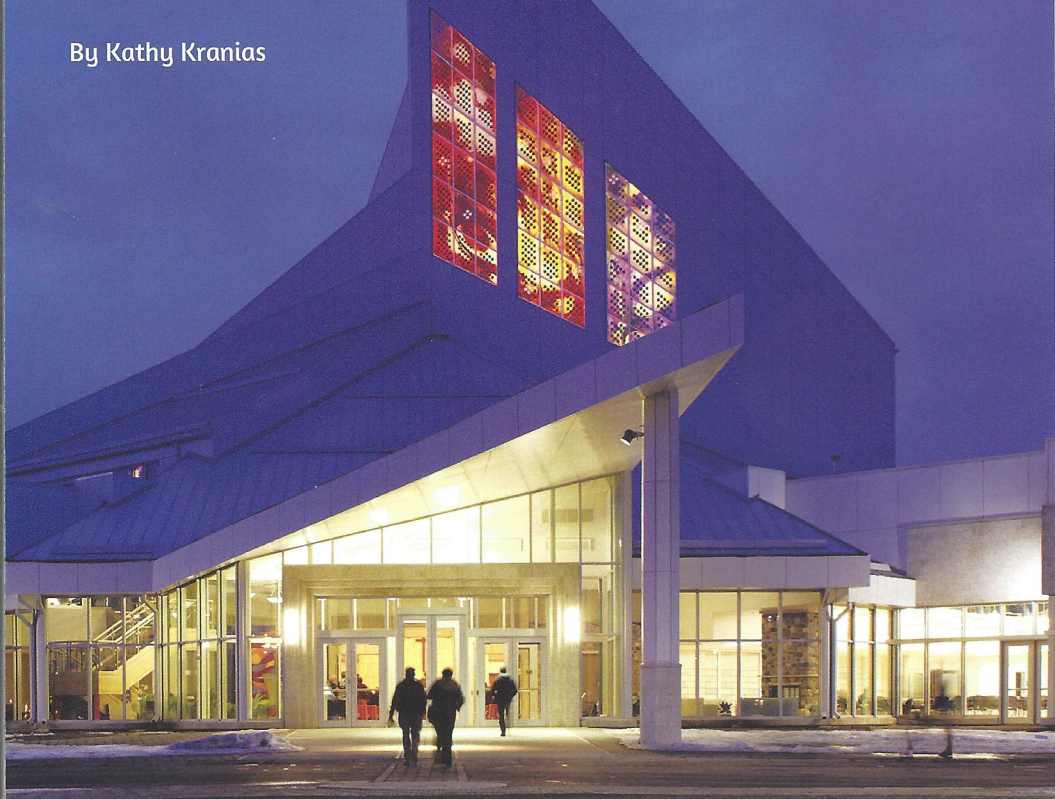


# Stained Glass with a Solar Future

*Stained-glass artist Sarah Hall talks about the next generation of an ancient sacred material.*

By Kathy Kranias



*'Lux Gloria' windows at the Cathedral of the Holy Family in Saskatoon, Saskatchewan, Canada, integrate photovoltaic technology for generated electric power.*

**Kathy Kranias:** Can you share your thoughts on stained glass innovations of the past 40 years?

**Sarah Hall:** The entire past century has seen incredible innovations in stained glass – so much so we no longer use the words stained glass for our windows, and have yet to find generally accepted new terminology. There have been enormous advances in glass technology, which have had a great impact in our field. Many factors have driven these advances – artistic, economic, and the requirement for

our art glass to meet standardized building codes for glass. Now common in Europe are large-scale paintings made with enamels on float glass (with excellent color and permanent adhesion), huge kilns, mechanical sandblasting, digital printing on glass, computer cut stencils, air-brushing of glass paint, fluorescent and metallic paints, screen-printed imagery, 3-D laser etching, CAD for design work and full sizing of cartoons, photo imprints on glass with ultraviolet light and high-quality lamination. Scientific, dichroic glass is com-

