Pacific Science Center
Seattle Historic Landmark Nomination

February 26, 2010
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1. Building Information

Name (Historic):	United States Science Pavilion of the Century 21 Exposition (aka the 1962 Seattle World's Fair) (also referred to as the Federal Science Pavilion)
Name (Current):	Pacific Science Center
Year Built:	1962 (commissioned in 1959)
Street & Number:	200 2nd Avenue N., Seattle Washington, 98109
Assessor's File No.:	1985200140
Plat/Block/Lot:	Dennys D. T. 3rd Addition, Block 39, Lots 4-11
Present Owner:	Pacific Science Center Foundation
Present Use:	Independent non-profit science center
Present Owner Address:	200 2nd Avenue N., Seattle Washington 98109
Original Owner:	US Department of Commerce (General Services Administration)
Original Use:	Federal science exhibit at 1962 Seattle World's Fair
Original Architect:	Minoru Yamasaki & Associates, design architect (Birmingham, Michigan) Naramore, Bain, Brady & Johanson, associated architect (Seattle)
Original Landscape Architect:	Lawrence Halprin & Associates (San Francisco) for planting plan only; original landscaping features by Minoru Yamasaki & Associates
Original Consultants:	Worthington, Skilling, Helle & Jackson, structural engineers (Seattle) Bouillon, Griffith, Christofferson & Schairer, mechanical engineers (Seattle)
Original Builder:	Purvis Construction Company, General Contractor (Spokane)
Original Building Cost:	$ 3.5 million [1]
Building area:	Currently approx. 127,000 square feet on 6.2 acres Originally 85,000 square feet [2] on 6.5 acres
Legal Description:	A parcel of land situated in King County, Washington, described as follows: Lots 1, 2, 3, 4, 5, 6, 9, 10, 11, and 12, Block 39, D.T. Denny's 3rd Addition, according to plat recorded in Volume 1 of Plats, page 145, Records of King County, Washington; and Lots 5, 6, 7, and 8, Block 40, excepting the northerly 27.41 feet of lots 5 and 8, said D.T. Denny's 3rd Addition; and

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[1] *Architecture West,* April 1962, p. 21.
[2] *Architecture West,* April 1962, p. 21.

Lots 5, 6, 7, and 8, Block 47, excepting the northerly 27.41 feet of Lots 5 and 8, said D.T. Denny's 3rd Addition; and

Lots 1 through 12 inclusive, Block 48, said D.T. Denny's 3rd Addition, excepting that portion of Lot 6 in said Block condemned for street purposes in King County Superior Court Cause No. 170139 as provided by Ordinance No. 45588 of City of Seattle.

Together with John Street from east line of Second Avenue North to the west line of Nob Hill Avenue; Third Avenue North from north line of Denny Way to a line 27.41 feet south of the easterly extension of the north lot line of Lot 5, Block 40, D.T. Denny's 3rd Addition; the alley in Block 48, D.T. Denny's 3rd Addition; the alley in Block 39, D.T. Denny's 3rd Addition; that portion of the alley in Block 40, D.T. Denny's 3rd Addition lying southerly of a line 27.41 feet south of the north lot lines of Lots 5 and 8 in said Block 40; that portion of the alley in Block 47, D.T. Denny's 3rd Addition lying southerly of a line 27.41 feet south of the north lot lines of Lots 5 and 8 in said Block 47.

And together with the west half of vacated Nob Hill Avenue North lying southerly of a line 27.41 feet south of the north lot lines of Lots 5 and 8 in said Block 47 and northerly of the north margin of Broad Street.

Less that portion of the above described parcel lying southerly and westerly of the following described line:

Commencing at the southwest corner of Lot 6, Block 39 of said D.T. Denny's 3rd Addition; thence south 88°31'54" east (City of Seattle Datum) along the south line of said Lot 6, 46.42 feet to the true point of beginning; thence north 01°26'35" east 58.52 feet; thence north 88°33'25" west 16.00 feet to the easterly face of a concrete retaining wall; thence north 01°57'56" east along the easterly face of said wall 15.87 feet to the intersection of the northerly prolongation of said wall with the southerly face of the Pacific Science Center Building; thence north 88°13'54" west 10.28 feet to a southwesterly corner of said building; thence north 01°25'06" east along the westerly face of said building 66.26 feet to a corner of said building; thence north 88°34'17" west along the southerly face of said building, 108.70 feet to a southwesterly corner of said building; thence north 01°25'16" east along the westerly face of said building, 129.97 feet; thence north 88°30'05" west 47.49 feet to a point on the west line of Block 39 of said plat of D.T. Denny's 3rd Addition and the terminus of said line.

2. Architectural Description

2.1 Adjacent neighborhood context

Pacific Science Center is located adjacent to, but separate from, the Seattle Center. The Pacific Science Center site is located north of downtown Seattle, at the south foot of Queen Anne Hill, at the juncture of the Lower Queen Anne and Belltown neighborhoods. Pacific Science Center sits at the south end of the Seattle Center, bounded on the east by 2nd Avenue N., on the south by Denny Way (a major east-west thoroughfare), and on the west by Broad Street (a major thoroughfare connecting south Lake Union with the Elliott Bay waterfront).

There are a relatively high number of surface parking lots and parking garages in the area, which serve the large numbers of people attending sports and cultural events at the Seattle Center. Nevertheless, in general, this is a dense and relatively vibrant neighborhood, containing a wide spectrum of office buildings, apartment and condominium housing, restaurants, and neighborhood shops and services. Most buildings are 3-5 stories, but a few buildings 10 stories or more are within a few blocks. Existing building stock dates from the early 20th century to present day development, with notable development in the 1910s, late 1950s to early 1960s, and 1990s.

Across 2nd Avenue to the west is the Sacred Heart of Jesus Catholic Church and three associated church buildings dating from the 1920s and 1960s; surface parking lots; a 6-story apartment building built in 2008; and at the corner of 2nd Avenue and Denny Way, the site of the new First United Methodist Church, currently under construction and designed by Bassetti & Associates, which will be the new sanctuary for the congregation formerly housed in the historic and prominent 1907 First Methodist Church at Fifth Avenue and Marion Street downtown.

Across Denny Way to the south is a 6-story concrete and metal siding apartment building dating from 2006; a large dark glass office building dating from 1982, with an unusual offset and overhanging "stacked tray" arrangement of floors; a 1957 2-story masonry retail store; a 1951 2-story masonry bank building and surface parking lot; and the 3-story concrete 1968 KIRO television station Broadcast House, by Fred Bassetti & Associates, which won a Seattle AIA honor award in 1970.[3] Also south of Denny Way is the 1982 concrete Bay Vista Tower condominium building, which although it is two blocks away, is clearly visible from the north entrance of the Science Center due to its 24-story height.

Blocks and buildings immediately south of Denny Way follow a sawtooth or triangular pattern, because Denny Way marks the juncture between streets to the north which are oriented to the cardinal points, and the Belltown/downtown street grid to the south which is canted about 45 degrees from north.

Across Broad Street to the east is a c.1990s gas station; a 1-story masonry 7-11 convenience store and parking lot; the 2001 2-building, 6-story glass and concrete Fisher Communications (KOMO television station) complex; and a triangular surface parking lot which until the mid-2000s was owned by the Seattle Popular Monorail Authority, a pro-monorail-transit agency created by—and later rescinded by—the voter initiative process. Just beyond these parcels is Fifth Avenue, and the raised Alweg Monorail running down the center of the right of way, which was a feature of the 1962 Century 21 Exposition, and connected the fair site to Westlake Center downtown. The monorail is a registered Seattle historic landmark.

Directly to the north of Pacific Science Center are the rest of the buildings on the Seattle Center grounds. Notable individual buildings there include:

- The Children's Theater, directly adjacent to the Science Center to the northwest, was originally the 1956 Nile Temple of the Shrine building (for the Shriners, a fraternal organization) just prior to the

[3] AIA Seattle, "AIA Seattle Honor Awards: Projects cited 1950-", www.aiaseattle.org, accessed online May 22, 2009.

Century 21 Exposition, and was leased out as a private dining club and lounge during the Fair. The city continued to lease it for fifteen more years, and then purchased it outright, using it as the Pacific Arts Center. In 1987 it became the home of the Seattle Children's Theater, and to this end received major additions in 1993 and 2000.[4]

- Mural Amphitheater, directly adjacent to Pacific Science Center to the northeast, is a grassy sloped site with a concrete raised stage for outdoor concerts, with a 17 foot by 60 foot curved glass mosaic mural by Paul Horiuchi serving as a backdrop. The Horiuchi mural was originally freestanding within a paved pedestrian pathway (the building behind it was added in 1998), and was the largest artwork commissioned for the1962 World's Fair. Today, the mural is a registered Seattle historic landmark.[5]

- The Space Needle, by John Graham Jr., Victor Steinbrueck, and John Ridley (1962), towers over Pacific Science Center to the northeast and houses a revolving restaurant and observation decks. A now-iconic symbol of Seattle, the Needle was one of the centerpieces of the 1962 World's Fair and is now a registered Seattle historic landmark.[6]

- The Key Arena, by Paul Thiry (1962), an important local pioneering Modernist and principal architect for the 1962 World's Fair. The building was originally the Seattle Center Coliseum, and is notable for the pyramidal roof form suspended from dramatic concrete beams. The building floor was lowered and the building renovated in 1992-95 by NBBJ.[7]

- Experience Music Project, by internationally renown architect Frank Gehry (2000), a music museum and special events venue created by Microsoft co-founder Paul Allen. When built, the building reflected Gehry's continuing interest in non-traditional building forms, in this case amorphous, curving, and undulate exterior surfaces.[8]

2.2 Site

The Science Center site is relatively flat, but drops sharply to the south and immediately west at Denny Way and 2nd Avenue. The site occupies the highest point of the Seattle Center, which slopes gently away to the east, north, and west.

The site is zoned NC3-85 (Neighborhood Commercial 3, 85 foot height limit), and is within Uptown Urban Center zoning area.

Pacific Science Center occupies a separate legal parcel from the rest of the Seattle Center, presumably due to the fact that it was originally owned by the federal government, rather than the state or city, for the World's Fair. In 2007, the parcel was revised through boundary line adjustment to more clearly separate the parking garage proper from Pacific Science Center buildings (and in fact follows the face of the west and south elevations of Building 4 and the Laser Dome building).

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[4] Seattle Department of Neighborhoods, "Historical Summary for 201 Thomas Street/Parcel ID 1985200185/Inv # CTR014", online historic buildings survey, accessed May 2009

[5] Seattle Department of Neighborhoods, "Historical Summary for 305 Harrison Street/Parcel ID 1985200130/Inv # CTR006", online historic buildings survey, accessed May 2009.

[6] Historylink.org, "Space Needle (Seattle)", essay 1424 by Walt Crowley, June 27, 1999, www.historylink.org, accessed May 2009.

[7] Dobney, p. 196.

[8] Historylink.org, "Experience Music Project (EMP) opens at Seattle Center on June 23, 2000", essay 5424 by Walt Crowley, March 15, 2003, www.historylink.org, accessed May 2009.

The original site did not include the parcel at the corner of 2nd Avenue N. and Denny Way, and for many years a small two-story masonry office building constructed in 1946 occupied the site, fronting Denny Way with a surface parking lot behind. This site was purchased by Pacific Science Center in 1996, and a three-story parking structure was built on it in 1997-98. Since this garage parcel is not part of the original site and includes recent construction, it is therefore not part of the site nominated for landmark consideration. [see figures 3-4, and attached Site Plan]

Today, the site around Pacific Science Center is grassy and landscaped, as are portions of the adjacent Seattle Center grounds. The Space Needle to the northeast is a nearby dominant presence on the horizon.

2.3 Pacific Science Center building description

2.3.1 Overview

The original buildings date from 1962 and were designed by Minoru Yamasaki & Associates; with Naramore, Bain, Brady & Johanson, associated architect; and Worthington, Skilling, Helle & Jackson as the structural engineers.

Pacific Science Center was originally built as the United States Science Pavilion at the Century 21 Exposition in Seattle, also known as the 1962 Seattle World's Fair. Designed to serve as exhibition space, it consisted originally of six rectangular, connected, brilliant white, nearly windowless building masses of varying heights and sizes, clustered in a U-shape around an open courtyard, with the open part of the U facing north, and a minimalist water garden filling the courtyard. Also original are five identical, connected but offset, freestanding entrance towers near the center of the courtyard at the open part of the U. The buildings and towers feature throughout a repeating pointed arch motif. All of these essential original buildings and design elements remain today, although some have been altered.

In the 1990s there were several additions and alterations. Buildings added include the Seattle Rotary Discovery Labs (1996, Callison Architects) attached on the northwest part of the original complex, and the Boeing IMAX Theater and Ackerley Family Exhibit Gallery (1998, Callison Architects) attached to the east side of the original complex. Both of these additions displaced walled garden spaces located at the northeast and northwest portions of the site which were original 1962 design elements.

Further primary alterations during this period included the addition of freestanding ticketing kiosks at the north (primary) entry location to facilitate visitors approaching from the Seattle Center grounds, as well as substantial alterations to Building 3 to create another facility entry for visitors approaching from Denny Way at the south end of the site. The Building 3 renovations also included alterations to accommodate a museum store.

As today's Pacific Science Center, the complex is a not-for-profit science foundation with the mission to inspire learning in science, math, and technology through interactive exhibits and programs. The current exhibits change on a regular basis, but all are "hands-on," inquiry-based, graphic learning tools to demonstrate in a non-traditional way the lessons of science and nature.

2.3.2 Building structure

The buildings are constructed with a limited palette of narrow, precast, repeating concrete wall and roof elements. A pointed arch motif is found throughout the wall elements, in openings or decorative ribbing, which is frequently called a "Gothic" arch, or sometimes—in the case of this building in particular—a "space gothic" arch. Generally, the portion of each wall element that is supporting the primary weight is the ribbed center; the rest of the wall panel is a flange which spreads out to create the infilling wall. Using this system of precast repeating elements facilitated rapid construction; and also offered an opportunity to create patterns of light and shadow across the building surface. This was a construction technique Yamasaki used in several of his early buildings.

For each building, the walls are constructed of prestressed and precast ribbed (ie, T-shaped) wall panels, each being 5 feet wide, but varying between 32 and 50 feet in height depending on the building. Panels with decorative ribbing and arches are load-bearing, while panels with a vertical scalloped form are non-load-bearing infill walls (although they carry their own weight and function as shear walls).[9] On the arched panels, the central rib extends 2 feet beyond the parapet, creating a delicate appearance.

The various concrete components were precast using fiberglass-reinforced plastic forms, which allowed repeated usage and flexibility in forming the curves, arches, and patterns needed. In the casting process, all of the wall components were faced with a brilliant white quartzite aggregate, so that the entire complex has a uniform appearance. The elements were cast off-site in controlled conditions, and transported 25 miles for erection.[10]

The wall panels support similar T-shaped prestressed and precast roof beams, which span up to 112 feet, thus allowing clearspan spaces in all the buildings—a desirable condition for exhibition space. The roof beams are 3 inches thick with ribs 6 inches wide and 18-21 inches in depth. Wall panels and roof panels are bolted together with some welded connections to resist seismic and wind load stresses[11], to allow for temperature expansion, and to provide adequate stiffness to create a single diaphragm structure of each building (that is to say, a rigid box not requiring cross bracing in any direction).

Tectonically, the repeating precast concrete elements are simply and frankly connected, and visible throughout the buildings, reflecting the modernist tenet that structure should be clearly expressed. Corbels project from the precast wall panels either abruptly or in a gentle curve in order to accept the precast roof beams. Interior ceilings and walls were and are exposed and often in plain view of the visitor, including the ceiling at the upper level theater at Building 5, the ceiling and walls at Building 4, the ceiling and walls at Building 2 [see figures 56-57], and the ceiling and walls at Building 1. In some cases, the lighting of the exhibits in the buildings make the ceilings difficult to see, as at Buildings 4 and 1. Additionally, particularly notable examples of structural connections visible on the exterior (and already covered by the landmark designation of the building exteriors) include the underside of the porch at Building 5, the underside of the covered walkways at Buildings 1 and 5, and the underside of the upper level tower platforms. [see figures 35, 75, and 77]

The structure was insulated with fiberglass before applying a built-up roof. Wall components were erected on site singly by cranes, and roof beams by pairs of cranes. When constructed, the pavilion was believed to be the largest single use of precast and prestressed concrete structural components in the United States. According to structural engineer Jack Christiansen, it was "one of the earliest uses of precast, prestressed, thin concrete components in the USA." [12] [see figure 13]

All of the buildings were finished with smooth concrete floors, with the precast wall and roof elements bare and exposed on the interior, to provide a basic shell into which exhibits could be built with false raised floors, temporary walls, and temporary ceilings if necessary. These drop ceilings and raised floor systems are sometimes used for contemporary exhibits in order to facilitate cable, cords, the location of exhibits, and so forth. In some locations, such as under enclosed walkways or porches, the concrete is finished with a sand-finish stucco.

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[9] Correspondence with Jack Christiansen, May 31, 2010.
[10] Precast concrete was by Associated Sand & Gravel Inc., of Everett, Washington, later owned by Rinker Materials Corporation.
[11] Correspondence with Jack Christiansen, May 31, 2010.
[12] *Architecture West,* April 1962, p. 21-22; and correspondence with Jack Christiansen, May 31, 2010.

Connected, full-height to partial-height basements underlie the buildings, providing mechanical and electrical ease of access to all parts of the floors, and parts of the courtyard area. Concrete floors in all the buildings were provided with light concrete "punch-outs" on a continuous 5 foot grid to facilitate ventilation and mechanical system installations to adapt to any exhibition configuration.

2.3.3 Buildings and original exhibits

The facility was commissioned in 1959 and completed in 1962, and was designed to house the largest science exhibit ever assembled by the federal government at that time.[13] The United States Science Pavilion housed 125 exhibits, which dwarfed similar exhibits at other fairs, at a time when there were relatively few museums in the world with science exhibits. Additionally, the exhibits were intended to tell the development of science as a totality, the search for knowledge from the history of science to contemporary issues, with each exhibit telling a part of a coherent story, rather than a collection of independently created exhibits, each for different purposes. Furthermore, as stated by the Commissioner in charge of the United States Science Pavilion, Dr. Athelstan Spilhaus, the pavilion was an attempt "to trace the history of intelligence in one whole field of human curiosity, and tell a coherent story aimed at providing a better understanding and enjoyment of science...an effort to display the innate beauty and joy of science, rather than its complex discoveries, to give the public some better insight into what is possibly the most powerful and important social force in the world today." [14]

The buildings were designed as essentially rectangular warehouses for exhibition displays, each with a different theme, and windowless to provide maximum flexibility for possible exhibit arrangements inside. Exhibits or other installations, such as the theaters, are wooden or steel stud structures built inside the concrete box provided by Yamasaki's design.

The general building layout was designed to move people through the space sequentially, so that visitors could experience the "storyline" that had been carefully composed for the series of exhibits. The buildings in 1962 were themed as follows: [15]

Building 1 – The House of Science
Building 2 – The History of Science
Building 3 – The Spacearium
Building R – The rest area upstairs, and Junior Lab of Science downstairs
Building 4 – The Methods of Science
Building 5 – The Horizons of Science

Upon entering the site from the rest of the Fair grounds to the north, wide stairs at the outside forecourt led visitors upwards and through five entry towers and viewing platforms towards today's Building 5 (1962: Building 1). The entrance was specifically elevated in order to keep the courtyard somewhat isolated from the rest of the fair.[16] Visitors were expected to then move through the five other buildings within the pavilion in a counterclockwise direction, including a rest building, and back to the lower level of the viewing platforms and entry arches (below the level they had originally entered at the beginning of their visit), finally to exit back up the stairs to the forecourt where they began.

