

Introduction



Time-wise, space travel and possibly tourism to Mars could be fully underway by 2035. With the realization of the impending settlement of humans on Mars comes a torrent of technical questions, atmospheric uncertainties, and survivalist concerns. Besides considerations of functionality, a question arises as to which cultural manifestations should accompany the early pioneers to the red planet? This series of eight meditations contain personal reflections about the possibilities of stained glass and innovative forms of glass art as answering the cultural siren by embellishing habitats on Mars.

The format for each written meditation consists of three parts. The first involves listing general topics for meditative focus. What follows are meditative questions and quotations to guide our thoughts. Thirdly is a personal written meditation in response to a selected quotation and the questions initially posed. From the personal meditations there may derive a sense of scope for the daunting tasks and obstacles confronting members of the stained glass profession who may be wondering about emigration to Mars. Likewise, future tourists to Mars may wonder if they will encounter any familiar fine art in habitats and public places. This exercise will offer speculation and educated guesses about the future of this special art on another planet.

The motivations for this series of meditative exercises are twofold. First is noticing themes of interplanetary travel and exploration embedded in the literature, designs, and materials of stained glass over the last centuries. It is as if we were preparing for this venture to Mars from classical times to the present. I seek to identify people, material innovations, and design ideas that over the past contribute to the development of glass art with interplanetary applications. This is about artists and professionals who envision life and art that can apply beyond our current earthly confines.



A second motivation is the realization that, in a protrusive way, traveling and settling on Mars will represent a monumental paradigm and zeitgeist shift. This is because space settlement may implicitly embody the continuation of the Mayan calendar end of days. There is a likelihood that by 2035 humans will measure epochs as pre-and post-space settlement. Some readers may remember a media frenzy in 2012 when speculation ran rampant that the end of

times was predicted by Mayan astronomers. When the Mayan long count calendar ended that year, many predicted a catastrophe. But the Mayan prediction only said that after 2012, things would not be as they were before. We see today technology, geo-politics, theology, and social mobility all face considerable uncertainty and the future seems less predictable than previously. We no longer feel the false security of a mechanical and harmonic universe, and instead we experience the existential angst of interplanetary forces threatening our extinction. This is to be expected under the Martian beginning of new times. My desire to write this is to encourage the many talented glass artists around the world to consider humans in a transitional time period and embrace a new direction.



Mars in Greek and Roman mythology is full of visual imagery for the minds of stained glass designers. In Roman times Mars was depicted as a muscle-bound male warrior in statues, paintings, coins and frescoes. Meanwhile, homage was paid to Mars through magnificent columned temples found throughout the Mediterranean region. Readers of Bulfinch's *Mythology* from school days may recall Mars (also Ares) as the Roman god of war, son of Jupiter and Juno, and the standard for battle lust, civil order, and manly courage.

Mars is often seen as the angry red planet due to its barren landscape, hostile environment for life, and red appearance from Earth.

The Greeks and Romans may have given us the appropriate labels for these new times. I suggest proclaiming the pre-Martian settlement period (let's say pre-2035) as the "Era of Ares," the Greek concept of the god of war, and the post-Martian habitation age (post 2035) as the "Epoch of Mars," the Roman version of the war god. Looking at the current political storms brewing over competing visions of how Mars should be settled, we can see no immediate end to ideological tension, cultural and political hegemony, conflict and fighting. War and battle were primary concerns of both the Greeks and Romans, but students of the classics point out the two deities were perceived differently by these western cultures. Ares was viewed by Greeks warily. This hyper-masculine warrior figure was depicted as aggressive, brutal, destructive, and intense. This was not a god to trust but to view with suspicion because Ares was often chaotic, impulsive, and reckless. It is not a stretch to say this image fits multiple world leaders as we close in the first quarter of the twenty-first century. It is my wishful thinking to believe that through these meditations, we can work through the focus on aggressive and warlike traits associated with Ares, leave them behind, and transition to the Mars epoch.



Mars, contrary to Ares, was an important divinity to the Roman citizen. This is because his portrayal was of a dignified god who was respected, dedicated to service and duty, and a protection figure. Mars fights battles in justified wars that have the strong backing of the political community. Mars also stood for agricultural fertility. Thus, the difference between the two was the chaos of Greek times versus the confident safety and fecundity of the Roman period. Today, can we bid farewell to Ares and Earth as we turn our attention

toward Mars?

A striking cultural notion is that the end of time could also bring finality to the traditional ways of making glass art. We might even predict the end of glass as we know it. In its place there may be a product unique to the material base on Mars with additional strength and properties to perform the equivalent or better than the medieval and modern requisites of glass. Only now will glass be required to multi-task. It is no longer enough for glass to look pretty, let in light, and keep out the weather elements. In addition to these functions, glass, manifest in glass art, will be asked to work with the architectural setting to assist with heating, cooling, UV-filtration, and so on in addition to its aesthetic dimension. This new glass and advances in other materials like cement, the likely in situ structural material of Mars, adds to the excitement of new challenges on the red planet.

I came to this topic while personally reflecting on why I am fascinated by the idea of interplanetary travel and exploration. From 1949 to 1953 I lived as an infant on the campus of Purdue University in Indiana while my father completed his degree in mechanical engineering. This was the same time Neil Armstrong, the moon walker before Michael Jackson, and Gus Grissom, a Project Mercury astronaut, were enrolled there. My father passed away before Grissom or Armstrong became well known, so it is unlikely that he knew them beyond casual classroom acquaintances. I have often wondered whether the proximity to these space age pioneers had any lasting effect on my interest in interplanetary exploration. Later, I was a student on campus at Purdue in July of 1969 when Neil Armstrong's landing on the moon was broadcast. The student body was in total jubilation, and the mood the entire following year was incredibly upbeat.

However, before he passed on, my father was involved with a technological first with the advent of the Telstar communication satellite. This type of story is likely repeated by countless families around the world as individual scientists, engineers and technicians' piece together

small components of what now totals up to space travel and Martian habitation. My dad worked for an engineering firm and one of his projects was to design ball-bearings that allow a communication satellite receiving station to rotate during its signal reception. I remember the summer of 1960 at our home in Indiana with my family huddled around our black-and-white 19-inch television watching incredulously a live broadcast of the Olympic Games from Rome, Italy. My dad was explaining how a television camera could broadcast a live event like the 100-yard dash by sending the image to a satellite orbiting the earth in space and relaying the broadcast instantaneously to a rotating receiving station in Connecticut where the images then ricocheted to the network headquarters in New York and to U.S. viewers in real time. Previously, international events had to be taped, and the film flown to New York before airing on television, a considerable lag time.

We take this live feed from satellites for granted but traveling to Mars and settling there will be a lot like this experience. No doubt modern technical experts are working on the equivalent problem of real time communication between Mars and Earth. This is because under current communications technology there will be a 6-25-minute delay in messages sent between planets due to the distance and the rotation of each sphere. We must learn to savor small technological steps that are necessary to overcome these problems.

Since that time, the prospect of habitation on other planets has continued to interest me. As the opportunity to reach Mars approaches, I am increasingly motivated to investigate how both the traditional craft of stained glass and contemporary forms of glass art might contribute to space settlement initiatives. Will glass artists be pushing and shoving at the spaceports anxious to take off for this new land like itinerant glaziers of old? Or will companies hire well-known artists and designers handing out commissions like the donors, patrons and sponsors of the Middle Ages in Europe?

I became involved in stained glass in the mid-1970s with an initial encounter with the Studio Glass Movement, taking blown glass classes taught by legendary Ohio glass artist Jack Schmidt. After learning the rudiments of blown glass and observing the exciting new directions of the art form by attending workshops under the likes of Chihuly, Labino, and Chao and making pilgrimages to nascent Pilchuck and the post-flooded Corning Museum of Glass, the spell was cast and I've been mesmerized by glass of all forms. I later decided to focus on "flat glass" as we referred to stained glass then. I joined the Stained Glass Association of America in 1976 and became involved in indexing and microfilming their quarterly magazine. Later I co-edited a lengthy bibliography on stained glass in the form of an information guide which was published in 1980. These projects required that I read literally thousands of books and articles on stained glass and glass art. Since 1980, as first a librarian and later a college professor, I have

researched the impact of government regulation on the stained glass industry publishing on tariffs, lead exposure, environmental safety and so on. At the same time, I have followed the exciting developments in modern glass, having been an initial member of the Glass Art Society. I have watched stained glass lose its stereotypes of being a “craft,” “lost art,” and “handmaiden of architecture.” Since the 1970s glass art has matured into an art form that at times transcends painting and sculpture in the public’s perception, two media that traditionally cast a lengthy critical shadow over glass art.

This series of meditations intends to be both a selective look at American stained glass over the past century and a projected forecast for what may be ahead. The objective is to demonstrate that the professions of stained glass and glass art possess the ingenuity, resilience, and creativity necessary to adapt to the entirely novel Martian environment and its challenging atmospheric conditions.

