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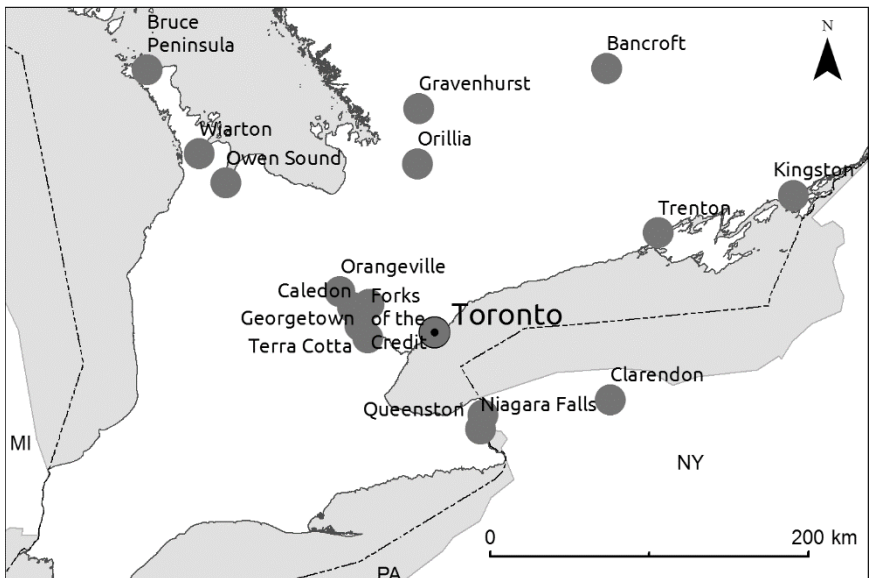
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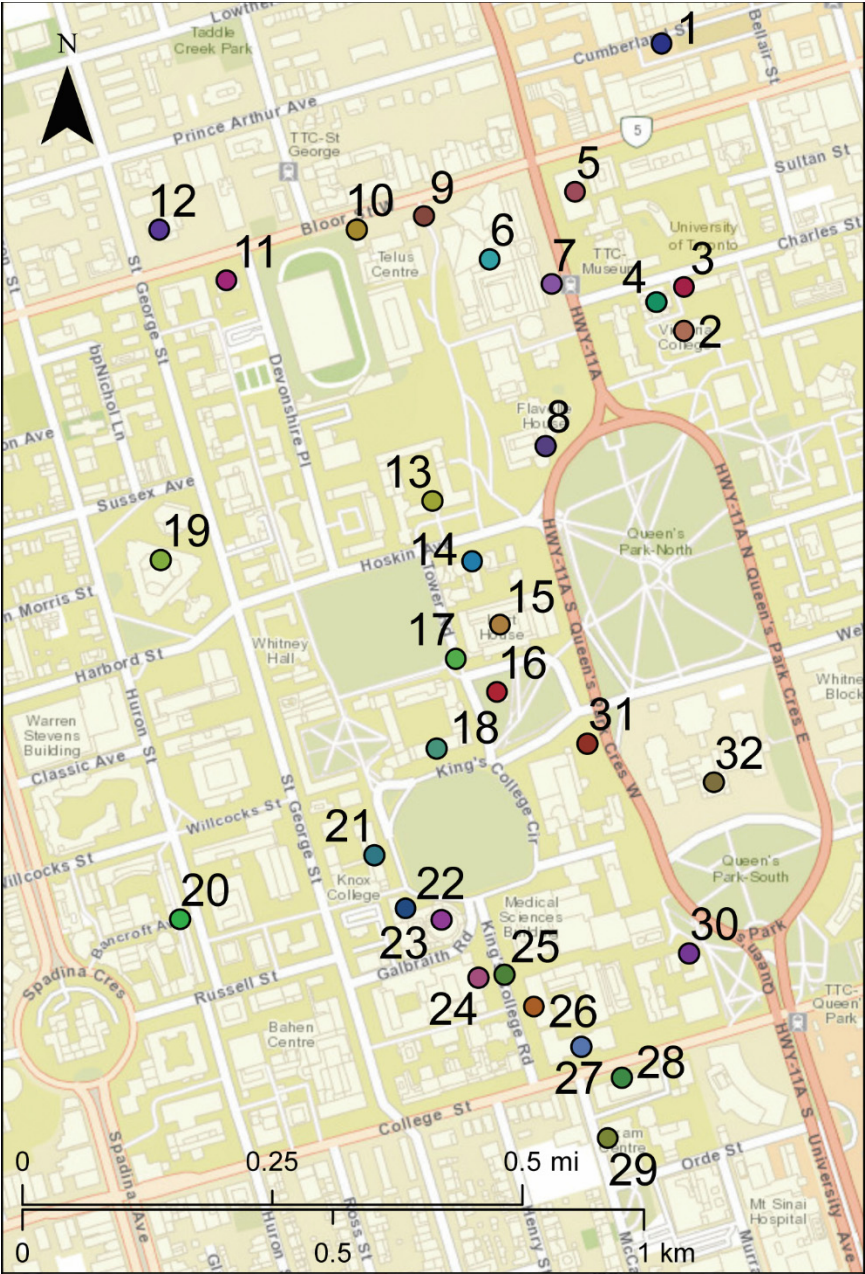
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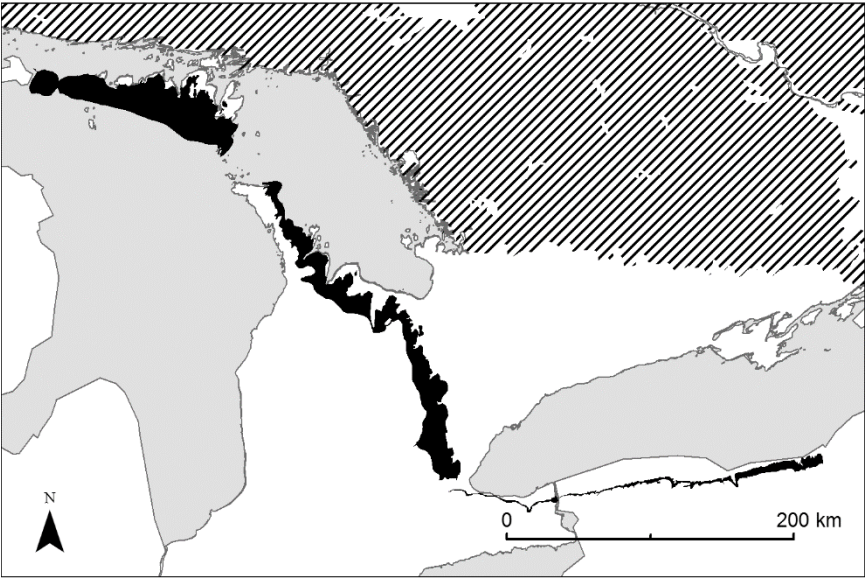




