More Than a Building on Broad Street: A History of the Science Museum of Virginia, 1910-2017

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Chapter 3: The Science Museum of Virginia at Broad Street Station

The Science Museum of Virginia's staff received decidedly mixed opinions from industry professionals and community leaders on the move to Broad Street Station. One particularly salient letter reached Paul Knappenberger's desk in April 1976. Victor J. Danilov, the director of the Museum of Science and Industry in Chicago, explained to Knappenberger that he felt conflicted about the SMV's new home. He wrote, "I don't know whether to congratulate you or feel sorry for you on the acquisition of the Broad Street Railroad Station in Richmond."[1] Danilov admitted that the location "presents a wonderful opportunity under the right conditions," but "remodeling old railroad stations can be an expensive headache."[2] Danilov's letter would prove to be all too prescient as the Museum staff confronted the challenge of preparing the Broad Street Station for exhibits.

In January 1978, a full year after the Museum's Discovery Room opened in Broad Street Station, Milton Elliott wrote an amusing, but urgent, letter to J. Stuart Barret, deputy director of Virginia's Division of Engineering and Buildings. "Mice," he exclaimed, "little grey field mice, are running rampant at the Museum." [3] The pests had made their way "in[to] the office, as well as the Discovery Room areas" after a lengthy stay in the Station: "yesterday, the day before, and many days prior."[4] Because the rodents were "unsettling for our visitors" and "disruptive in an office context," Elliott requested the state "begin immediate extermination efforts."[5] "Your assistance," he concluded his letter, "is, squeak, urgently requested."[6] Since the Museum's opening in the new building, the Trustees, Foundation Directors, and staff members had struggled to obtain state funding and services to help develop the Station into a workable exhibit space. They relied heavily on volunteers and community professionals willing to donate their time and money to see the space transformed into an operational science museum. Even in the case of the rodent infestation, the state was slow to deploy resources. Elliott joked that his staff

could "domesticate and train the invading hoard for the first, and perhaps only, Mighty Mouse Museum Variety Show," but it would be much easier if the state just sent an extermination team.

This chapter details the preparation of Broad Street Station for hands-on exhibits and its first few years of operation as the Science Museum of Virginia. Like the Museum's founding years, the renovation and operation of the facility was full of ups and downs, successes and failures, and constant pleas to the state for more money. The acquisition of a physical location did not spell the end of the SMV's struggles to bring statewide public science education to Virginia. If anything, it created a new set of challenges that a small, but growing, staff met with waves of well-intentioned trial and error.

Preparing Broad Street Station and the Death of Dr. Hughes

Once the SMV had access to a physical exhibit space, the next steps for the Board of Trustees and staff were to determine how to adapt the Station to educational programming, which programs the institution should offer, and what resources the Museum needed to develop those programs. The Board began this process immediately after the state reviewed Knappenberger's request for roughly $150,000. In March 1976, the Virginia treasury informed the Museum that the General Assembly appropriated "$97,000 for the initial move to the Broad Street Station and an additional $52,890 for operating expenses."[7] The Board intended to hire two new staff members with part of the available funds, including an Education Program Coordinator and an Exhibits Preparator.[8] The rest of the monies would be used to cover expenses associated with "occupy[ing] about 12,000 square feet on the first level of the station's east wing."[9] The lower level of the wing was designated by the staff as exhibit space while the second floor would house "museum administrative offices… until the Richmond, Fredericksburg and Potomac Railroad vacates the station."[10] Afterwards, the offices would be "moved to a permanent location on the second floor of the west wing."[11] The Museum did not receive enough funds from the state to renovate the entire Station for educational use; indeed, members of the General Assembly, including Senator Willey, expected portions of the train station to house state offices.[12] With these spatial limitations in mind, the SMV reached out to the Junior League of Richmond for help designing the Museum's first hands-on exhibits.

In April 1976, the Junior League voted to adopt a proposal to "develop and establish a Discovery Room in Broad Street Station."[13] The new exhibit space would "be an introduction to the community of the Museum's 'hands on' participatory philosophy and format," offering "a vibrant exhibit area where children and adults can interact to learn about science."[14] The League pledged an additional $20,000 and "volunteer support" to make the room a reality.[15] While planning the Discovery Room, the Museum also sought to "develop spaces for travelling exhibits, demonstrations, and a meeting room for science clubs and special events."[16] Around the same time as the League's proposal, the Board received a significant donation from Elizabeth Talbott Gwathmey, sister of Allan Talbott Gwathmey, past president of the Virginia Academy of Science and founder of the Virginia Institute for Scientific Research.[17] Her gift was intended for the development of a permanent crystallography exhibit to be located in the rotunda of the Station. With her financial support, the Museum could restore more of the first floor for exhibit space, making room for potential travelling and permanent displays. Though the occupation of Broad Street Station came suddenly, within months the Museum had crafted a plan of action to employ new staff members, build a hands-on exhibit space, and design a permanent exhibition for the rotunda.

