009

Physics Building

University of Saskatchewan Heritage Register

November 2014
1. Statement of Significance

The Physics Building is a significant heritage building at the University of Saskatchewan, constructed between 1919 and 1921, and designed by the architectural firm of David Brown and Hugh Vallance of Montreal. It has heritage value as one of a collection of early stone buildings located around ‘The Bowl’, a large landscaped courtyard forming the heart of the campus. The Canadian Register of Historic Places has called this group of buildings “the finest collection of Collegiate Gothic university buildings in Canada.” The Physics Building was originally planned to be constructed as part of a second phase of buildings including a second residence, a chemistry building and an arts building. The Physics Building was approved in principle at an April 1914 meeting, at an estimated cost of $100,000, but was delayed in favour of the residence and wasn’t tendered until November 12, 1914. By this time the First World War had begun and the Physics Building was postponed for another five years. Architect David Brown redesigned the Physics Building for lack of any other work to do in the office during these years of hardship.
After the war, the Physics Building became a project of special concern for the university. President Walter Murray appealed to the Board of Governors, “in the strongest manner possible the urgency of the need for the Physics Building.” The need arose from a lack of laboratory and general classroom space; without the Physics Building, the university would have had to turn students away. In 1921 Murray’s concerns were assuaged and the Physics Building was completed according to the 1909 plan.

The Physics Building was situated such that it closed the northern vista of The Bowl, which was at that time surrounded by open prairie. Boasting the first real lecture theatre at the university, the Physics Building soon became used by all colleges and departments. The lecture theatre and classroom space gave the university the ability to grow and accommodate more students. The final sum of construction costs for the building was $437,000.

Note: The Physics Building is configured with floors numbered Basement, First Floor, Second Floor and Attic. This report follows the same convention.
2. Character - Defining Elements

2.1 Materials

The exterior of the Physics Building was designed to match in style and materials the other buildings already constructed around The Bowl. Its walls are constructed of local ‘greystone’, with Indiana limestone for cut stone decoration and window surrounds, and a granite base course (Figure 1). Granite was also used for the exterior steps leading up to the main entrance (Figure 3). The greystone walls of the Physics Building were built in the ‘scotch masonry’ style, with squared stones laid up in a more tightly cours ed pattern than on the earlier MacKinnon Building. The architect described the effect as “stiff and formal”. The roof of the Physics Building features slate tiles. The stone façade of the Physics Building and its slate tile roof are character-defining elements. (For further information on building stones used at the U of S, refer to ‘Appendix: Stone’).

In the entry foyer, the original slate stair treads have been replaced by concrete steps. Both the exterior doors and the interior vestibule doors are in oak. On all the foyer walls brick is used to create arches supporting a vaulted plaster ceiling. Public corridors also feature brick wainscoting and arches with plaster walls and ceilings (Figure 25). Corridor floors are slate with inset red clay tile. Doors and door surrounds are quarter sawn oak, featuring glazed panels. The glazing of the panels features a character-defining frosted pattern that renders the panels translucent (Figure 5). Some of these glazed panels have been replaced with oak to obstruct the view between corridor and classroom; such is the case at the doors of the lecture theatre. Transoms are composed of three glazed lites. In some instances they have been replaced with a single lite or another material. Window frames are fashioned out of steel and where there are latches they are brass, as shown in Figure 6. Brass ventilation grilles, some painted, are found throughout the building. Cast iron radiators, although painted, are still found throughout the building (Figure 7).
The main staircase in the Physics Building shares many characteristics with other early University of Saskatchewan buildings, such as the MacKinnon Building: slate treads, and oak handrails supported by steel and iron balusters (Figure 4). The commemorative integrity of the staircase is diminished by the fact that the treads between the ground and first floor have been replaced with concrete. The remaining original slate treads in the Physics Building were replaced with matching slate in 2012. Two secondary staircases also exist in the building: a narrow flight of stairs leading from the Second Floor to the Attic level and roof, and an interconnecting spiral stair between the Second storey and the Attic. Both of these secondary staircases are constructed of iron and steel (Figure 8).