**Landmark**

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Geological Units in Southern Ontario



Legend

- Niagara Escarpment
- Canadian Shield
- Undifferentiated Paleozoic



## Guide to some of the building stones at the University of Toronto

Chris Rogers

### Introduction

The University of Toronto has over 150 buildings built from about 1850 until the present. It is not possible or desirable that the materials in each building be described so there has been a necessary selection of some of the more interesting or unique buildings that have been constructed with natural stone. Over the years a surprising number of the older buildings have been demolished or rebuilt in some way. Because suitable building stones are not found immediately around Toronto they are imported. Some of the first came from England probably as ballast on ships. Early on stone tended to be reserved for trim and bases where greater durability was required, with the majority of the upper parts built of cheaper local yellow or red bricks. Heavy transport was by water and stone came from Ohio using the Welland Canal between Lake Erie and Lake Ontario and from Kingston and Quebec via The St Lawrence River and Lake Ontario. With the coming of railroads (1879 onwards) locally available building stones became economic such as sandstone from Orangeville and Caledon 60 km to the northwest and limestone from Queenston near Niagara Falls and limestone from near Orillia. Quebec and the maritime provinces of Nova Scotia and New Brunswick also supplied stone by rail. The nature and behaviour of the stone tells us about geology and mineralogy but also the way in which the stone was used gives us hints about the hopes and aspirations of the people who originally built and occupied the buildings. The intent of this guide is to instruct on some of the stone sources used and also discuss some of the issues arising from the choice of a particular stone and the way in which it is used and behaves. Most of the buildings mentioned are owned by the University of Toronto but others (York Club and the Ontario Legislature) are not.

### Site 1. The Rock

Located in the Village of Yorkville Park, this 650 tonne outcrop of the Canadian shield was disassembled at its natural home near Gravenhurst, transported south 150 km, and re-assembled in the park. This is a granitic gneiss typical of that composing much of the Canadian Precambrian Central Gneiss Belt of about 1050 to 1070 Ma (Armstrong and Carter). Note the characteristic “roche moutonnée” shape of this outcrop caused by glacial erosion. Toronto and areas to the north were covered by an ice sheet about 12,500 years ago (Dyke *et al*). This was followed by the formation of a

glacier-dammed lake that covered much of the city because the outlet used today on the St. Lawrence River was blocked. The old lake shoreline bluffs form a hill about 1 km to the north of here.

Immediately under your feet is 30 to 40 m of glacial lake sediments (varved clays, silts and sands) over a sequence of gently dipping Ordovician age shales and limestones that in turn overly Precambrian gneisses at a depth of about 400 m. The irregular Precambrian surface dips gently to the southwest.



*The rock on Yorkville Avenue.*

### Site 2. Victoria College

Designed by William Storm in the Richardson Romanesque style and opened in 1892 (H.H. Richardson, 1877 Trinity Church in Boston is the prototype of this style) the exterior of this monumental building consists primarily of red and white sandstone. The white Whirlpool sandstone is probably from Forks of the Credit (or is it limestone? it is hard to reach the 2<sup>nd</sup> floor). The red Sackville sandstone is from New Brunswick. The presence of muscovite mica flakes on the bedding surfaces in the quarry was noted by Parks (Vol. II, p.65). These mica flakes are apparent on some of the sandstone here and are useful to separate it from other sandstones.

The red granite columns are probably from the St George area in southern New Brunswick. Parks (Vol II, p. 110) gives an excellent description of the quarrying techniques and milling operations using the New Brunswick red granites. Similar granite columns are found on a number of Toronto buildings from the 1900's.

It is noteworthy that there was a proposal to demolish this building in the early 1950's by a Professor of Architecture, Eric Arthur, to make way for athletic

fields, parking lots and dormitories (Richardson p. 88).



*East side of Victoria College*



*Granite column at east entrance*

### Site 3. Burwash Hall and House

Funded by a gift from the Massey Estate and designed by Sproatt and Rolph in the collegiate neo-gothic style, this was a

combined residence and dining hall completed in 1912/13. The further addition of Lower Burwash House (originally called Emmanuel College and Residence) was completed in 1931. Both were built with light grey coloured Whirlpool sandstone from the Rogers quarry north of Terra Cotta (Parks, Vol. 1, p. 151), and Indiana limestone trim (Fooouts *et al.*, p.19). The limestone trim shows some etching of the surface due to the effect of acid rain. This combination of architectural style and choice of materials was continued in the later Hart House (Site 15).



*Burwash House middle entrance.*

Today this building is in marked contrast to the tall condominium and office buildings on Bay Street.

#### **Site 4. Isabel Bader Theatre**

Located just to the north of Victoria College, this building faces Charles Street and was finished in 2001. It was built with Owen Sound dolostone. There are four quarries on the Bruce Peninsular north of Owen Sound that supply this stone of Silurian age. A feature of this pure dolostone is that the colour fades with exposure to the sun. Go inside the building and note the colour of the stone of medium to dark yellowish brown in contrast to the outside colour that is a light yellowish grey. There is some rust staining from iron sulphides on the bedding planes and a few dolomite lined druze' or geodes. There is also an interesting outdoor wall made of multicoloured shale/slate tiles.



