

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

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Chapter 2

Persistence, Compromise, and Mobile Science Units: Saving the Science Museum of Virginia

After the General Assembly refused to fund the construction of more than one division of the Science Museum of Virginia, time transformed shock into action. In an interview with the *Roanoke Times*, Paul H. Knappenberger, Jr., the new associate director of the Capital Division, explained that the Assembly's decision "does not mean abandonment of plans for a statewide science museum system."¹ Indeed, Knappenberger understood the state's actions to be "a blinking light that tells us to slow down," not stop.² The SMV Board planned to press forward with the construction of a facility in Richmond and advocate for funding more regional divisions when the legislature was once again willing to support the project in its entirety.

Meanwhile, members of the Science Museum Association of Roanoke Valley were willing to "go it alone if necessary," as a local newspaper put it, and use their year without state funding to mobilize support for a science museum in Western Virginia.³ By January 1974, SMARV had assembled a pamphlet outlining a two-pronged plan of action for its members: "make efforts to seek modification of legislation to allow more than one division of the State Museum in accordance with the original intent and plan" and "continue on the local level with planning for a science center in Mill Mountain Park regardless of the outcome of efforts to become a part of the State Museum."⁴ In order to achieve their goals, SMARV would need to obtain "a substantial portion of the construction costs" from private "gifts and subscriptions even if the center becomes a unit of the State Science Museum."⁵ The hope of bringing an SMV division to Roanoke was not dead. The unwillingness of the state to fund such projects in their entirety, however, was evident and expected.

Though Knappenberger and members of SMARV were ready to move forward with the SMV in some capacity, not all Museum affiliates were optimistic. The Board of Trustees

experienced a wave of resignations following the General Assembly's appropriations bill. Each Trustee had their own personal reasons for leaving the Board, but all expressed dissatisfaction with the lack of commitment from the Virginia Legislature in their resignation letters to the Governor. As Harold Soldinger explained in March 1973,

In all candor, I feel that the legislature did not afford the Trustees the apposite support needed. The Science Museum was to be a reality when it passed the legislative process in 1970. Realizing the plight of the cities, the state and the need for cost controls, the Board of Trustees requested a minimal amount of money needed for master planning in order for the Science Foundation to raise building funds. Needless to say, the money was not forthcoming.⁶

Like others taken aback by the Assembly's actions, Soldinger expected the state to support an institution it created. In his eyes, "Dr. Roscoe Hughes and the other Board members have done an outstanding job and made much progress in spite of the money obstacles"—a feat that he believed should be rewarded by the legislature.⁷

Despite the losses that the Museum experienced immediately after the cut in state funding, there was still much work to be done to construct the Capital Division. The SMV had to persuade the public that it could recover from significant financial blows. Indeed, the Museum would only face more obstacles in the near future, necessitating persistence and compromise to survive. The SMV Board still had the site at Byrd Park to look forward to—for now.

Moving Forward with the Capital Division: Planning to Build a Physical Science Center

1973 was an eventful year for the Science Museum of Virginia. In addition to losing funding for its regional divisions, the SMV acquired new office space, sponsored investigatory trips to science museums abroad, and attracted significant donations to continue designing the Capital Division facility. The Governor appointed a series of new Trustees and the Board experienced a change in leadership when D. Rae Carpenter, Jr. was elected chairman. The circumstances surrounding the SMV may have changed, but the goal of the project remained the same: deliver interactive and meaningful public science education to as many Virginians as possible.

From the SMV's inception, the Museum staff had shared office space with the Virginia Institute for Scientific Research. While topical, the location did not provide the SMV with the legitimacy it needed to boost the confidence of donors and legislators alike. The Museum was a state agency after all; its headquarters needed a new home. On February 1, 1973, the SMV moved its office to 217 Governor Street, "just behind the Governor's mansion," as Knappenberger stressed in his memorandum to the Board of Trustees.⁸ Hughes informed the Trustees that "we will occupy some 1,200 square feet of office space; while another 2,000 square feet will be set aside in the same building for storage of collections and exhibits having significant quality for future use."⁹ If the Capital Division was going to become a reality, the Museum would need space to store donations of all kinds, including those intended for exhibits. The staff's equipment was also scheduled to be upgraded; Hughes authorized the ordering of "furniture and storage cabinets" along with "stationary reflecting the address change and new Trustees."¹⁰ The Assembly's budget cuts may have set the Museum back in its plans for a statewide system of museums, but the new office space on Governor Street offered a fresh start to the Capital Division project.

Knappenberger and the SMV Board spent the remainder of spring 1973 identifying more specifics to aid in the design process of the Richmond facility. They scheduled several trips to successful science centers and museums across the United States to observe effective (and ineffective) exhibit themes, teaching techniques, and building layouts.¹¹ The most influential institution on the Board's evolving vision for the SMV was the Exploratorium in San Francisco, California.¹² A recently opened center, the Exploratorium was designed by physicist Frank Oppenheimer, brother of J. Robert Oppenheimer, both of whom participated in the Manhattan Project to design the atomic bomb.¹³ Though known best for his work on the Project, Oppenheimer desired to improve science education in the United States later in his life, preferring hands-on learning to the more traditional memorization techniques that characterized his own childhood instruction.¹⁴ In keeping with his vision, the center included different exhibits and stations that allowed guests to learn first-hand how the laws of science governed the natural world.¹⁵ The Board concluded that whatever the Capital Division would be, it needed to provide guests with a similar, immersive educational experience.

Shortly after their return, Mary Ross Scott Reed, a member of the Board of Trustees, pledged a significant gift to the Museum in the hopes of pressuring the legislature to offer more

funding.¹⁶ Her trips with the SMV staff revealed the potential that such a project possessed; it would take commitment from the state to build a center with enough resources to adequately serve the Commonwealth. Reed had quite a history with the SMV by the time she made her gift in April 1973. She began her work on the Museum in 1968 as a member of the Science Museum Study Commission and was “appointed to the original Board of Trustees of the Museum in 1970.”¹⁷ Reed knew all-too-well the ups and downs that the project had experienced thus far, and crafted her donation accordingly. In a letter to Hughes, Reed explained that she wanted to “give the Science Museum of Virginia...a sum of \$500,000.00,” but she would only do so if “the State of Virginia contributes and funds an equal or greater amount.”¹⁸ Reed hoped that the terms of her donation would force the General Assembly to offer the Museum a hefty amount of money to construct the Capital Division, but it remained to be seen how the state would respond.

As the SMV Board waited for word from the legislature to match Reed’s \$500,000, the Trustees elected a new chairman to spearhead the Richmond project. When Dr. Hughes opted to take a less visible, though ever-enthusiastic, role on the Board, D. Rae Carpenter, Jr. stepped up to lead the Trustees. Born in Salem, Virginia, Carpenter attended both Cornell University and the University of Virginia to complete his graduate work in physics.¹⁹ After earning his doctorate, he became a professor at the Virginia Military Institute and served a term as president of the Virginia Academy of Science.²⁰ Like Hughes, he believed that learning should be accessible and enjoyable to the public; a philosophy that helped him successfully serve as chairman of the Research and Development Committee of the state Council of Higher Education.²¹ With new leadership at the helm, the Board of Trustees embarked upon a busy month of tasks to advance the Capital Division project.

First, the SMV needed to identify an appropriate and experienced architectural firm to complete the working drawings for the Richmond facility in Byrd Park. Beginning in July, the Board solicited proposals from firms around the country, including Glave, Newman and Anderson Architects; a Richmond-based group that impressed the Museum early in the process.²² While their search continued, the Trustees examined funding opportunities that could underwrite the “cost of hiring a solar energy consultant for preliminary planning.”²³ The facility in Byrd Park was going to accomplish more than simply being the first state-sponsored science museum in the Commonwealth; it was slated to become the first significant Virginia building heated and cooled by solar energy. The Museum coordinated a Solar Energy Planning Team to

establish “a methodology that will assist architects and engineers in planning buildings to effectively utilize solar energy for heating and cooling.”²⁴ In order to avoid a situation where “solar energy technology” was “added to buildings in an isolated and/or wholesale manner,” the team wanted to hire professionals to ensure the design of an efficient and state-of-the-art HVAC system.²⁵ As a result, the Museum applied to several design competitions and grants geared toward furthering the capabilities and applicability of solar energy in the United States. Since the Trustees had learned, like SMARV, that money for any project would not flow readily from state coffers, the Museum needed to secure outside means of funding, especially for more expensive investments like solar energy planning.

Though July 1973 was characterized more by the beginnings of planning rather than end results, Carpenter’s first month as chairman of the Board of Trustees moved the SMV in the right direction following the General Assembly’s devastating blow. The Museum was left with no choice by the state government but to move forward with the Capital Division and put its remaining divisions on hold. These efforts paid off when the Richmond Regional Planning Commission adopted a resolution “endorsing the SMV establishment” in the summer of 1973.²⁶ It was crucial for the Board to support activities that garnered positive attention for the Museum and demonstrated its continuing viability. In the months to come, the SMV built good publicity throughout the state in the hopes that the Richmond facility would progress further toward completion and the Virginia Legislature would bring its regional divisions back online.

