

THE EXPLORER'S GUIDE TO IMPACT CRATERS. F. Chuang¹, E. Pierazzo¹ and G. Osinski², ¹Planetary Science Institute (1700 E. Fort Lowell Rd., Suite 106, Tucson, AZ 85719; chuang@psi.edu; betty@psi.edu), ²Canadian Space Agency (6767 Route de l'Aéroport, Saint-Hubert, Quebec, J3Y 8Y9, Canada; Gordon.osinski@space.gc.ca).

Introduction: Impact cratering is a fundamental geologic process of our solar system. It competes with other processes, such as plate tectonics, volcanism, fluvial, glacial and eolian activity, in shaping the surfaces of planetary bodies. In some cases, like the Moon and Mercury, impact craters are the dominant landform. On other planetary bodies impact craters are being continuously erased by the action of other geological processes, like volcanism on Io, erosion and plate tectonics on the Earth, tectonic and volcanic resurfacing on Venus, or ancient erosion periods on Mars. The study of crater populations is one of the principal tools for understanding the geologic history of a planetary surface. Among the general public, impact cratering has drawn wide attention through its portrayal in several Hollywood movies. Questions that are raised after watching these movies include: "How do scientists learn about impact cratering?", and "What information do impact craters provide in understanding the evolution of a planetary surface?" Fundamental approaches used by scientists to learn about impact cratering include field work at known terrestrial craters, remote sensing studies of craters on various solid surfaces of solar system bodies, and theoretical and laboratory studies using the known physics of impact cratering.

Goals of the E/PO project: We seek to provide students, science teachers, and the public an opportunity to experience the scientific endeavour of exploring impact craters and to understand the process of impact cratering, which is a fundamental geologic process of our solar system. We will do this by creating a series of coordinated E/PO products and integrating them with existing E/PO programs through collaborations with team partners in the educational and museum communities. Our proposed E/PO effort is aligned with National Science Education Standards and current pedagogical methods. It will expose users to the scientific process, investigate the Earth as a planet, and make comparisons to other planets in

the solar system through guided activities, virtual tours of impact craters, computer simulations, and examination of rock samples. The E/PO products created will be used on the internet, in the classroom, and in a museum setting. Teacher training will be provided through established programs by the E/PO partners.

E/PO Components: The proposed E/PO project includes four basic components:

Introduction (web-based) to the science of impact craters and instructions for classroom activities. This will include examples of planetary impact craters (e.g., from the Moon, Mars, Venus, the Galilean satellites) that can be viewed in 3D, and establishment of a "Ask an impact cratering expert" link, which will enroll the expertise of all the Team Members to answer any question submitted through the Website. The introductory material will guide the user to the appropriate interactive and hands-on activities listed below.

Virtual tours (web-based) of selected impact craters including, but not restricted to, the Ries (Germany), Haughton (Canada), and Meteor Crater (Arizona). These tours will include aerial photographs and satellite images, as well as photographs and video footage to be acquired during the actual field exploration of the impact structures by field geologists. The Web site will be interactive, enabling students to select explanations of the mechanisms that produced features observed in the field. Students will also be able to select questions that will be answered by short videos.

Interactive simulations (web-based) showing the dynamics of impact cratering. Students will be able to choose different sets of initial parameters (impact velocity, projectile size, angle of impact, target layout) to see how they affect the model's output. Both early stage (contact and initial excavation of the crater) and late stage (crater collapse and formation of final craters) simulations will be provided. Along with the videos, students will have access to various output results to allow them to connect the simulations

with impact rocks from the kits, the virtual crater tours, and images of planetary impact structures.

Impact crater rocks kits made of samples provided by various Team Members (or purchased, if necessary) that can be checked out by teachers/schools interested in including the study of impact craters in their science curricula. These rock kits will also be included in planetarium exhibits.

Current Status: At this time we have activated “The Explorer’s Guide to Impact Craters” website that can be reached at:

<http://www.psi.edu/explorecraters/>

The front page is shown in Figure 1. The website is still under construction, and various links are not active yet. An example of virtual tours is already available in the virtual tour of the Haughton impact structure. The tour can be carried out by clicking on the various stops of the red-contoured tour outline (Fig. 2). The various stops will include photos and movies showing the area investigated. Rock samples are shown as pictures and in selected cases are incorporated into the Impact Rock Kits.

Audience: This E/PO program targets students in grades 5-12, K-12 science teachers, and the public through a presence on the internet and collaborations with established E/PO projects, including those of the Adler Planetarium and Astronomy Museum. Ultimately, this effort links research scientists with expertise in planetary geology, educators and the E/PO community, students, and the general and museum-going public.

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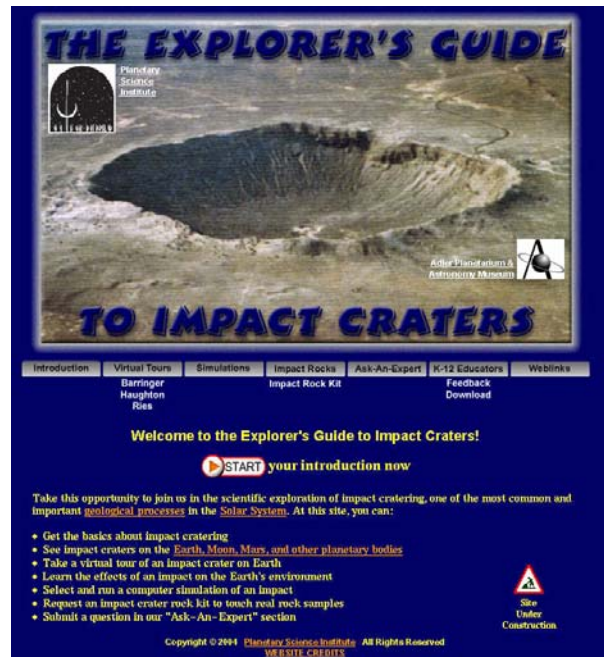


Figure 1. Front page of the “Explorer’s Guide to Impact Craters”.



Figure 2. Map of the Haughton virtual tour.