*Silurian dolostone showing rust staining from iron sulphides and a small geode.*

Just west of the theatre on the south side of Charles Street is the Birge-Carnegie Library by Sproatt and Rolph, built in 1910 in gothic style using Indiana limestone trim and Whirlpool sandstone.



### Site 5. Lillian Massey Dept of Household Science

This is on the east side of Avenue Road/Queens Park opposite the Royal Ontario museum and just south of Bloor Street. Sponsored by Lillian Massey Treble, a daughter of Hart Massey (manufacturer of agricultural implements). The facade facing the street has four freestanding Ionic columns and a number of engaged columns of Queenston limestone built in 1912. Some nice fossils are found on some surfaces. Courses in household science were only taught for a few years from 1902. The main interior stair of marble (if accessible) has some pre-Raphaelite glass windows showing human tasks such as hunting and harvesting (Richards p. 91).

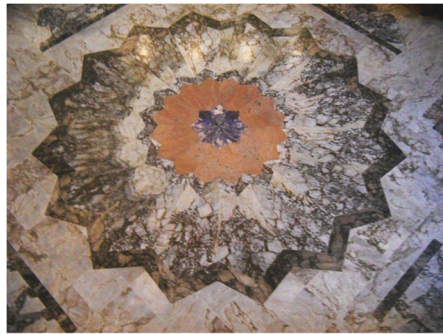


*Glass window Lillian Massey Building*

### Site 6. Royal Ontario Museum

This is at the SW corner of Queens Park (Avenue Rd.) and Bloor Street. The East Wing and entrance on Queens Park were built in 1934 using a base and trim of sawn Queenston limestone with upper walls of grey Whirlpool sandstone. The east entrance has bas reliefs in Queenston limestone and inlaid patterns made of sandstone on right and left of doorway.

The rotunda on the ground floor of the east wing has floors, steps and columns built with pink, buff, white and brecciated marbles from quarries just south of Bancroft, Ontario (Goudge, 1938, p. 108). In the middle is a star made with sodalite from east of Bancroft (see Site 20). The interior walls are of honed fossiliferous Queenston limestone and seem to need cleaning.

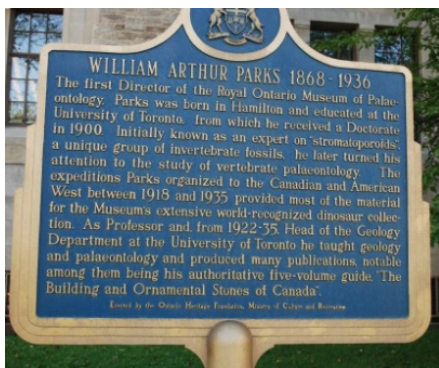


*Rotunda floor Royal Ontario Museum*

On the second floor to the south side of the rotunda you will find the mineral gallery. For the geologist this is well worth some time. You will find a copy of the first Geological Map of England and Wales by William Smith. The gold nugget collection is well worth visiting in the gem collection area at the south side of the gallery.

### Site 7. Memorial to William Parks

This is on Queens Park on the west sidewalk, south of the east entrance of the ROM. William Parks, professor of geology at U of T, wrote an encyclopedic five volume guide to the building stones of Canada that is referenced below. It seems his major interest was vertebrate palaeontology.

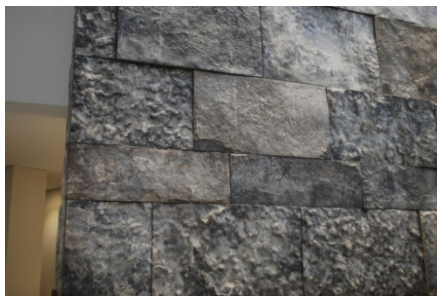


*Memorial to William Parks.*

### Site 8. Jackman Law Building, Queens Park Circle (NW corner)

This has been recently constructed with an interior atrium having a large wall of Eramosa dolostone from Wiarton on the Bruce Peninsula showing a scalloped bituminous rich bedding surface and also sandblasted panels that bring out the thinly laminated structure.

The outdoor stone cladding appears to be Owen Sound dolostone from the Bruce Peninsula similar to that used in the Isabel Bader Theatre (Site 4).



*Eramosa dolostone bedding surface in the Jackman Law building.*

### Site 9. Queen Alexandra Gateway

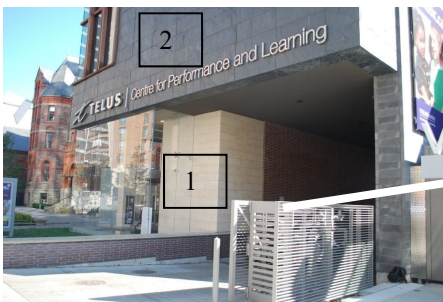
This is on south side of Bloor street at the north end of Philosophers Walk. Built to commemorate Edward VII's Queen consort (who was born in Copenhagen in 1844), it was opened by the Duke (future King George V) and Duchess of Cornwall and York in 1901. Built of a yellowish orange laminated sandstone of unknown origin, it is possible that it was from Wallace, Nova Scotia on the Northumberland Strait where a stone of similar colour was quarried in the early 1900's (Parks, Vol. II, p. 71). However, it is possible the colour of the stone has changed from the original colour due to oxidation. The gateway was originally near the Lillian Massey building on Queens Park. This gateway now marks the entrance to the Philosophers Walk that runs south along the west side of the Royal Ontario Museum toward Trinity College (Site 13). It follows the old Taddle Creek valley. The creek developed into a sewer and is now buried underground.



*Queen Alexandra Gateway*

#### **Site 10. Telus Centre for Performance and Learning**

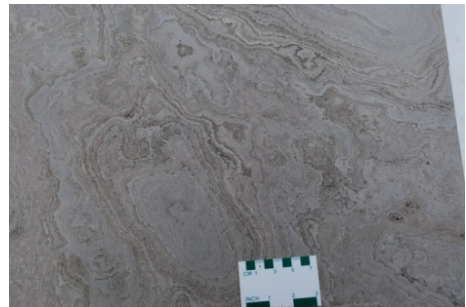
At 273 Bloor Street West you will find the Royal Conservatory of Music. There is light coloured honed calcarenite limestone (1), grey coloured slate (or is it faux slate?) (2) and a vesicular volcanic rock lines the west wall of the covered driveway.