Meditation 1: Exploring the Possibilities of Artistry on the Red Planet



In the grand tapestry of human exploration, Mars has emerged as the next great frontier. As we set our sights on this enigmatic planet, many practical questions arise: How will we sustain human life? What will our habitats look like? Amidst these considerations, a more poetic inquiry beckons: will there be stained glass on Mars and how will it be used?

Quote for reflection: “When I was watching man’s first landing on the moon’s surface, it came as a shock to me to realize that there could be no stained glass on the moon, at least, not in the form we have understood it in the past.”

Lawrence Lee, *The Appreciation of Stained Glass*, 1977, p. 1.

Quote for reflection: “If beauty is, to some degree, balance, can it help find usable paths between the assumptions and confusion that we have, be they in science, art, religion, or politics? A Romantic Age might be a chance for us to take back the forgotten parts of ourselves, to remember that we are more than a theory, an equation, or an idea. ‘The awful thing is that beauty is mysterious as well as terrible. God and the devil are fighting there, and the battlefield is the heart of man.’ –Dostoyevsky, *Brothers Karamazov*.” Full quote by James Hubbell, “Are We Entering a Romantic Age?” *Stained Glass*, Su. 2012, p. 139.

Meditation: Multiple variables and uncertainties face colonization efforts on Mars. Initial evidence indicates the potential for several types of settlements under various forms of sponsorship, including corporate, national, scientific, and consortium-based support. These financiers of colonizing expeditions will represent a spectrum of religious, political, social and cultural identities so that the future of Mars will rest with whichever ventures are successful or

not. Anthropologists outline stages of development, starting from an initial period where Earth has significant authority and cultural influence, leading to a more autonomous juncture where Mars seeks independence from Earth's control and culture.

These meditations mainly apply to the initial stage of Martian settlement. During this first arrival, memories of earth and one's culture are fresh and guide the crew's thought processes as they directly encounter what they have been training for over multiple years. Survival is a key concern of colonists as initial steps are taken to provide shelter through specially designed habitats, primarily aimed at functionality and sustaining the colony. One strategy to consider is a campaign by stained glass professionals to persuade architects to include art glass in these new habitat designs for the psychological and inspirational benefits to settlers.

In these initial habitats the living quarters will be spartan, offering sleeping, dining and recreation areas. Here small functional art glass may be brought along if personal items are allowed, and weight limits are met. Later, when space shuttles begin earth-to-Mars supply runs, colonists may consider acquiring art for personal or common spaces. Materials for creating glass art will likely become available after habitations are completed; the environment is analyzed, and the necessary atmospheric conditions are verified for understanding windows, lighting, power sources, and other related factors. Once all the requisite data is gathered, will an organization like the Stained Glass Association of America (SGAA) issue a reference and technical manual to assist glass artists planning to address the Martian market? Another stained glass-compatible area of some planned Mars habitats is the food growing areas which supplement grow lights with transparent covering to allow sunlight to aid plant photosynthesis. Here installing a stained glass piece or glass art sculpture, whether naturally or artificially illuminated, adds color, artistry, and cultural affirmation and may be a strategy for marketing to Martian settlements.

However, even if the second stage comes about quickly, enough has transpired in the history of stained glass to suggest possible pathways in the human quest for modernity, artistic originality and cultural autonomy. Will a Martian search for a separate identity from earth's cultural influence have the hellfire and righteousness of the Reformation echoing the tale of Richard Culmer, a.k.a. Blue Dick, defiantly rattling down proud Thomas a Becket's glazed but shattered image? Will the settlers rebuff the old ways of making stained glass? Will they clamor for new iconography or symbols? Will Martian modernism consist of original approaches to glass art as well as other media previously subject to earthly hegemony? Or will a newfound technology, one producing pleasant light and color images, drive a radical form of artistry, adornment, or decoration to depart unexpectedly from anything previously imagined? Historically, the stained glass profession has been poised to respect tradition but also embrace the new. Silver stain, various glazing masters, Tiffany/La Farge opalescence, dalle de verre, and kiln-formed or fused pieces all fall in the newfound technology development pantheon. Also necessary will be the design and construction of tools, kilns, furnaces, and a host of technological developments to make art glass production efficient. Will an equivalent new development emerge from the red planet?

The answer to these and an extraordinary number of predictions, anticipated problems, unpredictable variables, and overall uncertainty all influence whether and how stained glass will be used on Mars. Despite the inherent risks and uncertainties, the colonization of Mars represents a long-standing aspiration held by numerous cultures throughout history. That we can envision life on Mars owes to the imagination of artists and writers of books and plays and later film and television scripts who visually translated and conceptualized what scientists verified in their research that first air flight on earth was possible, then travel to the Moon was achievable, and now the culmination of this idea in planning actual human settlements on the fourth rock from the sun.

Writers on Mars's colonization point out that our collective world culture has set the stage for humans to accept that space colonization is not only possible but rather inevitable. Mostly from science fiction, space travel is taken for granted. Even the theater has experienced a Martian influence. In 1908, one of the most popular plays on the London Stage and later in the United States was "Message From Mars," written in 1892. It centers around a benevolent visitor from Mars who tries to change the main male character from a selfish, self-centered person to one who is more sociable and considerate (good luck with that). This favorable view of Mars and its possible inhabitants belies the later sci-fi trend to visualize the planet as teeming with raging winds, hostile landscapes, and horrific creatures that threaten human existence.

In stained glass, "creation" or "genesis" windows come closest to devising designs connecting with other planets. In this regard, the stained glass profession has already established an outer space connection back in 1974 with the "Window of Creation" incorporated into the National Cathedral in Washington, D.C. This window, created by Rodney Winfield, contains a piece of moon rock centered in an otherwise interstellar pattern. Attending the window's dedication were the three Apollo astronauts including Neil Armstrong, the first to set foot on the moon in 1969. We see that stained glass designers have had over fifty years to meditate on colors and settings to portray outer space in general and now Mars in particular.

Suncatchers and autonomous panels also have caught on as projectors of interstellar imagery. Favorite themes are Mars, Saturn, outer space, the Moon, and astronauts sitting on a crescent moon-- not to mention the E.T. or alien phenomena. All of this increases the likelihood that adventuresome and visionary members of the stained glass profession will plan to add Mars as a retail outlet or site for shop expansion.

If stained glass professionals are slow to act, they may be bypassed by other art media waiting in the wings to grab a Martian market share. For example, the ceramists joyfully proclaimed in a headline "Mars Has Clay!" in the January 1979 issue of *Ceramics Monthly*. The good news for ceramic arts came as a result of the first soil analysis taken by a NASA probe. More recently, the BBC reported in 2015 that British members of the European Space Agency designed an experiment to send stained glass to Mars on its rover to enable a robot to take "selfies" of the planet surface through filters of different stained glass colors. A number of societies have existed since the 1980s promoting space travel and urging science organizations, corporations, and governments to pursue spaceflight and colonization of the Moon, Mars and beyond. Some societies promote more art-friendly policies and design ideas than others. In the U.S. there is



even a political action committee supporting pro-space candidates. Also, there are online classes on “Space Advocacy 101” to promote lobbying and information dissemination skills for those seeking support for space agencies or space missions. Like human migrations in the past, some aspects will be predictable, but much will remain uncertain until just before happening.

Essentially, we can conclude this meditation with a response to the question of whether stained glass will be used on Mars--the answer is yes. How long the earth’s cultures retain primary influence is likely a century or more. During this time colonial settlements must prove viability. A scientific group estimates it will take 100 years to terraform Mars, reintroduce oxygen, rain, water bodies, vegetation, an ozone layer, and achieve sustainability from Earth. In the interim, the confluence of current cultures and religious beliefs will require the brilliance and color of glass art to esthetically accentuate new settlements on this distant world.

Meditation 2: The Architecture of Martian Habitats

Mars presents unique challenges for architecture, including extreme temperatures, reduced gravity, and high radiation levels. Designing habitats that can withstand these conditions while providing comfort and functionality is a formidable task. How will innovations in materials and construction techniques play a crucial role in shaping the built environment on Mars? How will stained glass integrate into these newly styled habitat and settlement designs?

Quote for reflection: “a chorus celestial rather than terrestrial.” --Abbot Suger on the aim of Gothic art and architecture in the 13th century. Quoted in Erwin Panofsky, *Abbot Suger on the Abbey Church of St. Denis and Its Treasures*, 1976.

Meditation: The creation of human settlements on Mars could present two momentous opportunities for glass artists. The first is to present an attractive and viable alternative to strictly functional architecture anticipated during the initial decades of the imminent struggle for human survival on Mars. The second opportunity is to create art works reflecting the Mars experience that can attract tourists from Earth for economic sustainability. In this meditation, the persona of Abbot Suger, a stalwart figure in stained glass lore, suggests a model to consider having encountered each dilemma and successfully established an enduring legacy.

