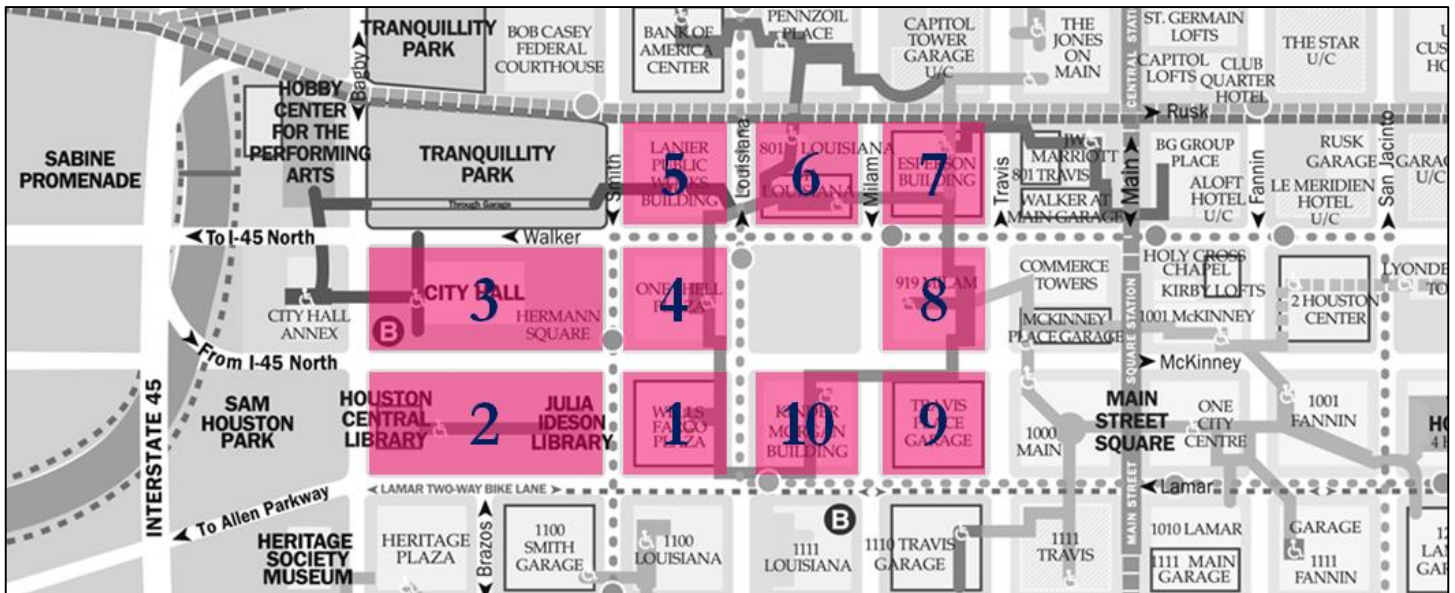
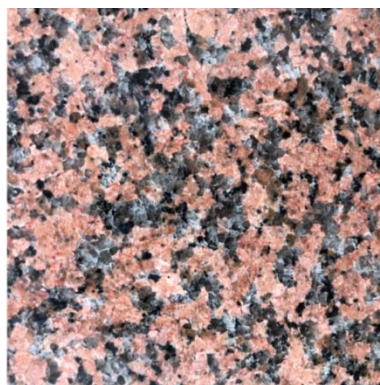
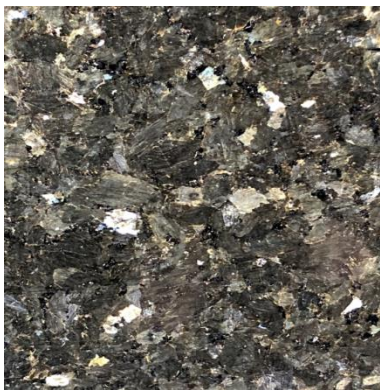
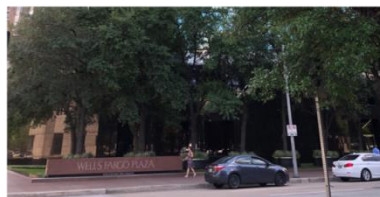


Skyline Geology: A Self-Guided Walking Tour of Downtown Houston's Buildings (2018)

CITY HALL LOOP – 1 MILE (~1 HOUR)



