



# The Measurements, Morphology, and Composition of Tycho Crater

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Objective: Our initial purpose in this project was to win and hopefully go to California. However, our purpose now has flipped completely! As time and our minds progressed we became more interested in the moon, it's features, and how it came to be. At this point in the program our main purpose is to find where the Tycho Crater and it's surrounding craters came from.

## Introduction

During this project we've learned many things about the Tycho Crater such as, the measurements, the morphology, and the composition.

With the program "Image J" we were able to find the diameter and depth. By setting a scale and using a line tool we found very accurate measures. The diameter of the crater is 85km and the depth is 4.8 km. We enjoyed using "Image J" because it gave us hands-on activities that we all enjoyed and that made us feel as if we were actually working for NASA.

The Tycho Crater is an impact crater, or simple crater, that formed in the southern highlands approximately one hundred eight million years ago on the coordinates 43.3 S (11.2W). The impactor that created this crater is said to be a member of the Baptistina family of asteroids. Several smaller craters surround the Tycho crater that have formed from the ejecta of the Tycho..

On January 10, 1968 Surveyor 7 landed on the moon in the southern highlands and collected a light colored rock, better known as plagioclase feldspar. Plagioclase is one of the most common minerals in the earth's crust, but is enriched in sodium, whereas the rocks collected from the moon are enriched with calcium (calcic-plagioclase). Some of the fragments were proven to be anorthosites, which are at least 90% plagioclase. Most of the fragments were diluted by mafic minerals (anorthosite gabbro).

These are the main things we've learned while studying the Tycho crater and now we've actually been able to analyze these things even more.

## Composition

The Tycho Crater has a dark "collar" around the edge of the Tycho. This is consisted of the rock, basalt. It is also made up of iron-bearing minerals such as pyroxene, olivine, and ilmenite. The innermost part of the crater is consisted of a light-color mineral called anorthosite. Anorthosite contains a mineral called plagioclase feldspar. Other rocks are also included like norite(mafic intrusive igneous rocks) and troctolite (coarse grained plutonic rock). The moon either has a metallic core or core dynamo(having a magnetic field). Scientists are unsure about the core of the moon though. The red circle around the picture on the main left outlines the dark outline around the crater.



Norite and Troctolite Samples

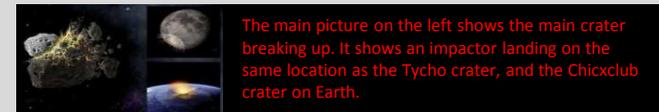
## Morphology

The tycho crater is relatively young compared to other craters, forming 108 million years ago. The most common formation hypotheses is that the impactor was for the Baptistina family. The Baptistina family formed from one big impactor that broke up into several pieces 160 million years ago, after colliding with a smaller body. The supposed asteroid was 170 kilometers in width. The impact event scattered materials to great distances. Minerals from Apollo 17 are thought to be originated from the Tycho Crater impact site. Samples include, impact melt glass. A method called radiometric age dating tells that these samples did form 108 million years ago.

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## Morphology Cont'd

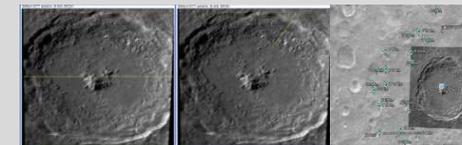
Several pieces of evidence prove different details about the Tycho Crater. -Large white nimbus surrounding the Tycho is twice as wide to the east as to the west. This proves that the Tycho impactor was perfectly oblique. -Ray material is concentrated in a downward direction. Thus, the impactor came in low over the moon's horizon. -The impactor was probably 8 to 10 kilometers. - The Tycho crater is so young that it's melt deposits have not been pulverized and mixed with several rocks. - Scientists say that the dinosaurs probably witnessed fist-sized pieces of ejecta hit the Earth due to this collision.



The main picture on the left shows the main crater breaking up. It shows an impactor landing on the same location as the Tycho crater, and the Chicxulub crater on Earth.

## Measurements

Throughout the process of this project, we've used one program consistently, "IMAGE J". Using this program, we calculated the depth and diameter. The depth of the Tycho crater is 4.8 km and the diameter is 85 km. When the impactor that created the Tycho crater hit the moon ejecta flew from the crater and created smaller craters surrounding the Tycho crater, with the same composition.



## Conclusion

Our main objective was to find where the Tycho crater and its surrounding craters came from. By researching the composition, morphology and the measurements we were able to come to the conclusion that an asteroid from the Baptistina family of asteroids impacted the moon approximately 108 million years ago.

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lroc.sese.asu.edu wikipedia.com  
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All our teachers and administration. And our Parents.