*Telus Centre.*

#### **Site 11. Former Meteorological Observatory**

At 315 Bloor Street west, built in 1909 as the headquarters of the Meteorological Service of Canada, the exterior uses yellowish grey coloured Miramichi sandstone from Quarryville, New Brunswick (Parks Vol. II p. 33). The building was purchased by U of T in 1971 and is now the Munk School of Global Affairs (Munk was a gold tycoon educated at U of T who gave \$47M for this School). The tower of rusticated stone originally had a domed observatory for a telescope. The light grey coloured granite fence posts are of Stanstead grey granite from the Eastern townships of Quebec near the border with Vermont. This was a popular granite building stone in Toronto but is sometimes rather porous and can deteriorate due to salt crystallization weathering as shown at the base of the Royal York Hotel on Front Street. The balustrade of greyish pink dolostone at the front is of Silurian age dolostone from the Bruce Peninsula and shows contrasting fine light and dark bituminous lamination typical of the Eramosa dolostone.



*Thinly laminated Eramosa dolostone.*





*Meteorological Observatory.*

*composition so firm, so formal-looking, as to endow the picturesque and asymmetric Romanesque with a majestic classic serenity." (McHugh).*



*Gooderham House / York Club*

To the right of the front door look for a portrait in stone said to be of Henry Sproatt who worked on the design and was one of the architects of Hart House (Richards p. 248).

### **Site 12. York Club/Gooderham house**

At the northeast corner of Bloor and St. George you will find a striking house built of red sandstone (Portage Brownstone from northern Michigan, Fouts *et al.*, p. 23) red brick and a base of red brown sandstone (Sackville, New Brunswick?). This house was built in about 1890 for Mr Gooderham 1830-1905 (a distiller of spirits and at the time of his death the richest man in Canada). It was sold in 1908 by his widow and is now a private club.

Designed by David Roberts in the then popular Richardson Romanesque Revival style. It has been described as follows: "*Consummately balancing assertive tower, gables, and chimneys with deep round-arched porch, gallery, and windows, the architect has created a*



*A view of the house in about 1900, City of Toronto Archives.*

### **Site 13. Trinity College**

Trinity is an Anglican theological school. Built in a mixture of styles including Jacobean and Gothic between 1925 and 1961. In the main quadrangle you will find a south doorway of deteriorated round columns of sandstone showing peculiar exfoliation of the outer skin. The cause of the exfoliation is a point of

speculation. The source of the sandstone is unknown but may be from New Brunswick. Find the college chapel north of Hoskin Avenue (1955) designed by Sir Giles Gilbert Scott (Liverpool Cathedral) in an elegant Perpendicular Gothic style (Richards p. 111). This was built with grey Whirlpool sandstone and Indiana limestone on the outside, and on the inside with Indiana limestone columns and mortar stucco with travertine flooring; a very serene use of stone.



*Column of doorway at Trinity College quad.*

#### **Site 14. Wycliffe College**

Located south of Hoskin Avenue, built in 1891 using red brick, what appears to be Portage brown (red) sandstone from Northern Michigan for trim and columns and red Sackville sandstone at the base.



*Doorway at Trinity College quad.*



*Wycliffe College entrance*

#### **Site 15. Hart House**

Hart House was built in 1911-19, in the neo-Gothic style (beaux arts Gothic-revival) designed by Henry Sproatt (see also York Club and other buildings). The exterior is limestone trim with walls of grey sandstone ashlar of the Whirlpool Formation probably quarried from Forks of the Credit near Caledon, Ontario.





*Exterior view of Hart House.*

Paid for by the Massey family (manufacturers of agricultural machinery) in honour of Hart Massey, the grandfather of Vincent Massey, the first Canadian borne Governor General. The Massey's stipulated that there be no women, drinking or studying within the walls. Senator J.F. Kennedy in November 1957 said: *"I personally rather approve of keeping women out of these places ... It's reassuring to come again to a place that does not fear to express its opinion of the female sex"* (Bradbeer). Women were finally allowed on equal terms in 1972.

Note how sandstone (probably Ohio sandstone) at base of a doorway has deteriorated due to a combination of freeze-thaw and salt crystallization weathering, while the limestone above is in better condition but still has a rough surface.

Inside the main south entrance compare the smooth interior surface that has not been exposed to the weather with the outside surface of acid etched limestone.

On the carvings outside some of the doors you will find black crusts in areas where there is little direct precipitation from acid rain. These black crusts are found wherever they are protected from

direct precipitation. They are probably composed of gypsum with dirt or carbon giving the dark colour. Eventually the formation of these crusts will result in stone deterioration.

The floor of Hart House is paved in Italian travertine. However the steps throughout the lower part of the interior and exterior of the building are made of granite that has better resistance to wear and abrasion.

The Great Hall in the east wing has an oak hammerbeam roof and a south window honouring ten of the university's benefactors and founders. Below this you will find coats of arms from the 51 universities in the British Empire at the early part of the 20th century.



*Base of doorway columns shows deterioration of sandstone due to freezing and thawing combined with salt crystallization.*

Hart House is worth exploring, you will not find a better example of the beaux arts gothic style in Canada (Dendy and Kilbourn, 1986). Look for the music room with a ceiling of British Columbia cedar.



*Black gypsum-rich crusts at exterior doorway*



*Moose engraving in boulder of migmatite/gneiss from Northern Ontario just to west of main south entrance of Hart House.*

### **Site 16. Stewart Observatory**

This was moved and rebuilt in 1908, just to the south of Hart House. It was used as an astronomical observatory until 1953 and is now the office of the U of T Students' Union. This was originally constructed to the south of Kings College circle as part of the Toronto Magnetic Observatory in 1855. Designed in the Venetian style by Cumberland and Stewart (who also did University College, Site 18) and is an early example of recycling of building materials.



