

The Beginning of After: Using Asteroids and the Moon to Explore Planet Formation and Early Solar System History

W. F. Bottke (1)

(1) Southwest Research Institute and NASA Lunar Science Institute, 1050 Walnut St, Suite 400, Boulder, Colorado 80302, USA (bottke@boulder.swri.edu)

The physical nature, distribution, formation, and evolution of asteroids are fundamental to our understanding how planet formation occurred. In our Solar System, asteroids (and comets) are the most direct remnants of the original building blocks that formed the planets. As such, they contain a valuable record of the initial conditions that existed in our solar nebula 4.6 Gyr ago. The bodies that survived the planet formation era, however, have experienced numerous collisional, dynamical, and thermal events that have shaped their present-day physical and orbital properties. Interpreting this record via observations, laboratory studies of meteorites, and theoretical/numerical modeling can tell us much about how the bodies in our Solar System have evolved with time. In fact, even though asteroids represent only a tiny fraction of the total mass of the terrestrial planets, their large numbers, diverse compositions, and orbital/size distributions provide powerful constraints for planet formation models.

Interestingly, many of the same issues can also be explored using the Moon, which is unique in the Solar System. It is the only object that is both relatively accessible and still bears scars, through its bombardment record, from practically every epoch of solar system formation. This is both a challenge and a blessing. It is a challenge because to probe the Moon's complex bombardment history, we need to understand the formation and evolution of the solar system as a whole. It is a blessing because the Moon is an irreplaceable resource for the study of events that have shaped the Earth and other planets. To understand the Moon we must study the planets, and to understand the planets, we must study the Moon.

In my talk, I will explore how the histories of asteroids and the Moon are linked together, and how both can be used in tandem to glean powerful new insights into how the Earth and our system of worlds has evolved.

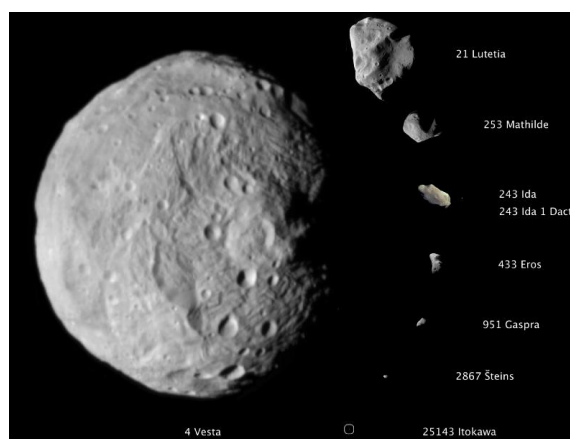


Figure 1: Asteroids: The battered remnants of planetesimals that may have formed in many realms of the Solar System.



Figure 2: The Moon: A "Rosetta Stone" that can be used to interpret the history of Earth as well as Solar System worlds in general.