In the first matter, Suger is one to consider vis-a-vis the architectural suitability of stained glass for Mars. Coming from a humble family background, the good abbot is a key figure in medieval stained glass history. It was his vision to use a multi-format decorated glass at St. Denis Church and Abbey near Paris. Erwin Panofsky’s 1946 publication on Abbot Suger, who led the St. Denis community during the mid-twelfth century and throughout the Second Crusade, presents Suger as a distinguished figure who could aptly be considered a patron of stained glass applicable to the hypothetical context of architecture on Mars. That is because he envisioned the spiritual uplift of the interplay of light and color accenting an edifice with mosaics, tapestries, sculpture as well as stained glass. Furthermore, he exemplified the ability to embrace a new architectural approach and elevate it to new levels in spiritual, philosophical, and aesthetic terms. Someday the residents of Mars will face the same crossroads: stay traditional or go inspirational?

Why all the embellishments, festoons and ornamentations? For Suger, the purpose of liturgical art is to support “a chorus celestial rather than terrestrial.” The celestial component also includes an attribution to the heavenly deity for steering donors and sponsors to provide gold, jewels, building funds, and even a maintenance fund for the stained glass. Suger’s modesty gave God the credit for shrewd investments and land transactions to further extend “divine generosity,” foreshadowing Calvinistic theological thinking.

However, Suger’s life also provides insights into a conflict analogous to the strained relationship that developed between the well-intentioned abbot and another religious leader known for his austere and ascetic approach-- St. Bernard. Is it possible that a significant rivalry might arise on Mars due to differing perspectives on aesthetics, architecture and interior design-- one side favoring vibrant colors and luxurious decorative elements, while the other advocates for restraint, functionality, and minimalism?

Initially, nations might engage either cooperatively or competitively over territory on Mars. Currently, the primary participants in interplanetary initiatives include the United States, Russia, China, Britain, United Arab Emirates and the European Union, alongside other nations waiting in the wings to enter the interplanetary space settlement race. Additionally, private companies such as Virgin Galactic and SpaceX are pursuing interplanetary expansion and settlement. Should space settlement become contentious, the perspectives of Suger and Bernard provide valuable frameworks for analysis. For the purposes of this discussion, we will characterize the "Terrestrial nation" as a Mars colonizer embodying the St. Bernard approach, while attributing Abbot Suger's influence to the concept of a "Celestial nation." St. Bernard, according to Panofsky, was born to a well-to-do family and he was a convert to Catholic doctrine. He founded an order of monks devoted to self-discipline, penance, self-denial, ascetic living and minimal stimulation from the material world. The architecture that Bernard chose to adopt was the most severe of the Romanesque era, that architectural transition from catacomb to austere functionality.

Suger, ironically, was born of poor parentage and lived humbly at St. Denis in a stark and somber cell while devoting his life to bringing light, spiritual uplift, and the Church’s message to those unable to read for themselves. There are multiple qualities to emulate in Suger during Mars’ settlement. Panofsky points to his fourfold extraordinary features as a patron of the monastic complex in which he employed his abilities as 1) a prince of the Church for spiritual authority and inspiration, 2) a secular ruler to provide political guidance and protection, 3) an aristocrat embodying an eye for quality craftsmanship and bringing about projects previously thought unimaginable if not impossible, and 4) a plutocrat with a knack for business, finance and profiteering to pay for all the opulence.

From Panofsky we can extrapolate that a Suger on Mars would operate like art patrons from the medieval days of the de Medicis, popes, kings and royalty. Under the patron’s guidance, building plans and facilities earn prior approval and budget, builders and artisans learn of their selection, and work is inspected and payment issued upon satisfaction (Panofsky smugly adds “or not”). On Mars, housing and architecture would reflect personal creativity and practical needs based on each person's role or purpose.

In matters of politics, Suger is said to be the father of French monarchy and the Divine Right of Kings. Panofsky says Suger was an original nationalist with two ambitions: 1) serve and strengthen the power of the French Monarch and 2) aggrandize the Abbey of St. Denis. Suger formalizes traditional ties to the Crown while carving out an independent and prosperous autonomy. He also provides ideological support for the “Divine right of Kings,” stating that monarchy supporters are aligned with God and Saint Denis, while their enemies lack respect for both the king and God. Panofsky further describes him as courageous, willing to use military force when needed. These qualities allowed Suger to bring his dreams into reality through shrewd political and business dealings and intrigue. The future political landscape of Mars may also require Suger-like political and financial savvy.

Suger’s appropriateness as a model for stained glass artists on Mars to entice earthbound visitors to the red planet applies to the entrepreneurial and business acumen among Suger’s enduring qualities. Panofsky observes that Suger demonstrated a notable ability to identify neglected, underutilized, or undervalued properties, transforming them into valuable assets that generated revenue for his abbey while simultaneously enhancing the surrounding community through property improvements. Also, he was willing to negotiate a price, and he was always looking for a strategic financial settlement to help his monastery. Similarly, he was able to reduce expenses for his decorative project by acquiring jewels, precious stones, and valuable metals from nearby monasteries. These institutions, following a vow of poverty, sold such items at prices comparable to those of a medieval pawn shop, with proceeds designated for charitable purposes. This is how Suger acquired many of the ornaments that were incorporated into chalices, monstrances, vestments, and sundry ornamentation.

Along with his administrative and business acumen, Suger was a visionary and promoter who Panofsky likens to modern movie producers, theme park designers, and World’s Fair promoters. His aim was to create a modern marvel to attract, amaze, and inspire visitors. This early vision of travel and tourism brought about one of the most essential aids to meditation-- the pilgrimage. A pilgrimage is intended to provide an opportunity to step away from daily routines, engage in several days of walking or traveling toward a significant destination, and visit one or more sacred sites for personal reflection on the experiences and insights gained. Upon returning, individuals may resume their personal and communal responsibilities with renewed clarity and purpose until their next pilgrimage. The concept of pilgrimage may be relevant to Mars for several reasons, such as religious practices, cultural customs, social movements, and the aspirations of pioneering communities. It is conceivable that future entrepreneurs on Mars could establish sites inspired by places like the St. Denis Abbey to serve as attractions for visitors.

One example of an imagined Suger-like attraction may come from the interrelationship between glass and concrete on Mars and the new properties they may contain. For example, since concrete on Mars will reportedly contain the ability to be reused and recycled, a demonstration of this quality could be designed for space tourists. Developers on Mars could invite space visitors to observe the new terrestrial materials fulfill what Abbot Suger referred to in a spiritual context as “regeneration and renovation.” Thus, a building, sculpture, monument,

or edifice constructed out of glass and concrete could be dismantled, hauled to a melting facility, and reconfigured through molds and forms and performed entirely by robots into a newly fabricated structure all taking place before an audience of space tourists over a period of days or weeks. Events of multi-week or multi-month duration will be the norm on Mars because space tourism will resemble the early days of transoceanic voyages on Earth during the 19th and early 20th centuries. Not only will travel time entail weeks or months, but return trips will be extended months apart because of Mars' and Earth's elliptical orbits.

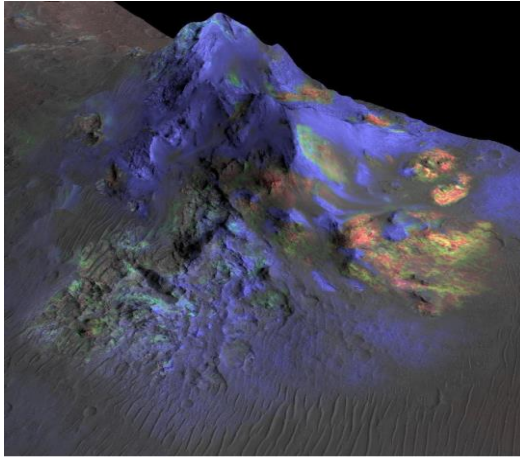
A second glass-related tourist excursion for the Red Planet would be a flyover and landing at the Alga Crater. This extensive surface indentation contains molten glass resulting from a meteor impact mixing with the silica and surface elements. The result is a breathtaking bluish cast captured in photos by various space agencies. It is possible that observers of the Alga Crater will resurrect a long-standing question asked of medieval stained glass on Earth-- how was the quality of blue achieved in the glass? Likewise, the accidental nature of the crater, the impact of heat from the meteor and the elements from Mars forming glass conjures to stained glass professionals, the story passed down from the ancient historian Pliny about the earthly origins of glass. In this tale of ancient seafaring traders from Phoenicia, a ship laden with natron used for washing caught fire on the sandy shores and molten glass resulted, identifying the elements of glassmaking: silica, ash and metals melted under intense heat. This story should be repeated on any tourism visit to the Alga Crater in order to illustrate the idea that glass is an interstellar medium.