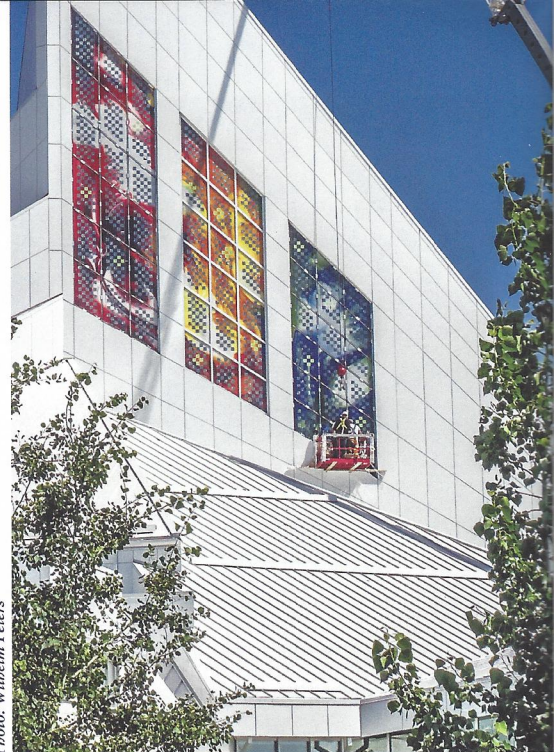


Photo: Wilhelm Peters

*Installation of 'Lux Gloria' solar windows at Cathedral of the Holy Family.*

mercially available and is compatible with glass for fusing, casting, and slumping. Finally, integrating art glass with energy (solar) technologies, fire-rating, heat-mirror, and other industrial technologies is possible. All the above techniques can be combined in unique configurations.

**KK:** Where did the idea or prototype for your photovoltaic windows come from?

**When?** What brought you to the creation of this type of work?

**SH:** The idea to bring solar into my work came from several sources which all converged within a couple of years. First, my mentor, Ursula Franklin, a physics professor at University of Toronto, encouraged me to explore connections to solar. Second, I saw many beautiful buildings in Europe created with a technique called Building Integrated Photovoltaic (BIPV) and was convinced it was a great direction for solar. This led me to make connections and take workshops in Canada, the US, and Europe with architects and engineers working in the field of solar and BIPV. The studio in Germany that fabricated my work had collaborated with Klaus Jansen and Christof Erban to make a prototype of art glass embedded with solar cells. They too encouraged me to create solar work. Lastly, and of great importance, I received a Chalmers Arts Fellowship from the Ontario Arts Council which gave me the time and resources to experiment with the integration of solar collection in to my art glass projects.

**KK:** Is solar the appeal of the avant-garde, or something else, in your opinion?

**SH:** I don't consider making an effort to care

Photo: Grant Kernan

SARAH HALL IS AN AWARD-WINNING GLASS ARTIST BASED IN TORONTO. KATHY KRANIAS IS A CERAMIC ARTIST, EDUCATOR, AND LEADING RESEARCHER ON CANADIAN POST-WORLD WAR II ARCHITECTURAL ART GLASS. SHE IS A CONTRIBUTOR TO *SSAC JOURNAL*, *STAINED GLASS QUARTERLY*, *STUDIO MAGAZINE*, AND *THE JOURNAL OF MODERN CRAFT*. THIS ARTICLE IS ADAPTED FROM THE BOOK, *A THOUSAND COLOURS—SARAH HALL GLASS* (FRIESENS, 2017).

*Lux Nova wind tower at Regent College, Vancouver, British Columbia, Canada, is illuminated with energy collected by stained glass PV panels.*



Photo: Michael Elkan

for our environment avant-garde. I think we need to find creative, beautiful, ecological ways of living in the world.

**KK: How have you adapted photovoltaic processes to suit your aesthetic interests?**

**SH:** I design for solar cells in the same way I compose for a graphic element or pattern. My initial design is sent to the solar engineer who integrates the electrical field and wiring diagram as an additional layer in the design. The wiring can appear strictly functional and almost invisible, such as my project for the Cathedral of the Holy Family, Saskatoon, or it can add an exciting graphic element to the overall composition, seen in my Regent College Wind Tower, Vancouver. Solar projects have brought a rigor to the design process because they require me to incorporate rigid graphic elements.

**KK: What hand processes are important to the photovoltaic projects?**

**SH:** The hand processes I use are the same as in any project. When used as a design element, photovoltaic cells make up only part of the window. There is always a need for hand processes to create the artistic context so that the solar cells can make visual sense within the window. The glass can be hand painted, laminated antique glass, air-brushed, fused, sandblasted, acid-etched, silver stained, or screen printed. In the short time I have worked with solar technology, the method of integrating the cells into the art glass has evolved, however there is always a need for the artistic context around the cells.

