

Thomas Jefferson wanted to sever ties with Europe in the early republic, both culturally and intellectually. He viewed his architectural pursuits as symbolic of this break and eschewed the British architectural style of the time in favor of classical architecture. He saw this style as evoking the classical ideals of civic responsibility, rational thought, education, and democracy. One of the most recognizable features of classical architecture is the use of columns. There are five orders (or specific proportions of the components) of column. The doric order is the simplest form, the oldest form, and the form used in Thomas Jefferson’s home, Monticello.

When constructing his home at Monticello, Jefferson used a variety of building materials, including glass from Europe, window sashes from Philadelphia, and wood and stone from his plantation. It was constructed by many people, though mostly slave labor.

*“Local white masons and their apprentices did the stone and brickwork. Local carpenters, assisted by several Monticello slave carpenters, provided the rough structural woodwork. The fine woodwork (floors, cornices, and other moldings) was the work of several skilled white joiners, hired from as far away as Philadelphia. One Monticello slave, [John Hemmings](#), who trained under the white workman [James Dinsmore](#), became a very able joiner and carpenter.”*

*(<https://www.monticello.org/site/house-and-gardens/monticello-house-faq#materials>)*

[The Architecture of the Doric Columns](#)

Source of Architectural drawing:

[https://www.masshist.org/thomasjeffersonpapers/doc?id=arch\\_N190](https://www.masshist.org/thomasjeffersonpapers/doc?id=arch_N190)

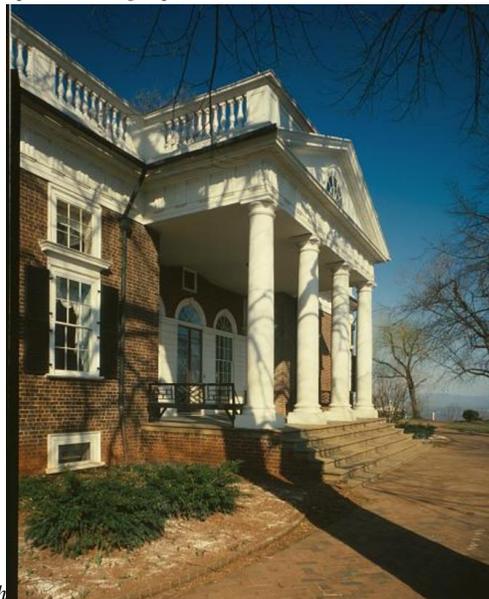


Original manuscript from The Coolidge Collection of Thomas Jefferson Manuscripts at the Massachusetts Historical Society.

[The East Facade at Monticello](#)

Source of Image of Monticello:

<http://www.loc.gov/pictures/resource/hhh.va0059.color.570387c/?co=h>



**QUESTIONS:** Show all work in the spaces provided.

*Note the four quartz columns of the East Portico, which is the main entrance at Monticello.*

1. The angle of elevation to the top of the column from a spot 45 feet directly in front of the column is  $29.6^\circ$ . Find the height of the column *in feet rounded to the nearest tenth*. Draw a right triangle diagram to represent this situation and label all parts. Note that the column is on a porch that is 3.08 feet above the spot on the path in front of the column.

2. Given that the column is approximately 6.08 feet in circumference, find a rough estimate for the volume of each column. *Give your answer in cubic feet and cubic centimeters rounded to the nearest hundredth (note: 30.48cm = 1 ft).*

3. Given that the density of quartz is  $2.65\text{g/cm}^3$ , find the mass of each of the columns. Use Density equals Mass divided by Volume. *Give your answer in kilograms rounded to the nearest whole number.*

## ANSWERS

1. The column is 22.5 feet tall.

2.  $V = 66.188 \text{ ft}^3$   
 $V = 187,423.83 \text{ cm}^3$

3. Given  $D = 2.65 \text{ g/cm}^3$ .  
In #2, they found the Volume (V) in  $\text{cm}^3$ .  
Plug in those two :  
 $D = M/V$  and solve for M. Units will be in grams.  
 $M = 4966730.26 \text{ g}$   
 $M = 4966.73026 \text{ kg}$

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## COLUMN GEOLOGY

### Chemical Weathering

The Goldich stability series predicts the potential of minerals to chemically weather (erode) on the surface of the earth. When minerals form under conditions of high temperature and pressure, they are more likely to chemically weather in normal atmospheric conditions.

- Using the image below, describe the relationship between chemical weathering and stability

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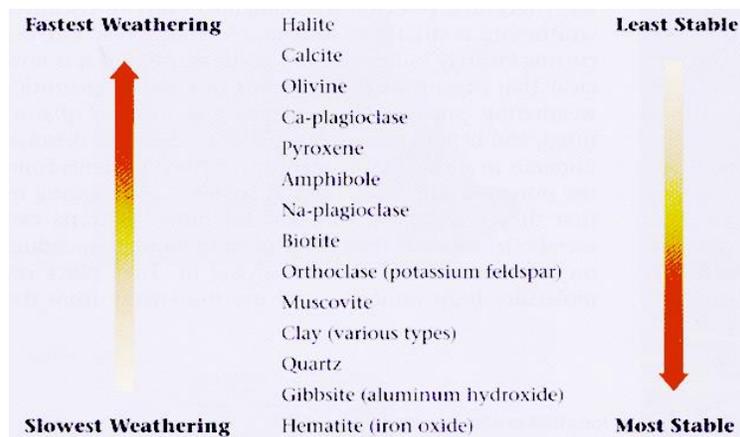
- Which mineral is most likely to chemically weather? \_\_\_\_\_ Least? \_\_\_\_\_

- The columns at Monticello are made out of quartz. Describe them in terms of weathering and stability.

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(image from <https://www.geol.umd.edu/~jmerck/geol342/lectures/02.html>)

**Mechanical Weathering**

Moh's Hardness Scale describes how resistant a mineral is to scratching and mechanical weathering (the physical breakdown of a rock or mineral via wind, water, roots, or other forces). Answer the following questions using the image below:

1. Which minerals are familiar to you and why?

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2. Which mineral is hardest (highest) on Moh's scale? \_\_\_\_\_  
Lowest? \_\_\_\_\_

Mineral Name	Scale Number	Common Object
Diamond	10	
Corundum	9	Masonry Drill Bit (8.5)
Topaz	8	
Quartz	7	Steel Nail (6.5)
Orthoclase	6	
Apatite	5	Knife/Glass Plate (5.5)
Fluorite	4	
Calcite	3	Copper Penny (3.5)
Gypsum	2	
Talc	1	Fingernail (2.5)

(image from <https://www.nps.gov/articles/mohs-hardness-scale.htm>)

3. What trends in material do you see between the Goldich stability series and Moh's hardness scale?

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4. Which materials would *you* select in order to build a column? Why are some materials problematic (look at both the hardest and softest to answer this question)?

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