> **Note:** The six original buildings of the complex were originally identified in the drawings and associated literature for the World's Fair as Buildings 1, 2, 3, R, 4, and 5, starting from the northwest and counting counterclockwise. However, currently Pacific Science Center

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[13] *Architecture West,* April 1962, p. 21.
[14] US Dept. of Commerce, *United States Science Exhibit, Seattle World's Fair: Final Report,* p. 7.
[15] US Dept. of Commerce, *United States Science Exhibit, Seattle World's Fair: Final Report,* pp.7-42.
[16] Yamasaki, p. 70.

staff refer to the buildings as Building 1, 2, 3, Laser Dome, 4, and 5, counting *clockwise*.[17] [see figure 5]

1962	Current	Site Location
Building 1	Building 5	Northwest corner
Building 2	Building 4	West side
Building 3	Laser Dome	Southwest corner
Building R	Building 3	South side
Building 4	Building 2	East side
Building 5	Building 1	Northeast corner

Current use of Pacific Science Center does not require a specific path to follow, and in fact the distribution of exhibits, activities, offices, and so forth discourages it. The 1993 pool pad addition and Building 3 (1962: Building R) renovation to accommodate another public entry reflects the need for multiple access points and destinations.

However, to better understand the original context of the building, the following descriptions of the buildings will follow the original sequence which was intended for visitors in 1962. The 1993 north entry ticket kiosks, the 1996 Discovery Labs building, and the 1998 Boeing IMAX Theater and Ackerley Family Exhibit Wing will not be addressed directly in this report, except as additions.

2.3.4 Building 5

in 1962 was Building 1, "The House of Science"

Current condition

This building is nearly square, measuring 105 feet by 120 feet, and 50 feet high, containing two stories. The courtyard-facing east elevation is among the most prominent elevations of the complex, in that it is distinguished by a high covered porch composed of arch-motif open wall panels, marked by high pointed arches, and exposed structure on the underside. Along the east first level, below the entry porch, the structure forms a recessed covered walkway along the reflecting pools. An exterior stair at the south end of this porch connects the first and second levels.

The north elevation uses scalloped wall panels, has two bays of the east-side entry porch visible, and is partially obscured by the 1996 Discovery Labs addition. The west elevation incorporates arched and ribbed wall panels, and is the location of a loading dock and associated offices at the first floor level, as well as the office entrance to the facility. The south elevation features scalloped wall panels, with two bays of the east-side entry porch visible. Currently, a non-original fabric awning is attached to the south elevation for weather protection.

This building contains a theater on the second floor and offices on the first. Visitors to the building enter through a high recessed porch on the second level east wall and into a small interstitial vestibule space between the exterior wall and the theater wall, and then into a high-ceilinged theater with an oval, curving back and side wall made of vertically oriented tongue-and-groove wood surfacing. The oval-curved wall, which dates from the original 1962 construction, begins approximately 8 feet above the floor, and has a soffit return with recessed lights, and is constructed of a steel framework and a plaster-like material on metal lathe suspended from the precast concrete roof beams. Risers in the center of the room for seating were added after the Fair and are not original; the current large curved projection screen is not original; and the current projection equipment is not original. As was the case in 1962, there is no dropped ceiling in the theater; the underside of the prestressed concrete construction is exposed above.

[17] To complicate matters further, for subsequent additions to the building, architecture firms for their own purposes have in some cases renumbered the buildings on their site plans.

The first floor office level is occupied by staff offices, workrooms, storage areas, and a loading dock, which also accessed Building 4 (1962: Building 2). This floor is essentially unchanged since 1962 and almost all of the office partition walls are still in place, although central restrooms were removed to be replaced with office space. The loading dock still functions and serves these buildings. Arched office windows for the loading dock offices are located along the ground floor on the west elevations, and most of the original metal sash and hopper operable openings appear to remain.

Offices along the east and north elevations have rectangular windows with original metal sash and a part-casement opening. Some of the windows along the north wall have been painted over due to the 1996 Seattle Rotary Discovery Lab addition to the north, or provide interior windows directly into those new spaces. Originally, these windows would have overlooked the Northwest Garden, which was removed with the Discovery Labs addition.

Certain offices, including the president's office and the adjacent conference room, are located along the interior wall facing the water garden, retain original Herman Miller furniture, fixed floor to ceiling windows and sliding glass doors, and door/window hardware.

Current finishes are for the most part non-original, and consist of painted exposed concrete, painted gypsum drywall, contemporary dropped ceilings, and contemporary carpet.

Original design

This, the first building of the 1962 exhibit sequence in the United States Science Pavilion, was intended to welcome visitors with its prominent front porch, as they entered the complex up the steps and under the entrance towers from the rest of the Fair grounds. The porch sheltered the visitors as they waited for the first part of the sequenced exhibit "storyline," in the theater, wherein a film was shown to introduce visitors to the topic of science in general—who were scientists, what did they do, what were the different branches of science, and so forth. The carpeted floor had no seating and visitors sat directly on the carpet. Visitors were shown a 13-minute film designed specifically for this exhibit by prominent architect and industrial designers Charles and Ray Eames, entitled "The House of Science," which was projected directly against the oval-curved wall which remains today. The Eames team designed the projection so that six different but inter-related images were projected simultaneously on a single surface, creating a rapid-fire effect of images.[18] The Eames team may also have designed the theater itself, according to one unconfirmed reference.[19] After the film, visitors exited through another set of doors on the south wall.

Current historic elements

- Wall panels with various arch motifs or scalloped motif, including vertical projections at parapet
- Porches, semi-enclosed areas, covered walkways
- Original windows, doors, openings
- White quartzite aggregate finish
- In-ground recessed light fixtures for wall up-lighting
- Maintaining clarity of building element connections might be considered a historic element
- Interior: The executive office and conference room on level 1 may qualify as historic, given their original location, furnishings, apparently original windows, and relationship to the courtyard.

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[18] US Dept. of Commerce, *United States Science Exhibit, Seattle World's Fair: Final Report,* p. 10. The entire Eames collection of work, including "The House of Science" film, is now held by the Library of Congress in Washington DC.
[19] *United States Science Exhibit: World's Fair in Seattle, 1962* (Souvenir guide book), p. 46. The Eameses were extremely detailed and methodical in the preparation of their films, so this assertion seems likely; see for example "Photographs documenting multiscreen film presentation (House of Science)" catalog record from the Library of Congress archive finding aid at http://lccn.loc.gov/00650059. A copy of the film remains in the Eames collection at the Library of Congress. Alternatively, Yamasaki designed the interior walls, no doubt in collaboration with the Eameses.

- Interior: The theater on level 2 may be considered historic due to its relationship to the original 1962 Fair.

Current non-historic elements

- Non-original doors, windows, and openings
- Signage, banners (no original signage appears to be extant)
- Fabric canopies, awnings
- Accessories for attaching signage or canopies
- Interior: Level 2 theater seating, including tiered platform, and associated railings, steps, ramps, and walls directly associated with the tiered platform
- Interior: Level 2 theater carpeting, projection equipment, projection room, projection screen and screen supports
- Interior: Interstitial space between but not including curved soffited wall, and the concrete exterior wall

2.3.5 Building 4

in 1962 was Building 2, "The History of Science"

Current condition

This building is rectangular, 175 feet long by 85 feet wide, 32 feet high, and is one floor with a mezzanine level. An entry/exit vestibule approximately 24' by 24' is located at the southeast corner and serves as a connection to the Laser Dome building as well as an exit to the central courtyard. The courtyard-facing east elevation is composed of solid arched wall panels, with doors to the central courtyard at the north and south ends. The north elevation, visible from the loading dock area, is composed of scalloped wall panels and has a large receiving door and double man-doors.

The west elevation is composed of the arched wall panels and has no wall openings; attached to the northern part of the west elevation is currently a large HVAC system installed in 2009, somewhat hidden by trees and landscaping. The south elevation is composed of scalloped wall panels with no openings. The south elevation of this building was altered by the construction of the multilevel parking garage against it. The entrance kiosk and drive aisle into the garage is located along but below the west elevation, due to the slope of the hill.

To access this building, visitors would have entered through three sets of double doors along the north wall, directly from Building 5 (1962: Building 1). The interior of this building has been changed over the years as exhibits have been revised. The building continues to be used for free-standing exhibits. The ramp along the west wall appears to be original. A single remainder of an original exhibit, a large rotatable model of the moon, hangs in a corner of this building, but its condition and original location could not be determined for this report.

A former auditorium from 1962 known as the "Science Theater" was removed and the sloped floor covered over, and the room is now used as a shop to design and construct exhibits for Pacific Science Center. Much of the rest of this space is used for storage, as it is adjacent to the loading dock receiving area. Finishes are painted cinderblock wall, gypsum wallboard, and asbestos tile flooring.

Original design

This, the second building in the intended Science Pavilion sequence, was filled with displays intended to address "the development of science from simplest beginnings" and to "show how man has improved his ability to see, define, measure, and predict events of the natural world". The exhibits dealt with elemental forces that provoked the curiosity of primitive man; the ability of the senses to be tricked, if unaided by proper tools; the development of tools and instruments, and the growth and importance of mathematics. Finally, the remainder of the exhibits showed the development of man's knowledge in four sample areas: electromagnetism, the structure of matter, genetics, and the concept of the universe. All of the exhibits in this building were designed by the prominent and influential graphic and industrial design firm of Walter Dorwin Teague Associates.

In this building, visitors moved from a mezzanine down a ramp along the west wall as they went through the exhibits, to return to the ground floor for the first time since they entered the Science Pavilion complex on the exterior steps leading from the forecourt to the entry towers. This provided a double height space for some of the exhibits.[20] The double-height space remains for current exhibits.

Originally, a small, 200-seat auditorium with projection booth was installed in the northern quarter of Building 4 (1962: Building 2), under the mezzanine, with access to the courtyard from three doors in the north part of the east wall. Called the "Science Theater," this auditorium was used during the Fair for entertaining and popular science presentations and lectures by Hubert "Dr. Boom" Alyea of Princeton University, as well as daily science films.[21]

Current historic elements

- Wall panels with various arch motifs or scalloped motif, including vertical projections at parapet
- Original windows, doors, openings
- White quartzite aggregate finish
- In-ground recessed light fixtures for wall up-lighting
- Maintaining clarity of building element connections might be considered a historic element

Current non-historic elements

- Non-original doors, windows, and openings
- Signage, banners (no original signage appears to be extant)
- Fabric canopies, awnings
- Accessories for attaching signage or canopies

2.3.6 Laser Dome

in 1962 was Building 3, "The Spacearium"

Current condition

The Laser Dome is 105 feet long by 100 feet wide, 50 feet high, and contains one floor. The courtyard-facing north elevation is composed of solid arched wall panels, with no doors or windows. The east elevation is also visible from the courtyard, and is composed of scalloped wall panels, with no openings. The south elevation is composed of arched wall panels, and faces Denny Way. At the foot of the elevation is the Southwest Terrace, a 1962 landscaped design feature. The west elevation is visible from the adjacent parking garage, and is composed of scalloped wall panels and has no window or door openings.

This building is used for laser light and music shows, which are projected onto a 78 foot original hemispherical screen overhead. The dome's geodesic steel framework supporting the screen is visible in the interstitial space between the dome area and the exterior walls, and is original to 1962, and appears to have been the design of Buckminster Fuller through one of his licensed companies.[22] The projection screen, made of perforated metal, is also original.[23]

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[20] US Dept. of Commerce, *United States Science Exhibit, Seattle World's Fair: Final Report,* p. 10.
[21] US Dept. of Commerce, *United States Science Exhibit, Seattle World's Fair: Final Report,* p. 43.
[22] Geodesic domes were promoted in the mid-20th century by R. Buckminster Fuller, who received a patent in 1954 for a technique and refinement which allowed for their quick construction. See additional information on Fuller in this report.
[23] Interview with Diane Carlson.

The floor is banked to accommodate seating. The banked floor may be original, based on 1962 revised drawings in the original drawing set (sheet 12-101, for example), but is contradicted by the United States Science Exhibit Final Report of 1962, which described it as a "stand-up circular carpeted theater." [24] A projection device sits on the floor in the middle of the domed screen, replacing the original "pillbox" projector. The current seating is not original.

Six doors to Building 4 (1962: Building 2) are on the west wall, and three sets of double doors to Building 3 (1962: Building R) are on the east wall. Both are preceded by a vestibule area, while two work spaces and storage spaces occupy the other two irregular interstitial spaces between the dome and exterior walls.

Original design

In 1962 this building was called the Spacearium, a Boeing-sponsored theater which displayed a 13 minute film, "Journey to the Stars", an imaginary travel through space, and the first immersive large format film production for a dome theater.[25] The purpose of the film was to convey the immensity of the still largely unknown universe. It was widely considered to be the most successful exhibit of the United States Science Pavilion.

Originally, a "pillbox" projection booth was located under the center of the dome, with space for the projection equipment and a stand-up projectionist. [26] The film was projected onto the 78 foot diameter hemispherical screen, described as the largest projection screen in the world at that time; it was not eclipsed until the construction of an even larger 80 foot diameter screen for the KLM Royal Dutch Airlines "Moon Dome" at the 1964 New York World's Fair, which also featured a space exploration film.[27] New projection equipment, lenses for filming and projecting, film stock, and film processing equipment had to be invented by the Cinerama company to accommodate this enormous curved screen.[28]

Current historic elements

- Wall panels with various arch motifs or scalloped motif, including vertical projections at parapet
- Exterior building elevations remain essentially intact, with the exception of additions built directly against them
- Original windows, doors, openings
- White quartzite aggregate finish
- In-ground recessed light fixtures for wall up-lighting
- Maintaining clarity of building element connections might be considered a historic element.
- Interior: The Laser Dome hemispherical projection dome may be considered historic due to its relationship to the original 1962 Worlds Fair. While the screen itself is original, it is the size, shape, location, and proportion of the dome that are the primary character-defining elements.

Current non-historic elements

- Non-original doors, windows, and openings
- Signage, banners (no original signage appears to be extant)
- Accessories for attaching signage or canopies
- Interior: Banked floor, seating, projection equipment, projection booth and steps
- Interior: Interstitial space between but not including interior curved wall/dome, and the inside face of the concrete exterior wall

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[24] US Dept. of Commerce, *United States Science Exhibit, Seattle World's Fair: Final Report,* p. 18.
[25] McConville, p. 4.
[26] Interview with Diane Carlson.
[27] McConville, p. 4.
[28] McConville, p. 4, cites the 1961 Cinerama Inc. Annual Report for this information. Strangely, this information is contained in the souvenir guide book for the Pavilion, but not in the heavily detailed United States Science Pavilion Final Report. See *United States Science Exhibit: World's Fair in Seattle, 1962* (Souvenir guide book), p. 46.

- Interior: Sound equipment and dome up-lighting do not appear to be original
- Interior: Carpeting

2.3.7 Building 3

in 1962 was Building R, the rest area and Junior Lab of Science

Current condition

This building is the smallest building of the complex, at 62.5 feet by 128.75 feet, but includes two stories plus a mezzanine, because of the steep grade drop at the south end of the site. The entire courtyard-facing north elevation consists of open arched wall panels, with a floor-to-ceiling glass wall assembly on the interior which was installed in 1993. At grade on the south side is an entry to Pacific Science Center and a drop-off drive aisle connecting to Denny Way. At grade on the courtyard side, a large open plaza extends from the building to the central courtyard pools.

The east and west elevations are composed of scalloped wall panels and serve as connections to the Laser Dome building (1962: Building 3) to the west and Building 2 (1962: Building 4) to the east.

The south elevation faces Denny Way and is composed of arched wall panels, with glazing at the very top of the panels. A balcony, original to the 1962 building, extends the entire width of the south elevation. A large rectangular bay projects from the central third of the south elevation, which was added during renovations in 1993, to create an at-grade entrance and canopy at street level. Above, doors at the east and west ends of the south elevation on the second (courtyard) level provide limited access to the balcony. The wide projecting bay is used as a location for signage advertising events and exhibits at Pacific Science Center.

In 1993 this building was completely renovated. On the interior, the floor was opened up to create a visual connection between the upper and lower floors, and the stair location was moved. On the exterior, the north wall was covered on the inside with a floor-to-ceiling glass wall assembly, to enclose the interior space. The building is now used as a gift shop and an entry to Pacific Science Center complex. There are also exhibits in the space and classrooms on a mezzanine level.

Original design

In 1962 this building contained two stories, the upper of which was a large covered open-air porch where refreshments were served, which provided an opportunity reflect and to take a break from the carefully planned sequence of science exhibits in the Pavilion. The lower area provided attended laboratories where children could learn about science through hands-on experience. The lower level was reached by interior stairs located in the west portion of the building.

On the upper level, the north wall consisted of open ribbed wall panels, creating a lacy screen from which to observe the water garden. The south wall contained high, pointed-arch windows near the ceiling, one of the few locations in the complex with windows. Also on the south side, a narrow balcony ran the width of the building, accessed by two sets of doors at the far ends of the elevation.

Current historic elements

- Wall panels with various arch motifs or scalloped motif, including vertical projections at parapet
- Original windows, doors, openings
- White quartzite aggregate finish
- In-ground recessed light fixtures for wall up-lighting
- Maintaining clarity of building element connections might be considered a historic element.

Current non-historic elements

- Non-original doors, windows, and openings

- 1993 glazed wall addition to north elevation
- 1993 projecting bay entry and canopy at south elevation
- Signage, banners (no original signage appears to be extant)
- Accessories for attaching signage or canopies

2.3.8 Building 2

in 1962 was Building 4, "The Methods of Science"

Current condition

This is the largest building of the complex, at 225 feet long by 115 feet wide, 32 feet high, and contains one floor. The courtyard-facing west elevation consists of solid arched wall panels, recently cleaned, with non-original double doors located at the center, with non-original signage directly above. Three single doors, located at the north part of the west elevation, are original but have been filled in. Three double doors at the southwest portion of the building lead directly from Building 3 (1962: Building R).

The south elevation consists of scalloped wall panels and has no doors or windows. Abutting the south elevation is the Southeast Terrace, an original 1962 design feature.

The east and north elevations, formerly visible to traffic along Denny Way and Broad Street, were completely obscured with the 1998 construction of the Boeing IMAX Theater and exhibit gallery addition, although the addition appears to have been built against the existing exterior wall, which may still be relatively intact. Several doors provide direct access to the exhibit gallery addition.

This building contains primarily freestanding exhibits, but also includes offices and a 40-seat planetarium. The interior of this building has been completely changed over the years as exhibits have been revised. The building is also used for large scale interactive exhibits. The mezzanine and stair access was removed. A two-story wood-stud office structure for Pacific Science Center staff now occupies the northwest corner of the building, the second floor of which is reached by a oversized staircase. North of this office structure, is the Willard Smith Planetarium, established in 1977.

Original design

In 1962, this building contained a wide-open floor of many exhibits which were intended to show the techniques of research for six major subject areas, including the sources of energy, the structure of matter, the functioning of living organisms, and so forth. The purpose was to show the breadth of types of scientists, the kinds of labs, the profusion of methods and instruments. Many of the exhibits were interactive and participatory. Originally there was a mezzanine along the west wall.

Current historic elements

- Wall panels with various arch motifs or scalloped motif, including vertical projections at parapet
- Original windows, doors, openings
- White quartzite aggregate finish
- In-ground recessed light fixtures for wall up-lighting
- Maintaining clarity of building element connections might be considered a historic element

Current non-historic elements

- Non-original doors, windows, and openings
- Signage, banners (no original signage appears to be extant)
- Accessories for attaching signage or canopies

2.3.9 Building 1

in 1962 was Building 5, "The Horizons of Science"

Current condition

Building 1 measures 105 feet by 120 feet, is 50 feet high, and contains one story with a small mezzanine. The courtyard-facing west elevation hides two stories directly behind it, and is composed of solid arch wall panels at level 2, with a covered walkway behind open arched panels at level 1. Doors at each level are located in the center of the west elevation.

The north elevation is composed of scalloped wall panels, without openings except for a two-bay return of the level 1 covered walkway, and is currently used as a prominent location for signage.

Although the shell of the building remains unchanged since 1962, the interior of this building has been completely changed over the years as exhibits have been revised. The building is used for large exhibits; the current installation features mechanized dinosaurs in realistic landscapes.

