

PREFACE

HEDS-UP (Human Exploration and Development of Space–University Partners) conducted its second annual forum on May 6–7, 1999, at the Lunar and Planetary Institute in Houston. This year, the topics focused on human exploration of Mars, including considerations ranging from systems analysis of the transportation and surface architecture to very detailed considerations of surface elements such as greenhouses, rovers, and EVA suits. Ten undergraduate projects and four graduate level projects were presented with a total of 13 universities from around the country. Over 200 students participated on the study teams and nearly 100 students attended the forum meeting. The overall quality of reports and presentations was extremely high, with most projects requiring that the students dig into space systems concepts, designs, and technologies in detail. University team outreach projects also reached approximately 1500 people through articles and Web sites developed by the students. Several of the teams had NASA or industry mentors and included visits to NASA centers as part of their class activities.

Awards were made to the three top undergraduate teams and the top team of graduate students. The first-place award went to a team from Wichita State University, Wichita, Kansas. Their faculty advisor was Dr. Gawad Nagati of the Department of Aerospace Engineering. Second place went to a team from the California Institute of Technology, Pasadena, California, with Dr. James Burke of the Jet Propulsion Laboratory as advisor. Third place was awarded to the University of Houston in Houston, Texas, where Dr. David Zimmerman was the faculty sponsor. The graduate award was made to a team from the University of Maryland, College Park, Maryland, under the sponsorship of Dr. David Akin.

Besides presenting their study results at the forum, the students were updated on exploration themes by NASA or NASA-related personnel who discussed current projects or views of human exploration. John Young gave a keynote address, recounting his lunar missions and encouraging the students to focus on the exploration of space as one of the key steps to preserving the future of humans on Earth. Steven Hoffman (JSC/SAIC) discussed current NASA concepts for the “surface mission,” the set of activities that astronauts on Mars will undertake on early missions. George Parma (JSC) described the Transhab project, an inflatable habitat for the International Space Station and the human exploration of Mars. Dean Eppler (JSC/SAIC) discussed the recent field projects to define requirements for Mars EVA suits. Ron White (National Space Biomedical Research Institute) concluded the presentations by describing efforts underway to understand the adaptation of people to space in the context of missions to Mars. Steve Squyres (Cornell University) contributed an invited talk on recent findings from robotic missions and plans for subsequent robotic exploration of Mars.

The papers resulting from the investigations are collected in this report, along with selected contributions from invited speakers. These reports also are available on the HEDS-UP Web site (<http://cass.jsc.nasa.gov/lpi/HEDS-UP/>).

Many good comments about the program have been received, which will be used to improve and strengthen the program. Participants asked for mechanisms for greater interaction between the participating universities and between the universities and NASA. The Web site will be used next year to provide these linkages. An expanded program will be conducted next year, with up to about 20 university teams.

Two aspects of the university program bear special mention. Many of the concepts developed in the student design studies should be of considerable interest to NASA engineers and managers as missions to Mars are contemplated. HEDS-UP will work to make sure that the students’ work is considered by NASA. The other aspect of interest is the outreach programs conducted by the universities, which included public Web sites, presentations to university and public audiences, and visits to elementary-school classrooms. Conservatively, 1500 additional people were directly reached by the outreach activities of the university teams.

HEDS-UP is off to a good start in building communities of interest in universities dedicated to advancing the human exploration of space. We are thankful to the sponsors of the project, particularly Lewis Peach of NASA's Office of Space Flight, for the opportunity to conduct the program. We thank all of the universities who participated so enthusiastically in the forum and for their work. And we thank the efforts of the LPI staff, who made the forum run smoothly and effectively.

*Michael B. Duke
Houston, Texas
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Nancy Ann Budden (Lunar and Planetary Institute) displays the first-place plaque awarded to the team from Wichita State University, Wichita, Kansas.



Nancy Ann Budden and Mike Duke (Lunar and Planetary Institute), Joyce Carpenter (NASA Johnson Space Center), and Lewis Peach (NASA Headquarters) meet with instructor and students from the University of Southern California.