Promoting the Capital Division and Keeping the Network of Museums Alive

While newspaper articles and press releases adequately put the purpose of the SMV into words, keeping the Museum on paper made it a distant reality in the minds of Virginians, especially politicians. The Board needed a tangible marketing tool to showcase its staff in action and offer the public a taste of the experiential learning the SMV would offer. Trans-Science 1, a 50-foot trailer with hands-on exhibits, became that tool.²⁷ From 1973 to 1976, the Museum’s mobile science unit “logged more than 4,000 miles, toured some 45 locations around the State, and attracted over 225,000 visitors.”²⁸ For years, the Board promised to supply Virginians throughout the Commonwealth with public science education. Trans-Science 1 allowed them to start delivering on that promise.

The mobile unit was made possible by one of the earliest corporate relationships the Museum forged. United Virginia Bankshares, Inc. donated \$75,000 to “design, fabricate and install exhibits and related items” in Trans-Science 1.²⁹ The donation was also used to “cover the salary and related expenses of a science mobile coordinator” and the costs “associated with the unit’s on-the-road operation.”³⁰ K. A. Randall, the Chief Executive Officer of United Virginia Bankshares, explained that the corporation was “in a unique position to contribute to Virginia’s economy as well as to demonstrate unique interest in the citizens of our state.”³¹ He also hoped that “other corporate citizens” would see Virginia Bankshares’s gift and “assist in building a Science Museum of Virginia to foster appreciation of and education in both the physical and natural sciences”—a desire that the SMV Board shared.³²

Once the SMV secured funding for the unit, the next decisions to be made were the kinds of exhibits Trans-Science 1 would tour throughout the state. Ultimately, the Museum narrowed the possibilities down to two: “exhibits related to astronomy, with emphasis on man-made satellites and their benefits, characteristics and flight paths” or “exhibits related to the proposed headquarters and physical science facility, as examples of the types of programs to be presented there.”³³ The final design included a few displays of both kinds, “some...operated by push button, while others [were] continuous with set recycling periods.”³⁴ Visitors to Trans-Science 1 could learn more about “the Museum’s plans for the future” which included “a Western Division facility, to be concerned initially with the natural sciences, in the Roanoke area.”³⁵ Likewise, they could peruse exhibits about “the space sciences, including models of Skylab and Viking (the Mars landing vehicle).” Finally, the unit was equipped with “a dome projection area for viewing satellites.”³⁶ All of Trans-Science 1’s exhibits were supervised by Dr. Charles D. Smith, a new Museum staff member “who received a PhD in astronomy from the University of Virginia.”³⁷ Financial support for his position came from United Virginia Bankshares’s initial gift. Smith would “be available for discussion and commentary on the unit, as well as the Museum’s planned programs” as Trans-Science 1 travelled throughout the Commonwealth.³⁸

The SMV’s mobile education unit became operational in November 1973.³⁹ Its inaugural trip began with a welcoming and dedication ceremony that offered guests “an advance tour of” Trans-Science 1 at the State Capitol.⁴⁰ According to a Museum press release, the unit’s “first tour” was “designed to familiarize citizens throughout the State with ‘Trans-Science 1’ and its value as a source for education.”⁴¹ In its lifetime, Trans-Science 1 traveled to several cities in

Virginia, including Norfolk, Fredericksburg, Williamsburg, Hampton, and Lexington.⁴² With the unit operational, the SMV had an effective marketing tool touring the state; a valuable asset that visited state legislators' home districts and showed them first-hand the capabilities of the Museum's staff.

The SMV was not the only organization in the state offering public science education as a marketing device. In November 1973, SMARV opened a 'Mini-Museum' to service the Roanoke Valley region.⁴³ Like Trans-Science 1, the Mini-Museum included hands-on exhibits; "only the butterflies and moths are encased to protect them," Don C. Junze, president of SMARV, explained.⁴⁴ Housed in a center operated by the Junior League of Roanoke Valley, the museum showcased "a cave replete with bats, limestone formations and cave onyx, a sink-turned-wishing-well with turtles and an odor bar [that] stress[ed] sense experiences."⁴⁵ The enterprise was the brainchild of Carole Massart and Nomeka Sours, "who planned and engineered the whole project."⁴⁶ Besides offering children in Roanoke an opportunity to learn more about the natural sciences, the Mini-Museum demonstrated SMARV's commitment to bringing a division of the SMV, or any science center for that matter, to western Virginia.

Back in Richmond, Paul Knappenberger coordinated several public meetings and events to reach out to the local community. Though effective at courting support, Trans-Science 1 was not enough to solicit all the help the Capital Division needed to get on its feet. In November 1973, Knappenberger initiated a critical relationship with the Junior League of Richmond.⁴⁷ After a series of meetings, the Junior League approved a proposal to back the SMV project in February 1974.⁴⁸ The proposal was broken up into three chronological phases, the first slated to begin immediately. During this time, the League would "research with the Science Museum staff into anticipated volunteer needs and the volunteer structures used by other museums."⁴⁹ In addition, it pledged "3-4 volunteers and up to \$350.00 for mailing and consultation necessary to the research."⁵⁰ After the first phase, members of the League would help recruit volunteers for the SMV and "follow-through with the [volunteer] structure organization to assure its self-sustainability."⁵¹ The League offered an additional \$1,000 to develop "guidelines, mailings, and recruitment needs."⁵² With the Junior League's help and resources, the SMV could counter any funding cut from the state that affected staffing the Capital Division.

In addition to solidifying a relationship with the Richmond Junior League, Dr. Knappenberger recorded a TV spot with a local news outlet that reached national audiences. In

December 1973, the associate director and Dr. Smith participated in a museum-sponsored viewing of the partial eclipse.⁵³ They “set up [special equipment] on the State Capitol grounds” and “were also on hand to answer questions” from the public.⁵⁴ In conjunction with the event, Knappenberger recorded a segment with WRVA, the local Richmond NBC affiliate, which was “then ‘fed’ to the [national] network.”⁵⁵ As a result, “the story was aired on NBC’s hourly newscasts twice during the evening of December 12, and at least four times during the morning of December 13, while the eclipse was in progress.”⁵⁶ The new Museum’s newsletter, which began circulation a year earlier, boasted that “more than half of the State’s 30 daily and 85 weekly newspapers used the information originated by the Museum, as did many of the radio and television stations.”⁵⁷ The eclipse viewing also coincided with an SMV mailing distributed to Richmond households outlining “A Few Facts You Ought to Know About the Science Museum of Virginia.”⁵⁸ These successful public outreach techniques introduced the SMV as an active resource for scientific information in the city. Though the Museum was still in the process of building a base facility, the citizens of Richmond could interact with the staff and reap some immediate educational benefits from the project.

While the SMV staff engaged in public outreach, the Board continued their efforts to further the design process behind the scenes. In November 1973, the Museum published the *Headquarters and Physical Sciences Facility Project Criteria*.⁵⁹ This document outlined more specifics about the “exciting, advanced new facility” planned for Byrd Park. Most importantly, it fleshed out details related to the building’s proposed “solar energy augmented heating and cooling system.”⁶⁰ In addition to “functioning as a heat source for the mechanical systems” and “saving conventional fuels and reducing operating costs,” the new environmentally friendly HVAC unit would be “designed as an exhibit and a tool for ongoing research.”⁶¹ In other words, using solar energy to heat and cool the Capital Division facility was as much of a teaching tool as it was a technological innovation. In a letter to State Senator Edward E. Willey, Knappenberger explained that the “impact of this facility on the research, development, application and public demonstration of the practical use of solar energy (a free, non-polluting energy source) will have far reaching consequences on the energy problems and associated economic problems now facing Virginia.”⁶² With the publication of the project criteria, the Museum took another step forward toward construction of the Richmond facility while offering the state a new reason to fund the SMV: energy conservation.

Despite all the publicity and progress the Museum achieved in 1973, the 1974 General Assembly provided only mixed results. Since the Virginia government was engaged in “an austerity movement” from 1974 to 1976, any funds the Museum could wrench from state coffers would be a bittersweet victory.⁶³ Nevertheless, the legislators unexpectedly reversed their decision to fund only one branch of the SMV and appropriated “\$25,000 for planning a division of the state museum in Roanoke.”⁶⁴ While crucial for developing the Western Division, the funds came at a cost. The General Assembly allocated only “\$240,000 for operating expenses, and \$225,000 for capital outlay planning” for “Museum use in the 1974-76 biennium”—far less than the SMV had requested.⁶⁵ The amount did not even break \$500,000—the threshold Mary Ross Scott Reed set for the state with her contingent donation to the Foundation.

