TOMATOSPHERE™

Mars: An Introduction

Exploring Mars
It is thought that Mars, our nearest planetary neighbor, will supply a number of answers to the questions we still have about the formation of the solar system, Earth's geology and atmosphere, and possibly the origins of life. Any conclusive evidence we find of the presence of life elsewhere in the universe will have very great scientific and social consequences.

Scientists want to prepare the way for human exploration in a foreseeable future. And they would like to answer the most intriguing question of all: is there, or was there ever, life on Mars?

Since the surface of planet Mars is most likely sterile due to high levels of radiation, surveys for traces of life forms and fossils will be done below the surface, in areas protected from radiation. Some scientists also hope to find ice or permafrost under the surface.

The Environment of Mars
Although Mars has an atmosphere, it is unfriendly toward life as we know it on Earth. Mars is smaller than Earth in diameter; this results in a lower force of gravity - only about 1/3 of the gravity of Earth.. If you weigh 150 lbs on Earth you will only tip the scales at about 50 lbs. on Mars … with no dieting! Partly as a result of the limited gravity on Mars much of the atmosphere of Mars has drifted away. With little atmosphere, and no ozone layer, there is less protection from the ultraviolet (UV) radiation of the sun, which is very harmful to life. This is similar to situations on Earth when living things are exposed to high concentrations of UV rays which produce "sunburn"; this is of greater concern in areas where there is a "hole" in the ozone layer, allowing increased levels of UV penetration to the surface.

Although the length of the Martian day (24 hours and 37 minutes) and the tilt of its axis (25 degrees) are similar to those on Earth (24 hours and 23.5 degrees, respectively), the orbit of that planet around the Sun takes almost twice as long as Earth. As a result, a Martian year is about twice as long as an Earth year and the seasons are each twice as long as those on Earth.

TOMATOSPHERE™

The atmosphere is composed mainly of carbon dioxide (95.3%), nitrogen (2.7%), and argon (1.6%), with small amounts of other gases. Oxygen, which is so important to us on earth, makes up only 0.13% of the atmosphere at Mars and there is only one-fourth as much water vapor in the atmosphere.

Component	Earth*	Mars*
Carbon Dioxide	0.038%	95.3%
Nitrogen	78%	2.7%
Oxygen	21%	0.13%
Oxygen (Argon)	0.93%	1.6%
Water Vapor	1.0%	0.25%
*figures may not add up to 100% due to rounding.		

This means that the temperature at the surface is very cold. Surface temperatures range from -113°C at the winter pole to above 0°C at the equator on the dayside during summer. The surface pressure averages about 1/100th that at the surface of the Earth.

In previous years in the Tomatosphere™ Project (2009) the tomato seeds used in the experiment were subjected to a simulation of the Martian surface environment for a period of one week. The temperature in the simulator was approximately -50°C, with a 95% concentration of CO_2 and an increased intensity of ultraviolet light, similar to that found on the surface of Mars. The pressure in the simulator was 0.6 kilopascals (kPa), compared to Earth which averages 101.32 kPa. This exposure simulated a situation whereby the seeds were "left outside" on the surface of Mars.

More Information on Mars

Mars has had a tremendous amount of interest in the past, from speculation about its "canals" to exploration from satellites and robots on the surface, to a book (and subsequent movie – "The Martian"). NASA plans to send more robots to Mars and collect surface samples to be brought back to Earth for study. SpaceX (which takes the Tomato seeds to and from the International Space Station) may also visit Mars in the near future.

Students will find many opportunities to enhance their knowledge of the Red Planet from numerous sites on the internet which are devoted to the study of Mars and educating the public about its properties and possibilities.