WELLS FARGO – 1000 LOUISIANA



Building Base

Larvikite (intermediate igneous)
 Specific variety of Monzonite, for thumbnail-sized feldspar
 From Larvik Batholith in the Oslo Rift in Norway (Permian, 292-298 my) or Killala Lake Alkalic Rock Complex near Thunder Bay in Ontario, Canada
 Could be confused with Ubatuba (I did)

Pavement/Accent Stone

Granite (red/pink, felsic igneous)
 Poikilitic texture

Fun Fact

The Wells Fargo Plaza is currently the 20th-tallest building in the United States, the second tallest building in Texas and Houston, after Houston's JPMorgan Chase Tower, and the tallest all-glass building in the Western Hemisphere

Building Base (left, black)

Distinguishing and observed features: alkali and plagioclase feldspars, blue labradorescence

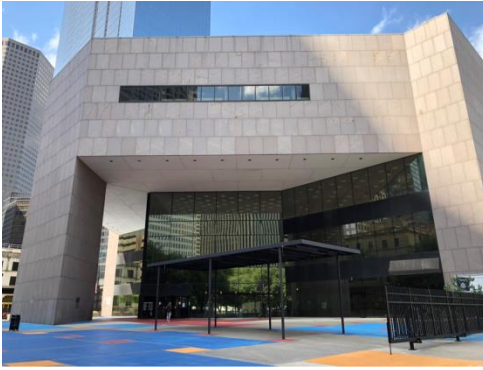
Pavement/Accent (left, pink)

Poikilitic texture: large component crystals (feldspar, in this case) contain smaller crystals of other minerals within them, most easily observed in petrographic thin sections
 Observed: Potassium feldspar, smoky quartz, biotite, hornblende, pyroxene

HOUSTON PUBLIC LIBRARY – 500 MCKINNEY



2



Building

Granite (dark pink, felsic-intermediate igneous)
From South Dakota

Contains xenoliths and pegmatite veins

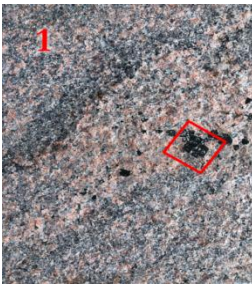
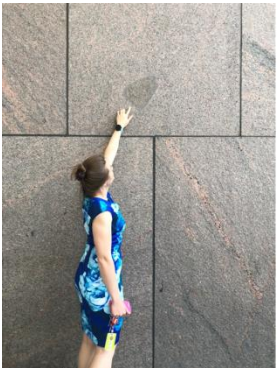
Xenoliths: a foreign (identifiably different from the rock it is within) rock fragment enveloped by a larger rock, a magmatic inclusion that occurred during magma emplacement (in this case)

Observed: xenoliths ranging in size from Katy's hand to Katy's head, contact metamorphism around rim

Pegmatite veins: holocrystalline (roughly), intrusive igneous rock composed of interlocking phaneritic crystals (usually larger than 1")

1. Pyroxene (~90 degree angle)
2. Pegmatite veins
3. Hornblende (~120 degree angle)

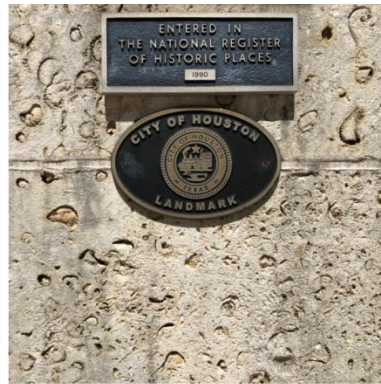
Observed: potassium feldspar rich veins and dark mineral veins, contains both pyroxene and hornblende



HOUSTON CITY HALL – 901 BAGBY



3



Pavement/ Corner Stone

Oolite (marine sedimentary)

Bedford Oolite from Bedford, Indiana (quarry)

Salem Limestone (geo)

Mississippian (358-323my)

Also found in Indiana University

Building/Pool

Fossiliferous Limestone (marine sedimentary)

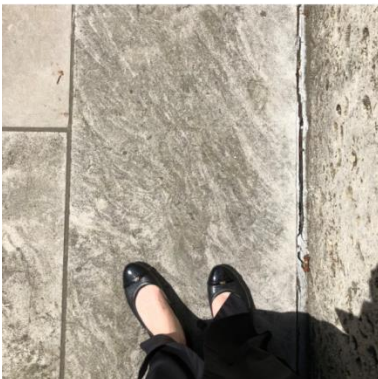
Cordova Shell from Austin (quarry/trade)