Suger faced criticism for his expansion initiatives, perceived opulence, extravagance, and materialism-- chiefly from St. Bernard. In response, he addressed his critics, particularly the Cistercians, by referencing St. Paul. Suger argued that, while he may be regarded as a wealthy abbot in contrast to the ascetic Bernard, Pauline teachings suggest it is a greater transgression to deprive ceremonial vessels, which represent Christ's body and blood, of elegance and quality than to employ modest materials. This perspective marked the beginning of the Catholic Church's preference for high-quality decoration, a stance frequently challenged by proponents of Bernard's values. The question remains whether this rationale might one day justify luxurious ornamentation in Martian settlements.

One date to remember on Mars: June 11, 2144 will be the 1000th anniversary of the dedication of St. Denis Abbey.



Meditation 3: Material Considerations



Undoubtedly, the creation of stained glass on Mars presents unique challenges. The planet's harsh environment, with extreme temperatures, dust storms, and lack of breathable air, pose major obstacles. Transporting traditional stained glass materials to Mars may be impractical, possibly necessitating the development of alternatives from materials found and processed on Mars. Researchers and artists may explore the use of Martian resources such as silica and iron oxide (hence the red planet) from the Martian soil to create glass. Will the unique properties of these materials result in new visual

effects and colors, enriching the art of stained glass?

Quote for reflection: "In the course of its existence, beginning with its removal from the bench, a window is subjected to various detrimental effects: acid rain and pollution, acids produced by the wetting of the framing materials or the curing of the setting caulk, heat from the sun, soot and grime on both interior and exterior surfaces, water in the form of rain or condensation, various cleaning fluids, lateral pressure such as wind, other pressures from opening and closing, settling of the building and the window, vibrations from traffic, airplanes, organs, etc., and various accidental human actions. All of these affect elements of a stained glass window, the glass and its painted decoration, and the lead, copper, iron, wood, and stone that support it." Julie L. Sloan. "Deterioration of Stained Glass," *Stained Glass Quarterly*, Winter, 1986, p. 256.

Meditation: Like the silica tiles that allow the space shuttles to insulate the interior portion of the vehicle from the intense temperatures during vehicle atmospheric reentry, the basic component in glass will play a role in building Mars. Robert Zubrin, a former NASA scientist and leading exponent for human settlement on Mars, sees the permanent development of Mars as a neo-Darwinian case of "survival of the most innovative." In this initial exploration scenario, teams of scientists will set up labs and shops to analyze the material conditions of the red planet. From these research facilities, they will emanate studies ranging from water extraction, greenhouse development, material analysis, and manufacturing equipment designs for ceramics, metals, and glass.

Survival will be dependent on how quickly site shops and small factories are established for producing items essential for continued living. In the scientific community, a consensus favors glass fibers and glass reinforced rebar to prevail because silica is in-situ. Thus, cement and other building materials will be in abundance and reduce the costs of transporting materials from Earth. It will take a teams of scientists channeling their inner Dominick Labino to successfully set up a) new glass formulas along with required furnace and annealing specifications, b) new connective materials like cement or metal channel for glass art, c) designs for glass art works, and d) robotic assembly for glass products. This last requirement will be due to a forecasted labor shortage during the early years. In fact, robots are expected to do most of the

construction and manufacturing in this new settlement because of the paucity of human labor owing to transportation issues and the uncertainty of the planet to support more people. In summary, it may require a few talented technical innovators like Dominick Labino to attend to the myriads of technical details necessary to pull off glass art manufacture on Mars.

When ruminating over materials, technology, the need for innovation, and challenges posed by Mars' atmosphere, no other person would meet these complex hurdles more than a reincarnation of Dominick Labino, if we can borrow from our blown glass cousins. Can we deny recognizing the achievements of someone who made space travel possible by heading the research team to discover glass fiber insulation that formed the heat shield to enable space vehicles to reenter the Earth's atmosphere withstanding heat that can exceed the temperature of a glass kiln's interior? Nick Labino is the penultimate combination of scientist, inventor, material technology engineer and later a prize-winning glass artist and co-founder of the Studio Glass Movement along with Harvey Littleton, Marvin Lipofsky and Dale Chihuly. Who else comes to mind with listings in *Men of Science*, *Who's Who in Commerce and Industry*, and *Who's Who in American Art*? Also, among his laurels is winning Corning Museum of Glass' Rakow Prize as well as induction as a Fellow into the American Ceramics Society.

For anyone not familiar with Dominick Labino (1910-1987) he graduated in engineering from what is now Carnegie-Mellon University in Pittsburgh in the 1930s. His early and middle years were devoted to a wide range of glass technology innovations. He ultimately held 57 patents devoted to new glass compositions and the machinery and tools necessary to process the glass discoveries. It is the combination of scientific mastery of glass composition, heating and refraction, from Egyptian sand-core vessels to space shuttles, which could hold the key to innovation upon Mars' colonization. The presence of glass on Mars may require someone traveling there in a purely scientific capacity to turn to glass manufacture, unlike the original days of the Studio Glass Movement (1960-1990).

In his 1968 book *Visual Art in Glass*, while blown glass is the focal point, stained glass is included and the contributions of French and German stained glass makers were recognized by him for the intense quality of colors in the windows. Here he articulates the discovery, also echoed by Lawrence Saint and James Rosser Johnson among others, who reached the conclusion that it was the impurities in the chemicals that added to the light refractions along the surface of ancient stained glass. Today, Labino claims the opposite problems exist of glass using chemicals that may be too refined, although modern glass making has overcome this problem.

Most important, Nick Labino, as are nearly all engineers, was a problem solver. This mindset, along with proper training and experience, is a key factor needed for the pioneers of Mars. While his scientific credentials as a glass scholar are unparalleled, often overlooked are his contributions to the technology of the Studio Glass Movement. He played a role in inventions and modifications of tools, furnaces, and kilns. He was available to his glass art colleagues to resolve a new set of problems from his industrial and commercial life.

His 1968 book also gives a short historical narrative of the rise of blown glass as a contemporary art form in the 1960s. The book shows Nick's glass studio on a farm in Grand Rapids, Ohio outside Toledo. One time, when visiting his studio in the late 1970s with a blown glass class from Ohio University, I came away with a complete sense of awe and deep-felt respect for someone who achieves a lifelong project to gain mastery over glass. Besides his comfortable home, gracious demeanor, and generosity of his personal time, I focused less on his glass-making studio, which was state-of-the-art for the time. More impressive to me was Nick's huge personal library replete with ceramic journals in German, Russian, Italian and others. He combined both depths of knowledge about ceramics and glass making with a breadth of knowledge of the role others from different countries played in glass development across history.

In summary, few match his depth and breadth of knowledge. These qualities will serve as a blueprint for the person or partnership of such persons to bring the process of making stained glass on Mars with new methods and materials that expand the boundaries of the glass art form. One factor that would have intrigued Nick Labino is the presence of large quantities of silica on Mars as well as molten glass resulting from a meteor impact. His analytical mind would undoubtedly concoct a protocol for breaking down the chemical composition and reformulating the technical requirements for reproducing the equipment and tools needed for full scale production. This should be considered all in a day's work for an expert like Labino because for over a millennium the stained glass and glass art professionals have stood among those at the forefront of glass technology.

Meditation 4: Adapting Techniques

The reduced gravity on Mars will require adaptations in the techniques used to create stained glass. Artists will need to experiment and innovate, finding ways to cut, assemble, and install glass in a low-gravity environment. What role will robotics, custom made machinery, or altered gravity furnace and kiln technology play the Martian colonial experience? Or will Mars' technological requirements influence the reconsideration of traditional stained glass (lead, zinc, or copper foil) for alternatives like faceted, fused, laminated, slab, and many other new forms? Some of us remember farbigem and gemmeaux. What other adaptations could lead to new artistic expressions and possibilities?

Quote for Meditation: "It [faceted glass] returns to the primary function of stained glass to transform a wall from a solid, unyielding object to a cascading, fluid mural of shimmering beauty. While the medieval craftsman, joining small pieces of glass with lead to make intricate designs, achieved the same effect for Gothic cathedrals, the earlier Byzantines transferred their mosaic patterns into colorful window designs. Present-day development of the technique stems directly from this beginning." John Gilbert Lloyd quoted by John Kebrle in "Dalle de Verre: History, Characteristics and Functions," *Stained Glass Quarterly* v. 97 No. 4, Wi. 2002, p. 294.



Quote for reflection: “Bob loved to stargaze and was very knowledgeable in astronomy.” Otto C. Winterich on Robert “Bob” Benes, “A Stargazer and Astronomer,” *Stained Glass* Su. 1982, p. 144.

Meditation: While the environment of Mars will require adjustment for traditional stained glass techniques, history shows that the profession is most likely to prevail. First blush indications show that traditional stained glass connective channels like lead, copper or zinc may be difficult to produce on Mars. With silica present in abundance, material technologists predict that concrete and even rebar may be manufactured in situ from spun glass. If rebar is possible from glass, could this be adapted to make glass came instead of lead or zinc? Also, factors are whether the solder, putty, and sealants meet atmospheric conditions.

