basalts or other igneous rocks, the interpretation of the volcanic evolution on Mars would be very different from current models. The disadvantage to the approach of landing on a homogeneous unit, such as the ridged plains, is that the measurements would be primarily for a single rock type (but of known geologic context) and would not address questions of compositional diversity on Mars.

The second approach is to select a site that potentially affords access to a wide variety of rock types. Because rover range is limited, rocks from a variety of sources must be assembled in a small area for sampling. Sedimentary deposits, such as channel deltas, derived from sources of various ages and rock types, potentially afford this opportunity. For example, a site in southeast Chryse Planitia (19.3°N, 35°W; –1.5 to –1.0 km elevation) is on outwash plains from Ares, Tiu, Shalbatana, and Simud Valles. Headwind regions for these channels include assemblages of ancient crust (Noachian plateau material) and Hesperian ridged plains, as well as modern eolian deposits indicated by local wind streaks. This general approach is demonstrated in Death Valley, where landing site studies were conducted, simulating Mars. A randomly located "touch down" was made on the Furnace Creek alluvial fan. Within a 1-m radius of the landing site, samples of rock included basalt, rhyolite, diorite, quartzite, limestone, and siltstone; within a 2-m radius, additional rocks included sedimentary breccia, carbonate siltstone, and gabbro. All these rocks were transported from the surrounding mountains. Although Death Valley is not a complete analog to Mars, the area shows that alluvial fans and river mouths may be good sites to collect a wide variety of rocks. The disadvantage of this approach on Mars is that the geological context of the rocks in the deposit is not known, and the compositions of the potential contributing source units must be inferred.

Regardless of the approach taken in site selection, the Pathfinder site should include eolian deposits and provisions should be made to obtain measurements on soils. It is important to note the fundamental difference between dust (known to exist on Mars) and sand (suggested to exist). Martian dust is <10 μm in diameter and is settled from suspension. The dust is probably derived from a wide variety of sources and is thoroughly mixed through repeated cycles of global dust storms. As such, dust represents a global "homogenization." In contrast, sand is deposited from transport in saltation and reflects mostly local and regional sources upwind from the site. Sand grains are probably a few hundred micrometers in diameter or larger. Wind streak orientations and general circulation models of the atmosphere provide clues to the sources for sand. In addition to sand and dust, soils may include material derived from local weathering. Thus, it is desirable to be able to handle and analyze all three potential components of martian soil: dust, sand, and locally weathered material.

Tests conducted in March 1994 at Amboy lava field in the Mojave Desert with the Russian Marsokhod rover provide insight into the scientific use and operation of small rovers. The range was <100 m and the imaging system was limited in resolution. "Descent" images (a series of progressively higher-resolution images from orbital scales down to ~20 cm/pixel) were available for planning the science tests and rover operations. Initial results indicate (1) without the context provided by the descent images, the geologic setting of the site would have been difficult or impossible to determine (Pathfinder, for example, will not have descent imaging); (2) the low height (~1 m) of the stereo camera on the rover gives a different perspective of the terrain than is obtained from standing in the field; (3) the stereo imaging system developed for navigation by the rover was inadequate for most science analyses; and (4) the use of a simulated hand lens (×10) and microscope (×100) was extremely valuable for analysis of sand, dust, and rock samples.

Based on these considerations, a recommended approach for selecting the Mars Pathfinder landing site is to identify a deltaic deposit, composed of sediments derived from sources of various ages and geologic units, that shows evidence of eolian activity. The site should be located as close as possible to the part of the outwash where rapid deposition occurred (as at the mouth of a channel), because the likelihood of "sorting" by size and composition increases with distance, decreasing the probability of heterogeneity. In addition, it is recommended that field operation tests be conducted to gain experience and insight into conducting science with Pathfinder.

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OBSERVATIONS BY THE MARS '94 ORBITER AND POSSIBLE CORRELATIONS WITH MARS PATHFINDER.

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The Mars '94 spacecraft will still be operational when Mars Pathfinder begins its observations. While it will probably not be possible to detect the lander directly, the terrain, including the landing error ellipse, can be covered in high resolution (10 m) in various color bands. The stereo capability of the high-resolution camera will provide a three-dimensional terrain map. The landing site of Pathfinder could possibly be chosen so that correlated observations of IMP and the remote sensing instruments onboard Mars '94 may be possible. We will discuss this scenario based on the presently adopted Mars '94 orbit and resulting enhancements stemming from correlations of data obtained by both spacecraft.

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POTENTIAL LANDING SITES FOR MARS PATHFINDER.

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The last successful landing on Mars occurred in 1976 with the Viking mission. In the ensuing years, much has been learned about Mars and the characteristics of its surface. In addition to a better understanding of the geological evolution of Mars, new techniques for processing available data have emerged, new data have been acquired, and the engineering approaches for placing spacecraft on the surface have evolved. Selection of the Mars Pathfinder landing site must take these issues into account, along with mission constraints. In addition, consideration should be given to complementary sites chosen for the Russian Mars '94/'96 lander. The Mars '94 mission will establish a network of two small stations and two penetrators (Table 1) in Arcadia Planitia. Sedimentary and volcanic deposits are characteristic of the northern and southern regions respectively.