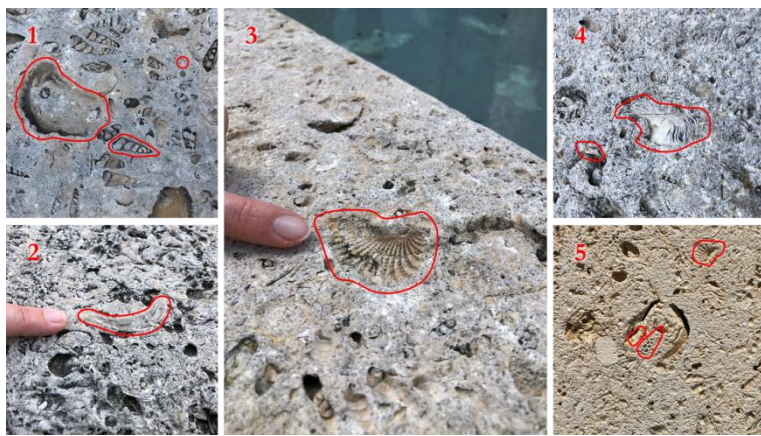
Whitstone Lentil (geo)

Walnut Formation

Middle Cretaceous (105my)

Also found in the National Museum of Natural History in Washington D.C.





Building/Pool

1. Trigonina, Turitella, Crinoid
2. Rudist
3. Trigonina
4. Rudist, Bryozoan
5. Trigonina, Turitella, Bryozoan



Pavement, etc.

1. Worm trail
2. Crinoid
3. Festoon trough-cross bedding
4. Bryozoan (Fenestella plate?)
5. Crinoid, Bryozoan

ONE SHELL PLAZA – 910 LOUISIANA



4



Building/ Pavement

Tufa (Travertine, continental sedimentary)
Travertino Romano (trade) from Tivoli near Rome in Italy

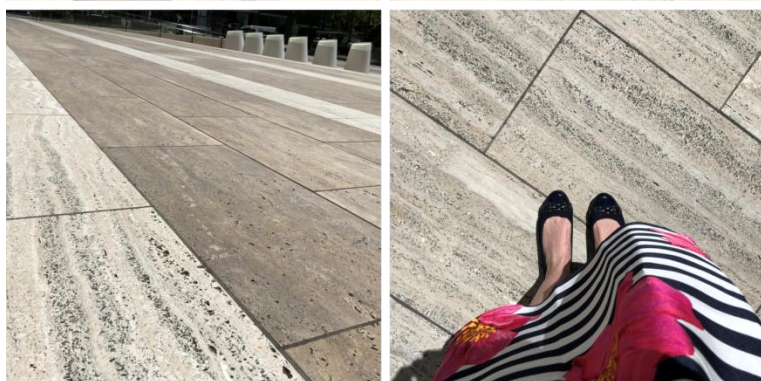
Also known as Romano Classico or Travertine Classico and Travertino Romano Antico (darker varieties)

Building, pavement, cornerstones, and accent stones all travertine

Tufa/Travertine: formed by algae/calcium carbonate in hot springs, phytoherms (freshwater reefs) and thrombolite-stromatolites; not to be confused with tuff/tufo (igneous)

1. Stroms
2. Alternating Travertino Romano Classico and Travertino Romano Antico
3. Vugs

Observed: stromatolite patterns/precipitation growth dominant feature, some vugs partially to fully filled with more transparent cement



LANIER PUBLIC WORKS – 611 WALKER



5



Building

Gneiss (high grade metamorphic)
Foliation of light and dark minerals in large bands



TWO SHELL PLZ – 811 LOUISIANA



6



Building

Tufa (Travertine, continental sedimentary)
Identical to One Shell (see One Shell for details)

Building Base

New façade (<5yrs)
Diabase/ microgabbro (mafic intrusive igneous)
Lower Jurassic (201-174my)
Virginia Mist Granite (trade) from Canada
Also found in Jet Mist Quarry in Rapidan, Virginia
Diabase/ microgabbro: dark-gray mosaic of elongate plagioclase crystals and clinopyroxene, with some masses characterized by olivine or bronzite

Pavement (bottom left)

Best guess: slate (low grade metamorphic)...but most likely phyllite (low-medium grade metamorphic) as micas were observed