The third floor or attic features a material set completely different from the rest of the building. Shown in Figure 9, the walls appear to be made of painted wood as well as the doors. The floor is painted concrete and the original ceiling has been covered by a suspended acoustic tile system. Steel roof trusses, which form part of the roof structure, are also partially exposed in the attic level (Figure 10). (See Section 2.6 Systems).

The lecture theatre (Figure 11) is a character-defining element, but many of its material finishes have been altered over time. The concrete risers and wooden tablet-arm chairs are original. The painted wood ceiling, painted wood wall paneling and acoustic panels on the walls and ceilings were the product of later renovations. The brick walls have also been painted. The original oak and slate chalkboard, although worn, has not been refinished. The original steel and iron balustrade is pictured in Figure 11. Overall, this room has a high level of commemorative integrity.

The interiors of rooms
now used for offices have been maintained to a high level of commemorative integrity although some alterations have been made. Flooring in many offices has been replaced by vinyl composite tile (VCT). Many doors between offices are no longer functional, however, in many cases they exist in their original state. Original wooden moldings are still in place near the ceilings although they have been painted. In many offices the original windows have been retrofitted with new aluminum framed secondary glazing (Figure 12). This method allows for the original windows to be kept, while improving their thermal performance. Many of the original large window and transom frames feature hinged blind covers. No original blinds are known to remain. (See Section 2.6 Systems).

2.2 Form

The Physics Building is a T-shaped building in plan, laid out with its primary axis parallel to the central axis of The Bowl. Its secondary axis is laid out perpendicular to the first, aligned with the centre of The Bowl and protruding to the north of the building. The architects intended for the Physics Building to eventually take the shape of an H, with two hallways joined by lecture theatres at the centre. Figure 13 illustrates the original plan, and the form of the building as constructed in 1921.

The Physics Building as built functions as an enclosure, defining the northern edge of The Bowl. The height of the Physics Building includes a half exposed basement, two floors above ground and an attic. This makes the massing of the Physics Building consistent with the scale of the other buildings which ring The Bowl; an important factor in maintaining the pedestrian scale of the central campus.
The form of the Physics Building has been added to over time. Figure 14 shows the original form. For a plan view of the original form refer to Figure 13. In 1948 the Betatron Building was built as a one storey addition accessible through the basement of the Physics Building. The Betatron Addition featured thickened concrete walls to contain the gamma rays being researched there. This addition also featured a small concrete chamber for gamma rays to be shot into and measured. The thickened walls of the chamber are shown in Figure 15. Between 1966 and 1967, an addition to the Physics Building was constructed to the south-east.

A similar modification was made to the building’s form on the north-west where a link to the Geology Building has joined the two buildings, as seen in Figure 17.

These adaptations came to form a continuous building face that fully encloses the north side of The Bowl. All three additions change the commemorative integrity of the form of the Physics Buildings by adding to its massing; however, none of the additions have removed any of the pre-existing form. The 1966-67 Physics Addition and the Biology Building are beyond the scope of this report.
2.3 Style

With these additions to the Physics Building, none of the original stylistic elements of the building appear to have been altered; the original building maintains its Collegiate Gothic style with a high degree of commemorative integrity. While the Betatron addition, completed in 1948, largely blends in with its predecessor, the 1966-67 addition stands as a contrasting element from which the original Physics Building is easily discernible. The Geology Building sympathizes with the Physics Building, making use of greystone, bay windows and stone piers but is also a clearly differentiated building.
The exterior of the Physics Building features a number of elements associated with the Collegiate Gothic style. The main elevation, facing The Bowl, is composed of a row of windows on each of the basement, first and second floors, terminated at either end by a more prominent end bay. Both end bays feature a gabled roof line and a large double-height arched window opening (Figure 23). The central element of the façade is the main entrance, whose double doors are recessed within an intricately carved gothic vault. This recess is framed by Indiana limestone piers (Figure 18). A row of horseshoe arches in the form of tracery decorates the two piers (Figure 21). Further ornamentation was originally specified, but never carried out. Figure 19 shows this ornamentation in the form of carved stone statuary and reliefs, but the stone blocks intended to be carved still stand blank, awaiting decoration. Figures 18 and 21 both show the blank stonework that was intended to be decorated.

