ROCKS AND LANDSCAPES OF THE SOLAR SYSTEM: AN ACTIVITY FOR THE TEACHING AND SPREADING OF THE PLANETARY GEOLOGY. *Gabriel Castilla[1], Miguel Ángel de Pablo[1,2], Concha López[3].* [1]Seminar on Planetary Sciences. Facultad de Ciencias Geológicas. Universidad Complutense de Madrid. 28040 Madrid. Spain. [2]Área de Geología. Escuela Superior de Ciencias Experimentales y Tecnología. Universidad Rey Juan Carlos. 28933 Móstoles, Madrid. Spain. (depablo@geo.ucm.es). [3]I.E.S. 'María Zambrano'. C/ Alpujarras, 52. 28915 Leganés, Madrid. Spain.

Introduction:

The spatial exploration is providing us a large quantity of information about the composition of the planets and satellites crusts. However, most of the experiences that are proposed in the guides of activities in Planetary Geology are based exclusively on the images utilization: photographs, maps, models or artistic reconstructions [1,2]. That things help us to recognize shapes and to deduce geological processes, but they says us little about the materials that they are implicated. In order to avoid this dicotomy between shapes and materials, we have designed an experience in the one which, employing of rocks and landscapes of our geological environment more next, the pupils be able to do an exercise of compared planetology analyzing shapes, processes and material of several planetary bodies of the Solar System.

Objetives:

The objectives of this activity are three: to approach the students the shapes and materials that we can find in other planets or satellites of the Solar System through the geology of their environment (city, state or country), to take advantage this situation to introduce to the pupils in the recognition of the more characteristic rocks and minerals; and finally, to accomplish a critical exercise of compared planetology taking as base the terrestrial geological model that they can find in different textbooks.

Materials:

To put in practice this activity are needed the following materials: a rocks collection with two samples of each type, landscapes or places photographs where we could find them (for example: the basalts would go accompanied by the photograph of a famous volcano), and a planetary images collection in those which, after consulting the bibliography [3,4,5], we know that we can find rocks or similar minerals. In our case we chose the following materials: sulphur, basalt, andesite, granite, gneiss, limestone, ice of water, sandstone, conglomerate, fine sand and crushed rock that simulates regolite of the Moon (Table 1).

Table 1: Rocks and bodies where they appear.

Rock	Planet and/or Satellite
Sulphur	Io
Basalt	Mercury, Venus, Moon, Mars
Andesite	Mars
Sand	Mars
Conglomerate	Mars
Regolite	Moon
Granite	Venus
Ice of water	Enceladus, Europa

To each one of these materials we assign to him a color that we will paint over the images of the Earth and the other planetary landscapes (Fig. 1). Finally, it will be built a box of where we will keep a copy of each type of rock of the collection.. This box must be totally closed and we will make in it a hole that permit us to introduce the hand in its interior but without seeing its contained.

Description of the activity:

The activity is accomplished in three phases:

1st. The pupil introduces the hand in the box and extracts a sample anyone of all the rocks that contains. After must seek its couple comparing it with the other rocks of the collection. The number and kind of rocks of the collection will vary of some educational levels to other, increasing thus the degree of difficulty. Then, the pupil must classify the sample and to verify thus the color with the one which is associated.

2nd. The pupil seeks between the photographs of the Earth until finding the landscapes or places that has painted the same color that the rock that the pupil extracted of the box. Once the has identified, it described the shapes or the reliefs that observes and interprets the image.

3rd. After, we seek the planetary image that has the same color in order to know in what bodies of the Solar System appears the type of studied rock. Finally, it is compared the existence of the rocks in the Earth and in other planets and satellites in order to know some of their similarities and differences between them.

Some rocks of the collection by the moment only they have been uncovereded in the Earth, like limestones, slates and gneiss. In other cases can include material that we can not find in our planet like crushed rock simulating regolite. In this case the pupil will have to reflect on the training conditions of these materials and the why of its absence in other bodies. In our example we decided to include furthermore ice of water because it is the material that constitutes the crust of many satellites, a characteristic that called the attention of the pupils.

Experiences:

This activity was development with students of Geology of the Obligatiry Secundary Education (17-18 years old) like a complementary activity (together with other [6,7,8]) within a didactic unit on Planetary Geology created by the authors [9]. Moreover, and until this moment, this activity has been presented with great success in the 'III Feria de Madrid por la Ciencia' (III Fair Madrid by the Science) -March of 2002-, and in the XII Symposium on Teaching of the Geology celebrated in Gerona, Spain -July of 2002-.

In the Fair of the Science of Madrid (Spain) the game was used as a scientific spreading tool in order to approach the Planetary Geology to the public (Fig. 2). In this case were proposing to the visitors of our stand that are felt as astronauts exploring the Solar System, since upon introducing the hand at the box could experience the sensation of

touching a rocky sample of other worlds. For many of the attendees them surprised to discover that exist bodies whose crust is basically of ice or of sulphur.

In the Symposium of Gerona (Spain), and in a forum of secondary education teachers [10], this activity was exposed so that the assistant teachers could play, in order to promote this type of activities of introduction to the Planetary Geology in other associations or institutes and of different educational levels.

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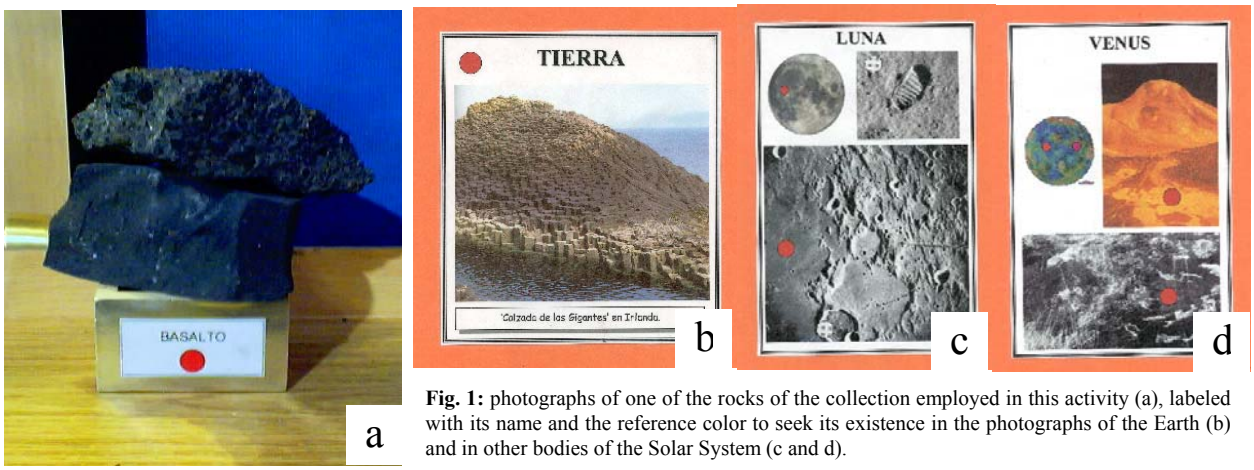

Fig. 1: photographs of one of the rocks of the collection employed in this activity (a), labeled with its name and the reference color to seek its existence in the photographs of the Earth (b) and in other bodies of the Solar System (c and d).

Fig. 2: an example of the development of this Planetary Geology activity by the public during the III Fair Madrid by the Science.