Niels Tower

Oolite (marine sedimentary)

Built in 1926 by Mellie Esperson

Bedford Oolite from Bedford, Indiana (quarry)

Salem Limestone (geo)

Mississippian (358-323my)

Also found at Houston City Hall

Cornerstone, Accents, and Base

Granite (light-pink felsic intrusive igneous)

Town Mountain Granite from Austin and Llano

Uplift

PreCambrian (>1.37-1.23gy)

Fun Fact

The only complete example of Italian Renaissance in Downtown Houston

Mellie Tower

Oolite (marine sedimentary)

Built in 1941 by Mellie Esperson

Bedford Oolite from Bedford, Indiana (quarry)

Salem Limestone (geo)

Mississippian (358-323my)

Also found at Houston City Hall

Cornerstone, Accents, and Base

Gabbro (mafic intrusive igneous)

Fun Fact

Intentionally built to not be as tall or as ornate as Niels Tower

Joined with Niels Tower on all but 2 floors

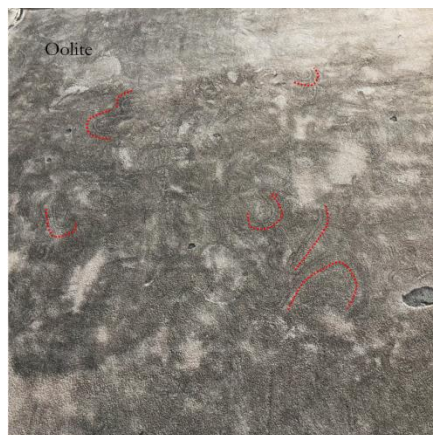


Mellie Tower (left, crest)

Gabbro: coarse-grained, dark-colored, intrusive igneous rock, usually black or dark green in color and composed mainly of the minerals plagioclase and augite

Cornerstone: Contains Esperson Nordic Crest

Oolite: See Houston City Hall Pavement, contains worm trails (red)





Niels Tower

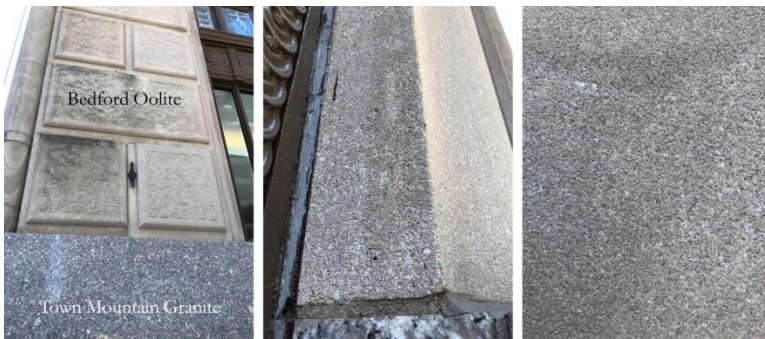
Town Mountain Granite: Coarse-grained, pink, quartz-plagioclase-microcline rock, in part porphyritic with large microcline phenocrysts. Occurs in plutons up to 13 mi in size that tend to be concordant circular vertical cylinders with concentric textural variations; boundaries range from sharp and regular to highly irregular with wide zones of mixed rock. Makes up Enchanted Rock granite mass, Gillespie and Llano Counties. Observed: zoned and rapakivi feldspars, poikilitic texture



Poikilitic texture: large component crystals contain smaller crystals of other minerals within them, most easily observed in petrographic thin sections
Rapakivi: large rounded crystals of orthoclase each surrounded by a rim of oligoclase (a variety of plagioclase)

1. Poikilitic texture
2. Rapakivi
3. Zoned feldspars

Oolite: sedimentary rock formed from ooids, spherical grains composed of concentric layers



919 MILAM (WITH THE STARS)



Red Base

Granite (felsic intrusive igneous)
Original (?): Coldsprings Bright Red Granite from Milbank in South Dakota (trade)
Resurfaced (?): Radiant Red Granite from Bear Mountain near Fredericksburg (trade)
Radiant Red from Llano Uplift
PreCambrian (>1.37-1.23gy)

Fun Fact

Renovated in 2006
The first of three buildings in Downtown Houston to be networked in the first phase of a pedestrian tunnel system