**KK: How do you respond to the criticism that photovoltaic components are not green or eco-friendly due to the materials and energy-intensive processes required for their production?**

**SH:** I am pleased to have a chance to correct this view, as there is no truth in it. The cost of producing solar cells and solar panels is paid back within four years. They last 40 years-plus and importantly do not pollute with greenhouse gas. The technical information to back this up is easily available on Wikipedia ([wikipedia.org/wiki/net\\_energy\\_gain](http://wikipedia.org/wiki/net_energy_gain)).

*Detail of PV film in Lux Nova tower windows.*

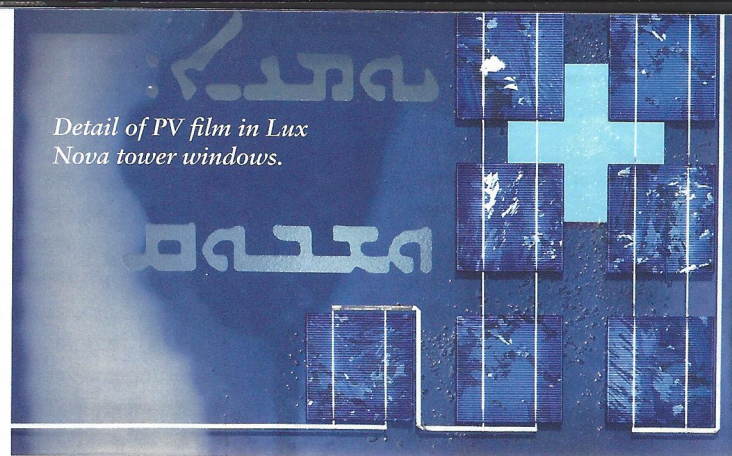


Photo: Michael Elkan

Let's compare this to fossil fuels, which are a onetime use, releasing pollutants into the atmosphere every minute - and the original material is not recoverable or recyclable.

**KK: Then there is the question of their limited lifespan, whereas traditional stained glass compositions last hundreds of years.**

**SH:** Regarding solar cells incorporated in art glass installations, these can be reconfigured after 40 years with newer technologies or the solar layer separated from the art glass and recycled. Solar technologies will have developed in ways we cannot imagine. We all love the idea that our stained glass will last for hundreds of years. Sadly, this is no longer the truth. I have seen my own and other artists' traditional leaded glass projects taken down and replaced within a few years of installation—with a change of owner, purpose, or style.

In my current work I use many techniques, including traditional leaded stained glass. However, this technique does not last hundreds of years unless it is cared for through its lifetime, and periodically rebuilt and renewed. Despite this, windows are vulnerable to countless hazards, including wars, civil unrest, religious “zeal,” changing fashions, and most often physical neglect. I asked a few restoration studios in Europe what percentage of traditional leaded windows remain. They estimated that what remains is approximately 2 percent Romanesque, 8-10 percent Gothic, 2 percent Baroque, and 35 percent 19<sup>th</sup>-century windows. I think it would be great to bring this question to dozens of stained glass restorers throughout Europe for academic verification.

**KK: Has the solar process “caught on”? Are there others in Canada or the US who are creating analogous work? Is the expense a drawback?**

**SH:** My work in integrating solar is not a new “studio process.” I am an artist who has created work in collaboration with a solar engineer. A solar engineer is required in the process of making solar panels because the panels must conform to national and local electrical codes and standards. Since it is new technology, the codes and standards have often lagged in North America. Integrated photovoltaics cannot really be considered a craft or studio practice, but rather a collaboration between artist and electrical engineer. Many artists and designers are interested in the ideas and technology. In the US, Peters Studio along with Lynn Goodpasture have made an interesting solar project at the San Jose Library, and Carol Bennett along with Peters have integrated photovoltaics at the Hawaii State Art Museum.

There has been a lot of interest from solar energy companies who want to customize their work and look more attractive. There is also interest from architects and designers. I think my solar projects have greater impact on the solar and architectural world than on the field of stained glass, and this is as it should be. My interest as an artist is to advocate for the values I hold. I have always been interested in creating work that leads us forward, both spiritually and environmentally. Solar art glass is expensive - but the client has a unique art glass window that collects energy. 