Currently, the majority of the center of the building is given over to a large staged dinosaur model exhibit and a small science demonstration stage. Behind the exhibit walls are additional offices, a staff and volunteer break area, and general storage. The small mezzanine is original and now used as a snack shop, more generally reached from the second floor level of the exterior walkways under the arched entry towers.

The exterior of the building remains essentially intact, and like the adjacent Building 2 (1962: Building 4), was recently cleaned. The east elevation of this building is also completely obscured by the 1998 Boeing IMAX Theater and exhibit gallery addition.

Original design

Originally, this building contained exhibits to relay the idea that science cannot provide final answers to life's problems, and that science will continue to present moral, economic, and social dilemmas which all people, scientist and non-scientist alike, must find a way to solve.

The exhibit design was by Walter Dorwin Teague Associates and involved a rotating floor which carried the visitor past films showing contrasting images, graphics, dioramas, light and music displays, and voiceover narration. The visitor was finally deposited at the exit vestibule, and stepped out of the building onto the lower level of the pool walkways under the arched entry towers. According to Pacific Science Center staff, the turntable mechanism for the original rotating floor remains under the floor level.[29]

Current historic elements

- Wall panels with various arch motifs or scalloped motif, including vertical projections at parapet
- Original windows, doors, openings
- White quartzite aggregate finish
- In-ground recessed light fixtures for wall up-lighting
- Maintaining clarity of building element connections might be considered a historic element

Current non-historic elements

- Non-original doors, windows, and openings
- Signage, banners (no original signage appears to be extant)
- Accessories for attaching signage or canopies

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[29] Interview with Dave Roberts.

2.3.10 Central Courtyard (Exterior)

At the heart of Pacific Science Center is an irregularly shaped, rectilinear inner courtyard, open to the sky, which is dominated by a two-level shallow reflecting pool. The pools are ringed at ground level with relatively narrow walkways and ring-shaped tree planters, currently planted with crab apple trees.[30] The walkways are surfaced with a white quartzite aggregate to match the surrounding building walls, and poured in a small circular, large circular, and rectangular patterns with metal pavement dividers. In some locations the walkways widen to open plaza spaces, particularly in front of Building 3 (1962: Building R). Recessed in the courtyard paths, against the buildings, are lighting fixtures which originally dramatically lit the white buildings in the evenings. The exterior perimeter walls of the pavilion were also up-lit during the Fair, with a combination of wall-mounted and recessed lighting fixtures, shown in the drawing set (sheet 13-100). Essentially all of these recessed lights no longer work due to accumulated soil, water, and plant material, and because the original wiring apparently was set directly into the concrete, without protective conduit, and so has rusted.[31]

In the plaza north of Building 3 (1962: Building R) extending halfway over the pool is a raised viewing platform (in recent years called the "bandstand") which is composed of concrete and the same white quartzite aggregate paving as the walkways. There is a narrow depression serving as a shallow gutter around the edge, which is highlighted by darker aggregate . A custom railing, found throughout the complex, is set in slightly from the edge of the platform. The platform is accessed by open-riser concrete stairs with aggregate finish on the south side. Recessed lighting under the platform around the perimeter once highlighted the "floating" effect of the platform at night, but the lights no longer operate.

The pool which fills the courtyard is divided into two unequal parts, roughly the north half and the south half, the former being approximately 2 feet higher than the latter. A low wall divides them, and mid-wall scuppers allow some flow from upper to lower. The pool bottom is lined with small polished river stones, in a wide range of natural light and dark browns and tans.

Although the pools are filled with still water, and are essentially reflecting pools, there are 8 fountains set above the water, each in the form of a multi-petalled basin, each shooting a single stream of water directly upwards. Three are located in the upper pool, and five in the lower, each spaced out towards the center of the water.

Most of the courtyard features were custom designed by Yamasaki and are included in the drawing set; these include the petalled fountains, railings, benches, and planters. These elements appear to be in relatively good condition, although several of the benches are showing chips and wear on the legs. Custom designed drinking fountains indicated in the drawing set are either no longer extant, or may have never been built.

In 1993 the courtyard was altered with the addition of a pool pad and walkway bisecting the lower pool, allowing greater flexibility for movement between buildings and exhibits. Diverse contemporary displays, such as interactive water cannons or dinosaur sculptures, have been added over the years, either as stand-alone features or as part of larger exhibits. Signage is attached to several building walls at regular locations by means of metal tube supports bolted directly to the ribs of wall elements, sometimes damaging the quartzite finish.

Although the courtyard pools appear generally intact, ongoing maintenance issues with the courtyard water features are substantial. Settling, freeze/thaw cycles, and other actions have resulted in some cracks to the pebble lining and walkways and coping at overhangs, as well as leaks. The pools must be regularly

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[30] According to Diane Carlson, who came to the Science Center in 1980, the trees are the original 1962 trees, although one died and was replanted with a Dawn Redwood in the 1990s. Interview with Diane Carlson.
[31] Interview with Dave Roberts.

drained and cleaned of accumulated matter such as waterfowl droppings, decomposing leaves, large numbers of thrown coins, and so forth, and then refilled with tens of thousands of gallons of water at considerable cost. Because the pool's finish is rough pebbles rather than smooth concrete, unusually onerous cleaning procedures are required to keep a clean and attractive appearance.

Current historic elements

- Custom precast concrete petalled fountains
- Wall separating upper and lower pools
- Pool lining pebble finish
- Pool edging and coping

Current non-historic elements

- 1993 pool pad and walkway
- Non-original water features or displays

2.3.11 Entry Towers and walkways

At the center of the complex are five precast concrete 100 foot tall entry arches, which are topped with precast concrete open-ribbed vaults, and stand on ten 40 x 40 foot concrete cast-in-place slabs. Five of the slabs are post-tensioned on the entry level and five on the lower exit area.[32] The towers each support an identical custom light fixture on cable cross ties; the cables are structure required to resist the outward thrusts caused by the lattice roof structures.[33] The towers are centered on the primary north-south axis of the Seattle Center. Originally, Yamasaki had planned a single, 110 foot tall tower to mark the entry, but after plans for the nearby 650 foot tall Space Needle were made known, he realized that the single tower would have appeared "diminutive" in comparison and so opted for a multi-tower design.[34]

Two levels of concrete walkways with white quartzite aggregate and patterned paving (matching the rest of the paving around the pools) connect Buildings 1 and 5, and the entry forecourt. Curved concrete ribs enclosing tensioning cables are expressed on the underside of the slabs and create a pleasing pattern; these are in fact structural members which are organized along lines of principal bending moments, to most efficiently support the slabs.[35]

At the ground level walkways adjacent to the pools, there were and are no handrails. Currently, because the pools are empty due to wholesale leakages, plastic chains or pennant cords are strung between structural piers at times to protect pedestrians from the edge.

Current historic elements
Entry Towers

- Tower structure elements
- Central pendant light fixture at each tower
- Associated hardware and accessories
- High-voltage up-lighting equipment mounted to tower piers may be original

General courtyard elements

- Viewing walkways, lower walkways, and associated stairways, including undersides.
- Original guardrails; locations to be confirmed
- Viewing platform; including lighting, paving, railing

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[32] *Architecture West,* April 1962, p. 21.
[33] Structural information from correspondence with Jack Christiansen, May 31, 2010. Unfortunately, the electrical sheets showing more light fixture details, and the architectural/structural sheets showing the entry tower design and construction, could not be found within the drawing sets available for review in this report.
[34] Yamasaki, p. 70.
[35] Correspondence with Jack Christiansen, May 31, 2010.

- Paving, including patterns and aggregates
- Arch-legged benches
- Planters—large wide bowl
- Planters—small tall bowl
- Planters—tree ring
- Ceiling-mounted light fixtures at semi-enclosed walkways
- Custom pebble-finish garden walls
- Custom pebble-finish retaining walls
- Original artwork may contribute to the historic aspect of the courtyard if original to the location; each piece to be confirmed.
- Historic plaques may be considered historic in their own right, as well as contributing elements to the site.

Current non-historic elements

- 1993 pool pad and walkway
- Temporary structures, tents
- Non-original water features or displays
- Non-original Benches—gray contemporary
- Trashcans, recycling bins, and similar
- Non-original doors, windows, and openings
- Non-original sculpture or artwork; each piece to be confirmed
- Trashcans, recycling bins, and similar
- Signage, banners (no original signage appears to be extant)
- Fabric canopies, awnings
- Accessories for attaching signage or canopies

2.3.12 Additional areas: Entry Forecourt, West & East Exhibit Gardens, Southwest & Southeast Terraces

Yamasaki's original design included an entry forecourt to connect the stair entry to the rest of the Century 21 site paths, which included a pebble finish precast concrete fence atop a pebble finish retaining wall. This forecourt was intended to gently separate the inner court from the noise and visual distractions of the rest of the fair. New ticket booths, kiosks, signage, and fencing altered this condition when they were built in 1992-93. Part of the central pebble fencing was removed and replaced with new pointed-arch motif metal fencing, to match similar original fencing and guardrails at other locations on the site.

In the northwest and northeast corner of the pavilion grounds, directly north of Building 1 and 5, were the West and East Exhibit Gardens. The drawing set seems to indicate that the gardens and paths were designed by Yamasaki & Associates, with landscape architect Lawrence Halprin; however, it is not clear to what degree they collaborated. The garden locations were slightly off the beaten path, providing quiet green spaces away from the noise and sights of the fair, and offered a collection of non-objective sculpture for contemplation. Grassy bermed pyramids and cones, and rectilinear paths, offered a modernist perspective based on Japanese garden precedents.

Today, little remains of either of these gardens. The West Exhibit Garden was altered in 1993, and completely displaced with the construction of the Discovery Labs Building in 1996. A portion of the original pebble finish retaining walls and garden walls remain, but the southernmost return wall portion was reused in an altered configuration. The East Exhibit Garden was completely removed with the construction of the Boeing IMAX Theater wing in 1997-98, although the custom pebble finish retaining wall and garden wall along the east side remain.

At the southwest and southeast corners of the site, on the south side of the Laser Dome (1962: Building 3) and south side of Building 2 (1962: Building 4), are spaces called the Southeast and Southwest Terraces on the original drawings. These spaces were essentially the tops of bermed earth retained by pebble finish retaining walls, necessary due to the steep grade drop down to the south, with mechanical areaways underneath. Although the drawings indicate paving, benches, lighting, and planting areas, these terraces do not appear to have been open to the public, although they are accessible from Building 3 (1962: Building R). They seem most likely to have been landscaped and finished for appearance sake, since they would have been visible from the balcony on the south side of Building 3 (1962: Building R), or perhaps available for fairgoers accessing via a path on the east side of the Pavilion, which would have rewarded the visitor with views of Elliott Bay. The spaces were landscaped by Lawrence Halprin & Associates. Today, these spaces are closed to the public and used as informal break space for employees. A portion of the Southeast Terrace at some point was excavated in the center, where large transformer equipment is now located. A construction-site type portable building which is used for flex office space and storage is currently located at the Southwest Terrace area.

Current historic elements

- Custom pebble-finish garden walls, where remaining
- Custom pebble-finish retaining walls

Current non-historic elements

- Landscaping, paving, signage, furnishings, railings, fencing, temporary structures, equipment, entry kiosks and related structures.

2.4 Summary of primary alterations

Since becoming Pacific Science Center, the buildings have undergone repeated alterations to their interiors, and occasional alterations to the exterior of the buildings, in order to accommodate changing exhibits and programs as Pacific Science Center fulfills its education mission and welcomes the public into exhibit spaces that change over time. This summary of alterations is based on information from the King County Assessor's records, drawings on file at the Seattle Department of Planning and Development Microfilm Library, and drawings on file with Pacific Science Center maintenance office.

1959-62	Design and original construction
1964	"Merge (per Bldg Dept)" (text on Assessor's card)
1965	"New Imps. Seattle Center" (text on Assessor's card)
1965	"Park. lot" (text on Assessor's card)
1992-93	North ticketing kiosks and canopy; site improvements; Building 3 (1962: Building R) renovation. (Callison Architects)
1993	Parking area expansion; west garden walkway regrading; new lower pool pad and walkway; handicap ramp at Building 1 & 2 (1962: Buildings 5 & 4); new lunch pavilion tent at Building 3 (1962: Building R) forecourt. (Callison Architects)
1996	Construction of Building 6A Discovery Labs. (Callison Architects)
1997-98	New IMAX Theater and Exhibit Gallery, Addition 1A and 2A. (Callison Architects)
1997-98	Construction of Parking Garage (referred to in set as "Building 8"). (Callison Architects)

3. Historical Context

3.1 The development of Seattle and the Lower Queen Anne neighborhood

The site of Pacific Science Center and Seattle Center, in the 100 or so years prior to the development of the area for the 1962 World's Fair, had been an Indian hunting ground, an early pioneer settlement, and the early-20th century Seattle Civic Center.

For thousands of years prior to Euro-American settlement, the area that became Seattle had been part of the lands inhabited by Shilshole, Duwamish, and Suquamish Native American tribes. In contrast to the mostly forested lands of early Seattle, the site of today's Pacific Science Center and Seattle Center was originally a relatively flat, open meadow at the base of the south slope of Queen Anne Hill, which was likely kept cleared by the Native Americans in order to snare low-flying ducks flying between Lake Union to the east and Elliott Bay to the west. The tribes had hunting camps near the base of Queen Anne Hill, and permanent settlements just south of there near today's downtown.

In 1851, the first Euro-American settlers landed at Alki Point in West Seattle. Led by Arthur Denny, the small band of about two dozen people arrived by ship and overland from Portland, Oregon and from Illinois, and included the Boren, Bell, and Terry families, as well as Arthur's brother, David T. Denny, who was born in 1832 in Indiana. Almost immediately, the Alki Point site was found to be unsatisfactory and most of the party moved to the location that is now downtown Seattle. The new town of Seattle was platted in 1853, with David Denny claiming 320 acres of the meadow site north of downtown, including the location of the subject site.

The pioneer families called this large clearing "Potlatch Meadows," in the mistaken belief that the local Indian tribes held ceremonies there. David Denny and his wife built a home there, and later donated the land that became Denny Park to the City of Seattle. In the 1860s, a military road was cut through the area, following an Indian trail (today's Dexter Avenue). The hill and the meadow at the base of the hill were slow to develop, even after Denny subdivided his land into 500 building lots in 1872.[36]

In the meantime, the new settlement of Seattle was slow to grow. In 1852 Seattle was named the seat of the new King County.[37] The University of Washington was established in 1861 in Seattle, and by the Civil War the population of Seattle numbered 182. The town grew slowly for the next two decades, following the announcement that Tacoma (rather than Seattle) was to be the terminus for the Northern Pacific Railroad—the critical link over the Rocky Mountains to the Midwest and East. However, by the mid 1880s the Northern Pacific had reached Seattle via a spur line, resulting in a population boom. The Great Northern Railway was to reach Seattle directly via Stampede Pass in 1893, allowing direct transcontinental travel, resulting in an even larger boom. The city grew from 1,107 in 1870, to 3,553 in 1880, and exploded to 42,837 (with sizeable annexations to the immediate north and south of the downtown area in 1883) in the 1890 census. By the mid 1880s cable car lines and street car lines were beginning to be developed, along which neighborhoods were extended from the central city, with one of the most prominent lines going up Queen Anne Hill.

In 1889 the downtown suffered a devastating fire, but the economy was so strong that the entire city core was rebuilt in less than two years. 1891 brought more annexations (the Magnolia, Greenlake, Wallingford, and Mountlake areas), increasing the size of the population. The ups and downs of the century continued, as a national bank panic and depression in 1893 brought Seattle to a virtual halt by drying up capital, which

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[36] Historylink.org online encyclopedia of Washington state, Essay 3414 "Seattle Neighborhoods: Queen Anne – A Thumbnail History", David Wilma, 28 June 2001, accessed May 2009.
[37] Historylink.org online encyclopedia of Washington state, Essay 7934 "Seattle – A Thumbnail History", Walt Crowley, 26 September 2006, accessed January 2008.

four years later was alleviated by the discovery of gold in the Yukon. The 1897 Klondike gold rush brought thousands of potential gold prospectors through Seattle, which advertised itself as the gateway to Alaska, and Seattle benefitted economically by outfitting them, feeding and housing them. Also beginning in the late 1890s, Seattle also began a decades-long remarkable urban re-shaping by regrading hills and filling tideflats to attract new growth and improve the viability of the waterfront; the former Denny Hill was located directly south of the subject site of this report.

From 1890 to 1900 the Seattle population had nearly doubled over the decade, to 80,761. Prosperity continued unabated, with steel-framed highrises going up downtown, the Alaska-Yukon-Pacific Exposition (a precursor to a world's fair) in 1909, and city boundaries expanding through several 1907 annexations, such that by 1910 the population had nearly tripled to 237,194, and to approximately 327,000 in 1920.[38] During this period, Queen Anne Hill (particularly the south slope) began to be intensively developed with single-family houses of all sizes, including the mansions of many prominent Seattle families, as well as apartment buildings, with a primary commercial strip along Queen Anne Avenue at the top of the hill. At the base of the south slope, lower Queen Anne had developed a mix of single-family homes and large apartment buildings, with small businesses and one-story commercial buildings interspersed, but this area by World War I also began to develop a distinctly light-industrial land use pattern, including automobile garages, laundries, a bakery, and gas stations.[39]

In 1923, a new zoning code was enacted which allowed more intense development of apartment buildings and hotels in the lower south slope of Queen Anne Hill. The boom in multifamily housing in the mid-to-late 1920s created the dense urban fabric which characterizes the neighborhood today. Adjacent to this dense urban fabric, the city began the construction in 1927 of the Civic Auditorium, Ice Arena, and Civic Field following a voter-approved bond measure. This young civic center complex was used for concerts, graduation ceremonies, football games, and in this way served as a gathering site for the entire city.[40]

After decades of steady growth, Seattle's population began to level off, from approximately 327,000 in 1920 to 366,000 in 1930 and in the 1940s as well. World War II created a large number of jobs in the area, and postwar recovery saw the city's population begin to swell again, such that by 1950 the population was 467,500, and by 1960 it was a whopping 557,000.[41]

In the lower Queen Anne neighborhood, development stalled during the Depression and prewar years of the 1930s to early 1940s, with the major exception of the 1939 construction of the Washington State Armory at the civic center complex. This huge brick structure was built to house the National Guard and remains today as the Center House. After World War II, the area around the civic center, particularly the Warren Street corridor to the west of it, had fallen into decay. Although not a slum, the area had a higher crime rate, higher unemployment, fewer owner-occupied homes, and generally older building stock than the average Seattle neighborhood.[42]

It was under this socio-economic climate that, in the late 1950s, city boosters began to consider a World's Fair for Seattle, and the location chosen was at the civic center complex in the lower Queen Anne neighborhood.

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[38] Ochsner, *Shaping Seattle Architecture*, pp. xviii-xxxii.
[39] Lentz and Sheridan, pp. 12-15.
[40] Lentz and Sheridan, pp. 18, 22. The Civic Field was purchased by the School District in 1948 and rebuilt as a war memorial, the High School Memorial Field.
[41] Ochsner, *Shaping Seattle Architecture*, pp. xxvi-xxvii.
[42] Findlay, pp. 223-224; Lentz and Sheridan, p. 22.

3.2 The Century 21 Exposition (1962 Seattle World's Fair)

In 1909, Seattle hosted its first World's Fair, the Alaska-Yukon-Pacific Exposition, which was held to commemorate the Klondike Gold rush in the 1890s. Like most world fairs and expositions, it had exhibits of local products and businesses, rides, food, celebrities, demonstrations, and displays.

Although it lasted only 6 months, the AYP Exposition was a great success, and brought millions of visitors from around the country and the world, as well as good press for the young but bourgeoning city which advertised itself as the gateway to Alaska, the western Canadian frontier, and Asia. It also was held on the new grounds of the University of Washington. While most of the construction was lathe and plaster, and not intended to be permanent, some of the buildings were purposely built of more permanent materials, to be retained (along with much of the infrastructure and landscaping) for the benefit the community for years afterwards.

