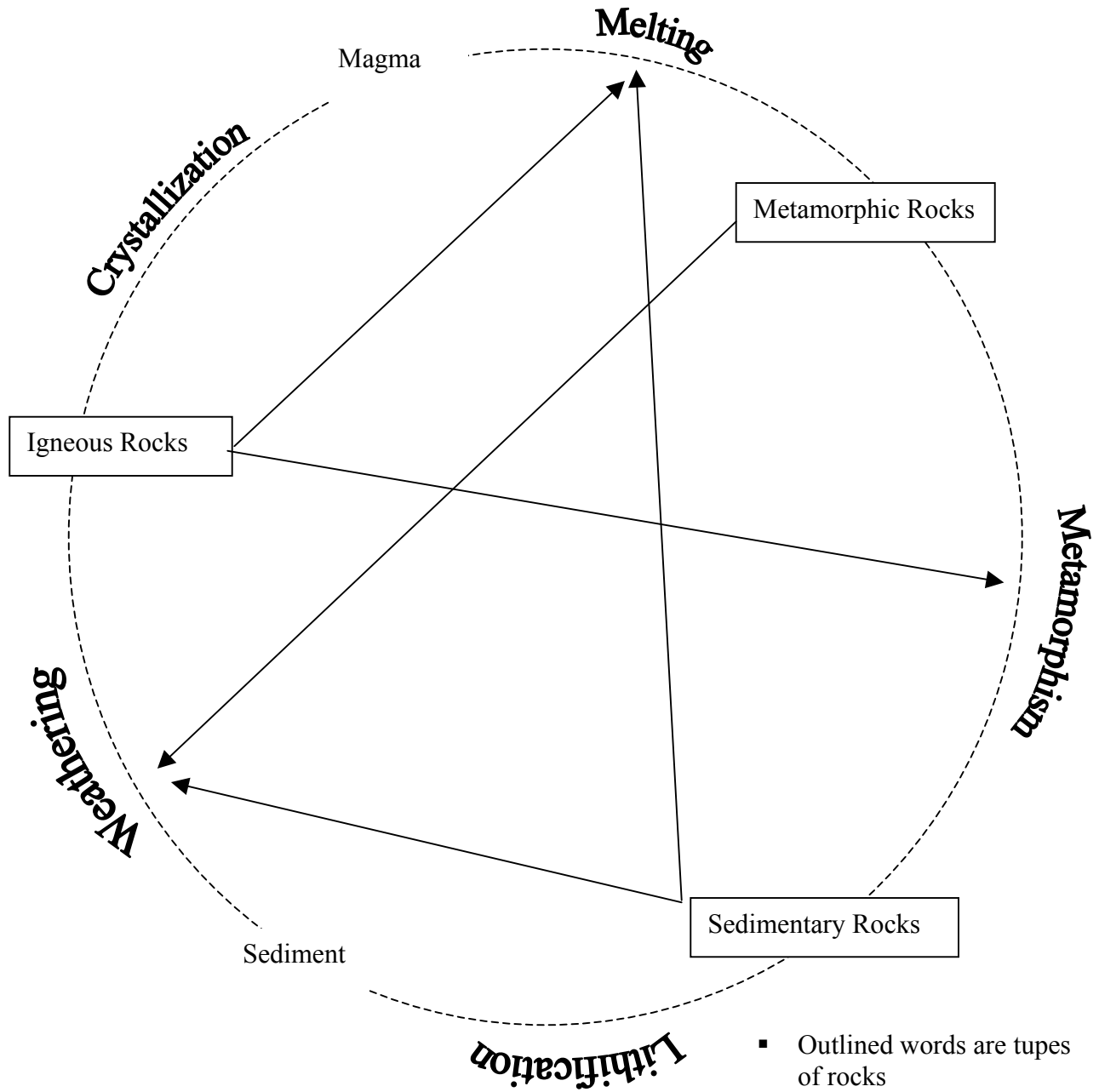


Rock Cycle



- Outlined words are types of rocks
- Words on dashed line are processes
- Magma and sediment are raw materials
- Arrows show direction of processes

Michigan Bedrock

To help understand the characteristics of Michigan's bedrock, it might be useful to briefly review the rock cycle and apply its basic characteristics to the State of Michigan. The **figure** shows the relationship that exist between the various rock types, as well as indicates the pathways that are followed as rock is transformed from one type to another.