Months of planning to inhabit the Station were interrupted by a disheartening loss for the Museum. On April 19th, 1976, the SMV received word that Roscoe Hughes passed away. "It was his foresight and imagination over the past decade," the Museum's newsletter explained, "that was, perhaps, the prime force in establishment of the Science Museum."[18] Without his persistence, the concept of a state-sponsored science museum would not have made it out of the General Assembly let alone into Broad Street Station. In addition to his work on the SMV, Hughes also helped establish the Department of Human Genetics at VCU and served as president for the Virginia League for Planned Parenthood.[19] Hughes was an active member of the Virginia community and an asset for the SMV, responsible for both its creation and the institution's philosophy "learning always should be fun."[20]

Before his death, Hughes had witnessed the termination of his vision for a statewide network of science museums. However, the state's lack of enthusiasm for a multi-facility establishment did not stop the SMV from attempting to serve patrons throughout Virginia. In addition to its work on the Discovery Room, the Board authorized the repurposing of Trans-Science 1. The unit was scheduled to be decommissioned in August and outfitted with a new set

of exhibits to tour the state.[21] Unlike its predecessor, Trans-Science 2 would "explore the potential of solar power" with "five active, hands-on learning/exhibit stations, supplemented by cut-away displays and several models."[22] Once again, United Virginia Bankshares offered to fund the project.[23] This time, however, Virginia Polytechnic Institute and State University would also provide the Museum with much-needed services by "complet[ing] the studies, develop[ing] the educational and evaluation programs," and "design[ing], assembl[ing] and construct[ing] the mobile vehicle, enclosure and exhibit systems."[24] Representatives from the university agreed that there was "a significant need in Virginia, as elsewhere in the country, to provide participatory motivational programs for the public."[25] The exhibit's theme could also lead to a better wide-spread "understanding of our energy future," a goal for all those involved in the Trans-Science 2 project.[26] By deploying the newly-outfitted mobile unit to different cities throughout the state, the SMV could fulfill part of Hughes's vision: to offer accessible and fun science education to as many Virginians as possible.

Back on Broad Street, the Museum continued preparing the Station's east wing for the opening of the Discovery Room: the SMV's first in-house, hands-on exhibit. Junior League volunteers helped clean and repaint the exhibit space while Rae Carpenter designed and built equipment for educational demonstrations at the Virginia Military Institute. In a newspaper article titled "Simple Items Preferred," Beverly Orndorff interviewed Carpenter about his participation in the exhibit design process.[27] He tapped into his experience as an educator to inform which contraptions the Museum needed to teach a variety of physics concepts. Before the SMV acquired space in Broad Street Station, Carpenter and VMI professor Dr. Richard B. Minix "spent…several spring vacations…touring high schools around the state, giving demonstrations and lectures for students."[28] From these travels, Carpenter learned that "the simpler and cheaper the items" used to construct exhibits were, the better those exhibits would be at "demonstrating physical laws and principles."[29] By August 1976, their hard work had paid off. At a public news conference, the Museum announced that the space would be ready for visitors toward the end of the year.[30] Lieutenant Governor John Dalton was in attendance and applauded the work of volunteers on the Discovery Room, especially those from the Junior League of Richmond.[31] He explained that the exhibit space was meant to "be a living workroom of science to be used and understood and enjoyed by young people and their families and their teachers and all who will come here."[32] Though the Museum was months away from opening

the Discovery Room, the potential for such a space energized local volunteers and excited Richmond community leaders.

The enthusiasm of residents in the capital stood in stark relief to the disappointment shared by science museum associations in other parts of the state. Members of SMARV were left with no science center or museum site after the Board of Trustees was unable to transfer rights to the Yellow Mountain Road location over to the Association.[33] Jack Ramey, in a letter to all members of SMARV, lamented:

> I am not sure which Greek tragedy our group is involved in. We may be like Sisyphus continually trying to get our museum on the top of the mountain only to get knocked back. We may be traveling through the System looking for the honest man. But most of the time it feels as if we have the Herculean task of cleaning the stables. We are again out in the cold and orphaned.[34]

With the SMV limited to the Broad Street Station in Richmond, members of SMARV were forced to break their ties with the state project and work to establish their own independent science center in the Roanoke Valley. That same year, the Association relocated their mini-museum into "the abandoned Tinker Creek School, a 3,000 square foot World War I era building."[35] They were able to expand the museum's offerings and eventually secured "funding…from the Virginia Department of Education," allowing for "the Museum's first full-time director" to be hired.[36] Today, the Science Museum of Western Virginia, as the museum was renamed in 1983, is located in Roanoke's Center in the Square and offers a wide variety of hands-on exhibits, science programs, and special events.[37]