The \$25,000 offered a breath of fresh air to SMARV whose members expected little from state government. However, according to an article in the *Roanoke Times*, the SMV Board became “fearful of doing too much for local branches” after the 74-76 appropriations bill “lest it jeopardize state funds for the main museum, planned for Richmond.”⁶⁶ For example, the Trustees “authorized planning and the hiring of a director” for the Western Division “provided the Science Museum Association of Roanoke Valley [could] raise another \$32,500 on its own.”⁶⁷ The newspaper’s evaluation was accurate—the Board could not afford to divvy up what little the state provided in operational costs. The Assembly’s “lack of commitment” to the Capital Division had already “eliminated [the Museum] from consideration as an NSF solar energy Proof-of-Concept project” and threatened the Foundation’s ability to raise private donations.⁶⁸ As Museum staff explained in their alternate funding request for 1974, “it is not feasible to continue to build non-State financial support without a firm State commitment to the project.”⁶⁹ While the new state budget offered hope for the divisional concept of the SMV, it put more stress on the Museum to foster non-state support in an unfavorable financial environment.

Solidifying Community Support and Planning the Western Division

On the heels of the 1974 General Assembly, the SMV renewed its efforts to foster the growing network of resources that the Board, Foundation, and staff built around the Capital Division. For example, Dr. Knappenberger reached out to Mary Ross Scott Reed immediately after the state’s budget cut and requested aid to cover the financial disparity it created. He

explained, “The General Assembly appropriated 200,000 for planning of the Capital Division, rather than 300,000 that was requested and is needed. It is necessary to seek 100,000 of non-State funds immediately.”⁷⁰ Without Reed’s help, the Museum would not be able to complete its “solar energy research” or pay “for professional consultants necessary to properly plan the various systems within the building.”⁷¹ The SMV also solidified its relationship with the Junior League of Richmond. Per their proposal, the League continued to “research anticipated volunteer needs for the Science Museum.”⁷² As a part of this effort, they created a museum advisory board which included members of the Junior League, SMV staff, Board of Trustees, and other individuals from the local Richmond area.⁷³ By renewing the support of community networks around the Capital Division, the SMV secured enough funds to continue working on the branch’s design following the General Assembly’s disappointing appropriations bill.

After stabilizing the Capital Division’s design phase, the Trustees turned their attention to reviving planning for the Western Division. In April 1974, the Board voted to authorize “employment of a department chairman for the Western Division in Roanoke to be paid with local, nonstate funds.”⁷⁴ This stipulation required SMARV to raise \$17,500 for the annual salary of their division’s director.⁷⁵ By tapping into the enthusiastic communal networks the Association rallied together after the 1973 budget, SMARV raised the funds necessary to hire a director in July 1974.⁷⁶ Dr. Thomas H. Krakauer, a member of SMARV and “former assistant professor of biology at Hollins College,” was an appropriate fit for the position.⁷⁷ In 1970, he helped found the “Spring Wild Flower Pilgrimage,” an annual nature walk sponsored by SMARV aimed at getting locals excited about the services a science center could offer their region.⁷⁸ Krakauer accepted the directorship with the hopes of “mak[ing] the Roanoke Valley the center for a first rate and very exciting science museum that will serve the entire western area of Virginia.”⁷⁹ With the appointment of a Western Division director, the Board changed Paul Knappenberger’s title from associate director of the SMV to director of the Capital Division.⁸⁰ The Museum now had two capable and eager leaders to represent regional divisions in public; an equally difficult task deserving of the same title.

In addition to creating a new staff position in April 1974, the Board “also authorized that planning of a Western Division of the state museum be carried through the preliminary drawing stage, and that \$57,500 be spent for such planning.”⁸¹ The cost for planning reports exceeded the \$25,000 allocated by the General Assembly; this discrepancy required SMARV to raise an

extra \$32,500.⁸² While the Association reached out to its donors to fulfill their fundraising goal, the SMV Board met with several architectural firms to determine if one could adequately plan the Western Division without exceeding budgetary constraints.⁸³ In August 1974, the Trustees settled on Venturi and Rauch, an architectural firm based in Philadelphia.⁸⁴ Venturi and Rauch charged a fee of \$30,000, which came in under the \$57,500 benchmark the Board set for SMARV.⁸⁵ Besides the relatively low cost, the Board chose the firm because of “the imaginative qualities of past work...their record for achieving excellent results with limited budgets, their understanding of economical construction methods and their experience in designing facilities for exhibits.”⁸⁶ Thankfully, by the time the Trustees chose Venturi and Rauch, SMARV had raised \$20,000. Coupled with the \$25,000 from the state, the Association’s swift acquisition of non-state funds allowed the SMV to sign a contract with the architectural firm on August 13th.⁸⁷

In September 1974, the Museum made more progress in the planning of the Western Division by settling on a specific site for the center. The Trustees chose “a 59-acre tract along Yellow Mountain Road, SE, near its intersection with the Blue Ridge Parkway spur to Mill Mountain.”⁸⁸ The Board rejected the site on top of Mill Mountain, which members of SMARV had criticized years before, in favor of a flatter and easier to develop area that still allowed for the construction of a modern facility with a planetarium.⁸⁹ The City of Roanoke approved the Board’s choice with Resolution No. 21806, offering “that certain 59 acre tract of land situate [sic] west of Yellow Mountain Road and south of the Mill Mountain Spur Road and presently designed for public park purposes for the construction thereon of a science museum.”⁹⁰ The President of the Blue Ridge Parkway Association likewise permitted the Museum to build on the proposed location, eliminating the final legal obstacle the SMV faced to secure a site for the Western Division facility.⁹¹

By September 1974, the SMV’s Capital and Western Divisions were making relatively good progress. However, the advances made by the Museum in the design and planning stages of both branches put in stark relief the limited work done to raise a Tidewater facility. As a result, the Board initiated an “invitational meeting of the Tidewater board members of the Science Museum of Virginia” on September 12, 1974.⁹² At the gathering, Paul Knappenberger “suggested a study be done for Tidewater to define needs, examine existing programs and suggest a comprehensive Tidewater program.”⁹³ Most attendees expressed complete agreement

with the Capital Division's director; however, John Pugh, representative of the Peninsula Nature and Science Center, recommended caution. He explained that the Peninsula Center was "eager to explore ways of cooperating in the broader Tidewater Science Museum concept development," but "consideration must be given to direct state support of existing facilities as well as new ones proposed."⁹⁴ The Newport News museum was rightly troubled that funding for a state system of science centers with a facility located so close to their own could threaten their ability to receive any funds from the Virginia Legislature. Representatives from the Tidewater region still had quite a bit to discuss before moving into the planning stages of a local SMV division.

Though the meeting did not result in the selection of a site or the outlining of an explicit relationship between the Tidewater Division and existing public science institutions, the attendees did form "a Committee to be called the Steering Committee for the Tidewater Chapter of the Science Museum of Virginia Association."⁹⁵ Like SMARV, the Steering Committee would focus on eliciting input from a broad range of Tidewater residents and soliciting financial backing from local donors. If Coastal Virginia hoped to bring a division of the SMV to their region, they needed to foster the same level of support that flourished in the Roanoke Valley. In the meantime, the SMV Board had to direct their attention back to the Capital and Western Divisions; the General Assembly was in the process of further limiting the funds available to state agencies.

Good publicity, Bad Economic Climate, and Renewed Opposition to a Science-Only Museum

September 1974 began as a relatively productive and positive month for the Science Museum of Virginia. In addition to the progress made on the Capital and Western Divisions, the Museum received a significant donation from Reynolds Aluminum company and good press for the mobile education unit, Trans-Science 1. Reynolds Aluminum gifted the SMV a 50 KV RCA Electron Microscope for use in educational programming.⁹⁶ The microscope was "fully operational" and "removed from the Metallurgical Research Division Laboratories" of the company.⁹⁷ Since the Museum still lacked a physical base in Richmond, they lent the "unit to Randolph Macon College for their use until" the microscope was "needed following the completion of [the] facility in Byrd Park."⁹⁸ Though the gift may seem small to readers,

Carpenter and the Museum's Donations Committee believed that the acquisition was "an important one" that could "contribute greatly to the [SMV's] physical science program" and forge a lasting corporate relationship with Reynolds Aluminum.⁹⁹

After the Foundation accepted the company's gift, Trans-Science 1 recorded its 100,000th visitor at the Virginia State Fair.¹⁰⁰ After "just 10 months of operation," the unit logged the noteworthy event using "a pressure sensitive device located just inside the front door" of the trailer.¹⁰¹ The lucky visitor, "nine-year-old Stuart V. King of Richmond," received a "60-millimeter refracting telescope on behalf of the Museum and United Virginia Bankshares."¹⁰² Newly re-elected Governor Mills Godwin presented the telescope to the young boy, a "specially inscribed" and particularly appropriate award since the exhibits on display "deal[t] mainly with space science."¹⁰³ The event garnered positive press for the Museum and offered the SMV an opportunity to show the Governor—in person—the tangible difference a state science museum could make in the life of a Virginian youth.