*Stewart observatory*

There is white weathering lithographic limestone of Middle Ordovician age, probably from quarries in the Kingston area at the east end of Lake Ontario where it is a well known building stone. Dolomitic limestones found associated with this limestone are well known to be alkali-carbonate reactive in concrete. The limestone used here has a medium dark grey colour when freshly broken but weathers to an attractive very light grey/white colour. Note the calcite 'birds eyes' formed by sparry calcite and also stylolites. The trim work is of brown coloured sandstone from Ohio.

### **Site 17. The Soldiers Tower**

Soldiers Tower just west of Hart House was built in Gothic style using Indiana limestone trim with walls of sandstone ashlar of the Whirlpool Formation. Designed by Henry Sproatt (Burwash Hall, Hart House and York Club) and Ernest Rolph. Built in the mid 1920's with \$400,000 raised by alumni for a memorial to those killed in the First World War, and subsequently enlarged after the Second World War. The tower contains a carillon, originally of twenty-three bells, now of fifty-one.



*Efflorescent salt stained limestone archway.*



*Delivery of a 2.5 t bronze bell in Sept 1927 (City of Toronto Archives 11640).*

There is a gateway just to the south west with efflorescent salt stains on the arch of Indiana limestone caused by capillary action in this porous but usually durable stone.

### **Site 18. University College**

This is one of the most important early structures at U of T. Designed by F. W.

Cumberland (St James' Cathedral on King Street and an addition to Osgoode Hall) with construction starting in 1856 and completed in 1859. At the time of construction this was an area of fields and woodland with the city of about 30,000 people to the south (Richards 2009). There was an extensive fire in 1890 with rebuilding, especially in the eastern portion, by 1892.



*University College.*

The style is 'Romanesque' with rounded Roman or Norman style archways rather than pointed 'gothic' arches. It has traces also of Byzantine and Italian palazzo styles. At the time it was considered one of the finest buildings in Canada (Friedland). The first part built was the round chemistry laboratory on the west side, because of the danger it might not be built for reasons of economy if it was left to the end. The inside of the building has some rather nice wood paneling and carving.

Richards (p. 48) notes that three types of sandstone were used: the Whirlpool sandstone, Ohio sandstone and a sandstone from France (or is it York stone?). About 2/3 of the surface is built with pale yellow brick made from a clay



pit near Yonge street at Ramsden Park about 1 mile to the north (Friedland).

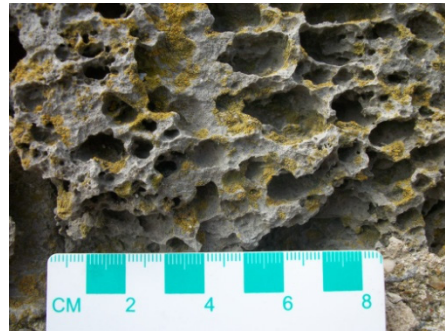


*Tafoni weathering University College*

The sandstone of the central arch shows intricate carving by the European masons in what is probably Ohio sandstone (Foutts *et al.*, p. 21). The right side of the arch has recently shown some honeycomb weathering probably caused by salt crystallization weathering. The cavity formed is called a 'tafone' (a Corsican word for a natural cavity in honeycomb structure caused by cavernous weathering). The plural is tafoni and such vertical faces with tafoni are sometimes called tafoni weathering. Thought to be due to salt crystallization near the surface disrupting the rock grains or in some cases caused by solution or hydration of free salts within the rock (Winkler and also Shaffer). Normally a common form of weathering in arid environments but also common in Canadian cities where salt is used in the winter to remove snow and ice.



*Intricate carving of the arch in Ohio sandstone*



*Tafoni weathering on sea cliff, Lyme Regis, UK.*

### **Site 19, Robarts Library, St George Street**

Built of precast and cast in place concrete in 1973, this is the main library and the largest in Canada, but there are over 40 other subject-specific libraries at U of T. The building has been much criticised for the triangular and hexagonal shapes. It was called an "illustrated dictionary of architectural miseries" (R. Thom quoted in Richards, p. 162). The concrete was made with quarried Silurian dolostone from cap rock of the Niagara Escarpment 60 km to the west, and glaciofluvial sands from the Caledon area. The dolostone has a high chloride ion content



*Roberts library.*

due to deposition in a saline reefal environment. However the chloride appears to be immobilized in the stone due to its macroporous nature, that prevents diffusion and it is not easily transported into the surrounding cement paste, nor does it seem to promote corrosion of embedded reinforcing steel.

#### **Site 20. Earth Sciences Building, NW corner of Russel and Huron Streets**

There are a group of boulders here of various interesting rocks. In particular the sample of Sodalite is worth finding. It is a feldspathoid ( $\text{Na}_4\text{Al}_3\text{Si}_3\text{O}_{12}\text{Cl}$ ) and has been mined near Bancroft, Ontario (Parks, Vol. I, p. 341). On the second floor is an excellent geological library. Also nearby is the Graduate Student Union, a pub with decent draft ales. This

is at the west end of Bancroft Avenue in a building on the north side built in 1911.



*Boulders of various rock types on Huron Street.*



*Boulder containing the blue mineral sodalite on Huron Street.*

#### **Site 21. Knox College at 23 Kings College Circle**

Founded as a theological college for Presbyterians (Friedland) with the original building in yellow brick still standing on Spadina Crescent. This new building was constructed in 1915 in the gothic style with fan vaulting in Indiana limestone and exterior ashlar of Whirlpool sandstone. It shows unusual freeze-thaw damage in the outdoor cloister possibly caused by a one sided freezing environment with a source of moisture on the exterior and continuous



freezing on the interior. A nice example of the effect of microclimate.



*Entrance to Knox College on Kings College Circle.*



*Damage due to freezing and thawing on a surface protected from sunlight.*

## **Site 22. Simcoe Hall**

This office for the university senior administration was built in 1923 in a neo-Georgian style. Note the graceful Palladian window over the entrance and sandstone columns. There is ripple lamination in the sandstone panels beside the columns. Eyles identifies the sandstone as being from the Whirlpool Formation.