At the basement level, a series of Indiana limestone piers align with the structural frame. The first floor windows all have arched openings. The second floor windows are rectangular, and feature stone spandrel panels. The roof line is punctuated by a row of narrow decorative archer-slots. Figure 20 shows the basement level piers, the arched first floor windows, and the second floor windows and spandrels.

Collegiate Gothic elements are continued inside the building. The entrance vestibule features brick walls and arches, and a second set of oak doors, with an arched wooden transom. In the corridors, a brick wainscotting is extended to form brick archways around door openings (Figure 25). The doors also feature arched transoms. Many of the interior windows share this arched shape. Many secondary hallways feature vaulted ceilings and arched entries. Figure 22 shows some of these interior elements. The attic contains heritage value in the large arched windows of the two end bays, which are set at floor height and nearly reach the ceiling (Figure 30).

The staircases serving this building also contain character defining Collegiate Gothic elements. The central staircase features ornate cast iron and steel balustrades. An iron and steel balustrade featuring decorative finials adorns the second level of the main lecture theatre. These character-defining elements are discussed in the Materials section; refer to Figure 4.
2.4 Location

The location of the Physics building is faithful to the 1909 Campus Plan by Brown and Vallance (Figure 24). In that plan, The Bowl is located at the intersection of two axes, which divide it into four quadrants. The Physics Building is centred on the secondary axis dividing The Bowl.

The Physics Building encloses the northern edge of The Bowl and sits directly parallel to it. A straight axis can be drawn from the grand entrance of the building to the outdoor quadrangle between Saskatchewan and Qu’Appelle Halls known as Voyageur Place. The prominent location of the Physics Building has maintained its commemorative integrity and is a character-defining element.

2.5 Spatial Configuration

As discussed earlier, the Physics Building is T-shaped in plan. The longer bar form, which sits parallel to the central axis of The Bowl, was arranged on each of the basement, first and second floors as a series of rooms arrayed along a double-loaded corridor (Figure 26). These rooms contained laboratories, classrooms and offices. The second volume of the building, which extends from its north side, contained the larger space of the lecture theatre, which spans between the first and second floors.
Several changes have been made to the spatial configuration of the Physics Building. The main corridor on the ground floor no longer terminates in rooms at either end. With the continuation of the building into the Physics Addition on one side and the Geology Building on the other, the corridor has now been lengthened to become a conduit through the building rather than one for purely internal circulation. Figures 27 and 28 show the changes to the spatial configuration of the building on the east and west end of the corridor respectively.

The basement’s spatial configuration has been changed in a similar fashion. Figure 26 shows its original layout. The east portion of the basement has been reconfigured to connect to the basement of the Physics Addition. The large lab that Figure 26 shows at the end of the basement corridor has become an extension of the hallway. Figure 27 shows this change. The west end of the basement has not been extended.

Figure 25. The main corridor of the Physics building relies on electric light.

Figure 26. A 1917 basement floor plan shows labs at either end of the main corridor. Retrieved from Facilities Management Division Asset Record system, File P-10-T.
The application of suspended ceiling tiles in the basement has reduced the height of these spaces. The ceiling in the northern portion of the building has not been covered. Where the dropped ceiling has been installed, some transoms have been partially obscured. Fluorescent lighting has been installed within the suspended ceiling tile system and now provides the majority of the light in the corridors.

The ground and second floors retain their high ceilings. The spacious dimensions of the corridors are a character-defining element. High ceilings also remain in many of the adjacent rooms. The tall windows that allow abundant daylight into these rooms have also been maintained, and contribute significantly to the character of these spaces.

The rooms in the attic space are also filled with daylight, owing to the large skylights and arched windows there. The skylights are original features, which retain their character and are useful in lighting offices, equipment rooms and labs. These skylights are important in defining the light and airy character of the attic. The exposure of the steel truss system, the high ceilings and sloped walls of the attic are all elements integral to the quality of this space (Figure 30).

As the university’s first true lecture theatre, the double height lecture hall in the Physics Building is an important space in the history of the University of Saskatchewan. The space still holds great commemorative integrity in its tall proportions, large windows and steeply sloping risers. These tenets serve to enhance the perception of the height of the room and define it as the Physics Building’s grand academic space. (See Figure 11 Section 2.1 Materials).
2.6 Systems

The primary structure of the Physics Building consists of cast-in-place concrete floors supported by load-bearing brick and stone walls at the exterior, and by two parallel brick walls on the interior. The floors are built in an unusual way, with cast-in-place concrete poured over and embedding hollow clay tile blocks. Figure 31 shows this unique flooring structure. Concrete beams support this assembly. The same clay tile and concrete structure was used in the Thorvaldson Building at the University of Saskatchewan, and in both cases reflects experimentation with concrete structures during the early years of their application.

