ONSET OF AN "EARLY HEAVY BOMBARDMENT" OF THE INNER SOLAR SYSTEM. S.J. Mojzsis[1,2], R. Brasser[3] and S. Werner[4], [1]Collaborative for Research in Origins (CRiO), Department of Geological Sciences, University of Colorado, 2200 Colorado Avenue, Boulder, Colorado 80309-0399 USA (mojzsis@colorado.edu), [2]Institute for Geological and Geochemical Research, Research Center for Astronomy and Earth Sciences, Hungarian Academy of Sciences, Budapest, Hungary, [3]Earth-Life Science Institute, Tokyo Institute of Technology, Meguro-ku, Tokyo, Japan, [4]Centre for Earth Evolution and Dynamics, University of Oslo, Norway.

Nectarian, Tolstojan and Noachian (pre-3900 Ma) terranes are the oldest and most heavily cratered on the Moon, Mercury and Mars, respectively. The latter two have crater densities vs. time comparable to the ancient highlands of the Moon as established from direct sampling in the Apollo and Luna missions; all three bodies were heavily bombarded during the first 600 Myr of the Solar System. Post-formation accretion impact bombardment has been suggested to follow a "Sawtooth" intensity profile, but its precise timing remains elusive. From high-precision U-Pb zircon and apatite-merrillite-whitlockite geochronology of lunar rocks, martian and Vestoid and other asteroidal meteorites, NASA MSL Curiosity radiometric age estimates and an updated martian crater chronology, we show that the inner Solar System experienced not one but two intense episodes of bombardment well after the primary formation stage of the terrestrial planets. From the thermal and mechanical records of impact re-setting of U-Pb systems on the Moon, Mars and Vesta, we determine the onset of the Early Heavy Bombardment (EHB) to be at ca. 4240 Ma. This "Early Heavy Bombardment" lasted about 200 Myr, and culminated in the "Late Heavy Bombardment" (LHB) at 3950-3850 Ma. We argue that this double profile was caused by an episode of late giant planet migration followed by depletion of impactor sources (left-over planetesimals, E-belt and Main Belt asteroids, in that order). The LHB principally tapped the innermost (E-Belt) region of the asteroid belt. The age of the EHB pushes the surface age estimates of Mars and Mercury back by another 200 Myr from current estimates.