# **Description of Nine Boulders In Sangudo Sundial Park**

Geologists divide rocks into 3 classes, (ie. Sedimentary, Igneous and Metamorphic) rocks. Examples of all three classes of rock are present in the Sangudo display. Definitions of these classes follow (see also glossary of terms in the book "Edmonton Beneath our Feet")

#### **Sedimentary Rocks:**

A rock resulting from the consolidation of loose sediment that has accumulated in layers. Generally deposited by water, wind or ice. Examples are sandstone and limestone.

#### **Igneous Rocks:**

Rocks formed by cooling and consolidation from parent liquid rock (called magma). The cooling can take place either rapidly as in the case of lavas in volcanic eruptions, or slowly at various depths within the crust of the Earth, as in the case of granite.

#### **Metamorphic Rocks:**

Rocks that have changed by heat, pressure or chemical reactions at the Earth's crust. Pre-existing rock could be sedimentary, igneous or metamorphic rocks. Examples are schists and gneisses.

The nine boulders are hereby described (their probable provenance is shown on the sign display map). All boulders were eroded and transported by glaciers between 20,000 and 12,000 years ago and melted down out of the glacier ice about 12,000 years ago.







#### Description of Nine Boulders in Sangudo Sundial Park (continued)

It takes the shape of a country grain elevator. The angle of the upper roof slope of the gnomn (casting arm) is 54° 54'. This corresponds with the north Latitude of Sangudo. This allows it to indicate local solar time. On average, the Sangudo Solar Time is about 40 minutes behind MST or 1 hour and 40 minutes behind MDT. The large boulders that mark the time are as follows:

## 1. Boulder on east sign of sign.

Cretaceous sandstone with cross bedding (climbing ripples), which contains some ironstone clasts and plant fragments. The cross bedding indicates that the original top of the horizontal beds is now facing the center of the sundial. The rock was deposited some 70 million years ago at a nearby location (up to a few kilometers away).



## 2. Boulder on west side of sign.

Cretaceous stratified sandstone with clay rip-up clasts. The clay was ripped-up by the currents that deposited the sandstone later. This happened about 70 million years ago. The Cretaceous sandstone boulders were only transported a short distance by the glaciers (probably just a few kilometers).

## 3. Boulder in the 6:00 a.m. position.

Foliated granite from the Precambrian Canadian Shield (originally in the Ft. Chipewyan, AB. and Ft. Smith NWT area). The granite is somewhat metamorphosed, giving the rock a foliation (class is in between igneous and metamorphic, but more towards igneous). Precise age of the rock is difficult to ascertain, but probably older than 1700 million years. The boulder relatively rounded and somewhat polished, which indicates that it experienced some water erosion, possibly at the base of the glacier.

## 4. Boulder in the 8:00 a.m. position.

Quartzitic sandstone of the Precambrian Athabasca Group. Typical purple-reddish colours. The rock shows nice cross-bedding, indicative of flowing water action. The rock was deposited sometime between 1500 and 1650 million years ago.

#### 5. Boulder in the 10:00 a.m. position.

Precambrian gneiss (metamorphic rock). The main minerals visible are quartz, feldspar and biotite. Metamorphic process is indicated by the alteration of quartz/feldspar rich layers and biotite rich layers. Also notice a biotite-rich blob of material. The minimum age of this rock is 1700 million years, but could be considerably older.

## 6. Boulder in the 12:00 p.m. position.

Cretaceous sandstone. This boulder is very well rounded, which was probably an original shape before the glacier incorporated this boulder. The boulder might have been a large concretion with carbonate cement in the original sandstone deposit. The concretion was formed by percolating groundwater with dissolved carbonate. Origin and age are similar to the other Cretaceous sandstone boulders.

## 7. Boulder in the 2:00 p.m. position.

Cretaceous sandstone with cross bedding. The cross bedding indicates that the original top of the horizontal beds is now facing the center of the sundial. The rock was deposited some 70 million years ago at a nearby location (up to a few kilometers away).

## 8. Boulder in the 4:00 p.m. position.

Precambrian Granite. The crystals (quartz, feldspar, and biotite) are generally medium grained (2-3 mm in size), but a few larger feldspar crystals up to 1 cm in size can be observed. The boulder looks very much like granites, which crop out in the Ft. Smith (NWT) area and are called Slave granites. Consequently, its probable age is about 1950 million years. The boulder has one flat, smoothly polished surface and is angular otherwise. The smooth surface was originally at the interface between the bedrock and the glacier and was polished before being incorporated by the glacier by a plucking action. The angular shape indicates that it was carried high in the glacier, without much glacial wear.

## 9. Boulder in the 6:00 p.m. position.

Quarzitic sandstone of the Precambrian Athabasca Group. Typical purple-reddish colours. The rock was deposited sometime between 1500 and 1650 million years ago.