Like SMARV, the informal Tidewater association of the SMV explored ways to deliver science education to their constituents once the Discovery Room was under construction. In September 1976, members of the Steering Committee for the Tidewater Chapter of the SMV and other community leaders formed the Science Museum Association of Eastern Virginia.[38] The "non-stock, non-profit corporation" assembled to "serve public interests" by "fostering regional cooperation in support of science museum programs and facilities in Eastern Virginia."[39] Since "several jurisdictions had official or semi-official science museum committees" and "a number of unofficial groups in the area had a strong interest in one or more museum-type programs," the new Association could serve Tidewater residents best if it worked to foster "area cooperation… from each of the eight jurisdictions."[40] Unlike the Roanoke Valley, Coastal Virginia had several

operational institutions that could offer science education to the public; what the region needed was an organization to synchronize their efforts and ensure the most efficient use of resources.

Though the preparation of Broad Street Station for museum use spelled the end of the SMV's regional divisions, eastern and western associations developed independent plans to deliver quality science education to their respective communities. In addition to these efforts, the SMV continued to move forward with the repurposing of Trans-Science 1; another means of providing hands-on instruction to students across Virginia. As the city of Richmond awaited the opening of the Discovery Room, citizens throughout the state could look forward to new or renewed access to fun and informative public science education in some form.

Opening and Staffing the Discovery Room

Dedication of the SMV's Discovery Room took place on a frosty day in January 1977.[41] Governor Godwin attended as the guest of honor and led the ceremony by "pass[ing] his hand through a laser beam tripping a switch which set a 'Rube Goldberg' apparatus into motion."[42] When the gadget struck a ribbon cordoned across the entry to the exhibit space, attendees applauded the opening of the Museum's physical location. Later in life, Rae Carpenter recalled that the Governor shivered as he set the event in motion.[43] The "old boiler house" had broken down before the ceremony, leaving the train station at a frigid temperature.[44] Milton Elliott also handed Carpenter a pair of scissors just in case the laser contraption failed to slice the ribbon.[45] Thankfully, the dedication commenced without disruption, readying the Discovery Room for its first public open house the following Sunday.[46]

The first visitors to the Discovery Room interacted with a variety of different exhibits and demonstrations. In addition to "aquariums and terrariums," the space included "logic games, a pendulum that pours a small stream of sand to trace varying curves as it is made to swing in different positions, and a visual demonstration of vibrating bodies."[47] A set of Chladni plates "made at the Virginia Military Institute physics department" concluded the room of over 40 stations, exposing visitors to a wide range of physics concepts in fun and interactive ways. Volunteers from the Junior League of Richmond helped staff the room which cost a quarter for admission.

To keep the Discovery Room operating smoothly, the SMV engaged in publicity events and staff hires in January and February 1977. For example, the Museum hosted its first reception in the Broad Street Station for members of the General Assembly.[48] Staff members, Trustees, and Foundation Directors needed to bolster their relationships with Virginia legislators, especially after the disappointing 1976 budget appropriation. The SMV also added new members to its staff including Mary Randolph Spencer who began her career with the Museum developing educational programming.[49] Before coming to Richmond, Spencer earned her Bachelor of Arts degree in political science at the University of California at Berkeley.[50] She gained experience in museum education by working with "children of elementary school age to coordinate an active science study program" at the Cora Hartshorn Arboretum in Short Hills, New Jersey.[51] Spencer also had a knack for artistic design, having made "many models, exhibits, murals and creative learning devices" at the Arboretum.[52] Her experience proved useful for the SMV's mission of providing hands-on learning.

In February 1977, the Junior League designed a travelling ambassadors program for the Museum in conjunction with the SMV's staff.[53] According to their proposal, one or two volunteers would take trips to cities and counties throughout Virginia, giving presentations on the SMV's exhibits, events, and future plans.[54] While most trips were destined for "counties within 75 miles of Richmond," some longer, overnight stays could be authorized by the SMV to reach more distant areas of the state.[55] The program primarily sought to "encourage schools to include the Discovery Room in any visit they might make to the Richmond area" and "provide Statewide exposure to the long-range…financial needs for further development of the Science Museum."[56] Like the SMV's reception for Virginia legislators, trips made by the travelling ambassadors were intended to advertise the museum's offerings while securing financial support for operating expenses. With the help of traveling ambassadors, the Museum brought out-of-town visitors to the newly opened Discovery Room. It was the first step in transforming one wing of an abandoned train station into a destination museum.

The Beginnings of a Multi-Exhibit Museum Destination

Soon after Broad Street Station opened its doors to visitors, the SMV continued planning and building exhibits and programs. While the Discovery Room was an excellent introduction to

the hands-on educational experience the SMV intended to offer, an institution of its kind needed to develop new content to encourage guests to return to the Museum—or visit for the first time. Such an endeavor required maintenance on the remaining unfinished space in the Station's east wing. To begin the necessary cleanup and renovation processes, the SMV consulted experts in historical preservation. The dedication of the Discovery Room only marked the beginning of the staff's efforts to repurpose the Station.