If the traditional mosaic style of flat glass is not suitable for the red planet, there is a plethora of other techniques that could be more appropriate. These include faceted, laminated, fused, and slumped glass. These seem likely for consideration on Mars if adjustments can be made to furnaces, kilns, annealers etc. One episode that might illustrate the process for adopting new techniques on Mars is to follow the creation and use of dalle de verre on Earth.

Known better as faceted glass in the U.S., dalle de verre originated in modern-day France, but its style harkens back to Byzantine times. The ancient uses of large chunks of colored glass were stymied by problems with connective materials. Putting pieces of glass in windows held by mud, plaster, alabaster, or soft metals all presented problems of deterioration and weathering. Thus, stained glass artists will be no strangers to atmospheric problems they could encounter on Mars.

In the 1930s French artist Auguste Labouret resurrected the ancient idea of thick glass forming a mosaic pattern, but this time modern concrete is the adhesive. In an early venture, Labouret used wood and metal frames for one-inch-thick poured slabs of glass inserted into a larger window framework to construct an overall pattern. Then he experimented with chunks of glass arranged in a mosaic pattern and concrete poured between the pieces of glass to form a glass panel. One of the distinctive features of dalle de verre is the clarity of color that transmits through the thick glass pieces aided by negative light areas surrounding the glass produced by the cement. Labouret produced this innovative technique at the age of 78, a testament to the adage “young at heart.”

The torch for this technology was taken up by Gabriel Loire in the 1950s. His works of dalle de verre were soon being installed throughout France and Canada. The Willet studio in the U.S. became interested in this technique and sent representatives to France to study the process. Both Loire and Willet faced off in a bidding process in 1956 for the first major U.S. dalle de verre installation destined for the First Presbyterian Church of Stamford, Connecticut. Loire won the bid. But Willet Studios persisted, and eventually in the late 1950s and 1960s received many commissions along with other SGAA studios. Eventually, faceted glass and the accompanying products of cement and later epoxy to connect the glass into an insertable panel became part of the stained glass profession and from the 1960’s forward.



In the early stage, artists experimented with designs that harmonize with the dalle-de-verre technique. The glass panel consists of large chunks of glass, either cut straight with a diamond saw or chipped around the edges with a claw hammer leaving facets or grooves around each piece's perimeter. Each glass piece is nearly one inch thick, four times thicker than traditional leaded glass. The pieces are laid out on a table with a frame, a layer of sand is poured between the pieces of glass, and the adhesive, cement, epoxy or otherwise, is spread between the glass pieces on top of the sand to form a solid panel. After curing and hardening when held to the light, the panel will cast positive light through the glass and negative shadow in the cement.

Artists liked the dalle de verre technique because it captured the spirit of the early mosaic patterns that emerged in early medieval times from the Byzantine period into the Christian era. Aesthetically, it harkened back to the basics of light, color, and pattern in its purest and simplest elements. Additionally, not requiring painting and annealing saves the hefty personnel costs of hiring flesh and figure painters. Even more significant to designers and artists and possibly to conditions on Mars are the evening and nighttime features of faceted panels. At night, the thick glass projects a negative light with positive patterns picked up from the surrounding connective material (cement or epoxy). Thus, a completed and installed panels have a variety of light casts throughout the day, looking brilliant at times and muted other times and each accented with the brilliance of a chipped facet or straight cut from the deeper color of the glass. In essence, early designers realized this was a versatile artistic medium if the deterioration problem could be solved. One of the anticipated delights of Martian settlement for stained glass artists will be to observe firsthand the effects of daylight and nighttime on the first installed faceted glass panels.

But the story is not finished, and the Mars lesson is about to surface. Here we are faced with age-old questions, what is glass? And what is concrete? By the 1960s, those dalle de verre windows constructed a decade earlier were experiencing structural problems. Moisture and temperature variations led to the glass and concrete separating, in some cases pieces of glass falling out of their setting. The separation occurred because glass varieties expand and contract at different rates alongside concrete which cures or stretches based on climate conditions. What was needed was an adhesive material that expanded and contracted with extremes of heat and cold, remained pliable yet strong enough to support the entire glass panel.

A research chemist out of St. Louis named Robert Benes looked at the problem and concluded that epoxy resin could be the answer to the dalle de verre dilemma. Benes was familiar with the work of German chemist Pierre Castan who discovered the extraordinary adhesive qualities of a thermoset resin soon to morph as epoxy resin initially used in aircraft and highway/bridge construction, structural reinforcement, flooring and construction materials, and most recently in 3-D printing, one of the defining technologies of Martian settlement plans.

Benes' reasoning is that epoxy accommodates the expansion ratio of the glass, thus making a lasting fit. He told clients that his material was lighter in weight yet stronger and more resistant to extremes of weather. Robert Benes then established his own company, and Benesco became a household word in the faceted glass business. In fact, he was dubbed the father of faceted

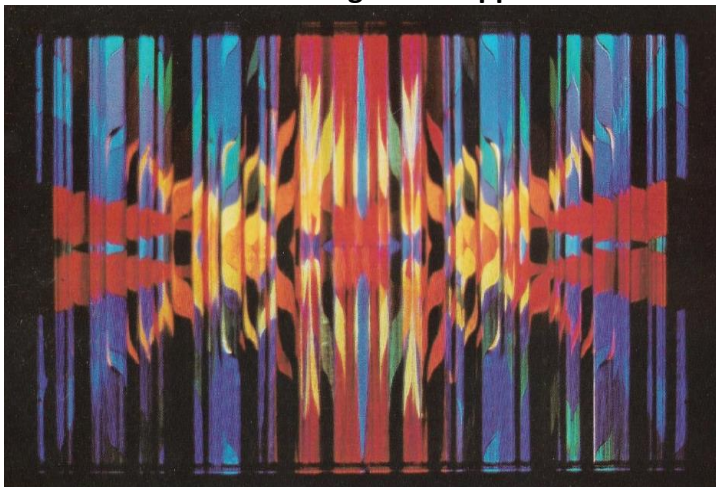
glass by some SGAA members and at the time of his passing in 1982 he was beloved by his studio customers and professional associates.

What made Robert Benes stand out was his ability to endure the research and development process, find a suitable application, form a commercial vehicle to produce and provide the material, and then have the ingenuity and marketing savvy to sell his product both in the U.S. and around the world. This inventor/producer/marketer persona may be exactly what is necessary for the success of the colonization of Mars.

Following the Benes model will require an individual well versed in material science and technology who can discover, patent, produce and market a composite product to adhere glass pieces into a pattern. This will necessitate an individual who is comfortable in the laboratory, familiar with production machinery, and sensitive to the artistic potential of a glass product. Once the product is complete, the developer must convince the artistic community of its value and encourage its use. For Robert Benes this meant traveling to France to convince Gabriel Loire and other of the superiority of the epoxy product over traditional cement. In addition, he sponsored design contests, faceted glass production workshops, and a presence at all gatherings of artists working in this media. Innovation, marketing, and good designs are the hallmarks of new product transfer, whether it is in the domestic or interstellar market.

It is also a fitting conclusion to acknowledge Robert Benes' other connection to stained glass and Mars-- his love of astronomy. Benes was a keen observer of the stars and their positions in the sky. With the placement of faceted glass in a facility on Mars would come a likely fulfillment of one of Robert Benes' fondest dreams, the dazzle of light and color on a distant world that he was only able to view from afar.

Meditation 5: The Challenges and Opportunities



Creating stained glass on Mars will undoubtedly present challenges, from the transportation of materials to the adaptation of techniques to the Martian environment. However, these challenges also offer opportunities for innovation and discovery. The process of making stained glass on Mars could lead to new methods and materials that expand the boundaries of the art form.

Quote for reflection: "This is what you might call a free-wheeling enterprise, finding one's way without too much preconceived planning, letting the glass tell you where to go. My process developed because I was drawn to the material in its pure colors and unlimited and challenging shapes. To us it in all its beauty just as I found it was the spur to invention." Frederica H. Fields, on 3-Dimensional Works, SGAA *Reference and Technical Manual*, 2d ed. 1992, p. 272.



Meditation: Among the challenges of settlement on Mars, the transportation of materials will be an exercise in balancing travel logistics, weight, cost, storage, etc.-- not unlike the problem facing stained glass makers in remote locations on Earth. Scientists suggest that people and supplies heading to Mars may first travel to a lunar or orbital transport base before departing for or returning from the red planet.

At the moment the travel time from earth areas to Mars is measured in months, giving a new dimension to the problem of the supply chain. No doubt initial transportation costs of materials, both raw and manufactured, will be exorbitant, and space and weight limits will keep transportation costs high. Like any new technology, some enterprising firms may figure out economical ways to ship goods to Mars. Alternatively, the focus will likely shift to producing glass art materials on site, requiring adaptation of Earth-based glassmaking equipment for Mars' atmosphere.

