SUMMARY

The human race has been intrigued with the Red Planet since the ancient time of the Babylonians. During the 17th century the telescope was invented and drastically changed the way Man viewed the planet. Early astronomers began mapping out rough predictions of the surface of Mars. As technology advanced, the maps became more detailed and accurate. The early greatest contribution to the map design was from the early Mariner Missions. These missions provided scientists with the first close range photographs of the surface Mars, previously only viewed with high power telescopes, to produce topography maps. Further advances in technology, such as the current Mars Global Surveyor, allow for the different properties of Mars to be mapped out. These properties include 3-D terrain contours, magnetic fields, and radiating heat. These maps are crucial to missions, giving scientists a pictorial representation of the various and optimal points available for current and future Mars missions.

INTRODUCTION

Man has been intrigued by Mars for many centuries, peering into the night sky at the Red Planet with awe. As early as the Babylonian time period, there has been interest in Mars. There are many documented sources of drawings and maps that depict the surface of Mars long before space flight and high-powered telescopes became a reality. In the 1970s these maps became much more detailed with the pictures obtained from the early Mariner missions. Today, it is possible to map the elevation changes in terrain, the fluctuating magnetic field, and other properties with the advanced technology available. Maps play an extremely important role in the exploration of Mars. They provide the necessary information when studying land structures and areas on the surface. But more importantly, the maps allow scientists to determine the optimal area to land missions for
EARLY HISTORY

With the invention of the telescope in the 1600s, space exploration experienced a large improvement (“The 1600s”). Astronomers viewed distant stars and planets with more detail and accuracy. The possibility of viewing the Red Planet was now much more a reality. These early astronomers witnessed dark spots on the face of the planet, and began to record their findings (“The 1600s”). These primitive maps were the first to chart out formations on the Red Planet. With improvements in the telescope through the centuries came more detailed observations of Mars. Polar ice caps and planetary cloud cover was noticed as early as the 19th century (“The 1800s”). One noted scientist, Richard Anthony Proctor published a map in 1867, as seen in Figure 1. He labeled the dark and light spots as oceans and continents. His choice as zero meridian is still the accepted meridian to this day. The major improvements in the mapping of Mars would happen decades later, in the middle of the 20th century.

ADVANCEMENTS IN MAPPING TECHNIQUES

During the 1960s and 70s with the multiple Mariner missions and powerful telescopes available, scientists were able to gather a great deal of photographic information of the surface of Mars. The first close range pictures of Mars were captured by the Mariner 4 mission in the year of 1965, obtaining pictures that detailed a few of the planet’s craters, see Figure 1 (“Mariner 4”). Mariner 6
During the three-year span of 1976-79, the two Viking Orbiters made high resolution a
realization. The Orbiters were able to photograph the total surface with medium and high
resolution, see Figure 3. Astronomers created a photomosaic of the gathered photos from
the above mentioned missions. The photomosaics
created from the earlier mission pictures had a relatively
high distortion rate, due to the Observers elliptical flight
pattern. This pattern caused for pictures to be obtained
at different distances from the surface (1500 to 5000km),
and thus different ranges of pixels. The pictures from
Mariner 9 were combined with a geometrically
transforming computer simulation to change all the
pictures to a common size and range. This allowed for a
detailed and accurate pictorial map to be produced
(Batson).

NASA soon followed with the Atlas of Mars:
1:5,000,000 Map Series in the late 70s. The photos gathered from the various missions
were compiled into one book to create a detailed representation of Mars. Once all the
photos were arranged in the correct arrangement, NASA created a systematic
nomenclature to identify the different regions. They divided the entire map into thirty
sections, or quadratures. Each quadrature name was based on telescopically observed
markings from history. Along with the quadrature name, each region received a number
(between one and thirty). This quadrature number is preceded by “MC” which represents
Mars Chart. For example, the northern pole is represented as Mare Boreum (MC-1),
while the southern pole region is represented as Mare Australe (MC-30). All points on
the surface of Mars fall within one of the quadratures. The photomosaic created in the
70s for their mapping system is still used today for control feature placements on maps
(Batson).

Shaded relief maps were created from the photomosaics to produce a more visible
contrast. These maps were created by airbrush techniques from copying the detail of the
photomosaic. The shaded relief maps were then combined with contour lines and
formation nomenclature to create the first Topographic Maps of Mars. These maps
showed the greatest detail as that time period. For many years, these maps served as the
primary source for scientists to determine optimal areas for landing sites (U.S. Geological
Society).
Camera (MOC). Each instrument provides scientists with valuable information about Mars (Views).

The Mars Orbital Laser Altimeter collects information regarding the vast range of altitudes across the planet, and records the topology of the surface. A laser altimeter functions by sending laser beams to the surface and recording the amount of time it takes the reflection beam to reach the instrument. This information is collected as the MGS orbits Mars, and is compiled to construct extremely detailed and accurate topology maps. The maps created by MOLA give great insight into the terrain, much more accurate than the previously available shaded relief maps. The Thermal Emission Spectrometer scans for heat near the surface and is able to map the atmosphere structure, weather, and the mineral compositions present across the planet. The Magnetic Field Investigation instrument is capable of reading the magnetic field at all points around the planet by sending radio waves and measuring the Doppler shift caused by presence magnetic forces. The Mars Orbital Camera produces photographs of the surface similar to the Mariner missions, but with greater resolution.

The MGS mission is to operate for approximately two years collecting information for the scheduled missions of 1998 through 2003. It is expected that this mission will gather at least 30,000 control points that allow scientists to recreate and add on to existing topography maps (Views, Duxbury).

CONCLUSION

Man has been fascinated with Mars for many centuries. Until recently, they used primitive equipment to view the surface and performed calculated rough predictions. With the invention of telescopes, the predictions and drawings became more accurate but were still in the infantile stage. High powered telescopes, space flight, and computers invented in the mid 20th century allowed scientists and astronomers to greatly improve their understanding of the Red Planet. Maps became more detailed and accurate with the multiple missions and orbiters sent to Mars. Continued technological advancements and
WORKS CITED


Views of the Solar System. “Mars Global Surveyor: NASA Mars Orbiter.” February 2,
Photo Credits

Figure 1. *Exploring Mars: The Starting Point for Exploring Mars on the Internet*,
http://www.exploringmars.com/images/old/proctorchart_m.gif

Figure 2. National Space Science Data Center.
http://nssdc.gsfc.nasa.gov/imgcat/html/object_page/m04_02f.html

Figure 3. National Space Science Data Center.

Figure 4. GSFC/NASA. http://planetscapes.com/solar/browse/mgs/mgstopo7.jpg