In April 1977, the Museum welcomed two travelling exhibits to Broad Street. The first, "Indo-Pacific Seashells," was a collection of "about 400 shells…rang[ing] in size from the very small to some a foot long."[57] Mary A. Dunham, the owner of the collection, acquired the shells "when she was stationed in Saigon with the U.S. Agency of International Development."[58] Before arriving in Richmond, the specimen had "been on display in Saigon as well as in the Washington area," "supplemented with illustrations on shell life and a collection of colorful stamps featuring shells."[59] The second exhibit was titled "The Future of the Oceans" and offered "an illustrated and documented presentation" to guests "reflecting Canada's approach to the management and conservation of world marine resources."[60] It was "a three-dimensional, illuminated exhibit, comprise[d of] four free-standing modules" that explored "the need to preserve the oceans" on the "Atlantic, Pacific and Arctic coasts."[61] The SMV housed the displays in "the main entrance corridor to the Discovery Room…and in the two small 'travelling exhibit' rooms" that were "carpeted, wired and painted by Buildings and Grounds" in March 1977.[62] Press coverage of their opening brought visitors back to the Museum after the Station opened in January.

In addition to new exhibits, the SMV forged relationships with local schools and Richmond residents through a series of participatory programs. William Fox Elementary School partnered with the Museum to allow gifted students to serve "as exhibit 'explainers' for other school groups who visit[ed]" the SMV.[63] When the Station opened, six of these students "selected one exhibit he was most interested in, wrote a paper on it and made up a list of thought questions that he believed other children visiting the exhibit might ask."[64] They volunteered at the Museum until the end of the academic year in May, 1977.[65] In July, the SMV launched its Sky Watch program in conjunction with the Richmond Astronomical Society.[66] Museum visitors could spend evenings gazing at the stars through telescopes set up in front of Broad

Street Station.[67] By partnering with local schools and organizations early on, the SMV attempted to brand itself as a resource available to the entire Richmond community.

To accomplish all its new programming, the Museum staff engaged in a number of administrative meetings and activities during the first few months of the Station's operation. On "four occasions in late 1976 and early 1977," historic preservation consultants from Mitch, Young, and Abramson, Inc. "met with the staff of the Museum and its architect, surveyed the building and took several hundred photographs."[68] The SMV chose the firm to evaluate the work that needed to be done to adapt the east wing and the remainder of the Station for museum use. Because the building was a historically significant structure, the Museum could only conduct maintenance and renovations consistent with the original architectural design. The SMV was also interested in the firm's evaluation of the amount of time it would take to improve the entirety of the Station if permission could be ascertained from state government. The consultants published a report for the Trustees in April 1977. In its pages, they detailed eight recommendations to restore the Station without compromising Pope's vision, including "alterations to the mass, color and texture of the concourse" and "top[ping] off" the "courtyards flanking the main waiting room" with "skylights at or above roof level."[69] The SMV also crafted an acquisitions policy approved by the Board in October 1977.[70] The Museum could not accept every donation from the public and designed the policy to evaluate the "present and future utilization" of gifted or purchased collections.[71] It was also important for the SMV to establish protocols for loaning or exhibiting loaned materials to and from outside institutions. The professional operation of a state science center required staff, Trustees, and Foundation Directors to investigate and determine the logistics necessary to run a long-term museum out of Broad Street Station. Their task would only become more daunting when the Virginia Public Buildings Commission voted to finally allow the SMV to occupy the entirety of Broad Street Station in addition to some land surrounding the building.

Living with Broad Street Station—and All the Renovations that Came with It

On November 10, 1977, Carpenter wrote a letter to Maurice Rowe asking if the Virginia Public Buildings Commission could "clarify at its November 15 meeting its intent regarding the assignment of the entire Broad Street Station building to the Museum."[72] Up until that point, the

state had not conclusively decided whether the SMV could occupy the entirety of the Station or remain relegated to its east wing, reserving the remaining space for government use.[73] On December 20th, Carpenter and Director Knappenberger attended the delayed Commission's meeting. Carpenter outlined "the three main objectives of the Museum" to the commissioners: "Direct maintenance and operational control by the Science Museum of Virginia of the total Station Building and the sheds; Preservation of train sheds as they exist; [and] Preservation of right-of-way for spur track entering property."[74] In addition to explicit permission to construct exhibits and locate offices throughout the Station, the SMV sought approval for exterior renovations to the historic butterfly train sheds; a defining characteristic of the building that Mitch, Young, and Abramson, Inc. had designated as an essential restoration project. The firm identified the sheds as "perhaps the largest single complex still extant in the U.S.A.," possessing "quite unusual beauty and technological significance."[75] If the Museum was going to fully make use of Broad Street Station, the exterior features needed to be restored as much as the interior rooms.

