

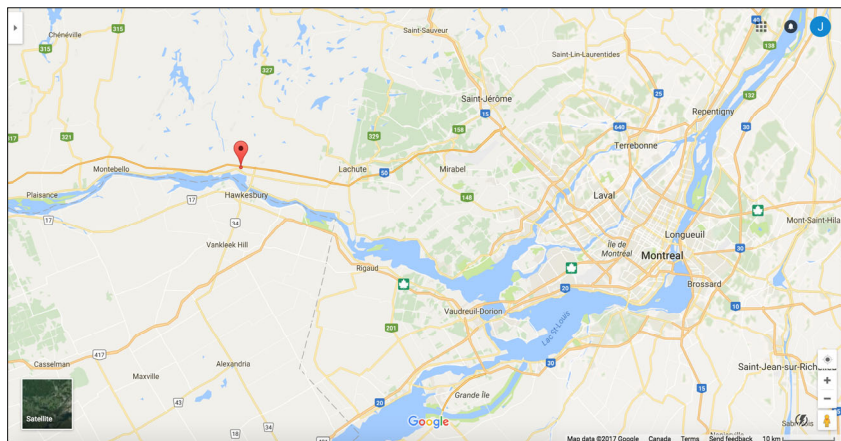
EPSC 240: GEOLOGY IN THE FIELD

# INTRODUCTION TO CRYSTALLINE ROCKS



## WEEKEND FIELD TRIP 1

- Depart: 9 am from Milton Gates. Return: 5:30 pm
- Bring: lunch, snacks, water, cold/wet weather clothes, geology equipment, notebook, hammers

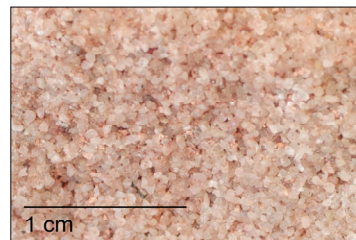


## TERM PAPER

- Due date: Due by email December 4 at 5 pm (week 14)
- Research tools
- Presentations: Nov 28, during lab (week 13)
- Powerpoint file due by noon that day

## LITHOLOGY

Sedimentary



Igneous



Metamorphic



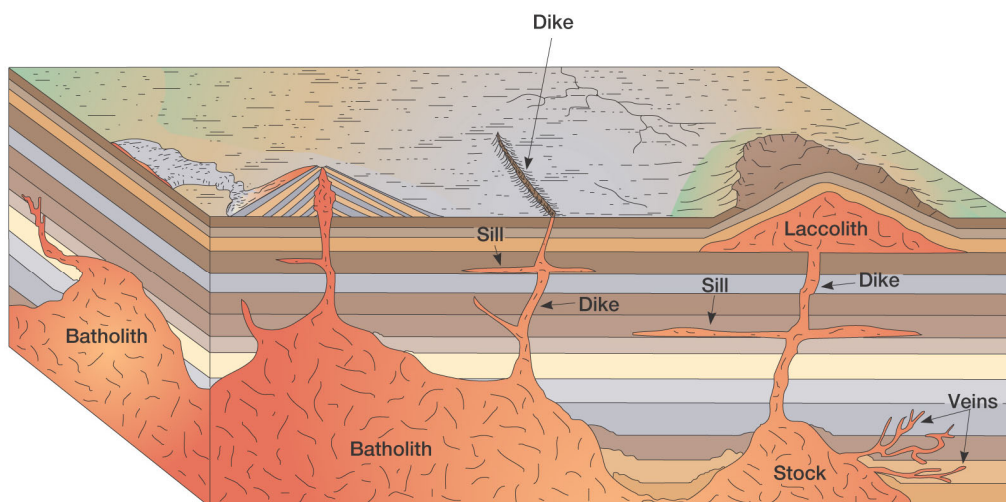
# IGNEOUS ROCKS

- Crystalline rocks with an *aphanitic* to *phaneritic* texture
- Form by cooling and solidification of molten rock (magma)
- Two types:
  1. Intrusive
  2. Extrusive



