Origin of gabbroic xenoliths within the Lone Mountain dacite intrusion, Big Sky, Montana: A field and petrographic analysis

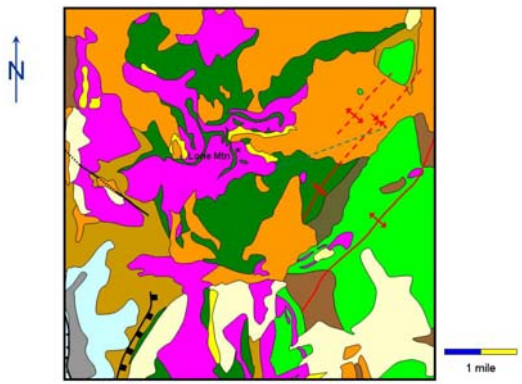
Emily Clement and Dr. Michael Krol
Department of Earth Sciences, Bridgewater State College

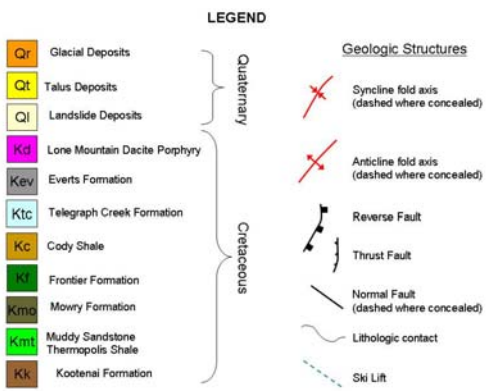
ABSTRACT

Lone Mountain represents a laccolith that intruded in Late Cretaceous time ~68 Ma. This intrusion caused contact metamorphism of the sedimentary country rock resulting in formation of a thin zone of black hornfels. Field work reveals the presence of abundant, 1-9 cm sized gabbro xenoliths and lesser amounts of siltstone inclusions within the dacite intrusion. Compositionally, the Lone Mountain intrusion is dacitic, characterized by hornblende + plagioclase + biotite + quartz. Mineralogically, the gabbro xenoliths consist of pyroxene + hornblende + plagioclase minor chlorite.

This study is concerned with the origin of the gabbroic xenoliths with relation to the dacite intrusion. Do these gabbroic xenoliths represent magmatic differentiation of an initial mafic magma or are they an older, crystallized mafic magma intruded by a younger Lone Mountain dacite magma?

Geologic Map of the Lone Mountain Area

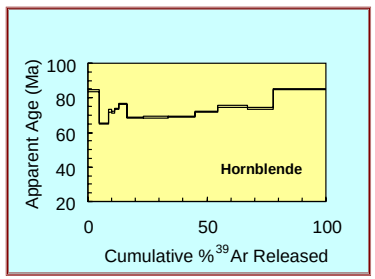




Sample Locations around Lone Mountain

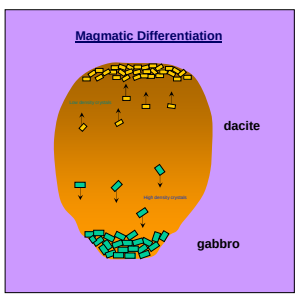
Lithologic Characteristics of Lone Mountain dacite & mafic xenoliths

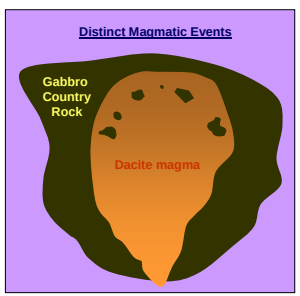
	Lone Mountain laccolith	Xenoliths
Mineralogy	Plagioclase Hornblende Biotite Quartz	Plagioclase Hornblende Pyroxene
Texture	Aphanitic-Porphyritic Anhedral 1-5 mm	Phaneritic Subhedral 1-9 mm
Rock Type	Dacite	Gabbro



$^{40}Ar/^{39}Ar$ age spectrum of hornblende from the Lone Mountain dacite. Best estimate for the age is 68 Ma (Tysdal, 1986)

Possible models for formation of Lone Mountain Dacite



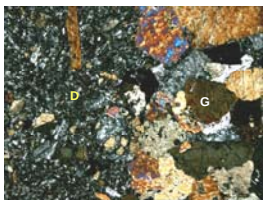


Field Photographs & Photomicrographs

LM-12-05
Porphyritic dacite. Large hornblende & plagioclase phenocrysts present. Small gabbro xenolith; found at an elevation of 8,567 feet.

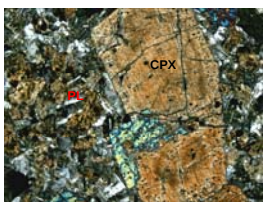
LM-2-04
Dacite porphyry which shows a large white plagioclase clast with coexisting pyroxene.

Dacite with rounded gabbro xenolith ~ 8 cm in diameter.



LM-1-04
Contact between the fine-grained dacite (D) and larger coarse-grained gabbro xenolith (G).

LM-11-05
Conglomerate country rock contains black chert and quartzite pebbles. Strike and dip N58E/79NW. Elevation was 8,487 feet.



LM-7-04
Clinopyroxene (CPX) and interstitial plagioclase (PL) in an altered ultramafic(?) unit.

Tilted and contact metamorphosed country rocks. Inset shows spotted baked hornfels.

LM-2-04
Secondary biotite within dacite porphyry.

Sunrise on Lone Mountain

Acknowledgements

We would like to thank the Adrian Tinsley Program for providing the financial support and the funds necessary to carry out this research. I would like to thank Dr. Krol for his support and advice throughout this research and assistance in the field in Montana.