About 50 years later, in the mid-1950s, Seattle civic boosters, businessmen, politicians, and other community leaders began to rally around the idea of a world's fair to commemorate the Alaska-Yukon-Pacific Exposition and to bring worldwide attention to this growing port city. The idea quickly spread, and in 1955, the Washington State legislature passed a bill creating a World's Fair Commission to develop a plan, a schedule, and to choose a site for the event.

Several sites were proposed for the Fair, including Fort Lawton, Sand Point Naval Station, and Union Bay near the University of Washington, but the site ultimately chosen was the nascent Civic Center at the foot of Queen Anne Hill. The existing 28-acre Civic Center site had the advantage of already being owned by the city, was centrally located and large enough, was relatively level, and could benefit after the Fair from any permanent structures, just as the UW had after the AYP Exposition in 1909. Several buildings already on the Civic Center site were adapted to Fair uses, including the 1928 Civic Auditorium (today's Opera House), the 1939 Armory (now the Center House), and the 1948 Memorial Stadium.[43] Furthermore, the city was interested in encouraging redevelopment of the area which was by that time perceived to be "blighted," to use the terminology of the time.

Fair planners determined that approximately 70-75 acres was the minimum necessary for the Fair grounds. Therefore, to create a larger site, approximately 50 acres of the existing residences and commercial buildings primarily south and west of the existing Civic Center site were condemned, and several street rights of way for many blocks were vacated in order to unify one large area. [see figures 8 and 93] The action followed a 1956 bond issue and was not without controversy; several landowners successfully petitioned to remain outside the condemned area (including the Sacred Heart Catholic Church, with remains across 2nd Avenue from the Pacific Science Center site).

Prior to condemnation for the 1962 Fair, the site that specifically became the United States Science Pavilion was approximately 30 city lots, alleys, and vacated portions of John Street and 3rd Avenue N. The 1905-1951 Sanborn map shows the site occupied by approximately twenty early 20th c. 1-2 story wood-framed houses, several with detached garages. Pictures of some of these houses exist in tax assessor's files for the demolished buildings; they resemble "foursquare" houses typical of many established Seattle neighborhoods. Also on the site were eight semi-detached apartments, six cottage apartments, one 9-unit apartment building, a labor union hall (unknown affiliation) with accessory offices, an automobile service station, and a milk depot. After condemnation and clearing, the site of the United States Science Pavilion was given, fee simple, to the Federal government for its construction.[44] [see figure 93]

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[43] Historylink.org, "Seattle Center", essay 1321 by Walt Crowley and Patrick McRobers, June 1, 1999, www.historylink.org, accessed May 2009; see also Duncan, pp. 24-25, 30-33.
[44] Findlay, pp. 223-224, and Duncan p. 35. For site ownership, see *United States Science Exhibit Final Report*, p. 55.

By 1957, state and city funding had been secured and the commission could begin concrete planning. Although the fair had tentatively been named "Festival of the West," the commission settled on the forward-sounding "Century 21 Exposition" and sought a theme to build upon. In October 1957, the Soviet Union launched the first Sputnik satellite, and the "Space Age" had begun. More ominously, the "Space Race" had begun—the USSR in the midst of the Cold War had beaten the United States in launching the first satellite into outer space, and what this held for the future of American security was uncertain. The importance of science, and educating the average American about the importance of science, suddenly became paramount. Embracing this direction, the commission determined that the overall theme of the Century 21 Exposition would be life in the 21st century, and how science would play a role in it.

The Century 21 Commission enlisted the support of the nation's top scientists through the American Association for the Advancement of Science, and with their participation an advisory committee was formed (which included UW faculty member and future director of Pacific Science Center and governor of the state, Dixy Lee Ray). Washington state senators Warren Magnuson and Henry Jackson were able to secure $12.5 million in federal funds for a federal science pavilion and NASA exhibit, the most federal money ever appropriated for a fair.[45] With a stamp of approval given by the Bureau of International Expositions in Paris, the Century 21 Commission was able to attract dozens of international exhibitors, as well as numerous national and local corporate sponsors.

An initial design commission for planning the fair included, among others, Paul Thiry, Minoru Yamasaki, Perry Johansen, and Lawrence Halprin. Chosen as architect for the entire project was Paul Thiry, who oversaw the entire site and coordinated individual architects for specific buildings. Thiry also designed one of the most prominent buildings, the Coliseum (today's Key Arena), which housed the State of Washington Pavilion. Landscape architect for the Exposition was Lawrence Halprin. The most prominent architectural feature of the Fair, the Space Needle, was developed as a privately owned venture by a group of local businessmen (including Howard Wright, Bagley Wright, and John Graham), because no public entity would take on the project.[46]

The grounds of the Fair were organized by axial paths and paved open spaces, highlighted with landscaped areas and freestanding pavilions, with larger buildings anchoring key locations, and at the heart was the large International Fountain at the center of a grassy lawn. To simplify access to existing utilities, Thiry kept the former rights of way "open" in the sense of generally being free of buildings and pavilions (in fact, Pacific Science Center is partly located in the former 3rd Avenue N and John Street rights of way).

The United States Science Pavilion was located at the southern edge of, and on the highest point of, the Century 21 Exposition site, at the end of one of the primary axial pathways organizing the fair grounds, and marked by entrance towers. According to Minoru Yamasaki, he sought in this design to create a quiet oasis separated from the rest of the fair.[47]

The site was divided into several themed areas, including World of Science (centered on the United States Science Pavilion), World of Century 21 (also known as the World of Tomorrow) inside the Coliseum, World of Commerce and Industry, World of Art, and World of Entertainment. Each of these areas held buildings with exhibits relating their theme to life in the 21st century. For example, at the World of Century 21, one area led visitors on a tour of the future in a "Bubbleator" (a spherical transparent elevator) and through an enormous abstracted cluster of plastic cubes containing exhibits which used models, film, graphics, light, and music to show what the future might hold for the average person—a high-tech home filled with labor-

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[45] Duncan, pp. 20-37.
[46] Duncan, p. 44.
[47] One source asserts that Yamasaki had initially thought that a location on Capitol Hill was to be the site for the Fair, and that the U shape of the pavilion was intended to face west towards Elliott Bay and the Olympic Mountains, but when shown the actual site, Yamasaki instead created an enclosed, inner-focused courtyard. This proposition was unreferenced and could not be confirmed for this report. It does not appear to be supported by Yamasaki's own statements, and may therefore be apocryphal. Duncan, p. 46.

saving devices, schools with electronics to enrich learning, flying to work in a personal gyrocopter or travelling via automatic monorail, enjoying completely automated factories and farms, and so forth**.**

In addition, several areas were devoted to food, shopping, and entertainment such as the rides on the Gay Way amusement park area, Food Circus, and Boulevards of the World bazaar. A futuristic monorail--which itself became one of the enduring iconic images of the Fair--was built to speed visitors to and from downtown.

Fair buildings near the United States Science Pavilion were primarily smaller pavilions in a variety of architectural expressions, often sponsored by participating corporations, including the Standard Oil Exhibit, the IBM Pavilion, the Bell System Exhibit, and the Ford Motor Company pavilion. Also nearby was the Fair's south entrance and information booth.

The fair was held from April 21 to October 21, 1962, and attracted nearly 10 million visitors. The event was a resounding success, and focused international attention for six months on a city which had previously been seen as something of a provincial backwater, to the benefit of local businesses and tourism for decades following.

After the Century 21 Exposition ended in October 1962, the former fair site reverted to the city and state. The United States Science Pavilion reverted to the federal government's General Services Administration. As had been planned, many of the buildings on the site were never intended to last beyond the Fair, and were demolished or otherwise removed, while others were left as permanent facilities for the city. After brief but considerable debate, the site was to be refashioned as a park-like, public, city center for arts, sports, and other cultural events. In June 1963 the fair site reopened as the Seattle Center.[48] Today, the Seattle Center is home to more than thirty cultural, education, sports, and entertainment organizations, with 12 million visitors annually.[49]

3.3 Pacific Science Center after 1962

On October 22, 1962, the day after the World's Fair ended, the Science Pavilion was leased from the federal government for $1 a year by the newly created Pacific Science Center Foundation, and reopened as Pacific Science Center. The vast majority of World's Fair exhibits remained there, for operation as a nonprofit science center, although some consideration had been given to converting the facility after the Fair into a garage, warehouse, office building, scientific research center, or permanent museum or exhibition hall.[50]

The Foundation's initial thirty-three member board included its president, Edward Carlson, who had been chairman of the World's Fair Commission; Dr. Athelstan Spilhaus, who had been the commissioner of the United States Science Pavilion; Joseph McCarthy, dean of the University of Washington graduate school; Rev. A.A. Limieux, the president of Seattle University; and Richard Fuller, the president of the Seattle Art Museum.[51]

In October 1974 Pacific Science Center Foundation received the title to the buildings and grounds from the federal government, a $7 million gift, in order to "resolve an increasingly awkward situation in which the Science Center has been the only non-federal agency occupying federal land," in which the government could have revoked its license to use the buildings at any time, for any reason. Ownership of the property was expected to facilitate fund-raising efforts as well. Prior to this, in the late 1960s and early 1970s,

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[48] Duncan, p. 92.
[49] "About Us," Seattle Center website, www.seattlecenter.com/information, accessed November 21, 2009.
[50] Duncan, p. 88; US Dept. of Commerce, *United States Science Exhibit, Seattle World's Fair: Final Report,* p. 55-56.
[51] "World Fair ends today in Seattle," *New York Times,* Oct. 21, 1962.

negotiations were held to arrange for the Smithsonian Institution, and later the National Park Service, to take over operation and supply part of the funding of the Science Center, but they were ultimately unsuccessful.[52]

Pacific Science Center continued the mission of the United States Science Pavilion in engaging the public in all aspects of science and nature. Grade school and high school students have often been, but by no means exclusively, the target audience. Since 1962, over 36 million people have visited the facility.[53]

Pacific Science Center belongs to a class of science museums which focuses on non-traditional, hands-on, participatory exhibits to engage the visitor. Natural history and technology museums have existed since the 1800s, generally as teaching tools connected to universities and colleges. Some museums claim to have developed a hands-on tradition before it was commonplace, including the Museum of Science and Industry in Chicago (1933), which claims that it was the first in the United States to feature interactive exhibits, inspired by similar exhibits at the Deutches Museum in Munich, Germany; and the Boston Children's Museum (1913), which developed such programs in the early 1960s under director Michael Spock. OMSI, the Oregon Museum of Science and Industry in Portland, Oregon, was founded in 1944, and also claims early participatory exhibits. However, according to the trade group the Association of Technology Science Centers, this particular class of hands-on museums developed as an outgrowth of the populism, social and educational ferment, and curriculum reform projects of the 1960s, such as those espoused by physicist Frank Oppenheimer. Pacific Science Center was the first to use the term "science center," and was among the earliest to be established.[54] Others in the United States included the Lawrence Hall of Science in Berkeley, California, founded in 1968; the Exploratorium in San Francisco, California, founded by Frank Oppenheimer in 1969; and the Center of Science and Industry in Columbus, Ohio, in 1971. Traditional natural history and technology museums also began offering hands-on exhibits for visitors. By 1973, twenty of these institutions, including Pacific Science Center, formed the Association of Science Technology Centers as a breakoff branch of the American Society of Museums. There were almost 600 members in 2009.[55]

Today, the facility is owned by the Pacific Science Center Foundation, a private, not-for-profit 501(c)(3) organization, governed by a large, broad-based community board. Average yearly on-site attendance is approximately 850,000 people, although a mobile off-site outreach program impacts an additional 150,000 state residents annually, in every Washington county. Pacific Science Center visitors constitute nearly 10% of the total number of visitors to the Seattle Center.

Permanent, changing, and traveling exhibits and programs remain the core of the use of the Science Center buildings. Currently, three major traveling exhibits (consisting of 5,000 to 12,000 square feet) are installed in the Science Center each year, which take advantage of the Center's flexible exhibition space. However, the nature of the exhibits often require alterations to the facility—for example, temporary interior wall construction, semi-permanent features such as exterior awnings to protect visitors from the elements, and permanent or nearly permanent alterations such as the addition of handicapped ramps or new state-of-the-art HVAC systems to protect delicate materials. [56]

Over time, as new subjects and exhibits were presented at Pacific Science Center, essentially all of the original 1962 exhibits were replaced. Special facilities such as the theaters remain in their original use. Staff, facilities, and offices were, and continue to be, used to develop, design, and build exhibits of all sorts. Over the years Pacific Science Center has hosted large traveling exhibits requiring 10,000 sq. ft. or more

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[52] "Science Center to get the site it occupies," *Seattle Times,* Oct. 15, 1974, p. A16.
[53] Interview with Diana Johns.
[54] "Science Center History," Association of Science Technology Centers, Washington DC, August 2009, www.astc.org; accessed November 21, 2009.
[55] "Science Center History," Association of Science Technology Centers, Washington DC, August 2009, www.astc.org; accessed November 21, 2009.
[56] Interview with Diana Johns.

attracting hundreds of thousands of visitors; some of these have included the NASA lunar rover (1965), moon rocks (1969) [see figure 17], dinosaurs (1984-85, and later), exhibits on the historic and contemporary scientific achievements of China (1984) and India (1986).[57] Whales (1990), lasers and holograms (1992), Titanic (2001), Space (2004, Discovering the Dead Sea Scrolls (2007) and Lucy's Legacy: The Hidden Treasures of Ethiopia (2009).[58] In addition, Pacific Science Center has sponsored programs such as lectures, conferences, and workshops. Mobile and outreach programs allow off-site Pacific Science Center activities, and in 2008 Pacific Science Center partnered with the City of Bellevue to establish there the Mercer Slough Environmental Education Center, for hands-on urban ecological and environmental educational outreach.[59]

Pacific Science Center facilities have been the site of lectures and programs regarding the political and social implications of science, and the facilities have become the regular meeting place for outside community groups such as the Northwest Science Writers Association. To accommodate expanding programs for students, eleven classrooms have been added through building renovations, which are used for a variety of uses including "summer camp" programs during school vacations.

Besides on-site exhibits and programs, Pacific Science Center staff are also involved in statewide education initiatives and programs, partnering with local school districts, and state and national education and science groups.

Revenue for Pacific Science Center is derived from admission fees, as well as from additional sources such as the parking garage, on-site cafe, IMAX theater admission fees, and the retail store/gift shop located in Building 3 (1962: Building R). By virtue of their location within the complex, the cafe and retail store are accessible only to visitors who have paid admission. [60]

3.4 Notable persons associated with the United States Science Pavilion / Pacific Science Center

During the planning and execution of the United States Science Pavilion, countless scientists and educators prominent in their fields were involved in an advisory capacity to develop content for the exhibits, particularly through the National Science Planning Board, the Science Advisory Committee, as well as approximately 400 individuals, all listed in appendixes of the Final Report. Additionally, many important local persons were involved in creation and running of the World's Fair as a whole--of which the United States Science Center was a part. However, below are three particular individuals (Dixy Lee Ray, Eddie Carlson, and Warren Magnuson) who had a connection to the United States Science Pavilion and Pacific Science Center greater than most. Finally, Buckminster Fuller is included to clarify his role (or lack thereof) in the United States Science Pavilion Spacearium exhibit.

3.4.1 Dixy Lee Ray

One of the first directors of the nascent Pacific Science Center was University of Washington professor Dr. Dixy Lee Ray, who had been one of the members of the Century 21 Planning committee and the Science Advisory Board for the US Science Pavilion. Science, and the communication of scientific ideas to the public at large, remained a constant theme throughout her life.

Ray grew up and went to high school in Tacoma. She received a masters degree in zoology at Mills College in Oakland, California in 1938, and received a doctorate in biological science at Stanford by 1945. She began teaching at the University of Washington beginning in 1945, and was a professor there on and off until 1976. In the late 1950s to early 1960s she became more active in the National Science

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[57] Duncan, pp. 132-133.
[58] Duncan, pp. 132-133; Pacific Science Center records.
[59] "Mercer Slough Environmental Education Center expands," *Seattle Times,* October 9, 2008.
[60] Interview with Diana Johns.

Foundation, and was called upon to testify at House and Senate hearings on science. She was noted for her ability to communicate important issues between the scientific community and lay community.

These skills would continue to be honed when she was chosen as director of Pacific Science Center in July 1963, a position she would hold for nine years until July 1972. During this critical period of refining the facility's mission and securing funding sources, Dr. Ray was credited with keeping the institution alive through "her sheer stubborn persistence" and her ability to communicate the mission of the Center with a wide swath of Seattle's citizens and benefactors. [61] During her first year she also gave voice and focus to the mission of the institution, clearly and specifically delineating the unique roll that it could have in the region. Towards the end of her tenure there, Ray approached the Smithsonian Institution and the National Science Foundation to explore the possibility that either one might become more directly involved in the institution, but these negotiations were ultimately unsuccessful. [62]

In 1972 Ray was appointed by President Richard Nixon to the Atomic Energy Committee (AEC), even though her background was in marine biology (partly because Nixon wanted to appoint more women in his administration), and had to leave Pacific Science Center. In 1973 she was appointed to head the AEC. The AEC had been established in the 1940s following World War II, and oversaw both military and non-military nuclear policy. By the 1970s the country was grappling with energy policy and concerns over nuclear power plant safety; her roll was to communicate the opportunities of nuclear power with the skeptical public. Ray was headstrong and controversial, but credited with opening up the agency to detractors, putting the environmental impact of key AEC policies on the table, and attempting to pragmatically balance the demands of energy and the environment.[63]

Following the Nixon administration, President Ford in 1975 appointed Ray to serve as Assistant Secretary of State for Oceans, International Environement, and Scientific Affairs under Secretary of State Henry Kissinger. She resigned the same year due to conflicts with Kissinger.

In 1976 Ray ran for governor of Washington state as a Democrat, won, became the first female governor of the state, and served until 1980. Even as governor, both nuclear energy and environmental issues were controversial flashpoints in her administration, and ultimately she did not win re-election in 1980. She retired, wrote two books on her pragmatic view of environmentalism, and spoke occassionally on environmental issues. She died in 1994 at her home on Fox Island in Puget Sound near Tacoma.[64]

3.4.2 Edward "Eddie" E. Carlson

Eddie Carlson was one of the primary Seattle businessmen who spearheaded the Century 21 Exposition. Born in Tacoma in 1911 and raised in Seattle, Carlson's life was a rags to riches story. While working at various downtown hotels, he attended the University of Washington, until dropping out in 1930. During the Depression, several jobs continued to be associated with hotels, and the exclusive Rainier Club, where he established important friendships and contacts. After serving in World War II, Carlson worked for Western International Hotels, later to be called Westin Hotels. Moving up the ladder over the years, by 1960 he was president of the firm, and in 1969 was named chairman and CEO.

In 1955 Carlson was appointed by the Governor to head the World's Fair feasibility committee, and until 1960 was president of the World's Fair Commission—essentially the public face of the fair, publicizing it, raising funds, and enthusiastically cheerleading. In 1960 he stepped down, due to increasing conflicts performing his "real" job with Westin.

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[61] "Ray, Dr. Dixy Lee (1914-1994)," HistoryLink.org essay 601, by Paula Becker, November 20, 1994; accessed June 17, 2010; source quotes the *Seattle Post-Intelligencer,* January 3, 1994.
[62] Davis, pp. 21-25; pp. 68-70.
[63] "Environment: Changes in Dixyland," *Time*, November 5, 1973; "Dixy Rocks the Northwest," *Time*, December 12, 1977; and "Ray, Dr. Dixy Lee (1914-1994)," HistoryLink.org essay 601, by Paula Becker, November 20, 1994.
[64] "Ray, Dr. Dixy Lee (1914-1994)," HistoryLink.org essay 601, by Paula Becker, November 20, 1994.

From 1962 to 1966 Carlson served as President of the newly incorporated Pacific Science Center, following the World's Fair, and served on the Board into the 1970s. Particularly during the first early years of the Center, Carlson was instrumental in helping the institution find funding and fulfilling its mission.