# INTRUSIVE IGNEOUS ROCKS

- Occur in batholiths, plutons, dykes, sills

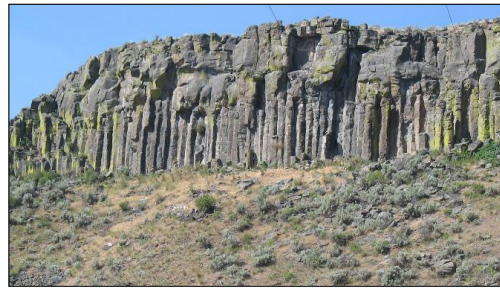


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# EXTRUSIVE IGNEOUS ROCKS

- Lava, ash, debris, mixture of all



Joyce and Mike Hendrix's RV adventures

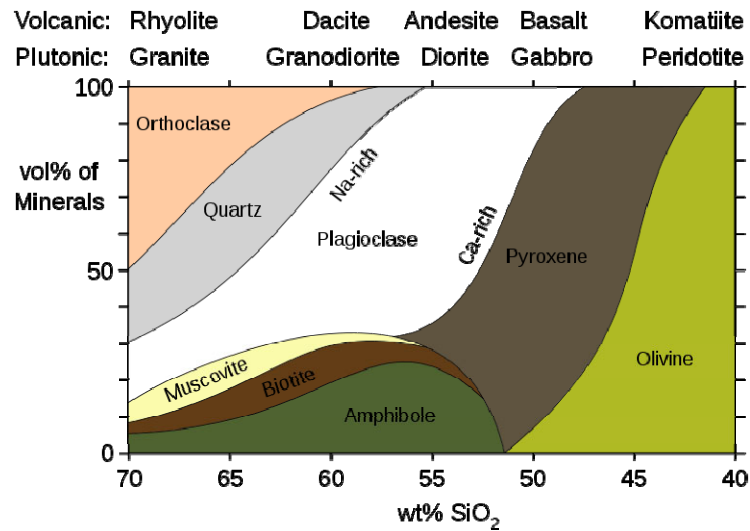
# CLASSIFICATION

- Rock type classified according to silica content

	COMPOSITION			
MODE OF OCCURRENCE	FELSIC	INTERMEDIATE	MAFIC	ULTRAMAFIC
INTRUSIVE	<a href="#">GRANITE</a>	<a href="#">DIORITE</a>	<a href="#">GABBRO</a>	<a href="#">PERIDOTITE</a>
EXTRUSIVE	<a href="#">RHYOLITE</a>	<a href="#">ANDESITE</a>	<a href="#">BASALT</a>	<a href="#">KOMATIITE</a>

# CLASSIFICATION

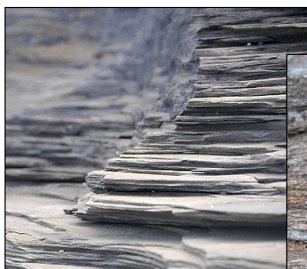
- Rock type classified according to silica content



# METAMORPHISM

- High pressure and/or temperature causes minerals in a rock to change, chemical composition stays same
- Atoms in minerals are rearranged into a different suite of minerals

SLATE



SCHIST



GNEISS



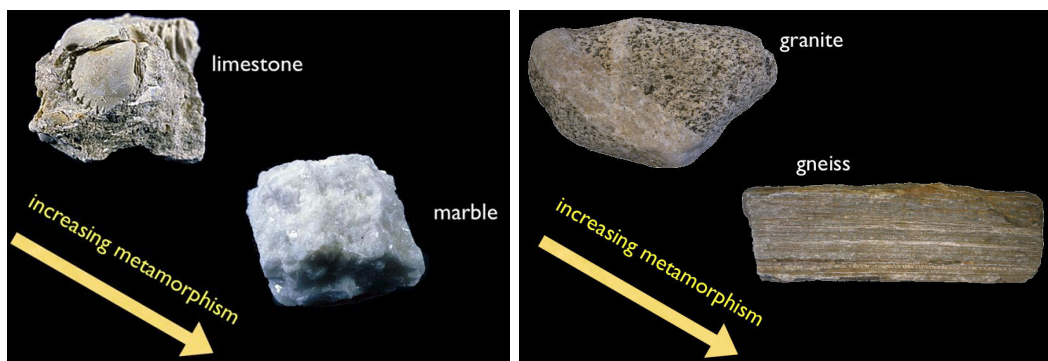
## REGIONAL METAMORPHISM

- Forms over large areas such as mountain ranges
- Formed from INTENSE pressure → crystals are “squished”