Unfortunately, the mobile unit's milestone was not enough to convince the Governor to offer more financial support to the Museum. Godwin's second term would be characterized by extreme fiscal restraint; a situation he made clear to state agencies on September 26, 1974. In a letter from Maurice B. Rowe, secretary of administration to the Governor, the SMV was informed that "the Governor...has concluded that there will be only limited budget revisions recommended to the 1975 General Assembly."¹⁰⁴ While Godwin recognized the "many important programs and capital outlay projects which merit[ed] consideration," there was simply not enough funds to satisfy every institution's request.¹⁰⁵ Furthermore, it was "necessary to effect reductions in expenditures as [the state] did in the previous fiscal year to assure balancing the budget."¹⁰⁶ According to State Senator Willey, the Virginia Legislature "expect[ed] a \$16 million shortfall in our budgeted income for the first fiscal year of the biennium," leaving no room for an increase in expenditures.¹⁰⁷ After making the announcement, Rowe wrote to Carpenter, explaining the implications of budgetary cuts to the Science Museum project. He believed it was "very doubtful that funds will be available and in fact, we are now considering curtailing certain existing projects."¹⁰⁸ The news was bleak indeed. If the Science Museum did not secure adequate funds elsewhere, it may face more than a reduction in appropriated resources; the project could be cut from the state's budget entirely.

Thankfully, the SMV received several gifts, awards, and donations from non-state sources immediately after Rowe's letter. For example, in November 1974, the Museum won one of four energy conservation awards from the Owens-Corning Fiberglass Corporation.¹⁰⁹ Specifically, the company recognized the energy-saving designs of two firms working on the Museum's Capital Division facility: "Hankins and Anderson, Inc., consulting engineers, and Glave, Newman, Anderson Associates, Inc., architects."¹¹⁰ In January 1975, the National Science Foundation awarded the SMV a grant of \$623,000 to further aid in the development of a solar-powered heating and cooling system for the Capital Division.¹¹¹ Both awards coincided with the location of Solar Lab in the Commonwealth, "the National Science Foundation/Honeywell, Inc.'s mobile solar laboratory."¹¹² The unit presented "a practical demonstration of solar energy collection and conversion" to "some 3,000 general public visitors, and some 500 people in special groups, including [Virginia] State legislators, science teachers, architects and engineers."¹¹³ The Lab was parked at the Richmond Coliseum "along with Trans-Science 1," bringing more visitors to the Museum's own mobile education unit.¹¹⁴

This confluence of events did not solve all the Museum's financial problems. However, national recognition of the Capital Division's solar energy HVAC system demonstrated to the state that the SMV was worth preserving—at least in some capacity—in the state budget. In 1974, the General Assembly passed a resolution "Commending the Science Museum of Virginia for Leadership in the Field of Solar Energy Development in Virginia."¹¹⁵ The text read:

That the General Assembly commends the Board of Trustees and staff of the Science Museum of Virginia; and the individuals in Virginia's businesses, industries, and universities who are involved in the final design of the Capital Division building, for their leadership in recognizing the potential of solar energy; for their determination to demonstrate this potential in the form of a working solar energy facility; for their dedication to educating the public concerning the use of solar energy as an abundant, clean, and economical energy resource; and for endowing the Commonwealth of Virginia with perhaps the most advanced systems-designed solar energy facility in the nation, thus placing Virginia in a position of leadership in the field of solar energy technology, design, and utilization.¹¹⁶

Though the Assembly could not fund the Museum's Capital Division in full, it recognized the potential of such an institution to bring scientific innovations to the state. The SMV would not, as Rowe feared, be dissolved as a state agency if it continued attracting positive national attention to the Commonwealth.

Bringing Solar Energy to Virginia as a Means and an End

Museum leadership learned quite a bit from the General Assembly's approval of its solar energy research initiatives. Strategically, the state government would remain enthusiastic about the SMV project if the Museum put Virginia on the map as an energy conservationist state. Such optimism also relieved pressure from the SMV to drop one or more of its regional divisions. With these benefits in mind, the Board approved several actions to continue advancing the SMV's solar energy research well into America's bicentennial. In the eyes of the Museum's Trustees, Foundation Directors, and staff members, solar energy was a means and an end: continued research allowed the SMV to develop its regional branches and successful execution of a solar powered HVAC unit would bring scientific acclaim to the state. In other words, educating Virginians about solar energy could enlighten the public and advance the construction of a statewide museum system.

On January 21, 1975, the Board of Trustees voted to adopt a resolution proposed by State Delegate George Grayson to designate the SMV as the Solar Energy Center in Virginia.¹¹⁷ In addition to educating the public about the physical sciences, the SMV's Richmond facility would use its solar-powered HVAC system to promote energy conservation throughout the state and encourage research into new energy-saving technologies.¹¹⁸ The Museum welcomed this distinction, hoping to capitalize on whatever positive attention it may attract from the Virginia Legislature and national grant agencies. While Grayson attempted to craft the resolution into a workable piece of state legislation, the SMV applied for and won a \$174,000 solar energy research grant from the Energy Research and Development Administration (ERDA).¹¹⁹ The Board announced its receipt of the grant at a meeting on May 15, 1975.¹²⁰ Rae Carpenter, Chairman of the Board, was "most pleased to accept these funds for continued development of our solar energy project, as Virginia assumes a real leadership role in the application of this important alternative energy source."¹²¹ Furthermore, the Museum revealed plans for "a workshop in Richmond to acquaint the general public, government leaders, school administrators, and businessmen with the solar energy potential in Virginia."¹²² That conference took place three months later on August 19-20 at Virginia Commonwealth University.¹²³

The ERDA-sponsored event "featured talks, workshops, exhibitions, films, and addresses by public officials and noted businessmen, builders, and scholars in the solar energy field."¹²⁴

All attendees came together with the goal of “assess[ing] the promise and problems of solar energy use in Virginia.”¹²⁵ The Museum reported over “1,000 registered participants” and “several thousand more” visitors to the conference’s “exhibits of solar hardware.”¹²⁶

Afterwards, Carpenter wrote Eugene Doering, a member of the ERDA, detailing the conference’s success. He explained how the SMV had “received a number of compliments on the exhibits, speakers and panels.”¹²⁷ Indeed, Carpenter believed that “conferences such as the one held recently serve a very real purpose in educating the public to the uses of solar energy and this one brought the museum application to the attention of several key legislators in a very forceful and informative way.”¹²⁸ Undoubtedly, the success of the conference bolstered support for Delegate Grayson’s resolution which passed the General Assembly on February 9, 1976.¹²⁹ A mere year after the Museum embraced its role as a Solar Energy Center, the state legislature amended the Code of Virginia to reflect the SMV’s new conservationist title.¹³⁰ The bill outlined the purposes of the Center as follows:

- (i) To serve the people of the Commonwealth as a clearinghouse to gather, maintain and disseminate general and technical information on solar energy and its utilization;
- (ii) To coordinate programs for solar energy data gathering in Virginia;
- (iii) To coordinate efforts and programs on solar energy with other State agencies and institutions, other states and federal agencies;
- (iv) To promote cooperation among and between Virginia business, industry, agriculture and the public related to the use of solar energy;
- (v) To develop public education programs on solar energy for use in schools and by the public;
- and, (vi) To provide assistance in formulating policies on the utilization of solar energy that would be in the best interest of the Commonwealth.¹³¹

The Science Museum’s Solar Energy for Virginia conference was a positive step in the direction of achieving its new, state-authorized goals as a Solar Energy Center. By advancing Virginia’s interests in energy-saving technologies and educating the public about the potential of solar energy, the Museum carried the favor it needed to continue planning the Capital and Western Divisions.

From January 1975 to February 1976, the SMV leveraged its positive press to increase its profile and make progress on the Byrd Park facility. The Museum began the year by sponsoring the Children’s Science Book Fair, “a group of exhibits and programs built around a collection of over 100 outstanding children’s science books published last year, and chosen for excellence in material and presentation in all areas of science.”¹³² The “16 different exhibits” included hands-on displays of topics “ranging from reptiles to rocks and minerals.”¹³³ Over “7,500 (mostly first

through sixth graders) visited the fair,” forcing the Museum to extend the event an additional two weeks.¹³⁴ At the same time, a group of VCU seniors under the direction of assistant professor of interior design Dorothy M. Hardy “selected the Science Museum’s Capital Division facility for its spring semester project.”¹³⁵ The students were tasked with “coordinat[ing] the location of exhibit areas and traffic flow patterns.”¹³⁶ They also constructed a “large scale model” of the facility for the Museum to use in talks and demonstrations.¹³⁷ The SMV benefitted from the publicity of both events and received useful advice for the Capital Division’s layout without tapping into their budget.