There was only one commissioner who expressed hesitation toward the Museum's request: State Senator Edward Willey.[76] When Carpenter explained that the SMV "would like to have control of the security, maintenance and custodial responsibilities that is now handled by the Division of Engineering and Buildings," Willey "emphasized that the Museum staff thoroughly familiarize themselves with the financial and other responsibilities involved in this pursuit."[77] He did not believe that the SMV had the staff or the resources necessary to care for the entire Station and its grounds. It is also likely that Willey did not want to relinquish state office space to the Museum; he was heavily involved with a development project to erect a business center around the train station.[78] Regardless of his wary response, Willey voted with the rest of the commissioners to recommend "to the Governor the entire existing terminal building with certain land surrounding that building" for Museum use.[79] They did specify that "no permanent plans should be made for the spur line right-of-way at this time nor should permanent plans be made for the use of the sheds," however, the SMV could temporarily inhabit these areas until further notice from the state.[80]

With full access to the Broad Street Station, the SMV began developing plans for the additional space. In a letter to H. Douglas Hamner, Jr., Carpenter laid out exactly how the Museum intended to use each floor of the building.[81] In the basement, the SMV would store

"Donated Exhibits," while the second floor would be reserved for "Offices, [a] Board Room," and additional storage.[82] The station's ground level was earmarked for exhibit space, preserving the east wing for the Discovery Room.[83] The rotunda would be cleaned up and prepped for the "Crystallography exhibits" and the concourse would be renovated to house an "Exhibit area Expansion."[84] The SMV also hoped to build an auditorium or public meeting room in the west wing, as well as a planetarium adjacent to Station.[85]

To ready the Station for these ambitious plans, the Museum developed a three-phased renovation schedule that allowed for adequate fundraising and a historically-appropriate renovation of the building. The first phase of the project tackled the essential work that needed to be done to get the Museum's most desired programs up and running. It included plans to "restore central areas of the Broad Street Station and to construct a major planetarium/space theater/astronomy exhibit area."[86] The second phase scheduled several interior and exterior renovations intended to improve the look and functionality of the building. For example, the SMV Board hoped to install exterior "lighting fixtures appropriate to the historic character of the building" and improve "the Women's Waiting Room to provide an enlarged and permanent store for the sale of items related to Museum's programs and exhibits."[87] Some of the more ambitious plans for phase II included the "installation of a freight elevator to move exhibits, equipment, and people from the lower level to exhibit spaces on the first, second, third, and fourth floors" as well as "solar collectors on train shed roofs to provide solar energy for new HVAC systems at [the] Museum."[88] The final phase focused on restoring the historic butterfly train sheds that were progressively soaking up moisture and deteriorating.[89] The Museum designed the master plan to commence over the duration of six years, provided adequate funds could be raised.[90]

The price tag for phase I of the Broad Street renovations was a hefty $7 million.[91] The SMV requested $6 million from the state for the 1977-78 biennium, however, the General Assembly only appropriated $2.5 million to the Museum.[92] The project did receive an additional $1 million of state monies from a 1977 bond issue, but the SMV's deficit still required over $3.5 million in fundraising.[93] Roughly $1 million had been pledged by donors, including the Jeffries family, before the Board of Trustees and state agencies finalized the Museum's master plan. These monies were earmarked to complete specific projects associated with phase 1, including the Crystallography exhibit.[94] To raise the remaining $2.5 million, the SMV initiated a fundraising drive in 1978 which included the distribution of widespread mailings to promising

Virginia households and the solicitation of funds from potential corporate donors.[95] The road to improving Broad Street Station was long and onerous, but the Museum had a plan to immediately move forward with as many elements of the renovation as funds allowed.

While the Trustees and Foundation Directors searched for philanthropic sources, the Museum's staff continued to provide new science programming to citizens throughout Virginia. In April 1978, the Museum launched the repurposed Trans-Science 2.[96] By November, the unit clocked "over 313,647" visitors across the state.[97] The Museum also launched a lecture series featuring presentations by professional scientists and knowledgeable science enthusiasts. The first speaker debuted on September 28, 1978.[98] Charles E. Arnold, cofounder and president of the Richmond Shells Club, delivered "Shells: More Stately Mansions" to Museum guests, a topical complement to the "Indo-Pacific Seashells" exhibit a year before.[99] Rae Carpenter and other university professors also participated in the lecture series, bolstering the institution's growing reputation as a resource for current scientific information.