Other challenges include understanding the atmospheric influence that Mars has on glass used in window openings. Artificially lit traditional stained glass may not be problematic. Nor are suncatchers, mandalas, lamps and lighting fixtures, sculpture pieces, or autonomous panels. How protective glazing will work on Mars depends on the architecture chosen. The Martian atmosphere may preclude the use of lead or copper foil as the connective material for glass pieces. In this case fused glass or glass fiber-based channel and rebar in place of lead and iron may become popular. Scientists at Northwestern University tested Martian style concrete and report it to be more than twice as strong as concrete on Earth as well as 100% recyclable. This leads us to possible innovations.

Innovations will present an abundant opportunity to bring a new perspective on glass. New products will likely develop as permanent settlements form, cultures become clearer, and scientific analysis reveals Mars's chemical, energy, and atmospheric conditions.

Glass fusing looks like a promising technique to ascend to Mars. The potential for producing glass on Mars is discussed in space colonization research. These discussions generally do not address whether elements necessary for coloring glass are present. Additionally, glass production on Mars would involve adapting kilns, monitoring coefficients of expansion rates, and managing fume ventilation.

One innovator in stained glass who seldom gets recognized for her work was Fredrica Fields. Her life speaks to those who resist the lure of big studio employment or large block-buster commissions and instead set up a self-operated studio. Fredrica Fields is also an inspiration to the many women in stained glass who become professionally active after starting a family. Her career exemplifies how someone can turn a common device into a far-reaching concept. For Fields, as a beginner in stained glass it was necessary to make a light box to view glass colors in her poorly lit home basement studio. After marveling the consistency of the lightbox to uniformly illumine glass colors, the idea surfaced for creating three-dimensional stained glass panels. Many trials and many errors occurred before she developed a series of protocols for box construction and glass arrangement to achieve a final piece.



From this simple beginning with a lightbox and 3-dimensional boxes, Fields went on to become a studio member of the Stained Glass Association of America (SGAA) and was active in many association events, including writing on her technique for the *SGAA Reference and Technical Manual* issued in 1989 and a second edition in 1992. Her background includes a degree from Wellesley College, study at the Art Students League and in France, marriage and three children before centering her attention on stained glass and later working with Frances Van Arsdale Skinner of the Connick Studio in Boston. Although she was highly skilled as a painter, Fredrica Fields worked primarily in abstract, fusion-formed windows built into container boxes. The total effect projected an image of fluidity. Colors remain distinct but blend seamlessly, without lead or copper foil, a fusion of medieval colors in a modern abstraction and with a blend of serendipity amid alert artistic control.

Her writing about her work shows that Fields was an innovator in her approach to stained glass. As mentioned in a previous meditation, Fredrica Fields was destined to become a solitary force in stained glass and three-dimensional work owing to her parent's interest in the psychic ability of Edgar Cayce. Cayce developed a reputation for both healing people and forecasting future events. He took no money for himself and scheduled readings of individuals with a stenographer present to record the transaction. At her parents urging, Fredrica became case number 499-2 in 1934 when she was 22 and about to marry the future Brigadier General Kenneth Fields, a Harvard graduate with a master's in engineering from M.I.T.

In 1977, Fields came across Cayce's stenographic copy of her reading. There in writing was Cayce's forecast that Fields would have activity in art "that has to do with a great more than as from stained glass on those that make for activities in the prism reactions to influences as related to things and to people, will be of great interest." Of note is that Cayce accurately predicts her future artistic profession at a time. According to Fields herself, that art was the furthest thing from her mind. But his statement saying her "activities in the prism reactions to influences as related to things and people" mirrors Fredrica Field's intent for developing 3-dimensional glass. Her idea was that the 3-D boxes with layered and fused glass engaged in an intimate viewership rather than the bigger audiences examining large scale windows. At the same time, the multi-dimensional appearance alters as the viewer moves or changes angles. Moreover, her style projects liquescence with no sharp angles or lines, and her composite images often project medieval colors with yellow dominating and red and blue supporting and other colors accenting. The finished work then assumes the appearance of an aurora borealis of the Middle Ages.

It was only in 1977 that she remembered the reading and seeing the written prediction prompted Fields to contact the Cayce Foundation and report the outcome of his reading. Fields achieved Cayce's prediction of placing windows in the National Cathedral in Washington, the Meditation Room at the Cayce Foundation Center in Virginia, and the Corning Museum of Glass. Other notable installation by Fields includes the Corcoran Gallery of Art, the Smithsonian, Concordia College in Bronxville, N.Y., as well as churches, colleges, hospice, and private collections. As a studio member of the SGAA, Fields was presented with its Award for

Excellence. More significant were the legions of students, clients, readers and colleagues who admired her pioneering achievements in 3-D, fused and alternative glass art.

In a crowning moment, her contributions writing about stained glass and as a studio owner and designer earned a significant boost from reviewers at *Professional Stained Glass* magazine. In a scathing negative review of the 1989 edition of the Stained Glass Association of America's *Technical & Reference Manual*, Fields gets one of the rare compliments. Written by the editorial team at PSG, they mention that Fields' section of the manual on three-dimensional glass "puts the other writers to shame" for its clarity and thoroughness, enthusiasm projected, and panels of her work which were called "unusual and quite exciting." This is high praise from a critical source and attests to the artistic height she achieved. Fredrica Fields is someone who taught herself the technical side of fused glass and 3-D boxes. As she began to understand the technique, she was able to render designs suited to the new medium.

On a Martian settlement, a future incarnation of Fredrica Fields could be a welcome addition. Her predicted future in stained glass was from a man who claims that Mars was once thriving and flourishing. For the Akashic records, which Edgar Cayce claims is the universal and eternal recording of all entities to be entered in the "Book of Life," I must admit to extreme skepticism about the seer. Nonetheless the example of Fredrica Fields raises interest. In two studies of Cayce's 14,000 readings, one academic team looked at Cayce's medical pronouncements and found them nearly 85% accurate while a second study found nearly the same ratio of correct climactic predictions. Moreover, Mars plays a significant role in the psychic cosmology of Cayce. In his writings he contends that Mars once was active with life so that humans are now in the process of reclaiming the planet for inhabitation. This supports the idea that earthlings are preordained to settle the red planet.

For those who are followers of both Fields and Cayce, there is another Cayce prediction that should give U.S. and European stained glass artists pause. According to Cayce, who died in 1945, the West will eventually decline followed by the rise of Asia, and particularly China. As this prospect begins to attain plausibility, glass artists may be better off tapping into Asian markets as opposed to exclusive focus on western outlets. Versatility in design and knowledge of colors and symbols from eastern cultures will require focus and study, but the rewards may be worthwhile.

Fredrica Fields' ability to teach herself and develop new techniques on her own speaks well to the future of the art form. Her style, the fusion format and container box window, is versatile enough to install in a window space or mount on a wall and backlight it. This could fit into the designs of Mars' habitats. Let us hope that Martian settlements allow the individual artist/inventor to reside and make artistic contributions. Even better, let artists pass on as Fredrica Fields did-- working on her next commission.



Meditation 6: The Spiritual and Cultural Impact



The interplay of light and color in stained glass has a profound impact on the observer, often evoking feelings of awe and contemplation. Historically, stained glass has been used to depict religious narratives and convey moral lessons, serving as a medium through which divine stories are told. In secular settings, it continues to inspire and elevate the human spirit, reminding us of our capacity for beauty and innovation. What requisite spiritual and cultural needs could stained glass fulfill in the initial isolated human existence on this other

planet?

Quote for reflection: "... In a stained glass studio a library can aid sales promotions, provide ideas for designers through the study of other windows both historic and contemporary, supply source material for subjects; and prove the accuracy of concepts, texts, portraits, dress and all sorts of details. Besides books and magazines, the library should have a clipping file, the visual record of windows already executed, sketches and/or cartoons, photographs, slides, copy machines, and of course, a librarian." Helene Weis, "The Role of the Library in a Stained Glass Studio," *Stained Glass*, Sp. 1986, pp. 66-67.

Quote for reflection: "I was always taught that art, by definition, is a conscious effort to imitate, supplement, alter or counteract nature by the human production or arrangement of sounds, colors or objects that affect the sense of beauty. With this basic premise in mind, how can stained glass be anything but art? A window certainly begins as a rendering created as a conscious effort to create or imitate an image that affects the sense of beauty. Numerous subsequent steps, in my opinion, exemplify pure artistry. The selection of the individual colors or the applications of surface decorations are all performed as a conscious effort to affect the sense of beauty." Kirk D. Weaver, former SGAA President, in *Stained Glass Quarterly*, Wi. 1999, p. 289.