Over the next few months, the SMV sponsored two trips abroad for Museum staff members. The purpose of these excursions was twofold: gather more data for designing the Byrd Park facility and curry favor with Virginian politicians. The first was to the Ontario Science Centre in Canada.¹³⁸ In April 1975, representatives from the Museum as well as Virginian statesmen, including Governor Godwin himself, visited the establishment which, “in just six years” had “become the second most popular of the 20 science centres in North America.”¹³⁹ Knappenberger explained in his letter to attendees that the SMV chose the Centre as a worthwhile destination because it “vividly display[ed]” the “‘hands-on’ approach to science education” that was central to “our Museum’s philosophy.”¹⁴⁰ In addition, the institution was “publicly funded by the province of Ontario,” a significant detail for the local legislators present.¹⁴¹ The field trip demonstrated to each of the 14 Virginians what a modern and fully-funded science center could accomplish: fun and informative educational programming along with international acclaim.

In June, Knappenberger embarked upon a solo-trip to Detroit to attend the first Tilted Dome Design Meeting.¹⁴² This assembly of “eighteen planetarium and space theater directors, consultants and architects from across the nation” met to “coordinate their individual efforts to develop tilted dome space theaters and work out mutual problems.”¹⁴³ At the time of the gathering, there was only one operational “space theater in the United States”: the Reuben H. Fleet Planetarium and Space Theater in San Diego.¹⁴⁴ As a work in progress, the San Diego Planetarium exemplified the costly construction of technologically advanced dome theaters—a lesson worth learning for smaller institutions with limited budgets like the SMV. Indeed, an important goal of the meeting was to “develop ‘compatibility and interchangeability in programming’” to reduce the cost associated with running these new and innovative theaters.¹⁴⁵

Knappenberger left the meeting with a bulk of information about constructing tilted-dome planetariums. He also joined “a six man [sic] committee” at the conference dedicated to “act[ing] as a professional clearing house coordinating new information, analyzing planned equipment, and answering future questions from meeting participants.”¹⁴⁶ The SMV wanted to become a leader in the production of tilted-dome planetariums; Knappenberger’s meeting was an important step in that process.

While the Richmond-based staff attended to the needs of the Capital Division, members of SMARV continued fundraising and planning initiatives for the Western Division. In May 1975, the Association “launched a campaign to raise \$30,000 by July 15.”¹⁴⁷ While “operation of the western division of the Science Museum of Virginia” was guaranteed “through Sept. 30,” the Museum needed funds to continue paying staff for the entirety of “the fiscal year beginning July 1.”¹⁴⁸ The state budget cuts left no room for the SMV to allocate money toward the operating costs of the Roanoke facility; members of SMARV had to underwrite the salaries of their two official staffers, including Director Krakauer. In June 1975, the Association received good news from the National Park Service (NPS). The NPS completed an environmental assessment report approving the construction of an access road from the Yellow Mountain site to the Blue Ridge Parkway.¹⁴⁹ This road, which “would be located on National Park Service land,” was an essential aspect of the Western Division’s design, connecting the anticipated museum to a popular scenic parkway.¹⁵⁰

With advances in the design stages of two regional branches and positive accolades from media outlets and legislators alike, the Museum’s Board felt comfortable developing a robust capital outlay request for the 1976 General Assembly. The Trustees drafted a request for roughly \$10.5 million dollars, \$7.5 of which would go toward constructing the Capital Division, \$2.3 million for the Western Division, and \$25,000 to plan the Tidewater Division.¹⁵¹ The “operating request” was “not to exceed \$1 M,” Carpenter explained to Jack Ramey, acting president of SMARV.¹⁵² The restraint exercised by the Trustees on the operating budget would necessitate further private fundraising to pay for the Western Division’s employees. However, it would also make the capital outlay request more passable in the eyes of state delegates and senators.

The Capital Division also had its own new philanthropic source to supplement its expenses and assuage leery legislators. In the same month the Trustees approved the 1976 budget request, Anna Garner joined the Board, bringing her enthusiasm and pocket book to the

project.¹⁵³ A “philanthropist and volunteer who devoted her time to organizations including the Science Museum of Virginia and the Virginia Opera,” Garner was born in Arcadia Florida and moved to western Henrico County after marrying her husband, T. Fleetwood Garner, who ran a flight school in the state.¹⁵⁴ Later in life, Garner joked that her “school days in the 1930s left me largely untouched by the infinite world of science.”¹⁵⁵ “Perhaps,” she explained, “my lack of exposure to science in the past makes me even more aware of how vital it has become for people of all ages to have a better understanding of the world that surrounds them.”¹⁵⁶ Garner was a high-profile and well-connected addition to the Board of Trustees. Her appointment, the Museum’s solar energy distinction, and continued progress on the Capital and Western Divisions should have been enough to carry the SMV’s capital outlay request through the General Assembly. Unfortunately, opposition to the multi-regional museum system arose from an unforeseen source: Governor Godwin.

Unforeseen Consequences: A Governor’s Opposition and an Abandoned Train Station

On October 21, 1975, Paul Knappenberger presented the SMV’s capital outlay request to Governor Godwin and the Virginia Budget Advisory Committee.¹⁵⁷ While the Director likely expected some push back from the state (after all, the Museum had never received the entirety of its funding requests from the General Assembly), Knappenberger was taken aback by the Governor’s hostility at the meeting. Shortly after he began his presentation “noting [the] overall Museum appropriation requests for 1976-78,” Godwin interjected and told the Director “you are asking for funds for facilities in the Western and Tidewater divisions, before we have funded construction of the Capital Division facility.”¹⁵⁸ He continued, “you and your Board of Trustees must be realistic, so there is no need to waste our time and yours by asking for projects that are not practical or approachable in the next biennium.”¹⁵⁹ Godwin forbade Knappenberger from delving into the progress the Western Division had made, preferring to spend his time—and the state’s money—on the Capital Division facility. Furthermore, he warned Knappenberger that “if the proposed Capital Division facility is not started or completed in the next biennium, then you will not need the operating funds you have requested.”¹⁶⁰ The Governor was clearly frustrated by the amount of time the SMV had taken to plan and design the Capital Division—an emotional

response that did not account for the very reason why the process had drawn on for several years: a lack of financial commitment from the state.

The Governor also surprised Knappenberger when he expressed skepticism toward the Museum's solar energy goals. He asked the Director, "Should Virginia attempt to prove to the nation the value of solar energy? Are we able to do this, or should it be done by the Federal government and others."¹⁶¹ He had, after all, "read that it will be at least 1989 before solar energy can be of any real value in helping to solve the energy crisis."¹⁶² Knappenberger attempted to defend the Museum's work on alternative energy sources—the same efforts that the General Assembly would sanction and laud in its January 1976 resolution. He argued that "solar energy could be used now," allowing "Virginia to assume a leadership role in its development as a viable alternative energy source."¹⁶³ While "solar energy is not the panacea for all our energy problems," Knappenberger explained it could "provide considerable relief in the heating and cooling of buildings in the very near future."¹⁶⁴ Even after drawing attention to the successful ERDA conference held at VCU, Knappenberger could not assuage the Governor's doubts.

Knappenberger's meeting with the Budget Advisory Committee resulted in two unforeseen and devastating consequences: the elimination of the regional divisions from state consideration for the 1976 biennium budget and the jeopardization of the Byrd Park facility in Richmond. After all of the work conducted by SMV affiliates, members of SMARV, and community leaders throughout the state, Governor Godwin and his budgetary committee swiftly rendered the museum system defunct with his "stern, critical, and almost rude" words.¹⁶⁵ In a letter to A. B. Niemeyer, a science specialist for the Portsmouth Public School division, Carpenter described the Governor's "attacks upon the presentation which Paul made."¹⁶⁶ He explained how the Director was "disheartened as were three of our Trustees who were in attendance."¹⁶⁷ As a result of the meeting, "as well as of conversations with other legislators," Carpenter believed that the Board needed to "have a rather extensive review...of our future plans and goals."¹⁶⁸ The Trustees had to determine which aspects of the Science Museum of Virginia could be salvaged in the wake of extreme opposition from the state.

