Manchester Geological Association
Abstracts for Some Aspects of Planetary Geology in the Solar System
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Cosmic Debris – The Geology of Small Bodies in the Solar System

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Small bodies in our Solar System include asteroids and comets. To date, only minute amounts of dust from one asteroid and one comet have been returned to Earth from space missions. Most of our understanding of the geology of small bodies has been obtained from material that falls to Earth in a constant daily rain of meteorites and cosmic dust. Materials from comets and chondritic meteorites include very ancient mineral grains that formed in the protoplanetary disk from which the Solar System formed, as well as material that predates the Solar System. These materials have escaped geological processing on their parent bodies for 4.6 billion years. Most meteorites are from asteroids on which geological processes were active in the first few million years after accretion. These rocks record the action of water and metamorphism, as well as large-scale melting and differentiation of some asteroids into a metallic core and igneous mantle. Meteorites also preserve a record of the effects of impacts on asteroids throughout Solar System history. Altogether, cosmic debris provides us with a wealth of geological information from a wide variety of Solar System materials.

Curiosity at Gale Crater, Mars: lake bed sediments, sand dunes and sulphate veins

Dr Susanne P Schwenzer, Lecturer in Earth Science, The Open University

The Mars Science Laboratory Rover Curiosity landed in Gale Crater, Mars, on the 6th of August 2012. Since then, Curiosity has seen over 1850 Martian sunrises, travelled about 18 km, and most importantly made many important discoveries. Among those discoveries are evidence for flowing water on the Martian surface, mineral alteration, clay formation, and sulfate veins. All this, and the sedimentary structures observed, combine to evidence for a lake bed, for habitable conditions, and a very varied and exciting geologic history of Gale Crater. The talk will look into the discoveries of the evidence for habitability from a geologic and geochemical perspective and also venture into other aspects of the mission, such as the Martian atmosphere.

Flood basalts and explosive volcanism on Mercury and the Moon

David A Rothery, Professor of Planetary Geosciences, The Open University

The Moon and Mercury have very different histories, but they have experienced many of the same volcanic processes. Both have large tracts of plains erupted as ‘flood basalts’ (comparable in volume with Earth’s large igneous provinces), mostly more than 3 billion years ago. On the Moon these were emplaced on top of an anorthosite flotation crust, whereas on Mercury we see little other than older and older flood basalts as we look further back in time.

There is abundant evidence of gas-driven explosive volcanism later in each body’s history. In the case of Mercury this may have continued until less than a billion years ago, and was enabled by the planet’s surprising crustal richness in volatiles.

We hope to learn much more about Mercury when the European-Japanese mission BepiColombo returns data from orbit in 2026.