging stations are provided to encourage parishioners to invest in this alternative transportation technology as a way to further reduce carbon emissions associated with the church. An array of photo voltaic panels mounted overtop outdoor parking areas flanking either side of the church is sized to generate all of the electricity required to run the pumps and fans of its mechanical systems along with the power required to light the church and provide plug loads for its office equipment, while protecting the vehicles beneath from snow and the hot summer sun.

Together, the cumulative effect of these sustainable design initiatives demonstrates this traditional parish's commitment to upholding the legacy of their Roman Catholic faith while responding to the 21st-century context in which they will worship, serve their community, and inspire future generations.

wisdom, and real well-being. Religious architecture needs to do likewise, articulating and embodying a positive ecological vision and an accompanying biophysical reality. In a climate-threatened, environmentally degraded world, religious architecture must now embrace a commitment to active environmental restoration. Religious facilities must regularly begin to generate renewable energy beyond what the mosque, temple, or church itself needs, must design on-site wetlands to help absorb storm-water runoff, and more. It is no longer enough for sacred sites to take less from nature. They need to give back, spiritually and ecologically.



Ahmed Bouzid, head of energy efficiency for Morocco's national energy investment company SIE stands next to photovoltaic panels recently installed on the roof of the nearly 900-year old Koutoubia Mosque in Marrakech, one of 600 Moroccan mosques to be retrofitted with modern energy technology.

Photo: Chris Bentley/flickr (CC BY-NC-ND 2.0)

Living Buildings for Living Faiths

The Living Building Challenge (LBC), and its associated body of work, represents one source of inspiration and support for such a vision. Launched in the early 2000s, its founder Jason McLennan had a vision of an ecologically regenerative approach to architecture, construction and building operation coupled with a commitment to the health and well-being of all who utilize a given space. He designed the Living Building Challenge to spur the creation of "buildings that give more than they take, creating a positive impact on the human and natural systems that interact with them." LBC is organized into interrelated performance areas. All LBC-certified buildings must gather and produce, on-site, all the water that they consume, capturing rainwater for internal use. They must be powered by 100 percent renewable energy, including daylighting, solar, and other systems. They must be sited in a manner that respects the health of natural systems. They must set aside newly protected land away from the building site equivalent to the land used in the development of the new building. They must provide a healthy indoor environment for their inhabitants through access to fresh air and daylight, and the use of non-toxic products that cannot include a number of red-listed items including PVC and formaldehyde. Construction materials must be sourced in an ecologically responsible manner. Social equity is integrated into the standards in the form of requirements around hiring and access to training for under-served communities, and in promoting expanded access to nature. Finally, the standards call for a commitment to building designs that elevate the human spirit, a subjective yet vital commitment of the Living Building Challenge.

LBC is the first and best-developed building design approach consistent with religious values. Religious-building architects, along with religious leaders, need to engage with these standards and the values they represent. They need to discuss them, understand them, debate them, and ultimately adopt standards that contextualize and deeply reflect religious values, and that actually help regenerate the Earth. Today, to our knowledge, no major religious body has intentionally aligned religious values with religious buildings. In a climate-threatened world, that must change.

Call for Action on Religious Buildings

The time has come for those who design, build, and operate religious facilities to take the Earth's health with a seriousness that our current context requires, at a collective level. Theologians and religious architects must work together to develop mission, vision, and values statements for religious architecture that speak directly to the threats posed by the climate and environmental emergencies and the response that religious buildings must embody. Religious networks, including regional, national, and international associations and networks of congregations must adopt green building policies. At a minimum, these should require all new religious facilities to use 100 percent renewable energy, and to contribute to ecological restoration and renewal within their community. Failure to take these steps represents a breach of religious communities' moral, spiritual responsibilities.

To support this evolution, religious institutions and networks must develop best practices and support knowledge and resource sharing to help congregations everywhere climb up the learning curve as quickly as possible. These religious networks, and their endowments and trusts, must develop funding and financing tools to help religious communities meet the costs associated with this shift.

The science is clear: we face a massive threat in the form of climate change. As part of its response, the religious sector must transform its approach to the design, construction and operation of its buildings. An initial model framework, the Living Building Challenge, exists. Architects designing religious facilities need to embrace this challenge, develop and adapt standards for their own use, and offer the leadership that only they can do.

For century upon century, religious buildings have served as beacons of inspiration and purpose for people around the world. Now, it is time for these same buildings to inspire us to meet the ecological threats that are a defining issue of our time. F&F

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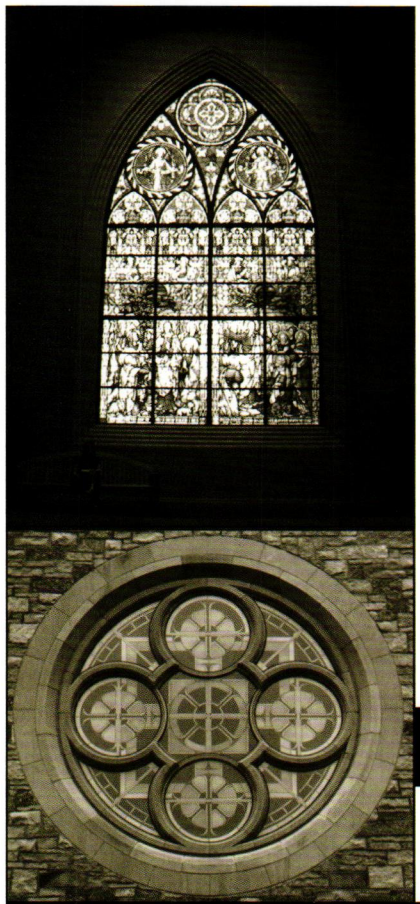
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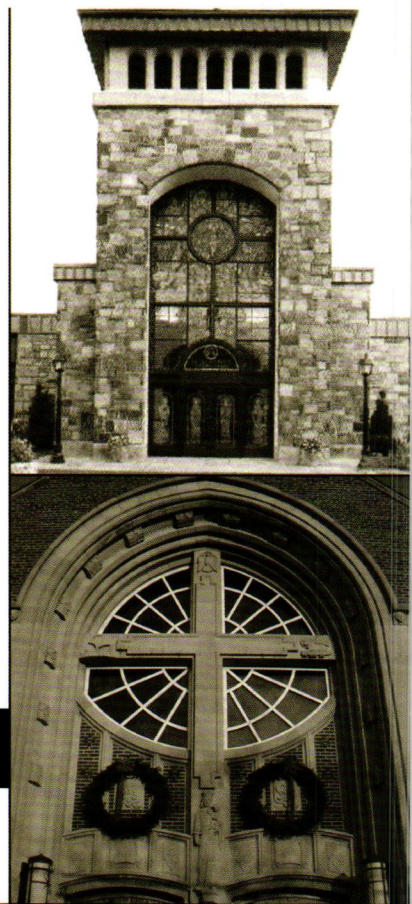
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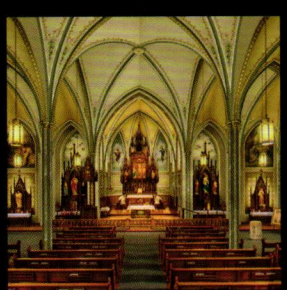
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