While the SMV struggled to regroup from these developments, a long-time Richmond landmark closed its doors across town. On November 15, 1975, one last train departed Broad Street Station, leaving the neo-classical building vacant.¹⁶⁹ Constructed in 1917, the Station was designed by John Russell Pope, the famed architect of the Jefferson Memorial and the National

Gallery of Art.¹⁷⁰ In addition to his evocation of the “Pantheon in Rome,” with his trademark domed roofs and tall, white columns, Pope designed the building with a “slope on the over 50 acre site” which “allowed trains to approach the covered platforms at the rear of the station below street level, out of view from the front.”¹⁷¹ With a price tag of \$3,100,000, the Station was built “by the Richmond, Fredericksburg and Potomac Railroad Company [RF&P] for passenger traffic during the first quarter of” the twentieth century.¹⁷² This period, known by historians as the “Golden Age of Railroads,” was characterized by improved railway travel, leading to an influx of passenger traffic in Richmond and other major cities across the country.¹⁷³ However, the development of better, faster, and more personalized forms of transportation, such as commuter vehicles and commercial airlines, after World War I marked the end of the Golden Age. As the number of railroad passengers decreased year-by-year, Amtrak, the new owner of the Station by 1971, opted to close the stop on Broad Street in favor of opening the new Greendale Station on Staples Mill Road to consolidate its transportation services.¹⁷⁴ The state purchased Broad Street Station from RF&P in 1976 with the intention of erecting an “office park.”¹⁷⁵ Unless the state could find a use for the building, it would be demolished to make way for the new development.

When the Board of Trustees opted to pull its capital outlay request from state consideration, the Station became a potential home for the Science Museum of Virginia. The decision to scrap the request in its entirety was a difficult one, as Carpenter explained in a letter to Norma Moran, a committed member of SMARV. He argued that the Board’s move was “a desperate attempt to salvage a greatly increased operating request”—if the Museum could not secure the money it needed to construct new facilities, the Trustees had to ensure the acquisition of operating costs to keep the SMV alive in some capacity.¹⁷⁶ Carpenter hoped the decision would also “leave a foot in the door” of the Governor’s office in case the Museum needed “to justify inclusion in a bond issue, if one should materialize.”¹⁷⁷ In the meantime, the Western Division, and any whisper of a Tidewater Division, would be left out of the state’s 1976-78 budget. The Board was already certain the 1976 Assembly would not fund construction of a facility in Byrd Park, but the state had offered the Museum use of the Broad Street Station as a temporary replacement. The Trustees could not threaten the very existence of a state-sponsored science museum by balking and asking for more.

Conclusion: SMV Limited to One Location at Broad Street Station

With these new circumstances before the Museum, the Board of Trustees was forced to cut their losses and settle for space in the abandoned train station. The months surrounding the Trustees' attempt to whittle down the SMV to one site were bleak for all those involved in the process. As early as November 1975, Edward Fordyce, the chief planning officer for the SMV, sent a termination letter to James Glave, one of the chief architects working on the Capital Division facility.¹⁷⁸ Though drawings of the building were nearly complete, the design was no more than a reminder of what the Richmond complex could have been in the wake of the state's budgetary cuts. When the Assembly officially voted to eliminate the Byrd Park facility from the state's budget in January 1976, the Board of Trustees was forced to remove the Western Division from the SMV project.¹⁷⁹ With no money to spare for operational expenses in Roanoke, and the Governor's lack of enthusiasm for a Western Division, it was no longer feasible for the SMV to advocate for the construction of a science center in the Valley.

Members of SMARV took the news particularly hard, writing numerous letters to the Board requesting an explanation for the elimination of a facility they had spent years preparing for. "Does not \$85,000 raised by the public mean anything?" Jack Ramey wrote in an emotional letter to Carpenter on January 29, 1976.¹⁸⁰ "It is a strange situation," he continued, "when the only group that is providing science activities for the system becomes a liability to the system and must be swept aside."¹⁸¹ Though Ramey was wrong in discounting the education initiatives of the SMV in Richmond, including the Children's Science Book Fair and the outfitting of Trans-Science 1, he was right to harbor frustration after SMARV had committed so much time and energy to pay for the Western Division's staff, coordinate planning initiatives with the NPS and the Blue Ridge Parkway Association, and offer Roanokers a mini-museum complete with annual activities, including the Wild Flower Pilgrimage. Carpenter understood SMARV's disbelief and tried to explain how the Trustees arrived at the decision to cut the Western Division.

He outlined how the Broad Street Station had become available and how its use as the Museum's only location necessitated a "request [of] no more than 19 new positions for a total of less than \$700,000 for...two years" from the state.¹⁸² Even that request was rejected by the Assembly, its members only willing to authorize a "7.5% per year increase in funds over present

funds.”¹⁸³ The Station itself was not particularly ideal since the state intended for it to be a temporary location for the Museum. Furthermore, it lacked space for a botanical garden; a condition that led the ailing Dr. Hughes to propose making the Yellow Mountain Road site the only home of the Science Museum of Virginia.¹⁸⁴ The Trustees overruled his suggestion because of the Roanoke Valley’s remoteness; the Museum could still reach more Virginians if its base of operation remained in Richmond. Once the Station was accepted by the Board as a feasible site, Knappenberger requested an audience “before [the] House Appropriations committee” to ask for some funds to adapt the train station.¹⁸⁵ On February 5, Knappenberger, Carpenter, Anna Garner and Mary Ross Scott Reed traveled to the state capital and requested “\$150,000 for station connected operations of which about 1/3 could be operating funds.”¹⁸⁶ The assembly approved their request, but only on the condition that the money be used for the Broad Street Station alone.

Looking back on the years between 1974 and 1976, the SMV experienced an extraordinary swing of successes and failures. With the launch of Trans-Science 1, the Museum delivered science education to children across the state and attracted positive press for the Capital Division. The General Assembly’s 1974 appropriation of planning funds for the Western Division kept the Roanoke facility alive on paper, allowing members of SMARV to raise funds for a small staff and the construction of their own science center. The Museum’s distinction as a Solar Energy Center gave the Board of Trustees hope that the state would continue funding the Byrd Park facility if it helped brand the Commonwealth as an energy-conscious state. And yet, despite all these gains, the Museum lost the ability to assemble a network of science centers due to opposition from Governor Godwin and the 1976 General Assembly. The defeat was bittersweet. On the one hand, the SMV had an immediate base of operations to offer at least some segment of the Virginia population quality, hands-on science exhibits. On the other, the Board had to cut ties with all the regional associations that had supported the project and worked to bring a part of the SMV to their hometowns. Though the Board of Trustees compromised their vision of a statewide network of museums by accepting a home at Broad Street Station, their persistence ensured the development of some form of centrally-located public science education in Virginia. Transforming the Station into a museum would take even more dedication and years of commitment.

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- ¹ Robert B. Sears, “Official Hasn’t Given Up on Virginia Museum System,” *Roanoke Times* (Roanoke, VA), March 2, 1973.
- ² Ibid.
- ³ Trudy Willis, “Science Center to Go it Alone if Necessary,” *Roanoke Times* (Roanoke, VA), January 4, 1974.
- ⁴ Science Museum Association of Roanoke Valley, *Toward a Science Museum Center in Roanoke Valley*, mailing, in Science Museum of Virginia Archives, print (accessed Jul. 27, 2017).
- ⁵ Ibid.
- ⁶ Harold Solding, *Letter from Harold Solding to Linwood Holton, March 9, 1973*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 30, 2017).
- ⁷ Ibid.
- ⁸ Paul H. Knappenberger, Jr., *Memorandum #88 from Paul H. Knappenberger to Trustees, Science Museum of Virginia*, memorandum, in Science Museum of Virginia Archives, print (accessed Jul. 30, 2017).
- ⁹ Roscoe D. Hughes, *Memorandum #43 from Roscoe D. Hughes to Trustees, Science Museum of Virginia, May 16, 1972*, memorandum, in Science Museum of Virginia Archives, print (accessed Jul. 30, 2017).
- ¹⁰ Ibid.
- ¹¹ D. Rae Carpenter, *Science Museum of Virginia: A Few Early Landmark Dates, October 2008*, handout, in Science Museum of Virginia Archives, print (accessed Jul. 26, 2017).
- ¹² Carpenter, D. Rae, Jr., interview by Kasey Sease, personal interview, Charlottesville, July 20, 2016.
- ¹³ “History,” Exploratorium.edu, <https://www.exploratorium.edu/about/history> (accessed Aug. 16, 2017).
- ¹⁴ Ibid.
- ¹⁵ Ibid.
- ¹⁶ Mary Ross Scott Reed, *Letter from Mary Ross Scott Reed to Roscoe D. Hughes, April 30, 1973*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 29, 2017).
- ¹⁷ Neil November, *Resolution, September 27, 1979*, resolution, in Science Museum of Virginia Archives, print (accessed Jul. 29, 2017).
- ¹⁸ Reed, *Letter from Mary Ross Scott Reed to Roscoe D. Hughes, April 30, 1973*.
- ¹⁹ *New Board Chairman Elected By Science Museum Trustees, July 5, 1973*, press release, in Science Museum of Virginia Archives, print (accessed Jul. 30, 2017).
- ²⁰ Ibid.
- ²¹ “Dr. Carpenter New Head of Museum Unit,” *Richmond News Leader* (Richmond, VA), July 6, 1973.
- ²² *Science Museum of Virginia: Headquarters/Physical Sciences Facility Project Criteria, November 1973*, report, in Science Museum of Virginia Archives, print (accessed Jul. 26, 2017).
- ²³ Ibid.
- ²⁴ Science Museum of Virginia, *Letter from the Science Museum of Virginia and its Solar Energy Planning Team to Charles Hauer, April 18, 1974*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 26, 2017).
- ²⁵ Ibid.
- ²⁶ Carpenter, *Science Museum of Virginia: A Few Early Landmark Dates, October 2008*.
- ²⁷ *Science Museum of Virginia: Serving the Future, Preserving the Past*, mailing, in Science Museum of Virginia Archives, print (accessed Jul. 25, 2017).
- ²⁸ Ibid.
- ²⁹ Beverly Orndorff, “UVB Gives \$75,000 for Science Mobile,” *Richmond Times-Dispatch* (Richmond, VA), n.d.
- ³⁰ Ibid.
- ³¹ *Remarks of K.A. Randall, Chief Executive Officer, United Virginia Bankshares, Inc., Sciencemobile Press Conference, Thursday, September 6, 1973*, transcript, in Science Museum of Virginia Archives, print (accessed Jul. 30, 2017).
- ³² Ibid.
- ³³ Don Harrison, “Mobile Science Exhibit Planned,” *Roanoke Times* (Roanoke, VA), Sept. 7, 1973.
- ³⁴ *Award Presentation by Governor Godwin to Feature Mobile Unit Stay at State Fair, September 19, 1974*, press release, in Science Museum of Virginia Archives, print (accessed Jul. 30, 2017).
- ³⁵ Ibid.
- ³⁶ Ibid.