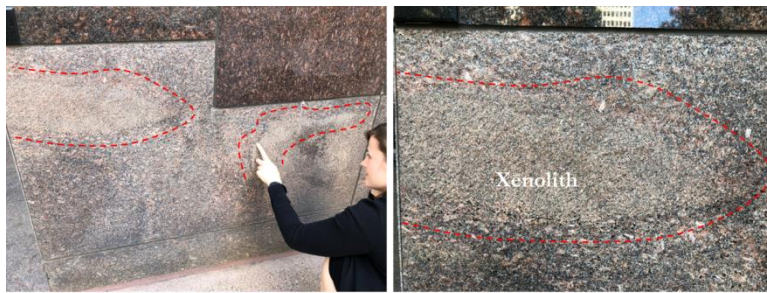


Pink Columns

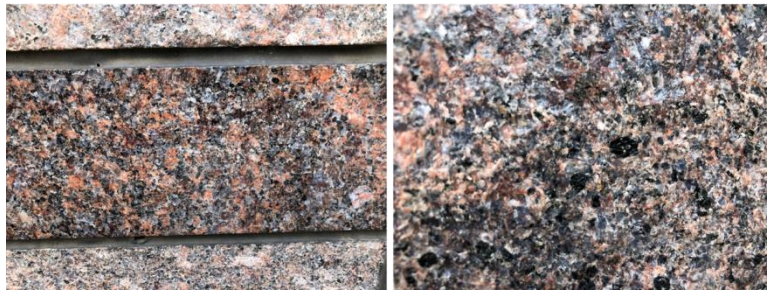
Granite (felsic intrusive igneous)
Coldsprings Dakota Mahogany Flame from Milbank in South Dakota (trade)
Could be from the same quarry as Houston Library (next two slides show similar xenoliths to Houston Library)

Accents

Gabbro (mafic intrusive igneous) and Aluminum stars



Xenolith: a foreign (identifiably different from rock it is within) rock fragment enveloped in a larger rock, a magmatic inclusion that occurred during magma emplacement

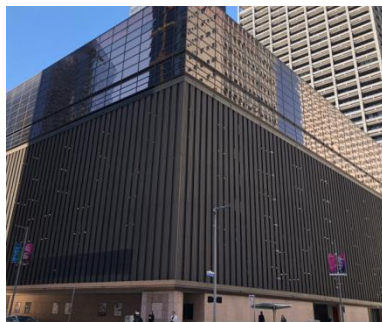


Observed: stray fractures/dike/veins filled with dark, fine-grained or glassy material

TRAVIS PLACE – 1010 TRAVIS

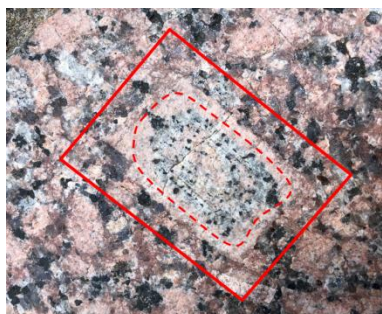
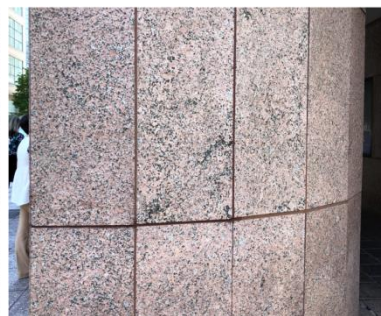


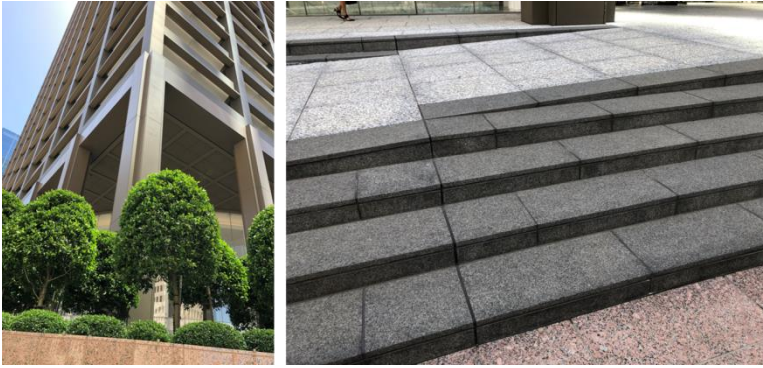
9



Building Base and Pavement

Granite (felsic intrusive igneous)
 Color/texture match to Sunset Red Granite from Llano uplift in Texas
 Phaneritic/ poikilitic pink granite with large rapakivi feldspars and dark mineral clusters
 Poikilitic texture: large component crystals contain smaller crystals of other minerals within them, most easily observed in petrographic thin sections
 Rapakivi: large rounded crystals of orthoclase that are surrounded by a rim of oligoclase (a variety of plagioclase)