In 1970 Westin and United Air Lines merged, and Carlson left Seattle for Chicago that year, where he served variously and effectively as president, CEO, or chairman of United until 1979. He kept a home in Seattle and returned frequently. In 1977 Carlson was appointed an honorary chairman of the Seattle Center Foundation, and served on many Seattle institution boards throughout the 1980s, retired but very active. Carlson died in Seattle in 1990.[65]

3.4.3 Warren G. Magnuson

Warren Magnuson was the longest-serving Washington state senator (1944-1980), and used his considerable influence (often partnering with fellow powerful Washington state senator Henry "Scoop" Jackson) to secure legislation that was often science- or environment-related, and to fund favored projects in his home state such as the 1962 World's Fair and Pacific Science Center. For the latter, Magnuson acted as both quarterback and cheerleader; he helped arrange it, fund, and continue it in the late 1950s and early 1960s; he shepherded and looked out for it over the decades, including critical efforts to transfer the ownership from the federal government to the Pacific Science Center Foundation.

Over his career, Magnuson spearheaded legislation for major increases in health care and research, including the establishment of the National Institutes of Health, and the Fred Hutchinson Cancer Research Center; for consumer protection, including safe drinking water and food labeling acts; for major bills protecting marine animals and the marine environment, such as the Marine Mammal Protection Act, as well as fisheries, including that which extended US territorial waters to a 200-mile limit. Appropriations he garnered for the state included funds for dams and hydroelectric power, the 1962 Seattle World's Fair and the 1974 Spokane World's Fair, disaster relief following the Mt. St. Helens eruption, and the preservation of Pike Place Market.

3.4.4 Buckminster Fuller

Buckminster Fuller (1895-1983) was an American inventor, engineer, designer, visionary, teacher, writer, and early sustainability advocate. Although he held many patents, the creation he is most associated with is the geodesic dome, for which he received a patent in 1954 for a technique and refinement which allowed for their quick construction. They could be constructed out of any number of materials. Fuller tirelessly promoted the dome, showing that the remarkably lightweight and cost-effective structures could enclose more area without intrusive columns than any other structure, and at nearly any scale.[66] The domes were immediately popular with the government and military as quick and cheap shelter, and by 1958 the Marines had almost one thousand in use.[67] Fuller owned the patents but did not necessarily design each one; in 1964 there were more than 50 companies in the US licensed to make them.[68] He was himself involved in some of these companies in different states, including President of Geodesics, Inc., of Forest Hills NY (1949-), President of Synergetics Inc. of Raleigh NC (1954-1959); President of Plydomes Inc. of Des Moines IA (1957-), and Chairman of the Board of Tetrahelix Corporation of Hamilton OH (1959-).[69]

By the 1962 Seattle World's Fair, the domes were not especially unfamiliar to the general public. Notable early domes included a 1953 domed restaurant in Woods Hole, Massachusetts (still extant), the 92 foot diameter 1953 glass dome over the Ford Rotunda show building in Detroit (demolished), the 150 foot

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[65] "Carlson, Edward "Eddie" E. (1911-1990)," HistoryLink.org essay 7202, by Paula Becker, January 5, 2005; accessed June 17, 2010.
[66] Buckminster Fuller Institute, "Biography: R. Buckminster Fuller, 1895-1983," www.bfi.org/about-bucky/biography, accessed June 18, 2010.
[67] "Art: Fuller Future," *Time*, October 20, 1958.
[68] "The Dymaxion American," *Time*, January 10, 1964.
[69] "Chronological Biography, Richard Buckminster Fuller," Buckminster Fuller Institute, www.bfi.org/about-bucky/biography/chronological-biography, accessed June 20, 2010.

diameter 1956 "Gold Dome" Oklahoma City bank, the 384 foot diameter 1956 dome used as a train depot for the Union Tank Car Company in Baton Rouge (demolished 2007)[70], and the 1959 dome measuring 200 feet in diameter for the US Exhibit at a global trade fair in Moscow. In 1959, New York's Museum of Modern Art opened a one-year exhibit on geodesic domes.[71] By 1964, the US had for eight years been using Fuller domes to enclose their exhibits at global trade fairs in Warsaw, Casablanca, Istanbul, Kabul, Tunis, Lima, New Delhi, Accra, Bangkok, Tokyo, and Osaka.[72] In 1964 his domes were a feature of some exhibits at that year's New York World's Fair, and even more dramatically in 1967, when an enormous dome became the centerpiece of that year's World Expo in Montreal. In 1964, when featured at that year's World's Fair in New York City, a portrait of Fuller's head was famously featured as a geodesic dome on the cover of that year's January issue of Time magazine.

For the 1962 Seattle World's Fair, one of Fuller's geodesic domes was employed as the 110 foot diameter Ford Motor Company exhibit building, just east of the United States Science Pavilion on the fair grounds, which Ford used repeatedly at shows and expositions (although Paul Thiry is listed as the architect of this exhibit building in the June 1962 issue of *Architectural Record*).[73] For the Spacearium projection screen in the United States Science Pavilion, the geodesic dome appears to have been designed by one of Fuller's licensed companies. Evidence of this is based on a photograph entitled "Boeing, Seattle Fair – Cinerama Skyrama Dome, 1962" in the Buckminster Fuller papers and archive at Stanford University by LECO, a company which (according to the Fuller archive) was used by Fuller to document all of his works.[74] Additionally, there is anecdotal evidence that the Synergetics company of North Carolina (one of Fuller's licensees) was the designer and supplier of the dome.[75] However, any connection of the Spacearium geodesic dome to Buckminster Fuller was apparently unknown or unremarkable to contemporaries associated with the planning and development of the United States Science Pavilion. There are no mentions of Fuller in any of the likely sources one would expect, such as the lengthy *United States Science Exhibit Final Report,* by Athelstan Spilhaus, which extensively details the type of film and camera that had to be developed for the huge screen, the various companies involved in the development of that particular exhibit, and so forth—everyone is mentioned except Fuller. However, Synergetics Inc. is listed as one of many exhibit "Fabricators" in the acknowledgements pages of the Final Report.[76] Similarly, there did not appear to be any mention of Fuller in the contemporary architecture and engineering periodical feature stories on the World's Fair (for example, *Architecture West, Architectural Record, or Architectural Forum* magazine) reviewed for this report.

Fuller did have additional connections to Seattle. Dr. Richard E. Fuller, the president of the Seattle Art Museum and an early boardmember of Pacific Science Center, was Buckminster Fuller's second cousin.[77] Finally, Buckminster Fuller visited Pacific Science Center in 1983 as part of an exhibit themed "Creativity," and toured the buildings, including the Spacearium/Laser Dome with Pacific Science Center staffmembers.[78]

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[70] "KCS razes geodesic dome built in 1958," *The Baton Rouge Advocate (newspaper)*, November 28, 2007.
[71] "Fuller Basic Biography (timeline)," R. Buckminster Fuller Archive, Stanford University Libraries, www-sul.stanford.edu/depts/spc/fuller/index.html, accessed June 18, 2010.
[72] "The Dymaxion American," *Time*, January 10, 1964.
[73] "Everything I Know (EIK)" lectures by Buckminster Fuller, Session 9 part 10 (transcript), recorded January 1975. Buckminster Fuller Institute, www.bfi.org/about-bucky/resources/everything-i-know, accessed June 20, 2010. See also "A Tour of Century 21 with Paul Thiry," *Architectural Record,* June 1962, p. 148.
[74] "Guide to the R. Buckminster Fuller Papers," Collection no. M1090, Series 13, Box 2, Folder 21; Stanford University Libraries, Stanford, California.
[75] Correspondence with Diane Carlson, April 1, 2010. She and Pacific Science Center staffmember John Boercherding met Pete Barnwell, visiting in Seattle, who said he and his company, Synergetics Inc. of North Carolina, had assisted Fuller in designing and assembly of the dome.
[76] US Dept. of Commerce, *United States Science Exhibit, Seattle World's Fair: Final Report,* p. 73.
[77] "Fuller, Dr. Richard Eugene," HistoryLink.org essay 7190, by Paula Becker, Jan. 2, 2005.
[78] Interview with Diane Carlson.

3.5 Modernist architecture debates in the mid-20th century

Modernism in architecture broadly refers to a design approach in the 20th century which rejected traditional historical references and forms in architecture, particularly following the historical eclecticism of the 19th century, and instead embraced optimistically the new technologies and materials that were developing through industrialization, pursuing such themes as clear expression of structure, flexibility of interior space, movement and dynamism, transparency, and avoidance of applied detail, for example. The movement had its roots in the early 20th century work of European architects and educators such as Le Corbusier, Walter Gropius, and Ludwig Mies van der Rohe.

After World War II, American architects were heavily influenced by the Modernist movement, and as they entered the postwar urban building boom, the sheer number of buildings built in the 1950s and 1960s sometimes resulted in average designs driven by a "pragmatic utilitarianism" rather than the more nuanced designs of Mies or Corbusier.[79] In Seattle, Modernism had been growing in popularity among architects since the 1930s and 1940s, with designers and educators such as Paul Kirk, Paul Thiry, and Lionel Pries leading the way. A 1953 national AIA convention held in Seattle helped to put a spotlight on a growing body of Modernist and contemporary architecture developing in the region, as well as the booming development of suburbs throughout the 1950s and 1960s.[80]

By the late 1950s and early 1960s, increasingly strident debates were rising within the design community regarding what was appropriate or not for the design of modern buildings. In 1964, Ada Louise Huxtable, architecture critic for the New York Times, in her review of a new exhibition on this topic opening at the Museum of Modern Art in New York, characterized this debate unfolding around her as follows:

> "[In the past,] No one questioned that form followed function and structure made style. Now the profession is split apart, between those who still feel that architecture is properly the expression of structural techniques, and those who have broken with this principal for a more free-wheeling kind of design. It is a deep and serious split... each side is convinced of its own virtue and the opponent's sin. Oversimplified, the lines are drawn between the show-the-bones versus the cover-up or slipcover schools of design, guts versus embroidery, steel versus lace.
>
> This puts [Ludwig] Mies [van der Rohe],...Skidmore Owings and Merrill, I.M. Pei, et al., on one side, building solidly, beautifully and conservatively on basic structural systems, seldom departing from the proper revelation of structure's presence and importance, preserving its visual and sensory integrity, clearly suggesting its basic role no matter what manner of enrichment is used...
>
> In the other camp are men like Paul Rudolph, Philip Johnson, Minoru Yamasaki, and Edward Durrell Stone, all of whom would scream bloody murder at being lumped together, but that is exactly how the first group lumps them...[and] considers them traitors to modern architecture. Their work seeks special, pleasing effects—dramatic, decorative, historical, exotic, luxurious and sensuous—and it's not always too fussy about camouflaging or dissembling structure to do it. It is sophisticated, romantic, experimental and exploratory; its construction can be quite secondary to purely ornamental, social, or emotional ends.
>
> Yamasaki, for example, has been known to have a love affair with a folded plate roof because he was as interested in the look of accordion pleats as in the provision of shelter.[81] Stone has gift-wrapped everything from embassies to gas stations in grilles and screens. Johnson might be called a structural esthetician... [For] Rudolph...basic

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[79] Roth, *A Concise History of American Architecture*, pp. 274-277.
[80] Ochsner, *Shaping Seattle Architecture*, pp. xxxiii-xxxiv.
[81] This is referencing his design for the American Concrete Institute (Detroit, 1958).

> construction is not denied or hidden, but exploited theatrically for its most dramatic aspects. Call him a structural expressionist." [82]

Huxtable concluded her review, writing that she intended "to sit tight and watch the game...even keep score" in "this period of transitional modern design," as architects decide whether they are "a 'structural purist' paring his building to its beautiful bones, or a romantic experimenting with decorative taboos."

3.6 Minoru Yamasaki & Associates, design architects

Minoru Yamasaki began his career as a follower of International Style ideals, and embraced Modernist architectural values such as expression of structure, simplicity of form, rejection of ornamentation. He was a particular admirer of the work of Ludwig Mies van der Rohe. Later, he sought to incorporate ornament into building structure, and was sometimes called a "romantic" modernist.

Life in Seattle

Minoru Yamasaki is a relatively rare example of an architect who was raised and educated in Seattle and then went on to international notoriety. As such, it is worthwhile to note Seattle-related elements of his autobiography in greater detail than would normally be necessary for a landmark assessment, particularly since the building in question was a commission in his hometown.

Minoru Yamasaki was born in Seattle in 1912, the son of Japanese parents who met and married in Seattle. His father came from a well-to-do rice-farming family from the west coast of the island of Honshu, but as he was not the eldest son, by Japanese custom he was not to inherit the farm, and instead followed another brother to Seattle at the turn of the century to seek his fortune. His mother was the eldest of twelve children, whose father had established a successful tailoring business in Seattle. In Minoru's early childhood years, his family lived in a tenement on Yesler Hill (although they later moved to better quarters), and he recalled in his autobiography that "American ways remained foreign to [my parents] because of language difficulties and the strong racial prejudice that existed on the West Coast against Orientals at that time."

In school, Yamasaki was an good student overall, and particularly excelled in math and science, although lacked overall direction in his studies. In high school, one of his mother's brothers visited. The uncle, who had graduated in architecture from the University of California with some help from Minoru's father, was on his way to Chicago for employment, and briefly stopped in Seattle on the way to visit her family. While there the uncle unrolled some architectural drawings from university coursework, and as Yamasaki recalls, "I almost exploded with excitement when I saw them. Right then and there I decided to become an architect...Prior to this I had been barely conscious of art in painting, sculpture, or architecture..."

In his autobiography he also recalls the dramatic impression the natural setting of Seattle made on him, citing the "exceptionally beautiful evergreen forests rimming its many waterways, lakes, canals, and of course Puget Sound...the Olympics to the west and the snowcapped Cascades to the east...[and] Mt. Rainier the focus of it all...I vividly recall stopping at the top of one or another of Seattle's seven hills and taking in the extraordinary view of the sound with its beautifully irregular shoreline and vistas of islands and the Olympic Peninsula beyond." He was fond of the city as well, and stated in his 1979 autobiography that "[Seattle] will continue to be one of our finest cities due to its outstanding civic leadership." [83]

Education and career

Yamasaki enrolled in the University of Washington architecture school and spent his summers working at an Alaska cannery under "seeming dehumaniz[ing]" conditions to help pay his tuition. He graduated in

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[82] "Dams, domes, and the battle of styles," by Ada Louise Huxtable, *New York Times,* July 5, 1964.
[83] Yamasaki, pp. 9-11.

1934 and moved to New York to seek employment. On the way, he stopped in Chicago and went to the 1934 "Century of Progress" World's Fair there several times. Arriving in New York, he was unable to find architectural work in the Depression-era economic climate, so instead found employment for a year wrapping china dishes for a Japanese importing firm. Also during this period, he started his master's degree in architecture at New York University night school, and taught painting to students there. In 1935, as a student he helped finish drawings for the Oregon State Capitol Building competition proposal submitted by the firm of Trowbridge & Livingston in association with Francis Keally. The firm won, and was impressed with Yamasaki's work, so hired him as designer-draftsman. After a year, work dried up, and Yamasaki found work with Shreve, Lamb & Harmon, a firm whose most famous work to date was the Empire State Building (completed in 1931). At this firm, he was employed from late 1936 to 1943 preparing working drawings, and where he said he learned valuable lessons in construction methods, budgets, timelines, and production of large projects.[84]

Much work for Yamasaki while at Shreve, Lamb & Harmon during World War II involved defense contracts. As a Japanese-American, Yamasaki was investigated by the military after the Japanese attack on Pearl Harbor, but nothing came of it. His first large project as project manager was a 50 million dollar contract to design and build from scratch the Sampson Naval Training Station on Lake Seneca, New York. Although a two-year project, each building was on an extremely tight schedule, and involved many different building types including barracks, a large garage, a multifaith chapel, and so forth.

Yamasaki married in 1941. That same year, the day after the US declared war on Japan following the attack on Pearl Harbor, Yamasaki's father was fired from his job, so Yamasaki invited his parents to live with him, his wife, and his brother, in their one-bedroom apartment, to avoid his parents being sent to one of the Japanese relocation centers.

After 1943, Yamasaki was hired by Wallace K. Harrison, who at that time was most noted for his work on the design team for the Rockefeller Center in 1940.[85] Yamasaki worked at Harrison, Fouilhoux & Abramovitz for about a year, and through the middle and late 1940s worked for a variety of firms, including Raymond Loewy's influential industrial design firm, a brief project-based architectural partnership with architect and product designer George Nelson (who was noted among other things for many midcentury Herman Miller furniture designs), and a several-year stint as chief designer with the large Detroit architecture firm Smith, Hinchman & Grylls, at which time he moved from New York to Michigan. His primary project there was an International Style addition to the 1920s neoclassical Federal Reserve Bank of Detroit, but set back 30 feet from the streetwall and forming a small plaza with trees.[86]

In 1949 Yamasaki left Smith, Hinchman & Grylls, and formed the partnership of Leinweber, Yamasaki & Hellmuth with two former principals there, George Hellmuth and Joseph Leinweber, based in Detroit. One of the first large projects Yamasaki headed was the Pruitt-Igoe public housing project (1950) for the city of St. Louis, consisting of an enormous 57 acre site with 33 eleven-story housing towers containing over 2800 apartments. The buildings were arranged as a series of freestanding, mid-rise, spare International Style blocks, set in a large park-like green space without the grid of city streets, to open up generous ground space for parking and recreational green space—the kind of scheme championed by LeCorbusier in his work. Yamasaki's design included skip-stop elevators, communal hallways with common services on certain floors, and other elements pioneered by LeCorbusier in his projects, which were intended to provide residents with opportunities for walking, interaction, and the same social intercourse traditionally occurring on a city street. The project was completed in 1955, and praised as a model of urban renewal and public housing. Within years, plagued by a variety of problems, including funding, maintenance, crime, and arguably modernist architectural design issues as well, Pruitt-Igoe fell into decay. In 1972 the entire

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[84] Yamasaki, pp. 11-19.
[85] Harrison was the senior partner in the New York firm of Harrison, Fouilhoux, & Abramovitz (later Harrison & Abramovitz) from 1941 until 1976.
[86] Time, "Road to Xanadu", Jan. 18, 1963, p. 3.

complex was demolished, and while the reasons for its demise remain fodder for architecture, sociology, and political theorists, the project was frequently used thereafter as the classic, textbook example of the failure of postwar public housing projects.

In 1951 the firm received the commission to design the Lambert-St. Louis Municipal Air Terminal, the first work for which Yamasaki received substantial critical acclaim. The design was inspired by the great central space at New York's Grand Central Terminal (Reed & Stem, 1903) because no contemporary airports he toured offered a satisfactory spirit of the excitement of travel, departure, and arrival. The design consisted of three connected pairs of intersecting thin-shell concrete barrel vaults with copper roofing, with the intent that more vaults could be added as necessary to expand the airport in the future. The design had few detractors and won the AIA First Honors Award. Later in Yamasaki's career he would have many critics, but even renowned architectural critic and historian Nikolas Pevsner would say in the late 1970s in a backhanded compliment, "St. Louis [airport] is Yamasaki at his rare best." [87]

To accommodate construction of the terminal, the firm opened a St. Louis office. Ongoing frustrating issues during construction, compounded by repeated commuting back and forth between Detroit and St. Louis, caused Yamasaki such stress that he was diagnosed with potentially deadly bleeding stomach ulcers in December 1953. Doctors removed two thirds of his stomach and he was hospitalized two months for recovery. With this experience Yamasaki resolved to simplify his life. He and the firm partners agreed to go separate ways, closing the St. Louis office after the completion of the terminal was completed in 1956). Yamasaki and Joseph Leinweber formed the partnership of Yamasaki, Leinweber & Associates in Detroit, and George Hellmuth went on to form Hellmuth, Obata & Kassabaum with Gyo Obata and George Kassabaum in St. Louis (today known as HOK, one of the largest and most successful architecture firms in the world).