*Simcoe Hall.*

## **Site 23. Convocation Hall, 30 Kings College Circle**

Built of yellow brick with Ohio sandstone trim and columns in 1904-1906, and designed by Frank Darling in the beaux arts style. The sandstone base at ground level shows deterioration due to salt crystallization weathering. The sandstone near the bottom of the columns seems to be changing colour from a light brown to a yellow orange. Is this due to oxidation of iron sulphides? The hall seats about 2000 people and is used for convocation ceremonies. The yellow colour of the bricks identify them as being made with clay rather than shale bedrock that gives bricks a deep red colour. The bricks came from the nearby Don Valley Brickworks (Eyles). In April 2019 the upper bricks were cleaned using high pressure air, water, dishwashing soap and small amounts of fine glass sand.



*Convocation Hall*



*Sandford Fleming Building.*



*Laminated Ohio? sandstone.*

#### **Site 24. Sandford Fleming Building**

The building was finished in 1907 and is named after the chief engineer of the Canadian Pacific Railway in 1871. He also was the main advocate of a uniform system of 24 hour time, so that the rail timetable did not use local time which was a serious problem with a rail system stretching over 70 degrees of latitude. You will find the meridian of Toronto set in the ground just north of the building. It was from near here that the old observatory (site 16) was moved in 1908. This building is in yellow brick and Indiana limestone with a rock faced laminated Whirlpool sandstone base. The surrounding low level walls are topped with Owen Sound dolostone.

#### **Site 25. Kings College Road**

Here you will see the use of granite setts for paving. Today they have been mostly removed from the streets of Toronto but were commonly used in the past especially near street car tracks. Today it is hard to find information on the technology of these setts but Knight and Knight (1948) has a brief description of the specifications, European sources, and the economics of sett production. It is likely that the majority of setts found in Toronto were from sources in Quebec and Europe (Scandinavia and UK) from where they were shipped as ballast. Another source would have been Quebec, where quarries in the light grey coloured Stanstead granite (found in the eastern Townships near the border with Vermont) were extensively used. Parks (Vol. III, p. 159) describes one quarry where 1,000,000 paving setts were produced per year and sold at \$40 per 1,000. The people cutting the pavers were paid \$0.0225 for each 4 in. x 5 in. x 8 to 13 in. block. Southern and central Ontario generally do not contain sources of granite that readily split into the required shape without considerable waste. Quarries in the far west of Ontario near Ignace (Hewitt 1964, No. 19) do have stone suitable for this use, and were

often shipped to the prairies. Ignace is about 1600 km by road from here.



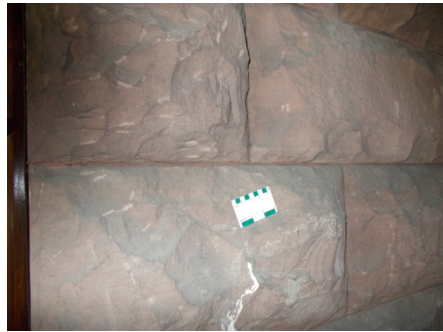
*Granite paving setts Kings College Road.*

### **Site 26. Mechanical Engineering Building**

This is on the east side of Kings College Road just north of the Mining Building. The exterior surface is made of fossiliferous Queenston limestone from near Niagara Falls. Built in 1948 and said to be one of the most significant mid-twentieth-century modern buildings in Toronto (Richards p. 75).

### **Site 27. Mining Building 170 College Street**

Originally called the chemistry and Mining building, built in 1905 of red Whirlpool sandstone and red brick with Ohio sandstone door frames. Inside you will find the Canadian Mining Hall of Fame. Under the main steps on College Street you will find the basement entrance.



*Red Whirlpool sandstone at the south side basement entrance.*

The stone and brick on the exterior of the building have not been cleaned and it is only in the basement entrance that you can see the clean stone and the red colour and original appearance of the unweathered sandstone.

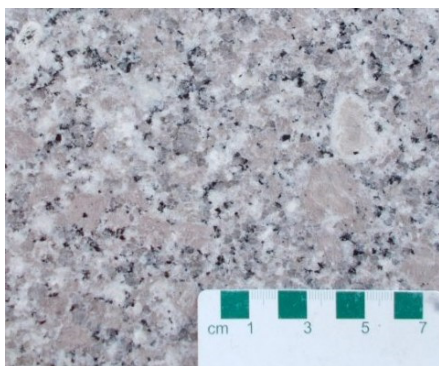
### **Site 28. Health Sciences building at 155 College**

This was built in 1959. The interior has some book matched brecciated slabs of Italian Loreda Chiaro marble. The lilac coloured granite slabs on the exterior are from Deer Island in Maine (Richards p. 184).





*Book matched marble slabs*



*Polished lilac coloured granite exterior slab.*



*Acid etching highlights fossils in the stone.*

dolostone from Queenston quarry. Crinoid and fossil fragments can be seen, enhanced by etching from acid rain.

### **Site 30. David Naylor building**

Located at the NW corner of University Avenue and College Street. Built in 1931 as the Universities' Botany building. Designed in a Georgian -revival style and nicely proportioned.



*Tyndall limestone at College Park*

The interior has a small lobby that is faced in Tyndall limestone from 50 km NE of Winnipeg, Manitoba. This is a famous Canadian building stone continuously quarried since the 1890's but this is the only known example at U of T. It is a bioturbated dolomitic limestone of Ordovician age. The brown coloured tubular burrows are largely dolomite. Some slabs have large and spectacular coral and nautiloid fossils. These are best seen on the exterior of the College Park building on the SW corner of College and Yonge streets, a five minute walk east of here.

### **Site 29. 255 McCaul Street**

Formally a warehouse for Toronto Board of Education, built in 1931, and taken over by U of T in 2002. Designed in a moderate Art Deco style, using calcitic



*Canadian Volunteers Monument*

### **Site 31. Canadian Volunteers Monument**

Erected in 1870 to commemorate those killed during Fenian (Irish American) raids from the US into Canada in 1866. The battle of Ridgeway ("Limeridge" on the monument) was fought near Fort Erie in June 1866. Three University College men were killed (Richards p. 60). Designed by Sculptor Robert Reid in Italian Renaissance style with statue of Britannia at the top. Base of Ordovician (Trenton) age limestone, green-brown sandstone probably from Nova Scotia (Foouts *et al.*) and statues in white Carrara? marble. Both the marble and

sandstone show damage due to a combination of acid rain and freezing and thawing.



