

The Physical-Based Definition of a Planet

Mark V. Sykes
Planetary Science Institute

Categorization of observed objects is commonly based on shared physical characteristics. New knowledge gathered over decades of robotic exploration of the solar system has revealed ongoing geophysical processes on many worlds that we also experience on the Earth. By learning more about these processes as they are manifested under different conditions throughout the solar system, we gain better understanding of how they work on Earth as well - a major benefit of our investment in solar system exploration. From a geophysical perspective, Earth is the object to which all planetary bodies are referenced, and an Earth-like body is the ultimate grail in the search for planets about other stars. An examination of bodies in our own solar system show that terrestrial processes correlate with objects being round. This is likely the consequence of being the point at which internal temperatures become sufficient to trigger differentiation, the release of volatiles and the advent of geology. This motivates a simple definition for planet that focuses on roundness as an indicator of the existence of terrestrial-related processes. Applied to our own solar system, the immediate number of planets increases to 12 and opens the door to future discoveries of more.