Shortly after establishing Yamasaki & Leinweber, the firm received a commission for the US Consulate in Kobe, Japan. Still recovering from his illness, Yamasaki travelled to Japan three times for the project, and, in addition to studying the architecture and gardens of Japan, arranged his travel to continue around the world to study the architecture of Paris, Milan, Venice, Pisa, and Rome in Europe; New Delhi, Chandigarh, and Agra in India; and Bangkok and Hong Kong in southeast Asia.

Yamasaki was struck by the traditional architecture of these places. Of the Katsura Palace, surrounded by gardens, in Japan, he "was overwhelmed by the serenity that can be achieved by enhancing nature," and decided that "serenity could be an important contribution to our environment." He found the historic architecture of Venice and Pisa to be quiet and reflective, and noted these two cities' historically close connection to the contemplative East. In the Gothic architecture of Europe, he noted that the flow of structure did not preclude the use of detail and ornament. Finally, in India, comparing the Taj Mahal with the modernist architect LeCorbusier's monumentally scaled buildings in the new Indian city of Chandigarh, he was amazed that the beautiful Taj Mahal continued to reveal more layers of exquisite detail the closer one came to it, whereas LeCorbusier's buildings appeared "magnificent" from a distance but grew "brutally crude" upon closer inspection.[88]

With several decades worth of Modernist architecture filling cities by the 1960s, Yamasaki began to see much of this architecture as bland, inadequate, and monotonous, except in the hands of only the most talented architects such as Mies van der Rohe. Structure remained very important to express, but to function, economy, and order, Yamasaki said "My premise is that delight and reflection are ingredients which must be added...Sunlight and shadow, form, ornament, the element of surprise are little-explored fields, barely understood by today's architects," exactly the qualities he found most alluring in the historic architecture of Japan, India, and Europe. He spoke of "the joy of surprise—the experience of moving from a barren street through a narrow opening in a high wall to find a quiet court with a lovely garden and still

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[87] Pevsner, *A History of Building Types*, p.234
[88] Time, "Road to Xanadu", Jan. 18, 1963, p. 2.

water; or to tiptoe through the mystery and dimness of a Buddhist temple and come upon a court of raked white gravel dazzling in the sunlight; or to walk a narrow street in Rome and suddenly face an open square with graceful splashing fountains." [89]

Besides the United States Science Center, Yamasaki's early representative projects which reflect these ideas include the McGregor Memorial Community Center at Wayne State University in Detroit (1955-58), the Reynolds Metals building in Southfield Michigan (1955-59), the Michigan Gas Building in Detroit (1958-63), the US Pavilion at the 1959 Agricultural Fair in New Delhi (1959), and the Dhahran Air Terminal in Dhahran, Saudi Arabia (1959-61), or the Oberlin Conservatory of Music at Oberlin College, Ohio (1963). For the United States Science Center, Yamasaki said he was inspired by the courtyard of the Swedish Pavilion at the 1939 World's Fair in New York, which he attended repeatedly while living there, and which was described as having a "general character of lightness and grace...the visitor walked through a friendly open entrance into a breathtakingly lovely garden completely contained by the building." [90] In McGregor, like the United States Science Center, the precast structural elements themselves are the vehicle through which the ornament is expressed. Notably, all of these projects are enhanced with pools, courtyards, or sculpture.

In later years, Yamasaki would continue to build an impressive portfolio of projects and was regarded as an architect who could capably deliver a project on time and on budget. Some of his work began to take on the more stately aspect of Modernism sometimes called "New Formalism", such as the Northwestern Mutual Life Insurance Company in Minneapolis (1961-64), or the Woodrow Wilson School of Public Affairs at Princeton University (1965).

Yamasaki & Associates designed two more buildings in Seattle, with NBBJ as associate architects—the IBM Building (1962-64), and Rainier Bank tower (1972-77). Yamasaki's most famous commission, however, was the World Trade Center (1962-1973) in New York City, the largest office building in the world at the time, and a job he received in part because the owner had visited the United States Science Pavilion in Seattle and was suitably impressed.[91] These three buildings share similar characteristics and reflect Yamasaki's later work in skyscrapers, including load-bearing exterior walls (rather than curtain walls), extreme verticality of expression enhanced by use of very narrow windows and a Vierendeel-truss-based [92] structure; and an integrated plaza area at the street level.

Minoru Yamasaki died in 1986, and the firm of Yamasaki & Associates remained active in Birmingham, Michigan, until early 2010, when they closed.[93] Throughout his career Yamasaki was a controversial figure, with as many strong critics as adherents. In the 1960s, art historian Vincent Scully decried the McGregor Building a "twittering aviary," and architect Gordon Bunshaft said "Yamasaki's as much an architect as I am Napoleon. He was an architect, but now he's nothing but a decorator...Now there's this clique that says 'let's build a beautiful building' and there is not even a thought to the architecture." [94] In the 1970s, Ada Louise Huxtable, architecture critic of The New York Times, vigorously panned the World Trade Center as "schmaltz" and a monstrosity; her successor, Paul Goldberger, called it "ghastly," and called the Rainier Tower "not visually pleasing or amusing; it is in fact rather terrifying" and "a self-aggrandizing narcissistic flamboyance." [95]

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[89] Time, "Road to Xanadu", Jan. 18, 1963, p. 4.
[90] US Dept. of Commerce, *United States Science Exhibit, Seattle World's Fair: Final Report,* p. 51.
[91] Glanz and Lipton, pp.89-90.
[92] Vierendeel trusses have no diagonal bracing; all the elements are orthogonal.
[93] "Architectural firm Yamasaki Associates Inc. downsizes last local employees," *Crain's Detroit Business News,* Detroit, MI, January 6, 2010, accessed online June 17, 2010.
[94] Quoted in Time, "Road to Xanadu", Jan. 18, 1963, p. 5.
[95] Huxtable in *The New York Times* in April 5, 1973; Goldberger in *The New York Times* June 24, 1976 and March 25, 1977.

With the destruction of the World Trade Center by an act of terrorism in 2001, the work of Minoru Yamasaki has come again into popular notoriety and awareness. However, other than his own 1979 autobiographical monograph, there is no published scholarly critique of his body of work, and only a few of his buildings at this writing appear to be on any local or national register anywhere in the United States. In Michigan, two buildings are listed only on the state register; two are on the National Register (although one now demolished), and three are in the process of nomination for the National Register.[96] In Los Angeles, efforts are currently underway to protect Yamasaki's Century City Hotel (1966), which was listed on the National Trust for Historic Preservation's "11 Most Endangered" list for 2009. [see figures 18-21]

3.7 Naramore, Bain, Brady & Johanson (NBBJ), supervisory architects

Naramore, Bain, Brady & Johanson was founded in 1943 by architects Floyd Naramore, William Bain Sr., Clifton Brady, and Perry Johanson. They had all previously worked independently or in other firms, but several enormous federal wartime commissions required them to work together in joint ventures. This combination of four found their personalities compatible, and kept their partnership going after the war. Naramore was named senior partner and remained so until his death in 1970.[97]

The firm's portfolio from the outset included a wide range of building types, including corporate offices, healthcare, civic and institutional buildings, and educational facilities. In the 1950s and 1960s notable work led by Bain at NBBJ included the Boeing Pre-Flight Facilities in Renton and Moses Lake, Washington (1956-58); the Scottish Rite Temple on north Capitol Hill in Seattle (1958-62); and First Presbyterian Church in Seattle (1965-70).[98]

Besides the 1962 United States Science Pavilion, NBBJ was also associated architect for two other Yamasaki & Associates projects, the IBM Building (1962-64), and Rainier Bank tower (1972-77). [99]

The list of NBBJ work in the Seattle area is extensive, but other notable NBBJ projects spanning the decades since the 1960s include 1001 Fourth Avenue (Seattle-First National Bank, 1968-70), a Miesian skyscraper which for years was the tallest building in Seattle; the United States Pavilion at Spokane's Expo '74 Fair (1973-74), a fabric-roofed pavilion that is a landmark on the Spokane riverfront; the Kingdome stadium in Seattle (1972-76; demolished 2000), with structural engineer Jack Christiansen of Skilling, Helle, Christiansen & Robertson, who together designed this largest thin shell concrete dome in the world; and Two Union Square (1985-89), an award-winning skyscraper for Seattle's Unico properties, the developers of Rainier Tower and IBM Tower. [100]

In 1977 NBBJ merged with the Columbus, Ohio-based firm of Nitschke-Godwin-Boehm, and retained the name NBBJ.[101] Today the firm is one of the largest in the world, and designs medical facilities, office buildings, arenas, civic buildings, schools, and research facilities, with consulting, branding, lighting, and landscaping services offered. NBBJ has an international clientele, with offices in Washington, California, New York, and Ohio, and international offices in China, the UK, Russia, and the United Arab Emirates.[102]

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[96] Interview with Bob Christensen.
[97] Ochsner, p. 202, 126. Other partnerships formed for major federal projects included Naramore & Brady, Naramore, Grainger & Thomas (with Clyde Grainger and Harlan Thomas), and Naramore Grainger & Johansen.
[98] Ochsner, p. 219.
[99] Unico company website, "Property Facts", www.unicoprop.com, accessed May 2009.
[100] Dobney, p. 19, 21, 32; and Historylink.org, "Kingdome: Controversial Birth of a Seattle Icon", essay 2164 by Heather Macintosh, March 1, 2000, www.historylink.org, accessed May 2009.
[101] Dobney, p. 10.
[102] NBBJ website, www.nbbj.com, accessed May 2009.

3.8 Lawrence Halprin & Associates, landscape architects

Lawrence Halprin was one of the most influential landscape architects in the 20th century, with considerable experience working in Seattle and the Pacific Northwest. Lawrence Halprin was the overall Landscape Architect for the Century 21 Exposition (with Paul Thiry as the overall architect). For the United States Science Pavilion, it is not clear to what extent Halprin and Yamasaki collaborated in the landscape design, although they worked together on other projects, including an early design for the Franklin Delano Roosevelt Memorial, and were both on the four-member Century 21 Exposition planning committee.[103] The original landscape and architectural drawings appear to indicate that the landscaped features (berms, paths, paving, and so forth) were designed by Yamasaki, while Halprin's role was limited to plant selection and the planting plan. However, Halprin presumably provided feedback for Yamasaki's design.

Born on July 1, 1916, Lawrence Halprin was raised in Brooklyn, New York, and lived for several years in Israel on a kibbutz. In 1935, he began his studies in Plant Sciences at Cornell University, and later attended the University of Wisconsin for a Master of Science in horticulture in 1941. During this time, Halprin married Anna Schuman, a dance student whose work influenced Halprin's ideas about landscape movement as well as his developing new graphic techniques to represent landscape experience. Halprin admired Frank Lloyd Wright's work. He entered the Bachelor of Landscape Architecture program at the Harvard Graduate School of Design in 1942, studying with landscape architect Christopher Tunnard whose book *Gardens in the Modern Landscape* (1938) Halprin credited with confirming his interest in landscape design. At Harvard, Halprin was also inspired by professors Walter Gropius and Marcel Breuer, and the writings of Laszlo Moholy-Nagy.

After World War II, he returned to the States and joined the office of influential modernist landscape architect Thomas Church in San Francisco where he worked for four years. In 1949, Halprin opened his own firm in San Francisco, which would eventually grow to a staff of 60.

During the 1950s Halprin's practice was comprised of small projects such as residential gardens, but eventually his work grew to several campus master plans as well as suburban shopping centers. By the early 1960s, he was taking on new types of projects on formerly marginal urban sites. His site plan for Sea Ranch (1962-1967), a 5,000-acre second home community near San Francisco by Charles Moore and others, is famous for its integration of architecture into the natural landscape.

By the mid 1960s, Lawrence Halprin and Associates work on the West Coast included such urban projects as Ghirardelli Square (1962-1968) and Embarcadero Plaza (1962-1972), both in San Francisco; four of Portland's public spaces: Lovejoy Plaza, Pettigrove Park, Auditorium Forecourt, and the Transit Mall (1965-1978); and Freeway Park, Seattle (1970-1974). Many of these projects are heroic attempts to carve out new urban parks that emote "natural" landscapes, albeit abstracted ones. The sites were frequently ones that had been cleared by federal urban renewal programs, or abandoned for new suburban developments.

Since the 1970s other commissions included the recent Franklin Delano Roosevelt Memorial in Washington, DC (which he called his favorite work); Levi Strauss Plaza, San Francisco; and the 52-acre approach to Yosemite falls in Yosemite National Park, California.

Halprin was awarded numerous honors such as the American Institute of Architects Medal for Allied Professions (1964), Fellow of the American Society of Landscape Architects (ASLA) (1969), ASLA Gold Medal (1978), ASLA Design Medal (2003), American Academy of Arts and Sciences (1978), the University

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[103] San Francisco Museum of Modern Art, *Lawrence Halprin: Changing Places,* p. 122.

of Virginia Thomas Jefferson Medal in Architecture (1979), and the National Endowment of the Arts Medal (2002), the nation's highest honor for an artist.[104] Halprin died October 25, 2009, at age 93. [105]

3.9 Worthington, Skilling, Helle & Jackson, structural engineer

John Christiansen of Worthington, Skilling Helle & Jackson was the lead structural engineer for the US Science Pavilion, and on many other Yamasaki projects. John "Jack" Christiansen (b. 1927) attended the University of Illinois where he received a Bachelors degree in Architectural Engineering in 1949. He then attended Northwestern University where he acquired a Masters in Civil Engineering in 1950. After working for various engineering firms from 1950 to 1961, Christiansen joined the engineering firm of Skilling & Helle in 1962 where he rose to become a senior partner and later president. During his time at Skilling, Helle, Christiansen & Robertson (1962-1983), the firm assisted in the design many notable structures around the Pacific Northwest and beyond.

Christiansen's structural design work with Yamasaki & Associates includes Pacific Science Center (1961), Rainier Bank Tower (1977), Woodrow Wilson School of Public Affairs at Princeton (1965), the Federal Reserve Bank of Minneapolis (1973), and the Japanese Cultural Center in San Francisco (1973). The firm's most notable structural design work however may be Yamasaki's World Trade Center in New York City (1973).

Other projects that were not in conjunction with Yamasaki & Associates include Seattle First National Bank Building (1969), Safeco Office Tower (1975), the King County Jail (1971), the Museum of Flight (1975-87), the Nalley Valley Viaduct (1969), the Washington State Convention and Trade Center, the Saudi Royal Naval Stadium in Jubail, Saudi Arabia, and the Baltimore Convention Center (1979).

Christiansen himself is best known for his work on thin-shell concrete designs. He is credited with being one of the top six thin-shell concrete designers in the world.[106] His notable projects include the Green Lake Pool (1954) the largest intermediate thin-shell cylindrical barrel in the world at the time of construction; the Seattle School District Warehouse (1955); the Yakima Valley Jr. High School Gymnasium (1956), the first thin-shell pre-stressed edge beams in the United States; the King County Airport Hangar at Boeing Field (1958); the Shannon & Wilson Inc. Building in Seattle (1960); the award-winning Rivergate Exhibit Facility in New Orleans (1968, demolished); the Federal Building for Expo '74 in Spokane; the Kingdome (1976, demolished), which at 661 ft was the largest clear span, concrete dome in the world; the SunDome Arena in Yakima (1988); and Bainbridge Island High School Grandstand (1990).

From 1984 to 1987, Christiansen taught at the University of Washington as an affiliate professor. From 1988 to 2002, he worked as a consultant and the principal of his own firm located on Bainbridge Island, where he currently resides. Christiansen was elected to the National Academy of Engineers and is a Fellow in the American Concrete Institute and American Society of Civil Engineers.[107]

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[104] Elizabeth K. Meyer, FASLA, an Associate Professor in the Department of Architecture and Landscape Architecture in the University of Virginia School of Architecture, The Cultural Landscape Foundation, "Lawrence Halprin", accessed April 2009.
[105] "Lawrence Halprin, Landscape Architect, Dies at 93," *The New York Times*, October 28, 2009.
[106] Docomomowewa.org, Architect biographies, "John 'Jake' Christiansen" Michael Houser, accessed March 27, 2009.
[107] Docomomowewa.org, Architect biographies, "John 'Jake' Christiansen" Michael Houser, accessed March 27, 2009.

3.10 Contemporary reception of the United States Science Pavilion

This project was early in Yamasaki's career. The general public, as well as art and architecture critics, generally looked upon the building favorably.

> "This most moving Pavilion...lies, happily, along the southern edge of the Fair, away from the main architectural babel, but one appreciates its dominance best from an aeroplane; five high slender Gothic arches rising above graceful plots of buildings enclosing a court of pools punctuated by jetting fountains. The six flanking buildings are slabs of prestressed concrete of such crystalline purity that even on dull days their reflection is as difficult to bear as Alpine snows. Their facades are evenly broken up with continuous Gothic arches used as a kind of filigree. As you come closer and are surrounded by the concrete surfaces everywhere, and the delicate and rippling interplay of light and water, arches and scintillating stone, it is as if the Gothic style had passed without a break through the Renaissance and the 18^{th} century, and in and out of Spain, and had achieved a final sensuous purity in the 20^{th} century. It is as if Venice had just been rebuilt."
>
> – Alastair Cooke, journalist
>
> "Probably no building put up in 1962 caused such a world of comment or brought into action so many cameras. It looked as if it could have been the setting from a poem by Coleridge. From any angle, it cast a spell."
>
> – *Time* magazine [108]
>
> "Take away the crowds and the space exhibits inside, and this could be the head abbey of a well-to-do monastic order of the central element in an admirably designed neo-Gothic campus plan. Add the crowds and the space exhibits, and...[it] becomes a puzzling, if 'delightful,' anachronism."
>
> – James T. Burns Jr. in *Progressive Architecture*, June 1962
>
> "The water in the courtyard is fine, very successful, but the building is not. Yama [his nickname] mass produced a facade in the Gothic idiom but without the Gothic logic. At best, this building is mere artistic caprice."
>
> – I.M. Pei, architect
>
> "I do not necessarily adhere to all that Yamasaki preaches, but he is not to be devalued at all. We cannot dismiss even his Seattle Fair. It has gaiety and a soaring that appeals to the public."
>
> – Pietro Belluschi, Dean of MIT's School of Architecture and Planning [109]
>
> "The Federal Science Pavilion summarizes the fair at its best."
>
> "The building is designed as a proper habitation for scientific exhibits, and Mr. Yamasaki's achievement is that he has not only met this requirement but has created a work of art. In harmony with the exhibits it encloses, it exists at the same time as a masterpiece of human imagination outside the bounds of science."
>
> "It is easy and terrible to imagine the hobgoblin palace that the wrong architect might have designed, given the space-age theme, a free hand, and a lively but inferior imagination."
>
> "...The building immediately impresses as an object of pure beauty, and later reveals its more deeply expressive character."
>
> "...One leaves the building and becomes aware of it again as a pattern of delight. But the delight is deepened because, without the use of symbols, with no decipherable analogy between architectural forms and the directions of science, the building makes one aware that the human

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[108] Cooke and *Time* cited in US Department of Commerce, *United States Science Exhibit, Seattle World's Fair: Final Report,* p. 53.
[109] Pei and Belluschi cited in *Time* magazine, "Road to Xanadu," Jan. 18, 1963, p. 5.

investigative intelligence are engaged not in a struggle with each other but in a process of mutual discipline directed toward discovery and fulfillment."

"Exalted..the fair's finest building."

– John Canaday, art critic for the New York Times, April 22, 1962.

"The hit of the Seattle World's Fair is the United States Science Pavilion, a dreamlike building before which people stand murmuring, 'beautiful," and through which they move not saying much because they are so fascinated by its exhibits. Scientists and display experts working together have created models, charts, and working demonstrations outlining the history, techniques and objectives of science in ways as spectacular to look at as they are impressive to think about. The pavilion and its contents add up to a largely unexpected hint that art, as part of man's search for spiritual expression, and science, as his search for objective knowledge, may eventually meet on common ground, not because one may serve the other but because their goals may fuse. The idea is not new to philosopher-scientists or scientist-philosophers, but here it takes a step toward popular realization."