Meditation: In her above quote, a 1980's summation of special librarianship applied to stained glass studios, venerated librarian Helene Weis shows why she was a mainstay at Willet Hauser (aka Willet Studios) in Philadelphia from 1956-2007 and a stalwart contributor to the SGAA through her intrepid work as Associate Editor of *Stained Glass*. Generations of practitioners of the vitreous arts who encountered Helene Weis undoubtedly benefited from her monitoring and reviewing new publications across a variety of media. Helene's most notable contribution to stained glass may be her patient explanation of the role that research and record keeping plays in the success of a studio and its designers. She showed enormous patience combined with clever analogies explaining the basic uses of research tools. Helene also championed the work of designers she encountered who did not receive significant publicity, but whose designs represent skill, expertness and virtuosity. Whether it was a long-time Willet artist or an emerging talent, Helene left a legacy of interviews to record the artistic achievements of others.

Also, her dogged research on women's contributions to the profession in a frank and creative manner resulted in a core of readers. Those unable to visit her at Willet Studio's library facility missed Helene's warm greeting, willingness to dig up even the most obscure factoid, and cheerful demeanor throughout the day.

Her quote here addresses this meditation topic because libraries, archives and special collections all serve to record and preserve the cultural and spiritual ideas of past human history. Meeting the information needs of colonists on the red planet will be an interesting phenomenon. Will requests override for technical information, symbolism, color theory, or design styles? Or will enterprising glass artists of the future discard the past and seek a new planetary artistic standard? The likely answer is that the former and later history on Mars may lead to the latter.

During her lifetime (1922-2007) Helene Weis kept the stained glass profession informed of craft developments—both in the United States and around the world. Helene came along when the librarian profession itself was shifting from waiting on foot traffic and shushing noisy patrons to going out and finding users and letting them know what is out there. One style is passive and the other is active. Helene was the latter and the art world was her client. Besides monitoring books and journal articles, for decades Helene helped organize multimedia (slides, tapes, videos) for students of stained glass to view. These items were advertised for loan in *Stained Glass* and members were encouraged to take advantage of the wide variety of topics, from the ethereal to the material.

Whether it be new tools and techniques, design innovations and her favorite topic—iconography, Helene was a singlehanded clearinghouse on the latest breakthroughs. Helene authored many articles detailing methodologies for researching images and doctrines derived from scripture and sacred texts. She also followed the latest unveiling of research about ancient stained glass and new discoveries about the emergence of styles and schools of glass painting that will serve the profession for the future. Her life was devoted to promoting liturgical art. It remains to be seen whether a future Helene Weis, dedicated to collecting, arranging, and disseminating information about stained glass will ascend. On Mars, artificial intelligence may be the means for discovering artistic information, and a Helene persona or informatics crew may be the facilitators to package and harness AI's potential.

The role of libraries and archives in preserving humanity's artistic and cultural legacy becomes even more vital in the context of interplanetary colonization. As stained glass studios on Mars begin to evolve, these repositories could provide the foundational knowledge and inspiration needed to adapt earthly traditions to extraterrestrial environments. Housing vast collections of design archives, material studies, and iconographic references, they would ensure continuity while allowing for innovation in a new setting. Libraries, physical and virtual could serve as both a tether to Earth's rich stained glass heritage and a launchpad for pioneering styles that reflect the Martian experience.

There are three considerations that arise about library materials and information on stained glass to assist with stained glass production on Mars. First is the scope of research materials

used for conception and design of the art object as well as supportive information needed to assist in its physical creation. Will colonists be able to bring with them what they need, or will they be forced to sublimate their research requirements until library or archival facilities are developed on Mars? Second is the type of access to information. Many libraries and archival facilities offer restricted access to rare materials, which are not always available on the Internet. Digitization of printed matter becomes relevant here if it allows remote access to otherwise rare and significant items. But remote access from Mars will need to be established, and this will raise a third problem. This third consideration is the communications time lag from Mars to Earth. Mars colonists may be faced with a situation like batch programming from the early era of computing. During the 1950s through the 1980s, large data queries at corporations, research departments, and academic computing facilities were submitted during daytime work hours, and then these programs were run over night in order of submission. The leading frustration was to find a programming error such as a misplaced punctuation mark preventing the successful program function. Mars colonists will anticipate advancements in technology that enable real-time communication with Earth. Most likely the first Mars colonists will patiently await delayed responses from Earth for information queries or make do with other sources.



If those on Mars are able to find individuals like Helene Weis in their settlement, they will benefit from her sage advice to create a “practical retrieval system” to acquire information and to build a documentation process for each work an artist creates. Could artificial intelligence be instructed to assemble a Helene-like posting and analysis of human liturgical and secular symbolisms, iconographies, readings, theories, images and so on for Mars’ artisans to access. The follower of these “Weis” words of advice will result in works of color and light that elevates the spirit and creates a thing of beauty on Mars matching Kirk Weaver’s well-schooled lessons of pure artistry quoted above.

Meditation 7: The Integration of Art and Functionality

In envisioning Martian architecture, we must explore how art can be integrated into functional spaces. Stained glass, with its ability to transform light and create ambiance, could serve as both a decorative and practical element in Martian habitats. It could be used to enhance natural lighting, provide psychological comfort, and create spaces of reflection and beauty.

Quote for reflection: “The time for a rational perspective into the attitudes

and phenomena of light admittance into architectural space is certainly upon us. We must first define for ourselves the meaning of the phenomenon of light transmission in relation to architectural stained glass ... These two terms are of utmost importance in the function of the architecture—projection and procession—their intersection being the spiritual. Light is essentially what architecture is all about.” James Carpenter, *Stained Glass Quarterly*, Su. 1989, p. 134.

Quote for reflection: “The artist in stained glass must be attuned not only to his or her own creative integrity but also to that of the architect and the users of the building. This is the method of creation that has made the art of the cathedrals retain its attraction for the modern viewer. The modern world is far more complex in its construction and financing than was the medieval era with its nobility and powerful clerics, or even the Renaissance with its elite circles of educated connoisseurs and cultivated artists. As architecture has again emerged as one of the dominant forms of artistic expression, we have seen art movements seek to eliminate the hierarchy that had crept into modern thinking between art and craft ... As architecture has become more flexible and attuned to sensuality, the place of glass will continue to expand. Artists, as always, will look back to historic times when structure, adornment, and feeling united ...” Virginia Chieffo Raguin. *The history of stained glass, the art of light, medieval to contemporary*, 2003, p. 281.

Meditation: Space travel and human habitation on Mars will contain survival risk factors which should be a strong reality check for those considering becoming pioneers. The short list of risks includes nuclear war, pandemic, climate change or asteroids—either on Earth or Mars. Surviving in an unfamiliar environment may involve facing epidemics, radiation risks, limited supplies, and social isolation. Some psychologists suggest that early settlers will have extreme anxiety levels over existential risk. It is upon this realization that stained glass, in all its functional as well as fanciful features, can justify its ability to provide psychological comfort.

In preliminary architectural renderings of habitats on Mars, the predominant style is a round or domed set of buildings arranged in a circular cluster. Within these domes, the rooms that seem most accommodating for stained glass include private crew quarters, a living room, an exercise and leisure room, garden, and work or lab spaces. One design includes a quarantine room, which may also benefit from stained glass for psychological comfort.

One individual who can serve as a directional beacon for glass artists envisioning expanding their media to Mars is James Carpenter. He receives international recognition today for his multi-focal achievements in glass art design, glass technology development, and architectural integration of newly developed glass art. As an SGAA Artist/Designer he excelled in his accomplishments. Besides winning a MacArthur Foundation fellowship to explore new ideas, Carpenter also garnered prestigious architectural awards from the Danish Villum and Velux Foundation and Britain's Royal Society of Arts. As a consultant for the Corning Glass Company, he added the needed technical background to support his internal passion for working with architecture to bring more light into public places. A budding humorist notes that Carpenter needs to get more serious because he is always making light of the situation.

Jaimie Carpenter's pilgrimage in glass began at the Rhode Island School of Design (RISD). His initial desire to become an architect was detoured by a newly emerging art form known as blown or hot glass. As an undergraduate at RISD, Carpenter studied glass art under Dale Chihuly and thus the two became legends as part of the Studio Glass Movement. Carpenter's early approach included photographs on glass within the design. After spending stints at several schools teaching glass art, he established in 1979 James Carpenter Design Associates which boasts an international clientele.

With glass art professionals the fundamental question for investigation is "what is glass?" This question was taken up in 2016 by Dr. William LaCourse and Megan McElfresh who remind us that the alchemist symbol for glass was the infinity sign above a cross representing the amorphous state of glass, belying the illusion of it as a solid and static silica composite. This searching for the essence of this vitreous material eventually pushed Jaimie Carpenter to originate "dichroic glass," a patented and uniquely developed type of glass with special metal oxide coating to give the material a transparent yet reflective appearance. Carpenter's innovation allows his art works to function as light filter, solar influx controller, and an ultraviolet ray shield. This combination of art and function addresses a primary need for habitats on Mars. Whether his dichroic glass discovery sufficiently satisfies conditions on Mars is yet to be determined. Is this a promising functional method to protect settlers from the harsh environment while transforming light and serving to decorate the habitat?