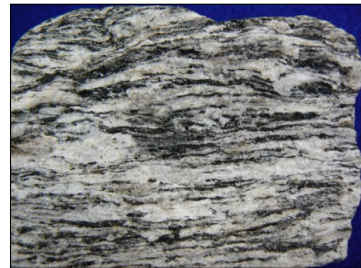
## EXAMPLES

- Type of metamorphic rock depends on “protolith”



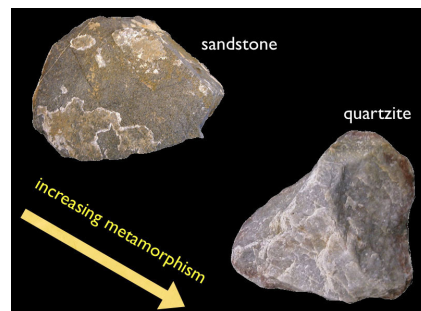
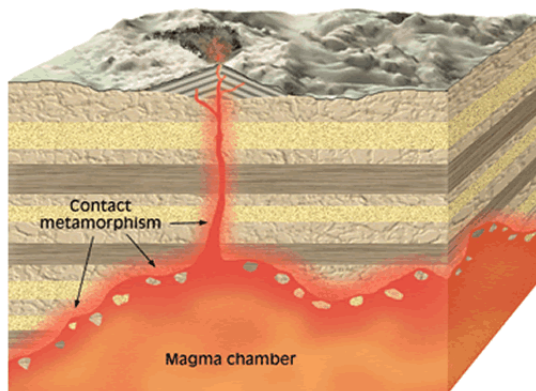
## FOLIATION

- Characteristic of many metamorphic rocks = “foliation”
- Cleavage, banding, banding + grain alignment



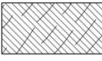
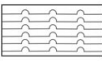
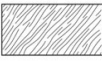
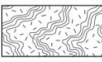

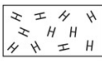

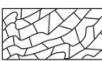

## CONTACT METAMORPHISM

- Elevated temperature without pressure caused by heat of nearby intrusion
- Igneous rock is chilled, country rock is baked (hornfels)





### Scheme for Metamorphic Rock Identification

TEXTURE	GRAIN SIZE	COMPOSITION	TYPE OF METAMORPHISM	COMMENTS	ROCK NAME	MAP SYMBOL
FOLIATED	MINERAL ALIGNMENT	MICA QUARTZ FELDSPAR AMPHIBOLE GARNET PYROXENE	Regional (Heat and pressure increases)	Low-grade metamorphism of shale	<b>Slate</b>	
				Foliation surfaces shiny from microscopic mica crystals	<b>Phyllite</b>	
	Platy mica crystals visible from metamorphism of clay or feldspars			<b>Schist</b>		
	High-grade metamorphism; mineral types segregated into bands			<b>Gneiss</b>		
NONFOLIATED	Fine	Carbon	Regional	Metamorphism of bituminous coal	<b>Anthracite coal</b>	
	Fine	Various minerals	Contact (heat)	Various rocks changed by heat from nearby magma/lava	<b>Hornfels</b>	
	Fine to coarse	Quartz	Regional or contact	Metamorphism of quartz sandstone	<b>Quartzite</b>	
		Calcite and/or dolomite		Metamorphism of limestone or dolostone	<b>Marble</b>	
	Coarse	Various minerals		Pebbles may be distorted or stretched	<b>Metaconglomerate</b>	

## SHEAR ZONES

- Zones of deformed rock across which relative displacement occurred
- Changes: reduced grain size, grain alignment, foliation





# GRENVILLE

- 1.6 billion year old orogen - ancient Himalayas
- “Hot” orogen because granites are rich in uranium

