

## Team Third

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ATLS 4151 - Flow Visualization

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### I. Title

*Malachite*

### II. Purpose

The purpose of this assignment is to experiment with, visualize and research some type of fluid phenomenon in order to better understand and explain the science behind the natural phenomenon. This is the third iteration of this particular assignment and for my visualization I chose to make my subject a fluid that has been static

and solid for thousands of years, a fascinating gemstone known as malachite.

While this is the first of my reports where I won't be going over my experimental process for creating this flow, I will be explaining the geological/quarrying/lapidary processes that malachite undergoes in order for it to end up in the form you see today.

### III. About the Mineral

Malachite is a copper(II) carbonate hydroxide mineral, formula  $\text{Cu}_2\text{CO}_3(\text{OH})_2$ . It most often forms in botryoidal, fibrous, or stalagmitic masses in fractures and deep, underground spaces, where *the water table* (an underground boundary between the soil surface and the area where groundwater saturates spaces between sediments and cracks in rock) and hydrothermal fluids provide the means for chemical precipitation where copper is altered by other chemicals in surrounding rock. Carbonate (close to the amount found in something like limestone) mixes with copper to create malachite.

Striking banded patterns define the distinctive appearance of this gemstone. Patterned bands form due to layers of copper that grow over time. These patterns make each piece of malachite completely unique and add to the gemstone's appeal and value. This process works in a very similar way to growth rings on trees. This example of an extracted and polished specimen helps to visualize this.



Slice through a double stalactite, from Kolwezi, Democratic Republic of the Congo. Size  $5.9 \times 3.9 \times 0.7$  cm.

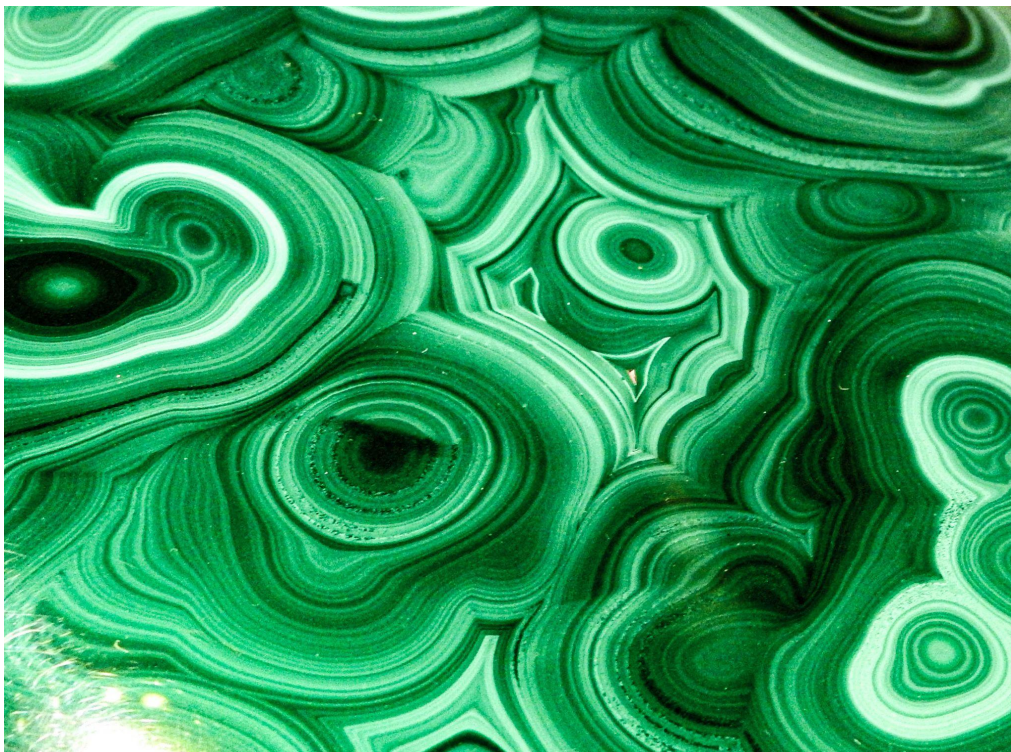
Varying saturations of green is a result of different levels of certain chemicals and climatic conditions in the surrounding area during each period of growth.

#### **IV. Photographic Technique**

This photo was taken with my grandfather's Nikon PX900 CoolPix camera at the Smithsonian Natural History Museum in DC. To be completely honest, taking this photograph was more of something I wanted to do just because now that I've taken this class, everything that looks like a fluid phenomenon makes me want to get a picture of it in case I can think of a way to scientifically explain why it looks that way.

<b>Camera settings:</b>	
F-stop	f/4.5
Exposure time	1/30
ISO	400
Focal Length	43mm
Max aperture	2.9

EDITED: 3021 x 2235 pixels



UNEDITED: 4608 x 3456 pixels



I edited various photos in Adobe Lightroom Classic to achieve this final image you see above. It mostly required some cropping, texture and clarity enhancement and color value adjustment. I think that the final edited image looks really good but I'm sure I could have gotten an even better photo had I spent more time with this item (again I was on thanksgiving break at a museum).

There was a pane of glass in between the subject and me so that caused some glare and clarity issues but overall I'm still satisfied with how these pictures turned out with minimal settings being played with too much.

## **V. Image Revelations / Self Assessment**

I am very happy with the look of this and I think I learned a good amount of information about malachite during the researching and reporting process of this as well. I love the way this type of flow looks visually and the rings patterned bands look very similar to fluid effects I had been looking to recreate somehow with my last experiment. While it would normally take a lifetime to be able to visually document the full process of how this beautiful mineral forms, I am glad I was able to be alive at the best time to see this. I am very thankful for the people who collected this mineral, those who polished it, and those who currently protect it so that I was able to learn more about it and make it the star and subject of this report.