Carpenter's approach to glass art and architecture goes beyond the typical artist/architect proclamations of symbiosis. One observer notes that Carpenter blurs the line between art and architecture, with each integral to the other. One example would be the award-winning work JCDA received for LED lighting handrails. This clever innovation adds artistic visual enhancement to pedestrian safety—art and function. Not only does the artist complement the architect, but each is beholden to engineers, particularly civil engineers, for a structurally strong, functionally sound, and artistically transformative structure. With this wholesome trinity, Carpenter can

design esthetically pleasing glass art using strips with dichroic glass addressing functionality by partially muting the sun's harmful effects while addressing the artistic side with designs that have both a psychological and cultural impact.

His focus is on creating environments with glass. Carpenter's work has been applied to corporate headquarters, office buildings, museums, public spaces, and visitor amenities. These include installations in Israel, Hong Kong, Dubai, Europe, and throughout the United States. In America, Carpenter dazzled critics with his St. Louis Arch Museum expansion project. Here he designed an open and airy ceiling solution that gave the new space what one commenter called "a lightness of being." Most poignant for Americans remembering the September 11, 2001 events were his work with Skidmore, Owings on the 7 New York City project replacing the twin towers. Other noteworthy achievements are uniquely designed glass and aluminum lens ceiling for the U.S. Courthouse in Phoenix and a suspended light pillar at the U.S. Courthouse in Salt Lake City.

Carpenter's research reveals four types of light interactions with glass: transmission, reflection, refraction, and diffusion. By comprehending these phenomena, the artist engages an active observer with works that alter visual perception because the glass is transformed through movement, viewing angle, weather conditions and so on. The four movements of light fall under Carpenter's heading of refraction; the title of a book issued in 2006 about his work.

James Carpenter and his JCDA firm are most likely to be called upon when new construction begins on Mars. One reason is because Carpenter and his design team have an international following with installations in countries' intent on establishing habitations on Mars. Moreover, as the race to build settlements on Mars commences, he will have both a proven record of successful innovations plus experienced research and development protocols in the materials most likely prevalent for in-situ development. Finally, Carpenter has built an organizational team of skilled designers who can work with engineers, architects, clients, fabricators and installers to bring about exciting design concepts. This will transfer well with counterparts on Mars upon reaching full understanding of atmospheric conditions and inhabitant needs.

James Carpenter's life's work sets the pattern for those in the stained glass and glass art profession seeking entry into the Martian outpost. Understanding the nature of glass is a prerequisite. This is followed by developing a design style in glass art meeting structural, environmental, and architectural conditions unique to the physical setting. The expected outcome is an architectural structure that is functional, artistically attractive, and psychologically uplifting while providing maximum protection from harmful external elements.

Meditation 8: A Testament to Human Ingenuity



Creating stained glass on Mars would be a testament to human ingenuity and adaptability. It would demonstrate our ability to bring art and culture to new worlds, bridging the gap between the familiar and the unknown. As we venture into the cosmos, stained glass would serve as a beacon of hope and a reminder of our shared humanity.

Quote for reflection: “Despite the realities of space travel, world wars, the effects of mass

media, and the bomb, most glass artisans of this century [20th century] have continued to work within the traditional standards of stained glass. Those standards, holdovers of an aesthetic mentality from previous centuries, have frequently been translated into bad reproductions of styles that are not relevant to our time. ... The new breed of glass artist presented in this book seem determined to explore the medium for all of its possibilities to shape it into a true art that is as responsive to the individual in the current world. The shift from craft to art is complete.” Otto Rigan in *New Glass*, 1976, p. viii.

Meditation: If anyone is prepared to lead the way for the establishment of stained glass and glass art on Mars it is Otto Rigan. One reason is that Rigan’s early life can be a lesson for future Martian settlers seeking to change directions from earth-based dominion to autonomous Martian cultural expression. Rigan has an ingenerate receptivity to outer space travel having been born three years after an infamous flying saucer incident in his hometown of Roswell, New Mexico becomes the underpinning for alien and UFO theories. Today, Rigan’s influence on contemporary stained glass seems under-appreciated. However, in his 1976 pathbreaking book *New Glass* he heralds an emerging generation of stained glass artists. He ascertains that preoccupation with tradition, and a liturgical focus were stifling creativity in stained glass design. This traditionalist versus modernist scenario is seen throughout the history of stained glass and anthropologists predict the same tensions on Mars in the future.

The idea of modern design among the large studio members of the Stained Glass Association of America at the time of *New Glass*’ release was quite tame in retrospect. It was Rigan’s portrayal of twenty-four rising artists and his follow-up book on Gaudi-inspired James Hubbell that introduced readers to light and color never before envisioned. Rigan highlights artists whose new direction in design and expanded innovation with a variety of techniques resulted in explosive and non-traditional windows and constructions. A young audience, influenced by the Studio Glass Movement in blown glass, discovered artists like Narcissus Quagliata, Ed Carpenter, Dan Fenton, Kathie Bunnell, James Hubbell, Paul Marioni (Dante’s Dad), Robert Kehlmann and others. Almost immediately after the book’s release stained glass in the United

States went from tradition-bound to artistic free-for-all. The essential points are 1) that upstarts in creative fields must supplement their art works with media analysis and insights aimed at influencing a mass audience to understand and be receptive to new approaches, 2) acknowledgment of the merits of the traditional craft keeps communications open between the old guard and rebels, and 3) at this stage of human history challenges to tradition should be expected rather than catch anyone by surprise. Otto Rigan introduced the glass art world to images and design concepts of inventive artists that still resonate today and coincidentally opened the way for transition to space habitation.



A second reason we may be following Otto Rigan to the red planet is his recent work which utilizes Mars-ready materials primarily. His twenty-first century focus has been on art for private homes, academic buildings, parks and cultural facilities, and public places. For Rigan, glass art is to be viewed in public places rather than only in museums and private galleries. His sculpture work is as if Japanese sculptor Isamu Noguchi worked in cast glass and stone. This

emphasis on public art and large vitreous sculptures ensconced in stone signifies a return to the legend of Roman chronicler Pliny and the origin story of glass. One of the many versions is cited in a book about stained glass in the Middle Ages by Hugh Arnold and Lawrence B. Saint. It claims that the origin of glass was the result of a burned wooden ship producing molten glass from its cargo of natron washing powder and sand from the shore. Since this saga was first circulated, the concept of fire, silica and chemical agents to create glass is imbedded in the mindset of any glass artist working in fused, cast, faceted, and 3-D. Evidence for the viability of the Pliny theory is found in the photo taken from Mars of the Alga Crater where molten glass, casting a bluish tinge, is shown having formed from the heat of a fallen meteor mixing with the Martian mineral surface.

Following the muse of Mars and the taking advantage of the wonderful stone deposits of the American Southwest are the *raison d'être* of Otto Rigan's work. His style could quickly embellish with light and color the bleak Mars landscape and adorn overly functional, almost sterile, habitats. By the way, his preferred materials of glass and stone are already abundant on Mars, so he has the advantage of rendering designs and using materials in a manner likely best suited for this new interplanetary venture. What remains is developing equipment and tools suited to the Martian atmospheric conditions.

Third, he could easily become one of the first space tourists to Mars. From his studio in Sante Fe, it is a 212 mile drive down interstate 25 to Truth or Consequences, New Mexico (named in 1951 for a radio and television quiz show) to the Spaceport Visitor Center to await the shuttle that will take space tourists to the launch site for either their Virgin Galactic or Space X lift off to Mars. If Rigan were to become an early space traveler he will observe while on his shuttle ride

from the Spaceport to the launch site a large sculpture piece decorating the New Mexico sky. It casts upward reddish space age U-shaped metal, glittering with specs of glass twinkling like stars, arching toward the blue desert sky toward the outer reaches of this planet. Rigan is familiar with this sculpture because he designed and executed it in steel and cast glass. This was completed in 2015. It is fitting that future space colonists or tourists from New Mexico will have as a remembrance a work by an exceptional artist as a final memory when departing from this planet for the newly inhabited one. The question remains; how many members of the stained glass profession will venture to the red planet?



In conclusion, the question of how stained glass will be used on Mars is more than a technical inquiry; it is a meditation on the role of art in human exploration. As we reach for the stars, let us not forget the importance of beauty, creativity, and spiritual expression. For in the dance of light and color, we find not only the essence of stained glass but also the essence of ourselves.

Finis

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Bill Serban became a member of the SGAA in 1976 and has made significant contributions to the Stained Glass Index and the Reference and Technical Manual, Second Edition.; and articles on tariffs, lead safety and government policies.

Now retired, he held teaching positions at Xavier University in New Orleans and New Mexico State University in Grants, NM. He lives in Gallup, N.M. and he can be contacted at bserban513@gmail.com.

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