"...Minoru Yamasaki's design combines a spareness and precision suggestive of science with a soaring lightness that can be called symbolical of spiritual aspiration"

– John Canaday, art critic for the New York Times, May 6, 1962.

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- David Peterson with Diana Johns, Pacific Science Center Director of Exhibits & Special Projects, December 17, 2009.
- David Peterson with Bob Christensen, Michigan State Historic Preservation Officer, December 3, 2009.
- David Peterson with John "Jack" Christianson, structural engineer, May 30-31, 2010.
- Susan Boyle with John "Jack" Christianson, structural engineer, for "Modern Talk: NW Mid-Century Modern Architects Oral History Project," on Jun 15, 2009, unpublished draft transcript courtesy of Eugenia Woo, DOCOMOMO.WEWA and Historic Seattle, Seattle, Washington.

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Date: February 26, 2010

Reviewed by: ______________________________

Date: ______________

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Site plan - Site sketch for Pacific Science Center, Seattle Historic Landmark Nomination (1 page)	NK Architects, February 26, 2010
Tax assessor records for United States Science Pavilion (8 pages)	King County Tax Assessor, 11/19/61
1-1 Site survey	Yamasaki & Assoc., 1960*
2-1 Site plan	Yamasaki & Assoc., 1960
3-1 Building # 1 ground floor plan	Yamasaki & Assoc., 1960
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A1.4 Gallery/Plaza – Floor Plan (New IMAX Theatre/Exhibit Hall)	Callison Architects, 1996
A2.1 Plaza Level – Floor Plan (Building 6A/Discovery Labs)	Callison Architects, 1996

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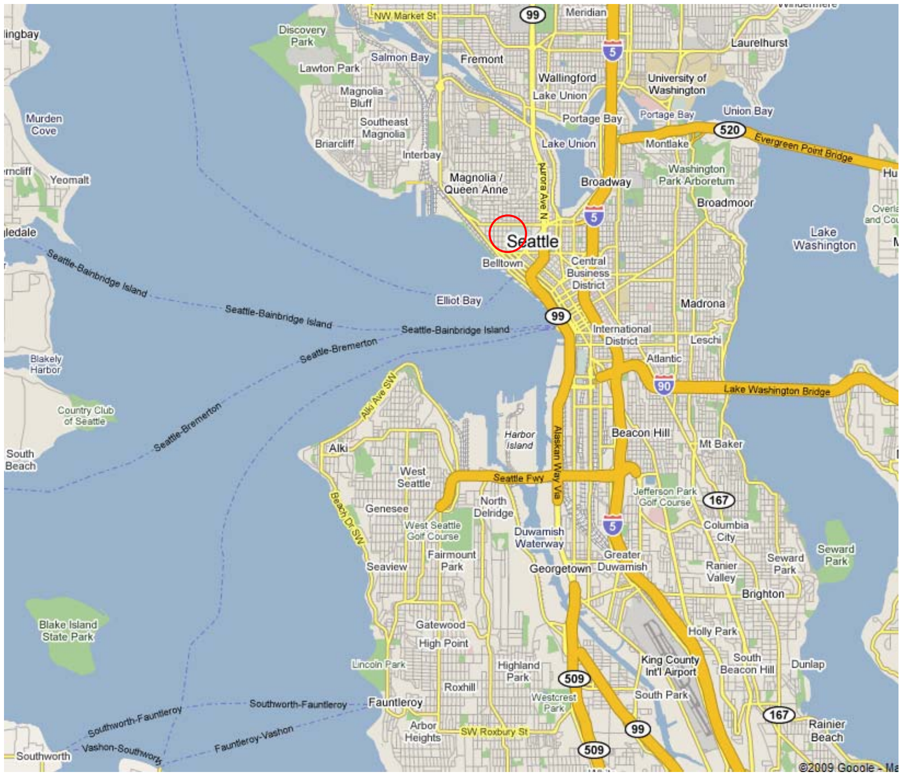

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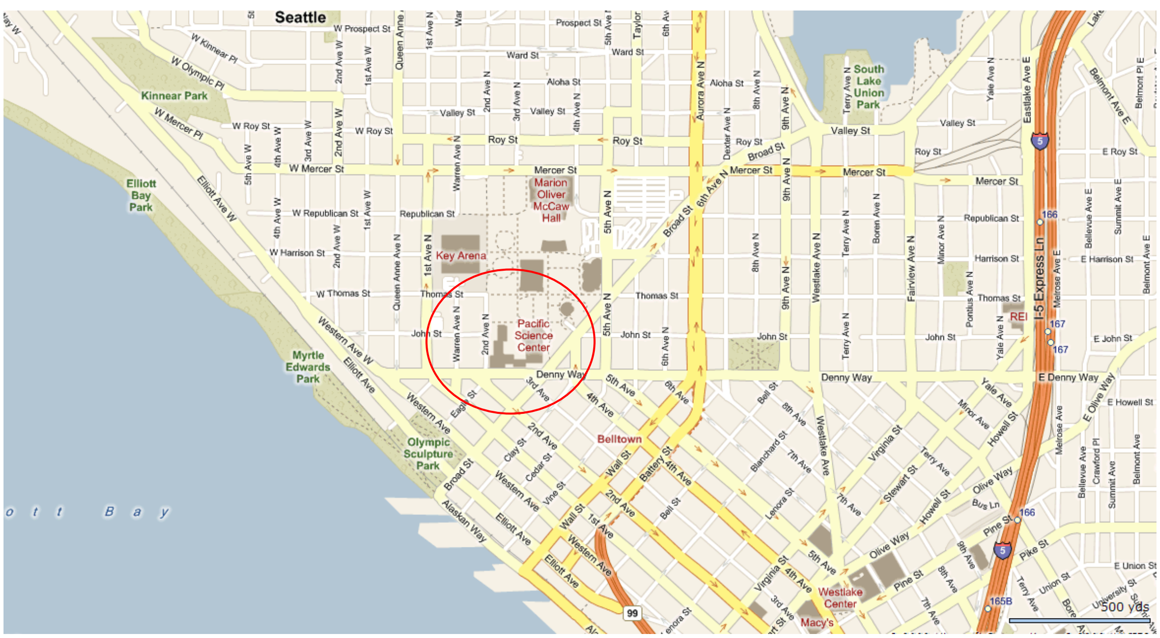

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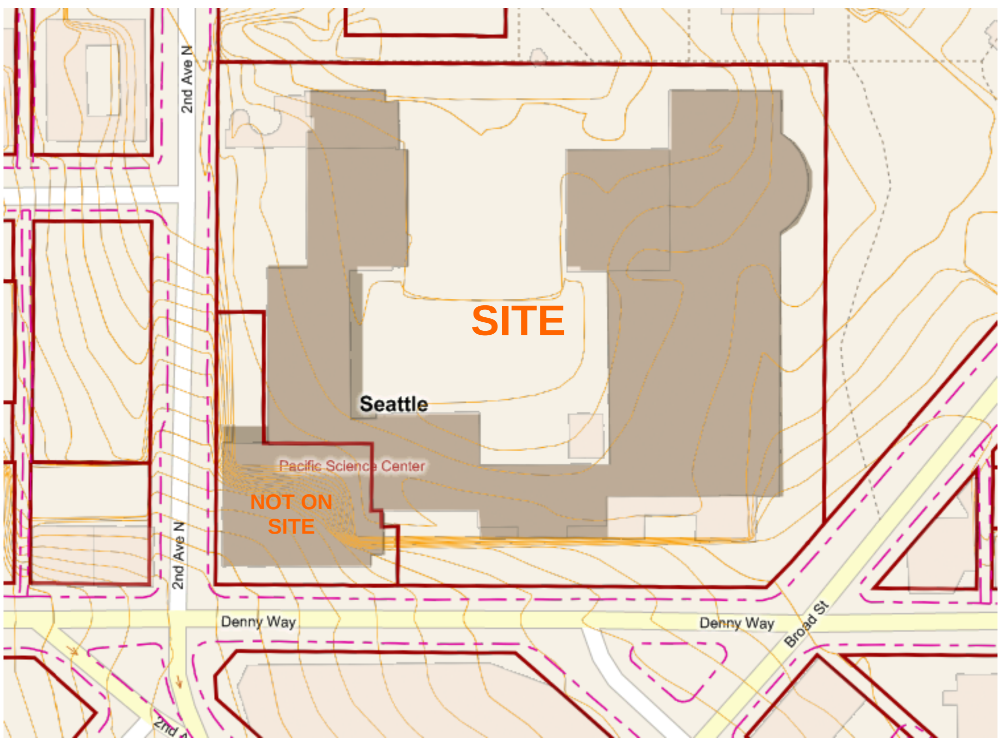

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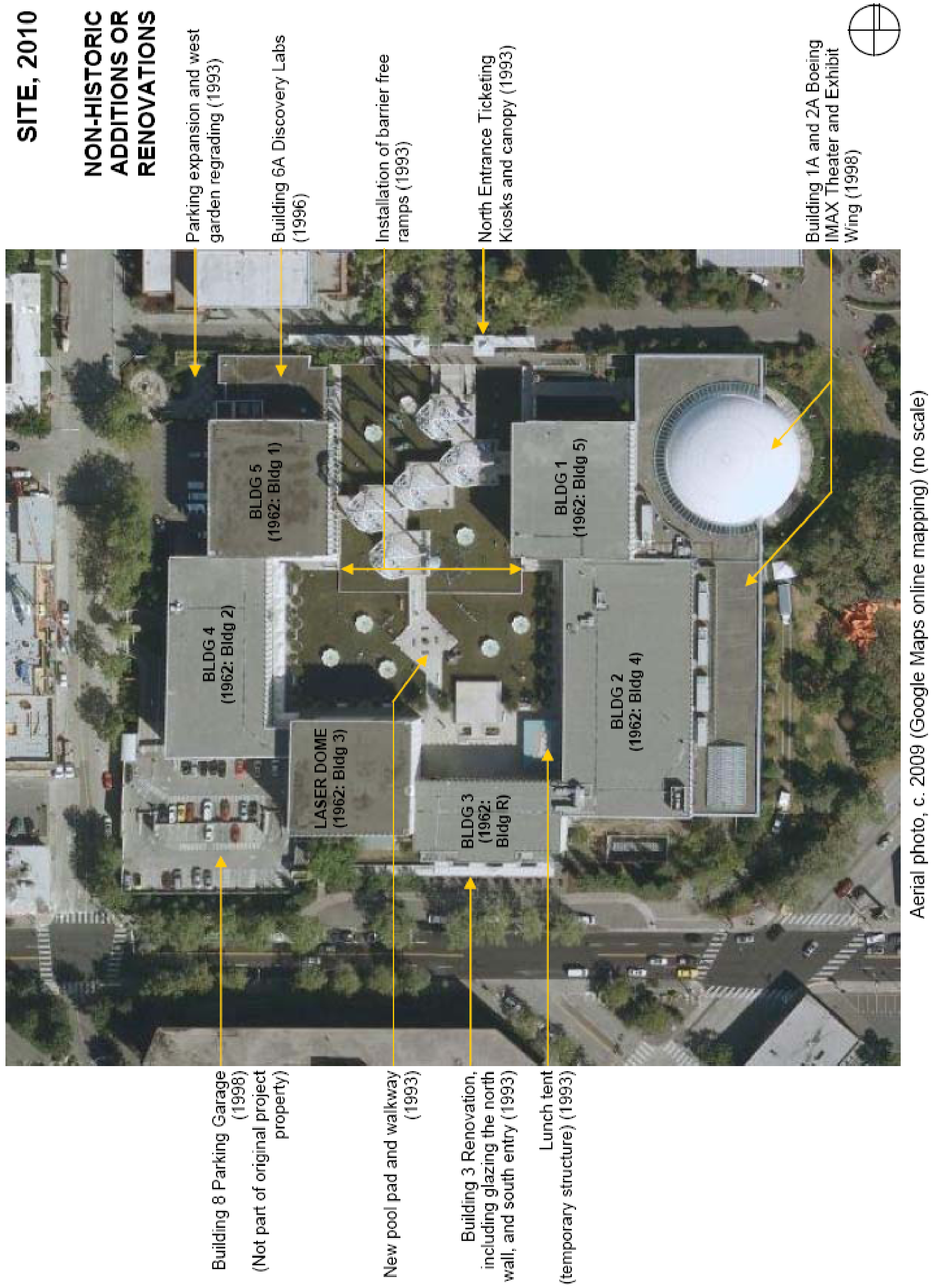

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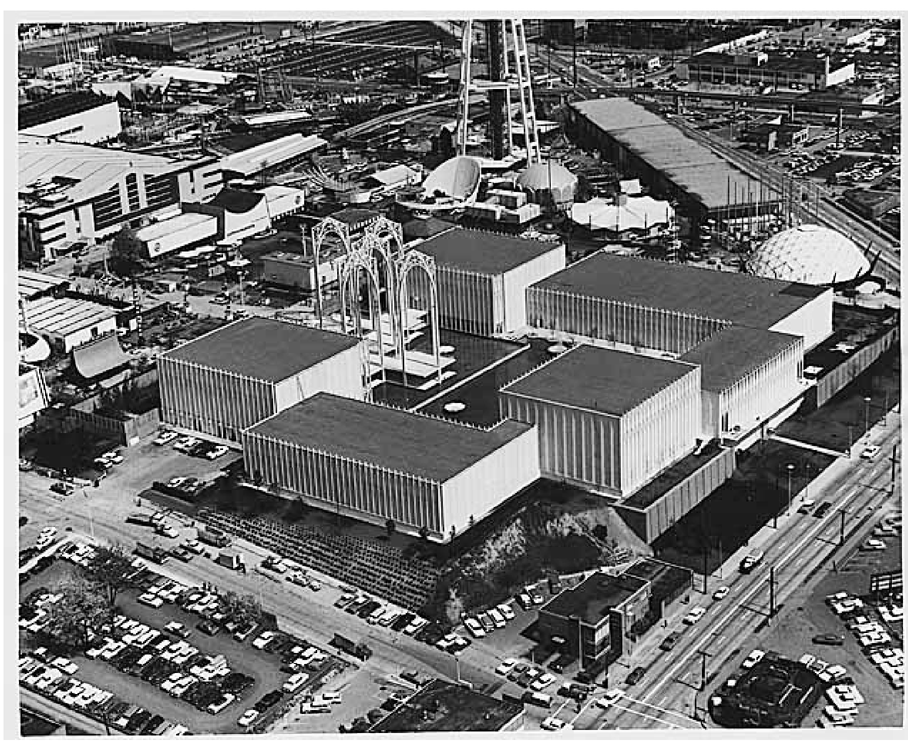

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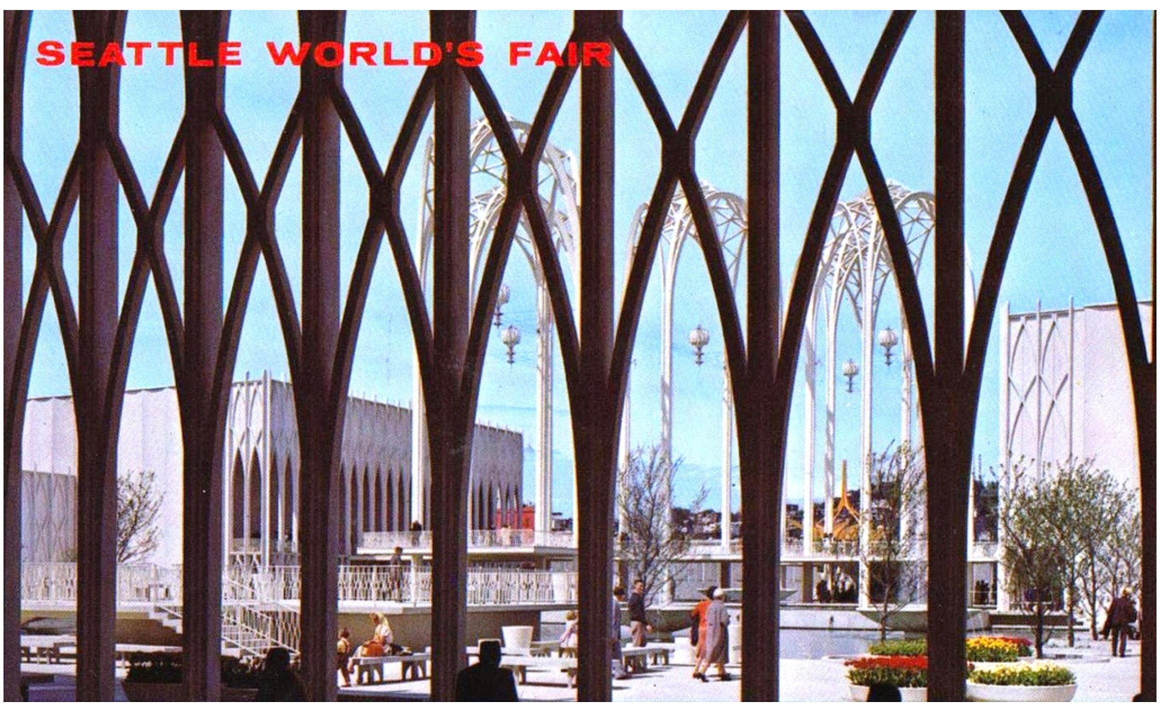

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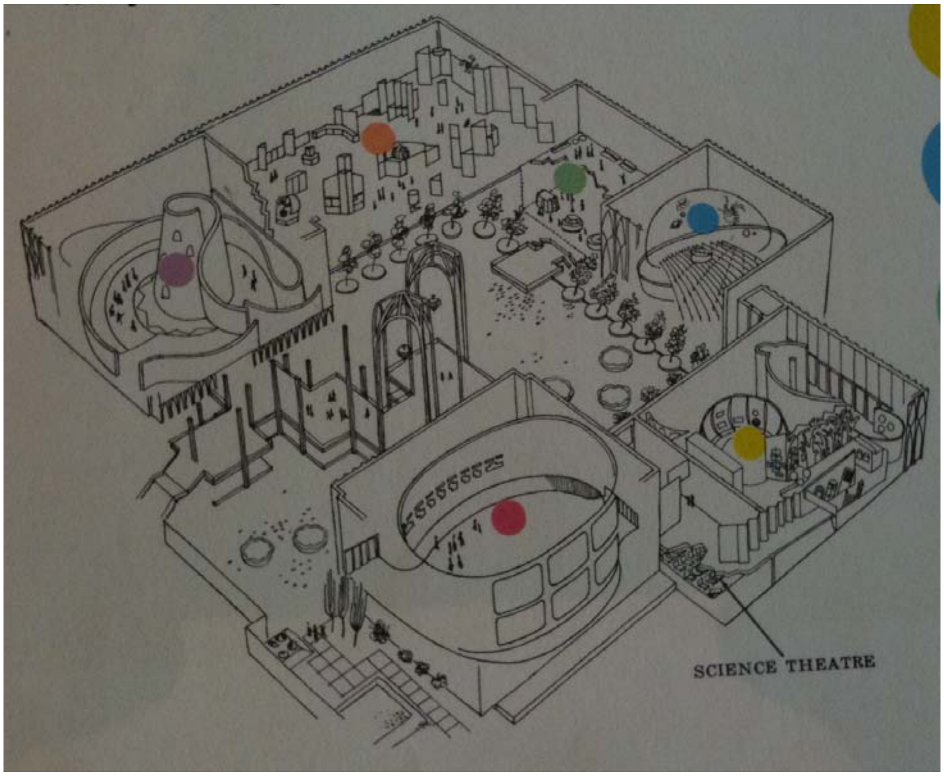