*Weathered sandstone at the base.*

Go east through the tunnel/bridge on the west side of Queens Park Crescent to the Legislature building.

### **Site 32. Queens Park Legislature Building**

Designed by a number of architects in the Romanesque Revival style at Wellesley Street and Queens Park Crescent 1886-93. The basement was built using Middle Ordovician age (Gull River Formation) lithographic limestone from Longford Mills near Lake St John, northeast of Orillia (Freeman). This white weathering limestone is a medium grey colour on a freshly broken surface. The south entrance was built with red Whirlpool sandstone from Forks of the Credit River in random rock faced ashlar. Note the massive blocks showing cross bedding at the base of the south entrance. These are an arkose of Jurassic age from Middletown, Connecticut and is called "Portland Brownstone" (Freeman).





*The south entrance using Whirlpool sandstone.*



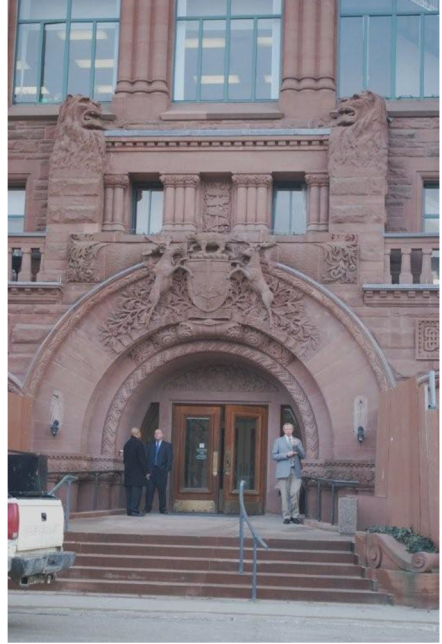
*Lithographic Ordovician limestone used in basement walls found in SW corner.*

The front entrance steps, installed in 1992, are of red sandstone of the Whirlpool Formation (Medina) quarried in Clarendon New York and sold as Hulberton red sandstone (Freeman). The west wing was destroyed by fire and in 1909 partly rebuilt using the distinctive red sandstone from Sackville New Brunswick.



*Cross bedded sandstone from Connecticut.*

The North wing of the legislature was built with the same stone in about 1912. In 1914 blocks of Sackville sandstone sawn on two sides of random length and width cost \$0.65 per cubic foot f.o.b. (Parks, Vol. II p. 66).



*North entrance with Sackville Sandstone 1912 and Red Lazonby sandstone steps.*

At the north end of the building the exterior red sandstone steps are reported to be of New Red sandstone (Triassic) from Penrith in England called Red Lazonby sandstone (Freeman). There was also some use of red sandstone (Triassic) from St. Bees Head in Cumberland in England for various smaller parts, perhaps the easiest to find are the Finials on the south side of the west wing (Freeman).

## **A note on some of the common building stones used in Toronto**

### Indiana Limestone

A massive bedded calcarenite extensively quarried in south central Indiana. Composed of oolites and fossil fragments. It is a high purity limestone of Mississippian age with a uniform texture and properties and thus is easily worked and cut. It is probably the most popular dimension stone used in North America. It has been used extensively in Toronto, the best examples being Union Station on Front Street built in the 1920's where massive 68 tonne classical columns may be seen, and the Royal York Hotel north of the station. Also found in Burwash Hall (Site 3), Hart House (Site 15) and elsewhere at U of T where it was used for trim work.

### Miramichi Sandstone

Quarried from the late 1800's onwards in the valley of the Miramichi river of northern New Brunswick. Of Mississippian age, olive coloured sandstone used in New Brunswick, Montreal and the Toronto and Hamilton areas. Parks (Vol. II) reports that in general this stone was not of the best quality. Some of the poorer varieties containing excessive amounts of black mica, having a susceptibility to damage by freezing and thawing and pronounced affinity for surface hardening on weathering. In Toronto this stone was used in the Meteorological Observatory (Site 11) where no significant damage can be seen. However a possible example of this stone at Trinity College (Site 13) shows evidence of surface hardening and weakening of the underlying rock.

### Ohio Sandstone

Ohio sandstone is also called the Berea Sandstone for exposures near Berea in northern Ohio and attains a thickness of more than 200 feet near South Amherst. Berea is a few miles southwest of Cleveland. It is a light brown coloured, fine grained sandstone with angular rather than rounded grains making an ideal material for grindstones and abrasives. It is thought to be of late Devonian age. Quarrying started in the 1830s for grindstones. It was commonly used in Toronto for trim work around doorways and windows. It was also used in the Canadian Parliament buildings Centre Block in Ottawa for trim work (Lawrence).

### Portage Brownstone

A red coloured sandstone sometimes called Lake Superior Sandstone. Quarried near Jacobsville in Houghton County, Michigan Upper Peninsula and in limited quantities near Sault Ste Marie as the Root River sandstone (probably of Cambrian age). Used in the York Club (Site 12), trim work on Wycliffe College (Site 14), and the Victoria Hospital for Sick Children at 67 College Street. Also used on the Gooderham Flat Iron building, 1892, at Front St. E. and Wellington St. west of Market St.