Perhaps the most noteworthy administrative addition to the Museum during its master planning stage was the appointment of Neilson J. November to the Board of Trustees. Before serving the SMV, November had chaired the "the Capital Region Airport Commission," directed "the Jewish Community Center," and donated his time and money to several other institutions and organizations throughout the state.[100] He was born in New York City but grew up in Virginia, eventually enrolling in Washington and Lee University immediately before the outbreak of World War II.[101] November attempted to become a wartime pilot, but was rejected by the Navy "because of poor eyesight."[102] Ironically, he spent the remainder of the war "identifying enemy aircraft in the Pacific because he could recognize anything with wings."[103] Upon returning home, he worked for his family's business, Friedman-Marks Clothing Co., "for 25 years before going into real estate."[104] According to November, Godwin appointed him to the Museum's Board because he was "a mover" that could oversee the completion of the planetarium.[105] On July 5, 1978, the Trustees elected November chair because of his experience in "matters of direction, policy, [and] State funding."[106] With the first phase of renovations scheduled to begin in December 1978, the Museum needed a leader well-travelled in the state's political, business, and philanthropic circles.[107]

Planning a Planetarium and More Museum Programming

The most daunting task in the first phase of renovations was the construction of a planetarium. Dr. Knappenberger and the Museum's staff engaged in a months-long investigation to identify the best equipment available for planetarium theaters and the feasibility of building a physical addition to the historic Station. The Trustees envisioned a technologically-advanced facility that could seat hundreds of guests. Visitors to the SMV would be able to enjoy planetarium demonstrations and big-screen movies, all intended to enhance their educational experience.[108] With the right projectors and design, the Museum's planetarium could offer Virginians shows unlike any others in the world. Such innovation, however, came at a price.

In January 1979, the SMV received an estimate for the inclusion of a 70mm Omnimax projection system in the Museum's planetarium. The sound equipment alone would cost the SMV roughly $150,000 in addition to the $221,335 projector.[109] Nonetheless, the possibility of housing an audiovisual system that rivaled that of the National Air and Space Museum in Washington, D.C. appealed to the SMV, especially since the Museum planned to use the 12,000-watt projection lamp to cast images across a large, tilted-dome screen; the first combination of its kind.[110] The Omnimax system would operate in tandem with a digital star projector for astronomy demonstrations; the only problem was digital planetarium projectors were still being developed in 1979. Up until the early 1980s, planetarium equipment had remained largely the same since its invention. As Kandy Kramer explained in an article for the *Richmond-Times Dispatch*, "every planetarium used a mechanical star projector—usually in the shape of a hollow metal ball with holes drilled in the surface." [111] When illuminated by a bulb, the machine "simulate[d] the star field."[112] However, Knappenberger and his colleague Charles Smith "felt restricted by the limitations inherent in the standard star projection equipment," and searched for a company that could offer a model with dynamic, moving stars, allowing viewers to "travel through space" during presentations.[113] After attending a demonstration in St. Paul, Minnesota, they identified that company as Evans & Sutherland.[114]

Beginning in 1968, Evans & Sutherland spent ten years developing DIGISTAR 1, a "digital star system."[115] By combining "the latest…digital computer hardware, state-of-the-art CRT developments and high precision optics," the company could assemble a projector that relied on computer programs to simulate the night sky. One of their advertisements boasted "your creativity is the only factor limiting the infinite star fields and special effects available

with the Evans & Sutherland digital star system."[116] While impressive, DIGISTAR 1 was not as advanced as the company initially claimed. When Knappenberger and Smith first witnessed the system in action, they noticed that "the stars just weren't bright enough" when the projector cast the digital images onto a smooth surface; "there was considerable distortion and, worse, the stars 'jittered' as they moved across the dome."[117] Regardless, they "recognized the potential of the system" and drafted a contract "with Evans & Sutherland to produce a system that would meet certain specifications, including steadiness of motion, brightness of the image and reduction of distortion."[118] The SMV secured the right to check in on the company's progress throughout the software's development, frequently sending Smith to Evans & Sutherland's headquarters in Salt Lake City to represent the Museum's interests.[119]

Back in Richmond, the Board navigated the legal waters surrounding the construction of an independent building to house the planetarium. As early as January 1978, the Museum was required to obtain permission from the city's Art Commission to erect a structure next to the historic train station.[120] Knappenberger assured the commissioners that "no changes" would "be made in the exterior appearance of the existing building" with the addition of a planetarium.[121] Instead, the Museum would build the structure "to the left rear of the" Station.[122] The Commission approved the SMV's plan on the condition that there would be no "visual conflict between the dome on the existing building and the proposed new dome for the planetarium."[123] By January 1979, the Museum hired Samuel Crothers Associates of Philadelphia to design the planetarium with the Commission's restrictions in mind.[124] Samuel Crothers, the firm's chief architect and namesake, fully embraced the need to preserve the Station's aesthetic presence on Broad Street.[125] "'This existing building," he believed, "is so strong and so monumental that we felt that, No. 1, we didn't want to change that at all and, too [sic], we felt that any addition we made to the building had to be subordinate to it."[126] As a result, his architects drafted blueprints for an inconspicuous but effective facility that utilized three domed layers to make up the planetarium's exterior roof and interior "projection area."[127]