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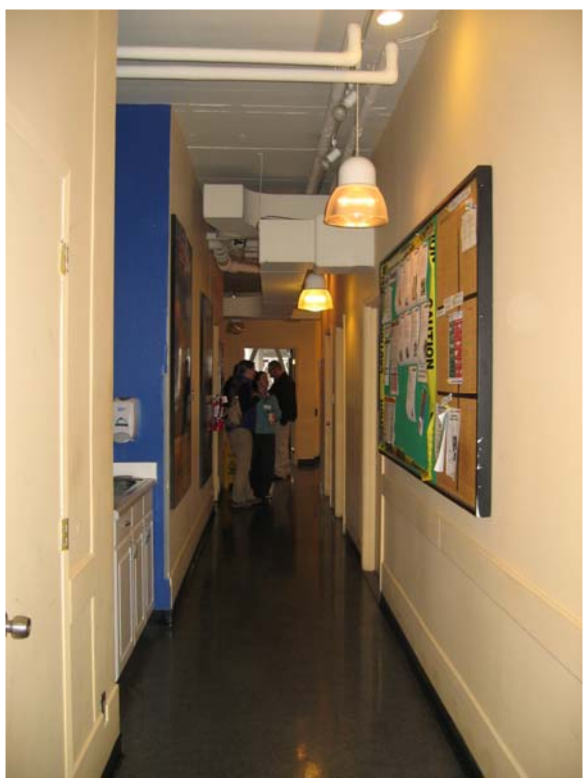

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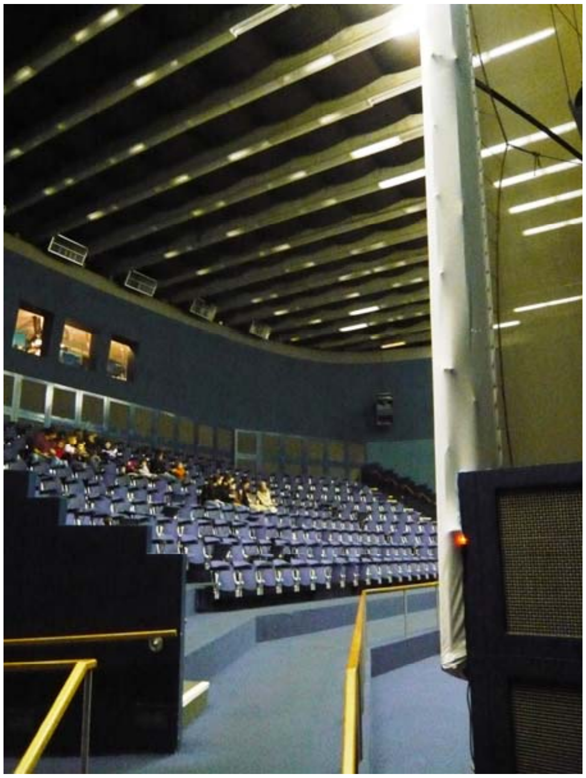

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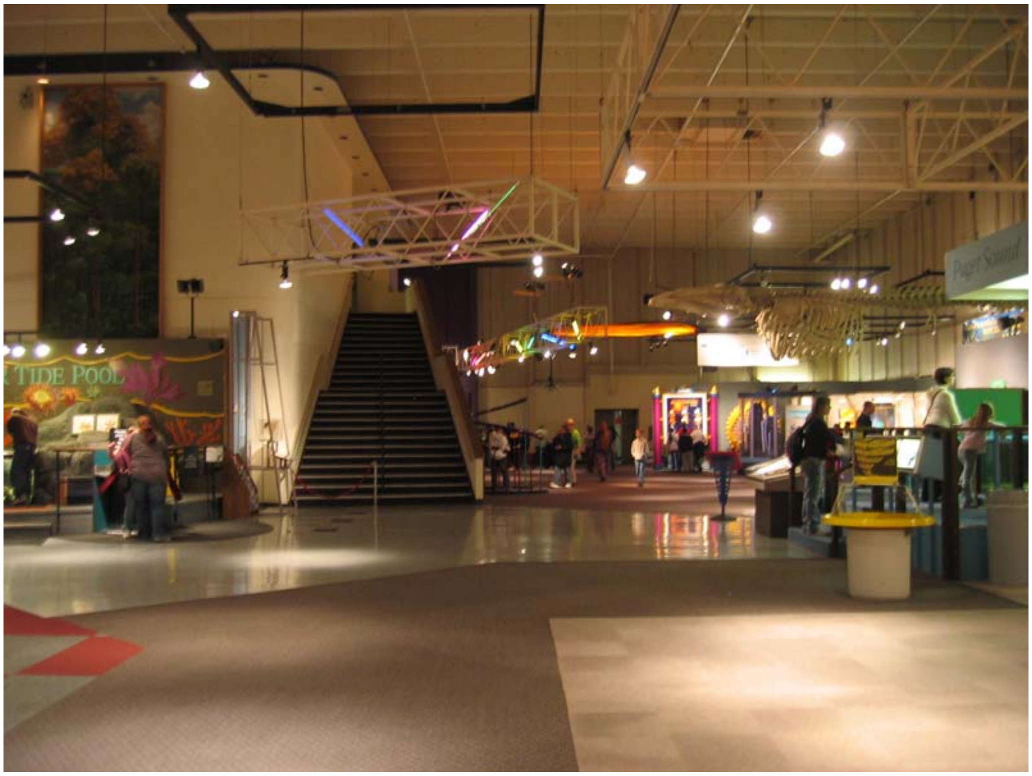

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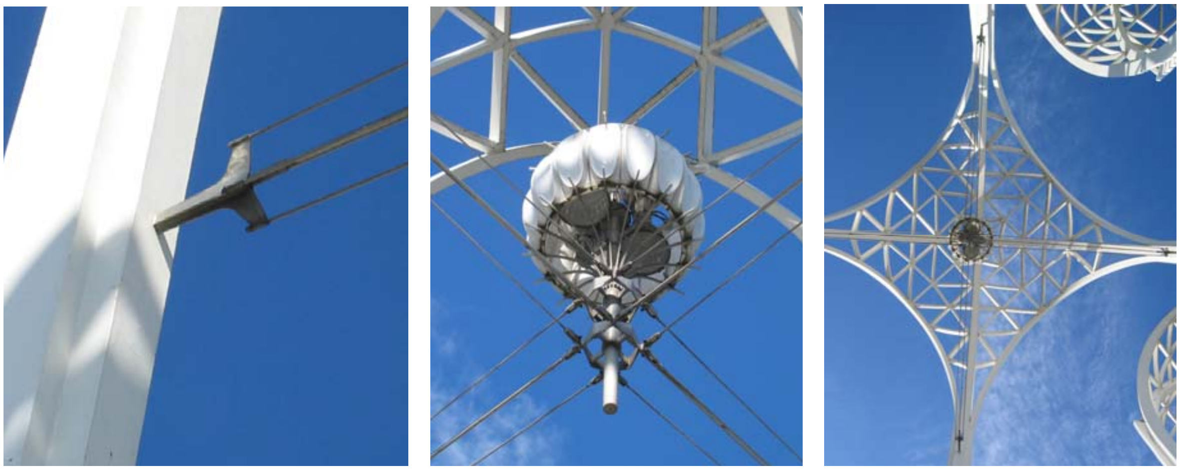

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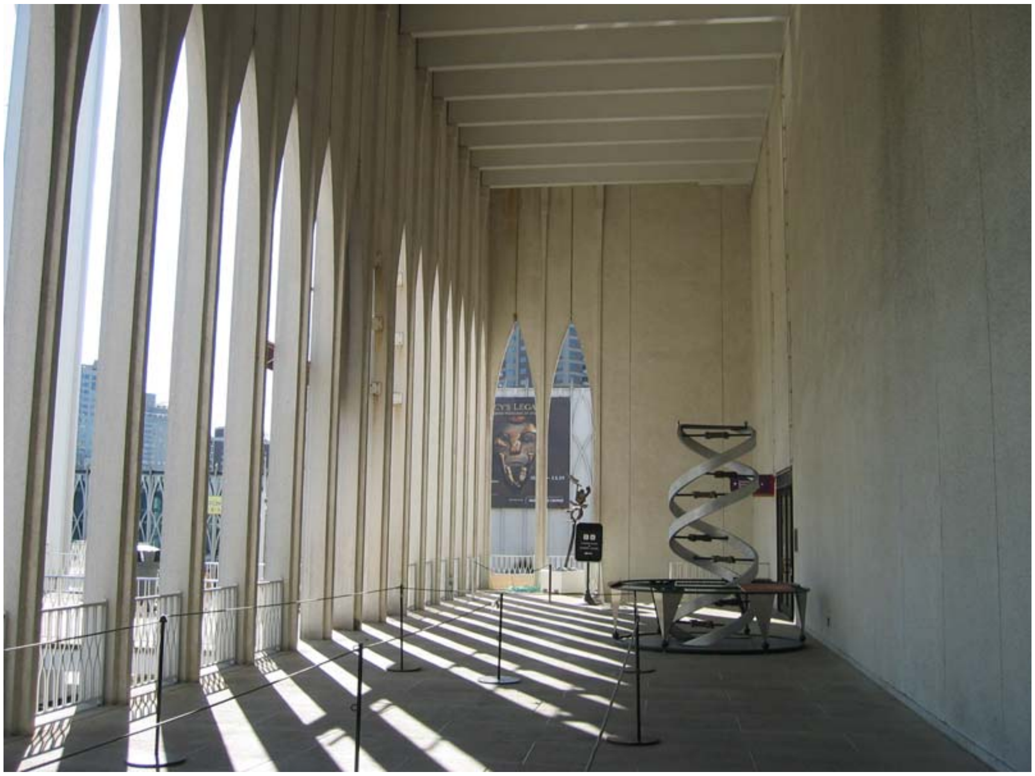

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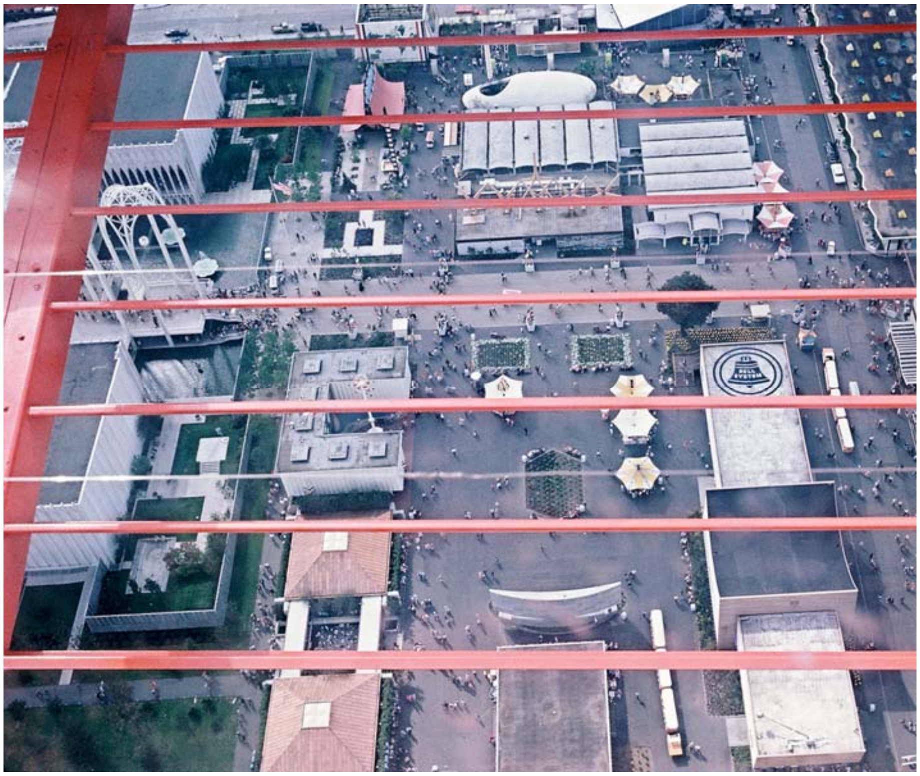

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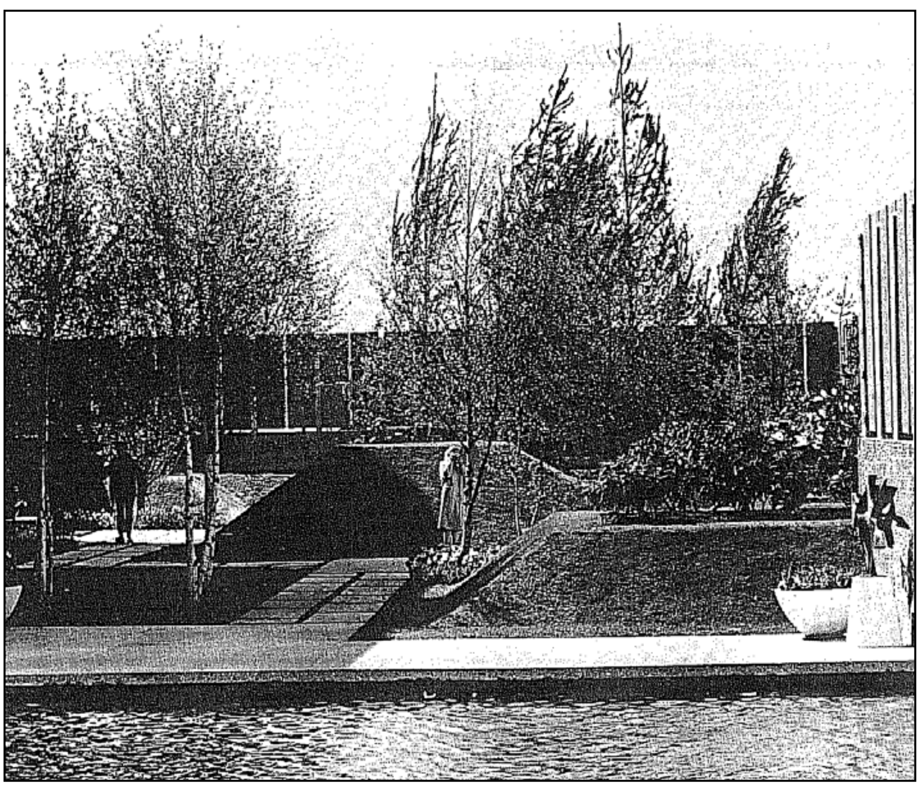

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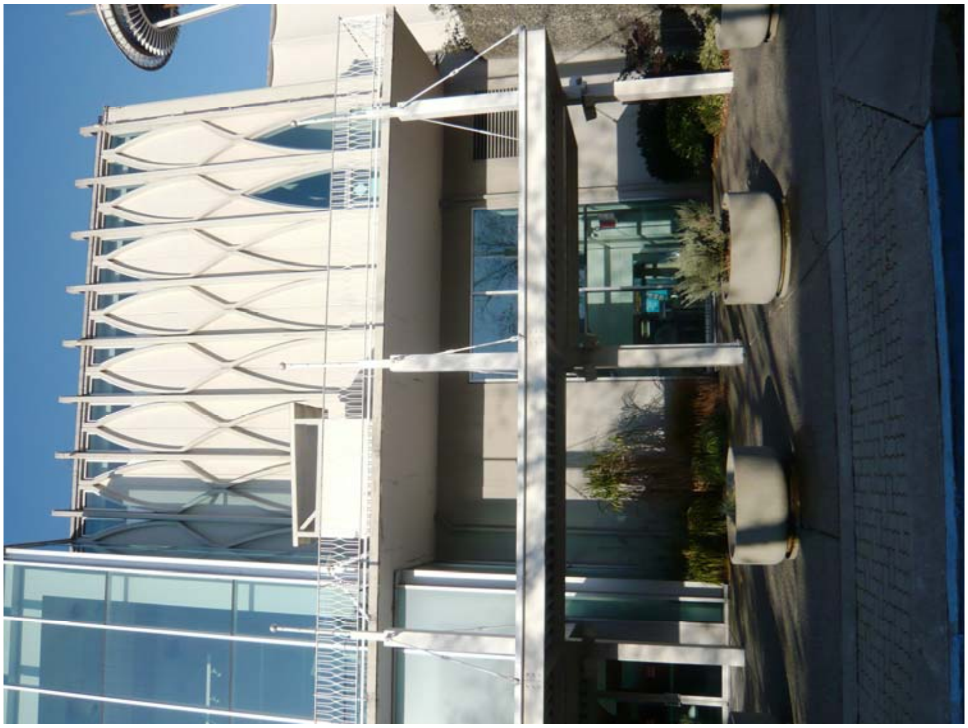

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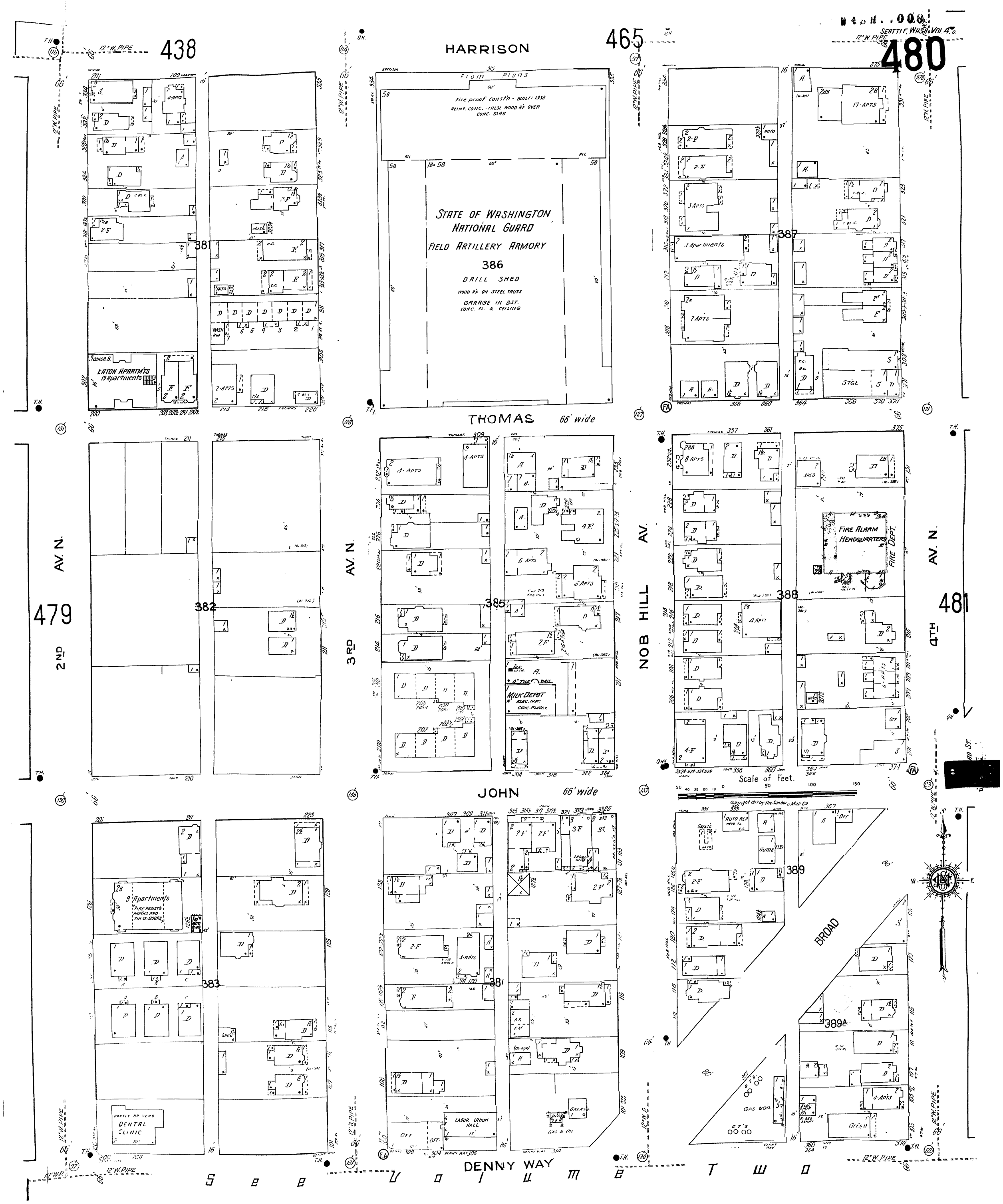

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