The roof structure over the laboratory wing in the Physics Building consists of a sloped concrete slab with embedded steel I beam purlins on a system of steel trusses. Steel columns and a steel truss system support the roof structure as shown in Figure 30. The truss system spans the width of the roof and continues along the slanted walls created by the slope of the roof. The walls that have been added in the attic now conceal the steel column supports shown in Figure 30. The steel truss remains visible in the attic. The roof structure over the lecture theatre is a cast-in-place concrete slab with embedded steel I beam purlins.

A notable innovation in the Physics Building relates to the provision of electricity. Each work station was equipped with access to gas, compressed air, and both A/C and D/C power outlets. In fact all rooms were built with these conduits in case their conversion into physics labs became necessary. At the time of construction it was common practice for D/C power to be provided by means of a portable battery. The Physics Building was built with a large storage battery in the basement wired to a distribution panel so that electrical current could be transmitted to any room. This method was shown to be superior and attracted a lot of attention from other universities building physics labs in later years.
The building also still carries remnants of more common systems at the time. For example, fire hose carriers can still be found attached to some of the stand pipes (Figure 33). Also, as the building was constructed for use in scientific education and experimentation, many of the windows and transoms were equipped with hinged valance boxes (Figure 34). The valences were presumably provided to house dark blinds for controlling light levels in the labs. Some windows still have built-in chases and provisions for tying down the blinds. The hinged valences remain, but no blinds are known to still exist.
2.7 Use(s)

The Physics Building was originally used for classrooms, laboratories, equipment, recitation rooms and offices. It housed biology laboratories until a Biology Building could be constructed. As Figure 35 shows, the ground floor originally housed an apparatus room, an optics laboratory, offices and classrooms. When the building was first occupied in 1921, biology was allotted the two large ground floor labs, the large lab at the west end of the basement and a number of smaller rooms in the basement for offices. Physics occupied the rest of the building aside from a few other assorted uses.

Figure 35. 1917 first floor plan for the Physics Building. Rooms were arranged with the assumption that professors would use minimal lab space in conjunction with classrooms and offices to carry out their research. Retrieved from Facilities Management Division Asset Record System, File P-9-T.
These other uses included a room for the Dominion Soil Analyst, the Shortt Library of Canadiana, a small medical library, and one room each for storage and a seismograph, all in the basement. The Physics Library was located on the second floor and in later years on the west end of the ground floor. It was incorporated into the Natural Science Library around 1986. The attic was used for varied purposes. Approximately four to five years after construction was completed the attic was divided into several spaces. These saw numerous occupancies: a lab for soil science, a painting studio for noted artist Augustus Kenderdine, storage for museum material from settlers originating in Central Europe, a room for binding books for the university library and the workspace of a taxidermist. Designated in the architect's drawings as museum space, the attic level is now home to graduate student offices, individual labs and equipment storage.

On the first floor, the rooms have in most cases retained their original size and configuration, but their uses have changed. This reflects the evolution of teaching and research practices over time. These rooms were designed on the historical assumption that experiments and research would be carried out by professors in small individual lab spaces. With changes in class size and experimentation methods these rooms were no longer sufficient for such uses and now house individual offices. Similarly, the room labelled ‘Apparatus Room no. 8’ in Figure 35 is now a seminar room, as shown in Figure 36.

The second floor has undergone much the same transformation as the first floor: from classroom space to office space. Once home to labs, offices, apparatus and recitation rooms it now houses the laboratories and offices of the Institute of Space and Atmospheric Studies. The rooms terminating either end of the first floor corridor are still existent and in use. Figure 38 shows the original uses of the second floor.

The main lecture hall pictured in Figure 39 is a character-defining element indicative of the building's original use. The room has stayed true to its original purpose and retains its commemorative integrity.
In the circumstances of its delayed construction, the Physics Building may be associated with the First World War and the economic situation it created. The unfinished stone decoration at the main entry is also perhaps an indication of these economic difficulties (Figure 40).

