Meteoritics & Planetary Science 9, Nr 2, 167–168 (2004)
http://meteoritics.org

Proceedings of the workshop, Impact cratering: Bridging the gap between modeling and observations

Understanding the process of formation of an impact crater is a complicated problem that requires a highly interdisciplinary approach. Over the past few years, significant progress has been made in several key areas of impact studies; however, in some respects, there is still a disconnect among groups employing different approaches. This pertains, in particular, to modeling versus observations. In February, 2003, approximately 60 scientists gathered at the Lunar and Planetary Institute in Houston, Texas, USA for a workshop titled "Impact cratering: Bridging the gap between modeling and observations." The workshop was designed to bring disparate groups together for an open dialogue to address outstanding questions about the impact process and to set future research directions. Abstracts, session summaries, transcripts, and presentations can be accessed at the workshop Web site at http://www.lpi.usra.edu/meetings/impact2003. The site contains a link to an open forum devoted to the impact cratering process. The workshop summary also includes recommendations for future efforts to build upon the momentum generated by the workshop.

This special issue of *Meteoritics & Planetary Science* is devoted to the proceedings of the impact cratering workshop. Like the original abstract submissions to the workshop, "modelers" were encouraged to address the question of what observations would better constrain their models, while "observationalists" were encouraged to discuss how their observations can constrain modeling efforts. Contained within, are ten papers that span the full range of impact studies, including field work, sample analysis, experimental work, numerical modeling, and planetary studies.

The first two papers of the issue are primarily broad review papers. The issue opens with the Barringer Award paper by Bevan French, titled "The importance of being cratered: The new role of meteorite impact as a normal geological process." The paper presents an historical overview of how impact studies have moved from an interesting oddity of the geosciences to a recognized position as a major influence on Earth's geological and biological evolution. The paper summarizes a variety of ways that impact studies have influenced studies in other areas of the geosciences such as the mining industry and the study of major extinction events. The Grieve and Therriault paper, titled "Observations at impact structures: What constraints have they provided on cratering processes," presents a review of how observations of terrestrial impact structures have influenced our understanding of the cratering process. For simple craters, complex craters, and impact basins, constraints are discussed for crater shape, the formation process, shock metamorphism, and ejecta processes.

The next four papers discuss different aspects of the response of rocks to the extreme conditions of an impact event. Collins, Melosh, and Ivanov evaluate approaches for accurately simulating damage and deformation in numerical models in their paper titled "Damage and deformation in impact simulations." In particular, they address how results of numerical models that have cell sizes too large to directly include small-scale effects are related to field observations. In "Dynamic tensile strength of terrestrial rocks and application to impact cratering," Ai and Ahrens summarize laboratory experiments designed to empirically determine dynamic strength parameters that are critical for modeling. Kearsley and colleagues' paper, titled "Early fracturing and impact residue emplacement: Can modelling help to predict their location in major craters?," investigates where to look for a signature of the impactor in large, possibly eroded, terrestrial impact structures. They indicate that basement fractures may be good locations for looking for impactor residue, and they suggest that modeling fracture development in large craters may help locate impact residues. In the paper titled "Structural evidence from shock metamorphism in simple and complex impact craters: Linking observations to theory," Dence uses shock metamorphism data from a variety of simple and complex Canadian impact structures to constrain various aspects of the impact process.

Spray, Butler, and Thompson also focus on a Canadian impact structure, Sudbury, in "Tectonic influences on the morphometry of the Sudbury impact structure: Implications for terrestrial cratering and modeling." They emphasize the importance of integrating ground-based field work with remote sensing data for understanding large exposed terrestrial craters and provide good constraints for modeling efforts. The next two papers focus on different aspects of ejecta emplacement. The paper by Anderson, Schultz, and Heineck, titled "Experimental ejection angles: Implications for the subsurface flow field during oblique impacts," provides experimental results for the flow field of an oblique impact and discusses limitations associated with simple analytical models of the flow field. Onose and Fujiwara

present experimental results designed to simulate aspects of the ejecta process on small porous asteroids in "Mass-velocity distributions of fragments in oblique impact cratering on gypsum." In the final paper of the volume, titled "Marine-target craters on Mars?: An assessment study," Ormö and colleagues assess the possibility of identifying potential marine cratering on Mars from a combination of theoretical calculations, numerical studies, and observations of terrestrial impacts in marine environments.

We wish to thank the authors, the *MAPS* staff, and the many dedicated reviewers that made this special issue possible. We are also grateful to all the workshop participants that contributed to a vibrant and exciting workshop. Convening the workshop and putting together this special issue has been a thoroughly enjoyable (but time-consuming!) experience. We hope that it was successful in promoting a renewed spirit of cooperation and coordination amongst impact investigators that will continue forward into the future.

Elisabetta Pierazzo
Planetary Science Institute
1700 E. Fort Lowell Road, Suite 106
Tucson, Arizona 85719
USA

Robert Herrick
Lunar and Planetary Institute
3600 Bay Area Boulevard
Houston, Texas 77058–1113
USA