Though time consuming, the Museum's planning efforts between 1979 and 1980 did not prevent the growing staff and volunteer corps from offering new exhibits, programs, and community events. In January 1979, several SMV volunteers formed the "Volunteer Association of the Science Museum of Virginia, or the 'Associates.'"[128] Members of the Association sought to "better serve the Museum and its many volunteers" by "establish[ing] a volunteer structure

with a slate of officers" to "insure the continuance of Museum Programs by a cohesive volunteer force."[129] The Associates helped the SMV organize a number of events and programs, including an expedition to Big Sky Mountain to view a solar eclipse in February 1979.[130] For $680, guests could accompany representatives from the SMV to Montana for a chance to witness the eclipse in its totality.[131] The Museum also offered several onsite programs "on eclipse mechanics and photography, star identification, astrophotography, meteorology, modern exploration, and radio astronomy."[132]

Beginning in September, the Museum hosted showings of a laser light show titled "Laserlumia Laserdrive."[133] The "spectacular light and sound extravaganza" was a "'live' performance with [a] Krypton-Argon laser producing intense colors in a multitude of patterns" for guests to see.[134] According to the Associate's December newsletter, attendance for the evening program "topped 7500 before closing Dec. 2," completing an "eight-week engagement" at the Museum.[135] The Foundation also used the show to entertain donors at a black tie fundraising event for the SMV's renovation.[136] While lasers amused guests on wintery evenings, the Museum offered a series of daytime movies on weekends and sponsored community field trips to nearby institutions like the Mariners' Museum.[137] Dr. Knappenberger brought scientific information into the living rooms of Virginia families by participating in SMV radio programs, such as the weekly *Science Conversations* show.[138] Once the new year began, the Museum brought repeat visitors to its station to gaze at the Gossamer Albatross.[139] The "gangling craft" which had flown across the English Channel was suspended from the ceiling of the rotunda and introduced guests to the capabilities of "man-powered aircraft[s]."[140]

By the summer of 1980, the SMV had accomplished several fundraising drives, sponsored communal field trips, and presented visitors to Broad Street Station a plethora of exhibits and demonstrations meant to make learning about science fun for all ages. The staff also engaged in research and planning activities for the planetarium space theater. In July, the Trustees published their first annual report, detailing the educational offerings of the Museum and the progress made on the first phase of renovations.[141] In a letter from the director, Knappenberger informed readers that the planetarium would be open to the public "in early 1983"; construction of the facility was set to commence on October 12, 1980.[142] The Museum's programs were expected "to expand" as the SMV assumed the role of "a pacesetter in innovative approaches to informal science education" with the opening of the theater. Until then, the staff

would continue to improve visitors' experiences at Broad Street Station by offering new permanent exhibits and community events.

Building the Universe and Completing Phase I of the Master Plan

On October 12, 1980, over 1,000 Virginians gathered outside of Broad Street Station to hear an imposing figure, clad in black, sanction the groundbreaking for the SMV's planetarium. Darth Vader, "the dark lord of the Empire," looked down on a multitude of small faces as he chided the Museum's Director for planning such an advanced theater.[143] "You appear overly zealous in your concept of this new planetarium, Knappenberger," he exclaimed.[144] Indeed, the Sith lord contended, "I shall have my own purposes for this structure" once completed.[145] In the meantime, Vader approved of its construction and commanded the Museum to "begin your preparations there," pointing to a patch of ground just behind the Station.[146] On cue, "hundreds of yellow and red and blue balloons" were released from the location, signifying the first tangible step toward erecting a physical home for the space theater.[147]

The SMV sought to mark the occasion with an appropriately-named "sky-breaking" ceremony, featuring "the Governor and his wife, a top Hollywood star, [and] a host of dignitaries."[148] In addition to getting an autograph from Kermit Eller, the costumed interpreter of Darth Vader, attendees listened to a performance by the U.S. Atlantic Fleet Band and remarks from the Trustees' chairman, Neil November.[149] He promised to deliver a theater unlike any other in the world. The planetarium, called 'The Universe,' would allow onlookers to travel through space and time, viewing constellations and nebulas that typical mechanical star projectors could not display. The SMV's staff hoped that introducing the concept to the public with a guest from far, far away would spark their interest in the Museum and keep them coming back for more. Active construction behind the Station would not halt educational programming or the opening of new exhibits—the staff wanted to bring a steady flow of Virginians into the Museum while the planetarium was raised.