-
- ³⁷ *Science Museum's New Mobile Unit to Begin Operation November 14, November 12, 1973*, press release, in Science Museum of Virginia Archives, print (accessed Jul. 30, 2017).
- ³⁸ Ibid.
- ³⁹ Ibid.
- ⁴⁰ Ibid; *Trans-Science 1, December 3, 1973*, invitation, in Science Museum of Virginia Archives, print (accessed Jul. 30, 2017).
- ⁴¹ *Science Museum's New Mobile Unit to Begin Operation November 14, November 12, 1973*.
- ⁴² *Trans-Science 1 Schedule: April 20-June 30, April 26, 1974*, schedule, in Science Museum of Virginia Archives, print (accessed Jul. 30, 2017).
- ⁴³ Trudy Willis, "Mini Science Museum Challenges Senses," *Roanoke Times* (Roanoke, VA), November 11, 1973.
- ⁴⁴ Ibid.
- ⁴⁵ Ibid.
- ⁴⁶ Don C. Kunze, "A Message from the President," *Happenings in Science* (1973): pg. 1.
- ⁴⁷ *History of Involvement of the Junior League of Richmond with the Science Museum of Virginia*, handout, in Science Museum of Virginia Archives, print (accessed Jul. 31, 2017).
- ⁴⁸ *Project proposal: Volunteer Structure for the Science Museum of Virginia, January 11, 1974*, proposal, in Science Museum of Virginia Archives, print (accessed Jul. 31, 2017).
- ⁴⁹ Ibid.
- ⁵⁰ Ibid.
- ⁵¹ Ibid.
- ⁵² Ibid.
- ⁵³ "Partial Solar Eclipse 'Heard' Around Nation," *Science Museum of Virginia Newsletter* 4 (1975): 3-4.
- ⁵⁴ Ibid.
- ⁵⁵ Ibid.
- ⁵⁶ Ibid.
- ⁵⁷ Ibid.
- ⁵⁸ *A Few Facts You Ought to Know About the Science Museum of Virginia*, flyer, in Science Museum of Virginia Archives, print (accessed Jul. 25, 2017).
- ⁵⁹ *Science Museum of Virginia: Headquarters/Physical Sciences Facility Project Criteria, November 1973*, report, in Science Museum of Virginia Archives, print (accessed Jul. 26, 2017).
- ⁶⁰ Ibid.
- ⁶¹ Ibid.
- ⁶² Paul H. Knappenberger, Jr., *Letter from Paul H. Knappenberger, Jr. to Edward E. Willey, January 23, 1975*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 29, 2017).
- ⁶³ *Science Museum of Virginia: Serving the Future, Preserving the Past*, mailing, in Science Museum of Virginia Archives, print (accessed Jul. 25, 2017).
- ⁶⁴ Robert B. Sears, "Steps Taken to Establish Western Va. Museum," *Roanoke Times* (Roanoke, VA), April 30, 1974.
- ⁶⁵ *Science Museum of Virginia: Brief History, December 3, 1974*, report, in Science Museum of Virginia Archives, print (accessed Jul. 30, 2017).
- ⁶⁶ "Progress Toward a Science Museum," *Roanoke Times* (Roanoke, VA), May 5, 1974.
- ⁶⁷ Ibid.
- ⁶⁸ *The Science Museum of Virginia: Alternate Funding Request, 1974*, announcement, in Science Museum of Virginia Archives, print (accessed Jul. 26, 2017).
- ⁶⁹ Ibid.
- ⁷⁰ Paul H. Knappenberger, Jr., *Letter from Paul H. Knappenberger, Jr. to Mrs. William T. Reed, March 27, 1974*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 26, 2017).
- ⁷¹ Ibid.
- ⁷² *History of Involvement of the Junior League of Richmond with the Science Museum of Virginia*, handout, in Science Museum of Virginia Archives, print (accessed Jul. 31, 2017).
- ⁷³ Ibid.
- ⁷⁴ Sears, "Steps Taken to Establish Western Va. Museum."
- ⁷⁵ Ibid.
- ⁷⁶ "Ex-Hollins Professor Gets Museum Post," *Roanoke Times* (Roanoke, VA), July 17, 1974.
- ⁷⁷ Ibid.
- ⁷⁸ Ibid.

-
- ⁷⁹ Ibid.
- ⁸⁰ Carpenter, *Science Museum of Virginia: A Few Early Landmark Dates, October 2008*.
- ⁸¹ Sears, "Steps Taken to Establish Western Va. Museum."
- ⁸² Ibid.
- ⁸³ *Western Division/Science Museum of Virginia Meeting Agenda, August 1, 1974*, agenda, in Science Museum of Virginia Archives, print (accessed Jul. 27, 2017).
- ⁸⁴ "Planning Contract Let for Science Museum," *Roanoke Times* (Roanoke, VA), August 2, 1974.
- ⁸⁵ Ibid.
- ⁸⁶ *Report on the Architect Selection Review Meeting with SMARV, August 1, 1974*, report, in Science Museum of Virginia Archives, print (accessed Jul. 28, 2017).
- ⁸⁷ "Planning Contract Let for Science Museum."
- ⁸⁸ Don Harrison, "Roanoke Site of New Museum," *Roanoke Times* (Roanoke, VA), September 20, 1974.
- ⁸⁹ Ibid.
- ⁹⁰ City Council of Roanoke, VA, *Resolution No. 21806, September 16, 1974*, resolution, in Science Museum of Virginia Archives, print (accessed Jul. 27, 2017).
- ⁹¹ *Western Union Telegram from the President of the Blue Ridge Parkway Association to the Science Museum of Virginia Board of Trustees, September 18, 1974*, telegram, in Science Museum of Virginia Archives, print (accessed Aug. 22, 2017).
- ⁹² *Invitational Meeting of the Tidewater Board Member of the Science Museum of Virginia, September 12, 1974*, notes, in Science Museum of Virginia Archives, print (accessed Jul. 31, 2017).
- ⁹³ Ibid.
- ⁹⁴ Ibid.
- ⁹⁵ Ibid.
- ⁹⁶ Paul H. Knappenberger, Jr., *Letter from Paul H. Knappenberger, Jr. to Richard E. Hughes, September 24, 1974*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 28, 2017).
- ⁹⁷ Richard E. Hughes, *Letter from Richard E. Hughes to Paul H. Knappenberger, Jr., September 18, 1974*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 28, 2017).
- ⁹⁸ D. Rae Carpenter, Jr., *Letter from D. Rae Carpenter, Jr. to Richard E. Hughes, September 27, 1974*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 28, 2017).
- ⁹⁹ Ibid.
- ¹⁰⁰ "100,000th Visitor to Mobile Unit is Recognized by Governor Godwin," *Science Museum of Virginia Newsletter* 3 (1974): 1-2
- ¹⁰¹ Ibid.
- ¹⁰² Ibid.
- ¹⁰³ *Award Presentation by Governor Godwin to Feature Mobile Unit Stay at State Fair, September 19, 1974*, press release, in Science Museum of Virginia Archives, print (accessed Jul. 30, 2017).
- ¹⁰⁴ Maurice B. Rowe, *Letter from Maurice B. Rowe to Heads of State Agencies and Institutions, September 26, 1974*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 29, 2017).
- ¹⁰⁵ Ibid.
- ¹⁰⁶ Ibid.
- ¹⁰⁷ Edward E. Willey, *Letter from Edward E. Willey to D. Rae Carpenter, Jr., October 11, 1974*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 29, 2017).
- ¹⁰⁸ Maurice B. Rowe, *Letter from Maurice B. Rowe to D. Rae Carpenter, Jr., October 7, 1974*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 29, 2017).
- ¹⁰⁹ *National Energy Conservation Award is Won for Science Museum Facility, November 18, 1974*, press release, in Science Museum of Virginia Archives, print (accessed Jul. 26, 2017).
- ¹¹⁰ Ibid.
- ¹¹¹ Paul H. Knappenberger, Jr., *Letter from Paul H. Knappenberger, Jr. to Edward Willey, January 23, 1975*, letter, in Science Museum of Virginia Archives, print (accessed Aug. 22, 2017).
- ¹¹² "Solar Lab was 'Hottest' Show in Town," *Science Museum of Virginia Newsletter* 4 (1975): 1-2.
- ¹¹³ Ibid.
- ¹¹⁴ Ibid.
- ¹¹⁵ *Resolution: Commending the Science Museum of Virginia for Leadership in the Field of Solar Energy Development in Virginia, 1974*, resolution, in Science Museum of Virginia Archives, print (accessed Jul. 28, 2017).
- ¹¹⁶ Ibid.