Nobel prize winner Dr. Gerhard Herzberg is associated with the Physics Building. He was a member of the University of Saskatchewan Physics Department from 1935 to 1945. Herzberg was a physicist and physical chemist, who won the Nobel Prize for Chemistry in 1971, “for his contributions to the knowledge of electronic structure and geometry of molecules, particularly free radicals”[2]. Herzberg’s work is commemorated in the Physics Addition as shown in Figure 41.
3. Associated Objects

The collection of Dr. Gerhard Herzberg memorabilia on display in the lobby of the Physics Building contributes to its character. Figure 42 shows another set of items that records the heritage of the building: a collection of photographs depicting the Physics Club through the years 1930 – 1967 is located on the ground floor, north of the staircase. They record a social aspect of campus life specifically linked to the Physics Building.

In October of 1983 a plaque and display case were dedicated inside the Physics building to commemorate the contribution of Dr. Balfour Currie and Dr. Frank Davies during the Second International Polar Year. Figure 43 shows the plaque being dedicated to the events happening in 1932-1933. The display case holds record books with observations as well as an auroral intensity recorder and original auroral photos.

Many objects of heritage value are stored in the building. These are shown in Figures 44 through 47. In the basement of the Physics Addition, old equipment and apparatus are stored. Objects of interest include: glass instruments hand blown by former Department Head Ertle Herrington (Figure 44), parts from the 1948 Betatron (Figure 45) and the first X-Ray unit in Western Canada (Figure 46).

Architects Brown and Vallance designed furnishings for the Physics Building that are shown in Figure 47.
4. Supporting Documents


Rangacharyulu, C. Personal communication, June 10, 2011.

Facilities Management Division (2011). Asset Record System [Data File]. Retrieved from \usask\fmddfs\files\iis\IIS\Public\ARS


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Figure 43. 24 October 1983. Elva Currie (left) and Nell Davies unveil a plaque in the Physics Building to mark the contribution of their late husbands Drs. Balfour Currie and Frank Davies during the second International Polar Year in 1932-1933. Photo A-8619, retrieved from http://scaa.sk.ca/gallery/uofs_buildings/

Figure 44. Glass instruments hand blown by Ertle Harrington.

Figure 45. A part used in the betatron, ca. 1948.
5. Summary of Character - Defining Elements

Materials
- greystone walls
- Indiana limestone trim and decoration
- slate roofing and floors
- quarter sawn oak doors, frames
- and window surrounds
- patterned glazing
- red clay tile floors
- grey granite base course
- brick interior walls, wainscoting
- plaster walls and ceilings
- steel framed windows
- brass door and window hardware and grates
- cast iron and steel tablet arm chairs
- cast iron and steel staircase with slate treads
- cast iron radiators
- slate chalkboard

Form
- scale (3 storey height)

Style
- arches and gothic arches (doors, windows, entries, transoms)
- keystones
- stone piers
- string courses
- absence of stone ornament
- stone spandrel panels
- horseshoe arches

Figure 46. Dr. Herbert Weaver’s X-Ray Machine, the Ranney-Wimshurt-Holtz static machine. Dr. Weaver moved to Saskatoon in 1905 and the X-Ray machine arrived in 1906, making it Western Canada’s first X-Ray unit.

Figure 47. Apparatus cases designed for the building by Brown and Vallance Architects.
vaulted plaster ceilings

Location
- on secondary axis of the Bowl
- enclosing northern edge of the Bowl
- terminates axis of Voyageur Place

Spatial Configuration
- double loaded corridors
- small, individual ‘lab spaces’
- double height lecture theatre
- high ceilings

Systems
- concrete floors with embedded clay tile
- remaining components of historical power distribution system
- fire hose carriers
- exposed truss in attic
- hinged blind boxes

Use(s)
- continuous use for physics education and research (classes, labs, apparatus storage, offices, recitation rooms, workshops)
- studio of Augustus Kenderdine

Cultural & Chronological Associations
- first lecture theatre (housed classes from every department)
- unfinished stone ornamentation
- Nobel Prize winner Dr. Gerhard Herzberg