In March 1981, the Museum made local news for continuing to offer fun, hands-on activities to Richmond school children.[150] The staff executed a class on "paper airplane making," allowing "youngsters who had learned to make paper fly [try] out their creations."[151] The simple, but instructive, activity supplemented the information on flight presented by the Gossamer Albatross display. In July, the Museum also remodeled its Aquarium, expanding the

tank to include more specimen for guests to examine.[152] The new fixture, however, was nowhere near as large as the analemmic sundial installed in the Museum's parking lot in September 1981. Its design was the brainchild of Walter Witschey, then an enthusiastic volunteer and local businessman who would later serve as the SMV's second director.[153] The Museum submitted the size of the unique clock-, not solar-, time-reading tool to *The Guinness Book of World Records*, receiving recognition in 1982 as the largest of its kind.[154] The sundial would maintain the distinction until 1987.

In the months after the planetarium's groundbreaking, the Museum also opened two new exhibits to the public. The first was *Computer Works*, a 400-sqare foot space with 19 displays and activities demonstrating the capabilities of computer technology.[155] The second, opening on January 16, 1982, was the highly-anticipated *Crystal World*, a striking visual display of "five giant crystals—one twenty-eight feet high."[156] Installed in the rotunda of the Station, each pod presented a different lesson about crystals, including how they grew and where they could be found in nature.[157] With a total of "94 displays, 46 of which [were] interactive," the new permanent exhibit gave museum visitors plenty to explore.[158] "While other museums have crystal displays that are exquisite to see," a pamphlet explained, "Crystal World is unique for it also explores crystals internally so that one can understand why their magic is so basic to our modern technology."[159] The display cost the Museum $800,000, but it was money well spent. When the space went live, it represented the "world's most comprehensive educational exhibit about crystals."[160] *Crystal World* distinguished the SMV from other science museums, offering guests an experience they could not get anywhere else.

While new exhibits debuted on Broad Street, the SMV continued to oversee the construction of the Universe space theater—another addition designed to set the Museum apart from its out-of-state competitors. On March 16, 1982, Richmonders traveling by the Station witnessed "two huge cranes" hoisting "the 25,000-pound dome frame" of the planetarium onto its base.[161] With the aluminum frame in place, the Foundation had to secure the last remaining funds necessary to outfit the planetarium with its projection equipment. Thankfully for the SMV, the Vice President for corporate planning at Ethyl Corporation was reevaluating the restrictions of a $500,000 gift to the Museum.[162] Arthur W. Helwig, who would later serve as director for the SMV's Foundation, convinced Ethyl Corporation to re-designate the donation intended to fund a chemistry exhibit. He argued that the corporation would benefit immediately

from purchasing projection equipment, "whereas an identity derived from the chemistry exhibit would await its completion which could be several years away."[163] When learning of the corporation's decision to approve the change, November wrote Helwig thanking him for his efforts. "You have truly been indispensable," he wrote, recognizing the importance of the gift to completing the space theater on schedule.[164]

Conclusion: Introducing the Universe to Richmond

The weekend of April 22, 1983 was the busiest in SMV history.[165] Over 10,000 visitors arrived at Broad Street Station to experience the first few days of the Universe planetarium and space theater's operation.[166] With the world's first Digistar projector and a 76-foot tilted-dome screen, the facility was unlike any other educational theater on the globe. Planetarium shows began when an operator pressed "a button labeled 'Boldly Go,'" shooting viewers "through space to distant stars" and galaxies.[167] After learning about the far reaches of space, guests watched a short film projected onto the domed screen by the 70mm Omnimax audiovisual system.[168]

On opening weekend, the theater screened *Genesis*, "a geology-oriented movie about the origin of the Earth and of many of the Earth's present features."[169] The Museum promised to offer a variety of films in the future, some on loan from institutions outside Virginia and others produced by the SMV in the "new facility['s] ...recording studio."[170] Knappenberger and other Museum affiliates viewed several Omnimax productions from outside institutions before choosing *Genesis*.[171] In an interview with the *Richmond Times-Dispatch*, November recalled watching one particularly entertaining film, *The Great Barrier Reef*, which concluded with "a shark frenzy."[172] He enthusiastically recounted the scene as follows: "This shark in the middle is being torn into shreds!, [sic] great hunks of bloody meat…It's unbelievable. I've seen it three times."[173] The SMV chose the film to be its second feature presentation.

By all accounts, the opening of The Universe was a success for the SMV. With record turnout and widespread guest satisfaction, the busy spring weekend was an exciting time to be at Broad Street Station. However, there was still a great deal of work to be done to complete the remaining two phases of renovations. In addition to improving the building, the staff had to maintain current exhibits while simultaneously developing new attractions to bring more visitors

through the Station's doors. The state's purse strings would only tighten with the completion of the theater, requiring Directors and Trustees to scramble for funds to support long-term projects. Operating a Museum with a world-class theater and unique exhibits was not easy; especially when the building housing those features still needed rounds of historically-aware renovations.

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