-
- ¹¹⁷ D. Rae Carpenter, Jr., *Letter from D. Rae Carpenter, Jr. to George W. Grayson, January 22, 1975*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 29, 2017).
- ¹¹⁸ Ibid.
- ¹¹⁹ D. Rae Carpenter, Jr., *Letter from D. Rae Carpenter, Jr. to Carter O. Lowance, May 9, 1975*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 28, 2017).
- ¹²⁰ Ibid.
- ¹²¹ *Solar Energy Research Grant is Awarded Science Museum, May 15, 1975*, press release, in Science Museum of Virginia Archives, print (accessed Jul. 28, 2017).
- ¹²² Ibid.
- ¹²³ *Solar Energy for Virginia: Conference Prospectus, 1975*, prospectus, in Science Museum of Virginia Archives, print (accessed Jul. 28, 2017).
- ¹²⁴ Ibid.
- ¹²⁵ *Solar Energy for Virginia: Conference Prospectus, 1975*, prospectus, in Science Museum of Virginia Archives, print (accessed Jul. 28, 2017).
- ¹²⁶ “Richmond Conference Draws Thousands,” *Science Museum of Virginia Newsletter* 4 (1975): 1-2.
- ¹²⁷ D. Rae Carpenter, Jr., *Letter from D. Rae Carpenter, Jr. to Eugene Doering, September 19, 1975*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 28, 2017).
- ¹²⁸ Ibid.
- ¹²⁹ *House Bill No. 1222, February 9, 1976*.
- ¹³⁰ Ibid.
- ¹³¹ Ibid.
- ¹³² Paul H. Knappenberger, *Letter from Paul H. Knappenberger to Undisclosed Recipients, December 11, 1974*, letter, in Science Museum of Virginia Archives, print, (accessed Jul. 25, 2017).
- ¹³³ “Book Fair Response was Overwhelming,” *Science Museum of Virginia Newsletter* 4 (1975): 1.
- ¹³⁴ Ibid.
- ¹³⁵ Paul H. Knappenberger, Jr., *VCU Interior Design Model for Capital Division*, invitation, in Science Museum of Virginia Archives, print (accessed Jul. 26, 2017).
- ¹³⁶ “Snack Bar Counts Calories,” *Buena Vista News* (Buena Vista, VA), June 5, 1975.
- ¹³⁷ Knappenberger, Jr., *VCU Interior Design Model for Capital Division*.
- ¹³⁸ Paul H. Knappenberger, Jr., *Letter from Paul H. Knappenberger, Jr. to Ontario Science Centre Trip Participants, March 24, 1975*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 29, 2017).
- ¹³⁹ J. T. Wilson, “Ontario Science Centre Attracts the Millions,” reprinted from the *Canadian Geographical Journal* (1976), pg. 2.
- ¹⁴⁰ Knappenberger, Jr., *Letter from Paul H. Knappenberger, Jr. to Ontario Science Centre Trip Participants, March 24, 1975*.
- ¹⁴¹ Ibid.
- ¹⁴² Paul H. Knappenberger, Jr., *Letter from Paul H. Knappenberger, Jr. to Trustees, Science Museum of Virginia, June 23, 1975*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 26, 2017).
- ¹⁴³ *Titled Dome Design Meeting Meets June 11 and 12 in Detroit, 1975*, press release, in Science Museum of Virginia Archives, print (accessed Jul. 26, 2017).
- ¹⁴⁴ Ibid.
- ¹⁴⁵ Ibid.
- ¹⁴⁶ Ibid.
- ¹⁴⁷ Robert B. Sears, “Science Museum Gets Reprieve,” *Roanoke Times* (Roanoke, VA), June 20, 1975.
- ¹⁴⁸ Ibid.
- ¹⁴⁹ National Park Service, *Environmental Assessment for Access Road in Conjunction with the Science Museum of Virginia, July 1975*, report, in Science Museum of Virginia Archives, print (accessed Jul. 27, 2017).
- ¹⁵⁰ Ibid.
- ¹⁵¹ D. Rae Carpenter, Jr., *Letter from D. Rae Carpenter, Jr. to Jack A. Ramey, February 18, 1976*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 27, 2017).
- ¹⁵² Ibid.
- ¹⁵³ D. Rae Carpenter, *Science Museum of Virginia: A Few Early Landmark Dates, October 2008*, handout, in Science Museum of Virginia Archives, print (accessed Jul. 26, 2017).
- ¹⁵⁴ Lea Setegn, “Anna Lauder Garner dies at 83,” *Richmond Times-Dispatch* (Richmond, VA), October 29, 2005.
- ¹⁵⁵ Ibid.
- ¹⁵⁶ Ibid.

-
- ¹⁵⁷ *Brief Excerpts from Budget Hearing Before Governor Godwin, Budget Advisory Committee, October 21, 1975*, report, in Science Museum of Virginia Archives, print (accessed Jul. 29, 2017).
- ¹⁵⁸ Ibid.
- ¹⁵⁹ Ibid.
- ¹⁶⁰ Ibid.
- ¹⁶¹ Ibid.
- ¹⁶² Ibid.
- ¹⁶³ Ibid.
- ¹⁶⁴ Ibid.
- ¹⁶⁵ D. Rae Carpenter, Jr., *Letter from D. Rae Carpenter, Jr. to A.B. Niemeyer, Jr., November 7, 1975*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 29, 2017).
- ¹⁶⁶ Ibid.
- ¹⁶⁷ Ibid.
- ¹⁶⁸ Ibid.
- ¹⁶⁹ *Broad Street Station: Union Station of Richmond*, broadside, in Science Museum of Virginia Archives, print (accessed Aug. 23, 2017).
- ¹⁷⁰ Ibid.
- ¹⁷¹ Ibid.
- ¹⁷² Ibid.
- ¹⁷³ Ibid.
- ¹⁷⁴ Thomas S. Driscoll, *A Brief History of Broad Street Station and the Science Museum of Virginia, 1992*, manuscript, in Science Museum of Virginia Archives, print (accessed Jul. 29, 2017), pg. 3.
- ¹⁷⁵ Ibid.
- ¹⁷⁶ D. Rae Carpenter, Jr., *Letter from D. Rae Carpenter, Jr. to Norma Moran, December 1, 1975*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 27, 2017).
- ¹⁷⁷ Ibid.
- ¹⁷⁸ Edward Fordyce, *Letter from Edward Fordyce to James M. Glave, January 20, 1976*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 26, 2017).
- ¹⁷⁹ "Hard Times for Science Museums," *Roanoke Times* (Roanoke, VA), January 31, 1976.
- ¹⁸⁰ Jack A. Ramey, *Letter from Jack A. Ramey to D. Rae Carpenter, January 29, 1976*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 27, 2017).
- ¹⁸¹ Ibid.
- ¹⁸² D. Rae Carpenter, Jr., *Letter from D. Rae Carpenter, Jr. to Jack A. Ramey, February 18, 1976*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 27, 2017).
- ¹⁸³ Ibid.
- ¹⁸⁴ Paul H. Knappenberger, Jr., *Letter from Paul H. Knappenberger, Jr. to Roscoe D. Hughes, February 12, 1976*, letter, in Science Museum of Virginia Archives, print (accessed Jul. 29, 2017).
- ¹⁸⁵ Carpenter, Jr., *Letter from D. Rae Carpenter, Jr. to Jack A. Ramey, February 18, 1976*.
- ¹⁸⁶ Ibid.