All of the world's rocks are grouped into one of three categories based upon the characteristics of their formation. At the top of the diagram is the molten material known as **magma**. It forms beneath the earth's surface but may eventually flow out onto the surface where it is generally known as lava. The cooler temperatures there cause the rock to eventually cool or crystallize.

The cooled magma forms **igneous rock**, the first of the three types. Since igneous rocks seem to be the source of other types, they will be the first discussed. While all igneous rocks originated from molten material, their chemical make up and rates of cooling differed considerably. As a result, they differ in color, specific gravity, texture and composition. Examples of igneous rock are pumice, granite, and basalt.

Regardless of their characteristics, all rocks are subject to the forces of nature and eventually undergo **weathering**, a breakdown by either physical or chemical forces. The **sediments** produced by weathering are the raw materials for other rock, for soils, and for other loose materials that cover the earth's surface.

If it were not for physical and chemical weathering, the earth's continental surface would be solid bedrock without soil or regolith (loose material covering bedrock). The rock materials and sediments resulting from weathering may remain near their point of origin, or they may be transported by water, wind, or ice. Weathered materials may accumulate to a significant depth, often at the bottom of a shallow sea, where either the weight of the overlying material or a chemical process may cement together (**lithification**) to form the second of the major rock types- **sedimentary rock**. Sedimentary rocks are composed of materials or sediments weather from previously existing rock.

Most sedimentary rocks form on the bottom of shallow seas. Later, often as the result of an uplift of the sea floor, those rocks are exposed on land areas well above current sea level. While they represent only a small percentage of the outer layer of the earth known as the crust, they are found as a thin layer over the majority of the earth's continents. Examples of sedimentary rock include sandstone, shale, limestone, gypsum, coal, and salt.

The first rock type, igneous, are rocks that at one time were molten. The second, sedimentary rock, are composed of sediments from pre-existing rock. The third type, **metamorphic rocks**, are rocks that were altered by heat and pressure.

Since metamorphism can alter any of the three rock types, metamorphic rocks vary considerably in texture, composition, and physical appearance. Some of the common types of sedimentary-metamorphic relationships are: limestone to marble, shale to slate,

and sandstone to quartzite. Each of those metamorphic types is generally harder and more resistant to weathering than was the sedimentary counterpart. That relationship is not necessarily true with igneous rocks that have been altered with heat and pressure.

From the figure it is possible to observe the possible transformation process from one rock type to another. Weathering can reduce all rock to sediments, which may then become sedimentary rock. The application of heat and pressure can convert any rock to metamorphic, and the melting of any rock type can convert it back to magma and eventually igneous material.

Points for Class Discussion

Why is the Rock Cycle important to a Watershed?

Depending on what kind of rock and soils are in an area the method of water going into the ground, as well as the amount of time it will take to replenish aquifers changes. Also understanding weathering and erosion are important when trying to control how much sediment is entering our waterways.

What type of rock is most common in the Watershed?

In the LGRW the most common type of rock is sedimentary. This is because of the large sea that used to cover Michigan.

What kinds of soils are in the Watershed?

The soils of the world are divided into 10 orders, we have 6 of them in Michigan. In the LRGW there are primarily three. The most common soil order is the Alfisols, which are found across much of the southern half of the Lower Peninsula. Closest to the surface in these soils is a gray to brown colored layer made up of organic material deposited by deciduous trees. The second most commonly found soil order is the Histosols. These soils are found in poorly drained areas and are made up of organic matter and are also known as peat or muck. They are usually found in swamps, along streams, and in old lakebeds. The third order of soils found in the LGRW is the Spodosols. They are located in the northern reaches of the LGRW. They form where coniferous forests and mixed forests grow.