Geological Origins of Aruba

This exhibition informs you on the origin and geological history of Aruba. Geology is the study of the crust of the earth. By studying the layers of rocks which constitute the crust, processes and events by which the crust is formed can be reconstructed.

The main rock groups are:

1. Igneous rocks, formed from cooling and solidification of magma or lava (volcanic material).

2. Metamorphic rock, a rock formed from a previous existing rock.
   The "transformation" is due to high temperatures and pressure.

3. Sedimentary rock, a rock that has formed as the result of deposition of material derived from other rocks.

All these three types of rocks can be found on Aruba. So by studying the Aruban rocks and the landscape they constitute, we can get acquainted with the major rockgroups and reconstruct the geological history of the island.

Volcanism

Aruba has its origin in volcanic activity 90 to 95 million years ago. Molten rock, known as *magma*, from within the earth flowed out to the surface from cracks in the earth's crust. Once this molten material reaches the surface, it is called *lava*. The natural activity by which lava is produced is called *volcanism*.

Aruba Lava Formation

The volcanic unit on Aruba is called the *Aruba Lava Formation*. Some of the volcanic activity that created Aruba occurred under water.

"Pillow-lava" at Dos Playa

Schist at Wela.

The rocks that were created under water have a distinct form. *Pillow lavas* are round, black rocks that form under water. The most common rocks in the Aruba Lava Formation are diabase, tuffs, conglomerates and schists. *Diabase* is a hard, black rock that is abundant in the Aruba Lava Formation. *Tuff* consists of consolidated ash and characterises violent volcanism.

When the volcano that caused this activity grew above sea level, *sediments* (material that results from weathering and erosion) formed new kinds of rocks. These include *conglomerates*, which consist of fragments from preceeding rocks. Higher pressure or temperatures transformed some areas of the Aruba Lava Formation into metamorphic rocks such as *schist* (a green, sheetlike rock).

Plutonism and the Batholith

Once the volcanism was over, more molten rock flowed out from within the earths crust, but did not reach the surface. This molten material had a different composition than the preceeding material. In a process called *plutonism*, the new molten material solidified within the existing rocks that had been produced by volcanism. This plutonism occurred 85 to 90 million years ago.

We know that the volcanism happened before the plutonism because of the transformation (*metamorphism*) that occurred in the rocks once the new molten material came in contact with them. The “transformed” rocks were originally volcanic, not plutonic. Therefore, we know that these rocks existed before the intrusion of the new molten material. This molten material solidified within the Aruba Lava Forniation and formed a big magmatic body called the *batholith*. Weathering, erosion, and upward movements of the earth have exposed some of the batholith. Today, the batholith constitutes the main part of the Aruban landscape.

The most abundant rock in the batholith is the black and white speckled rock called *quartzdiorite*, which can be found as small pebbles or as big boulders at such places as Ayo and Casibari. Big, round boulders of quartzdiorite arc the result of the way that quartzdiorite weathers, called *spheroidal weathering*. Another rock in the batholith is gabbro, a black, coarse-grained rock found mainly at Bushiribana and Matividiri. The Hooiberg, a very distinct part of the batholith landscape, is made up of a coarse, grained variety of quartz-diorite named *hooibergite*. The most resistant rocks — gabbro and hooibergite — are seen in some of the small hills in the Aruban landscape.

The batholith and the Aruba Lava Formation both contain *dikes* and veins. *Dikes* occur when igneous rock penetrates another rock and creates a sheet-like formation that cuts across the penetrated rock. *Veins* are deposits of foreign minerals within a rock fracture. Gold, such as that found in the roois on Aruba, formed in veins of a hard, white mineral called *quartz.*

Sediments

Limestones are the youngest rocks that make up Aruba and that surround the island's older rocks. Limestone formed after and on top of the older rocks.

Limestone formed very differently than the earlier rocks. Most limestone formed under water in an environment that is similar to the present-day marine environment where coral reefs grow. We know this because fossils found in the limestone are of the same organisms which live nowadays in the coral reef environment. Sediments from the breakdown of coral reefs were deposited on the seaslope, and these sediments consolidated into limestone. Other limestones are ancient sand dunes which have hardened over millions of years.

A combination of upward movements of the earths crust (known as *epeirogenesis*) and changes in sea level caused the limestone to be exposed above sea level. When these processes caused the earth's crust to rise up and remain higher, some limestone stayed above sea level. This resulted in a landscape characterised by terraces. The cliffs of the terraces follow old coastlines, which are very similar to the modern coastline of Aruba. We can identify older to younger limestone in the higher, middle, and lower terraces. The older limestone (higher terrace) is best visible at Rooi Frances. Younger limestone (middle and lower terraces) can be seen at Rincon.

In summary the rocks on Aruba originate from three major events, volcanism, plutonism and limestone formation. The latter is a very different process than the other two.
The rocks produced by these events differ in appearance and in the landscape they constitute. The island is nowadays mainly covered by the black and white speckled plutonic rock called quartzdiorite.

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