Pavement (light grey)

Granite (light grey felsic-intermediate intrusive igneous)

Color matched: Coldspring Rockville (trade)

From East-Central Batholith in Rockville, Minnesota (assumed)

PreCambrian (1.78gy)

Coldspring Rockville Granite: granite (quartz 20-60% and plagioclase 10-65%) to granodiorite (quartz 20-60% and plagioclase 65-90%)

Poikilitic texture: large component crystals contain smaller crystals of other minerals within them

Observed: large feldspars with poikilitic texture containing dense, dark minerals in almost every slab

Steps (dark grey)

Granite (dark grey felsic-intermediate intrusive igneous)

Color matched: Coldspring Lake Superior Green (trade)

From East-Central Batholith near Isabella, Minnesota (assumed)

Late Archean (2.8-2.5gy)

Coldspring Lake Superior Green: could be granite, granophyre, ferro-monzodiorite, or leucogabbro...challenging anyone to stick their nose to the rock and give us a more educated guess

Observed: uniform and equal amounts of salt and pepper

Pavement/Accent Stone

Granite (pink felsic intrusive igneous)

Color matched: Sunset Red Granite from Texas (trade)

From Granite Mountain near Marble Falls in Texas (assumed)

PreCambrian (>1.37-1.23gy)

Could be same stone as Texas State Capitol Building in Austin

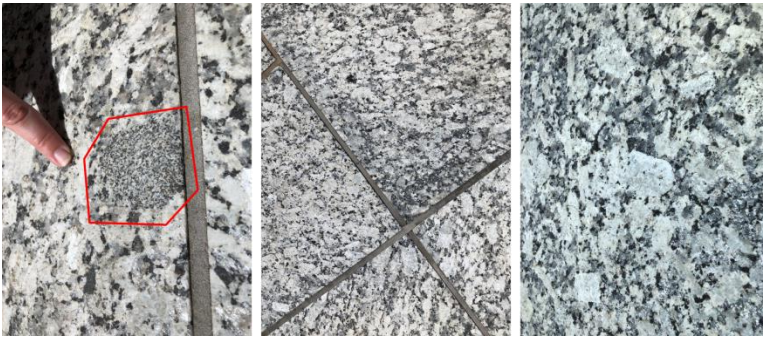
Town Mountain Granite: Coarse-grained, pink, quartz-plagioclase-microcline rock, in part porphyritic with large microcline phenocrysts.

Makes up Enchanted Rock granite mass, Gillespie and Llano Counties.

Observed: contains rapakivi and poikilitic feldspars

Fun Fact

Due to downtown Houston's diagonal street grid, all four sides of the Kinder Morgan building are exposed to the sun



BEFORE YOU GO

- **Safety**
 - Look up, not at your phone, when navigating downtown
 - Please be mindful of the traffic lights, pedestrian signals, bike lanes, and buses
 - Buses make frequent stops and can sometimes hop curbs
 - Some curbs, pavements, and streets may be uneven
- **Etiquette**
 - Please review the walking guide prior to arriving downtown to maximize time spent on the tour
 - Please be mindful of downtown employees and keep slower pedestrian traffic to the right so they can go about their business
 - Try to walk in pairs if walking around downtown as a group
 - If approached by a homeless person, try to be firm but respectful

REFERENCES

- Houston Geological Society, 1995, Walking Tour of Downtown Houston Building Stones: Research Committee, Philip W. Porter
- Houston Gem and Mineral Society, Houston Geologic Society, 2008, Walking Tour – Houston Building Stones, Neal Immega
- Fossils in the Architecture of Washington, D.C.: <http://dcfossils.org/index.php/gallery11/#origins>
- United States Geological Survey: <https://mrdata.usgs.gov/geology/state/map-us.html>
- Wikipedia
- Geology.com

CONTRIBUTORS

- Sheila Echols-Smesny, *Red Shoes. Red Wine.*
- Christen Peevy, *Short Sweet & Lovely*
- Katy Mainwaring