### Queenston Limestone

This is actually a calcitic dolostone quarried on the edge of the Niagara Escarpment north of Niagara Falls since the mid 1800's. The quarry is now exhausted but was extensively used for most of the 1900's as a major source of limestone for buildings in Ontario. The rock contains visible fossils, typically crinoid stems and shell debris. The

quarry closed in the 1990s as the rock was exhausted. The rock is from the Gasport Member of the Lockport Formation of Lower Silurian age that makes up the cap rock of the Niagara Escarpment that runs from New York up the Bruce Peninsula and over to Manitoulin Island in Lake Huron. It is a thick to massive bedded fine to coarse grained fossiliferous calcitic dolostone sometimes showing ripple cross-lamination and cross-bedding. There are descriptions of the quarrying operations and the chemistry of the rock in Parks (1909, p. 243), Goudge (1938, p. 251) and Hewitt (1960, p. 91). Goudge (1933) noted: *"In cities...where the stone is subjected to an impure atmosphere a slight blistering of some bush-hammered surfaces may be observed... The stone is liable to a slow and slight differential weathering in acid atmospheres, but its stability and soundness is not affected. The fine grained dolomitic matrix is the first to be affected, it is etched away and calcite fossils left in relief."*

In Toronto, the Queenston limestone has been used on the old Canada Post Office Building, the home of the Maple Leafs hockey team south of Union Station. It was also used for the exterior of the Royal Ontario Museum, the Government of Ontario Whitney building (1925-28) on the south side of Wellesley Street and the Frost building north (1954) and south (1966) at NE corner of College and Queens Park (University Ave). At U of T it was used on the Lillian Massey Building (Site 5), the Mechanical Engineering Building (Site 26), at 255 McCaul Street (Site 29), and the Galbraith Building (1960) where it shows

evidence of salt crystallization weathering at the base.

#### Sackville Sandstone

Quarried in the late 1800s and early 1900s in Sackville New Brunswick. It is a red coloured, medium grained sandstone of Pennsylvanian age quarried extensively in the late 1800s and early part of the twentieth century and exported by rail to Toronto, south western Ontario, the Maritimes (Parks, Vol. II, p. 64), and New York where it was used in brownstone buildings (Foouts *et al.*). The presence of muscovite mica flakes on the bedding surfaces was noted by Parks (Vol II, p.65) and is apparent in some examples and seems to separate it from other sandstones. It was used for the north wing of the Legislature buildings at Queens Park (Site 12) and can also be seen in the main entrance of Toronto Old City Hall (1890's) although it should be noted most of the stone used there is Whirlpool sandstone.

#### Stanstead Granite

A light grey coloured granite from the eastern Townships of SE Quebec adjacent to the border with Vermont. It was used extensively in Toronto from about 1900 onwards for the base of buildings instead of limestone, which is often used for the remainder of the building. Examples are the Royal York Hotel on Front Street where salt crystallization weathering has caused deterioration, the Dominion Building at 1 Front Street West, the old Bank of Nova Scotia on King Street West and the Cenotaph in front of Old City hall on Queen Street. At U of T it is used in the old Meteorological Observatory (Site

11). Parks (Vol. III) reports a composition of orthoclase with considerable plagioclase with quartz and black mica. Stone from adjacent quarries in Vermont are marketed as Beebe granite.



*Flaking of Stanstead grey granite due to salt crystallization weathering, Royal York Hotel.*

#### Whirlpool Sandstone

Sandstone of the Whirlpool Formation is quarried from Forks of the Credit near Caledon, and near Georgetown Ontario. This is a white to grey and sometimes dark red brown orthoquartzitic and sometimes sub-arkosic sandstone of lower Silurian age. The sandstone unconformably overlies red mudstone of the Queenston Formation of Ordovician age and is immediately overlain by impure limestones and shales, found at the base of the Niagara Escarpment capped by Silurian age dolostones. It is named for the whirlpool downstream from Niagara Falls where it outcrops. In New York it is called the Medina sandstone (Parks Vol 1 used the term Medina). It varies in thickness up to about 9 m (Armstrong and Carter) and is only about 6 ft. thick at Duntroon south of Collingwood (Hewitt Vol. IV). It shows various features such as trough cross bedding indicating deposition in a

braided fluvial environment (Armstrong and Carter). In Ontario it has been quarried mainly in the Georgetown, Caledon and Orangeville areas. Today it is largely unobtainable because of the increasing amount of overburden needed to expose the rock. In the Forks of the Credit area near Caledon it was mined in the late 1800s in shallow workings driven in as adits into the bank of the escarpment (Parks Vol 1 p. 154 and Freeman give descriptions of the methods used). The Credit Valley Railway did not reach Forks of the Credit until 1879. Parks (Vol 1 p. 139) reported that the best quality stone is found where overburden was greatest and that deposits with low overburden were frequently of poor quality. Perhaps this is due to effect of cold water carbonate leaching during the last ice advance? By about 1912, or earlier, the red coloured stone from Orangeville and Forks of the Credit was largely worked out (Parks, Vol. 3, p. 136). In 1964 there were 19 quarries operating (Hewitt, 1964 No. 17). Grey coloured stone continued to be available up until the 1990s (Foouts *et al.*) but generally not in thick or massive bedded sizes.

The rock was extensively used in Toronto for buildings such as Old City Hall (1889-1899) and the Legislature Buildings (Site 32). Some of the rock for Old City Hall originated from a quarry about 2 miles NE of Orangeville (Hewitt 1964 No 17, Parks Vol. 1, p. 161) and another quarry to the south (Parks p. 153). The rock was extensively used for buildings at U of T such as University College (Site 18), the Lassonde Mining building (Site 27), Hart House (Site 15) and Victoria College (Site 2). Freeman

(2003) has a map of the seven quarries for sandstone obtained from Forks of the Credit used in the Legislature.

### York Sandstone

The early buildings of quality in Toronto were often built with English York sandstone. Before the building of railroads the only way to transport stone was by water. As a result, the locally available stone sources were not used. Stones such as those from England were probably brought as ballast. A possible source for the stone are quarries in the vicinity of Morley, Leeds, West Yorkshire that have produced a light brown to buff coloured stone since the early 1800s (Leary, p.94). Examples of the use of York stone in Toronto include: Osgoode Hall (1829), St. Lawrence Hall (1850), St. James Cathedral (Church and King streets, started 1850), the Toronto Normal School facade located inside Kerr Hall at Ryerson University (1851), the carved details and trim found at Oakham House, SW Corner of Church and Gould (built in 1848 by William Thomas), the Commercial Bank of the Midland District (1845) built in the Egyptian revival style, and preserved inside Brookfield Place north of Front and west of Yonge Streets.



*Commercial Bank of the Midland District*

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<sup>1</sup> It is worth noting that this book is one of the first on the petrography of road building materials.