Impact cratering processes on Earth: Links to environmental change

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Collisional effects in our Solar System are now widely appreciated as having contributed to fundamental planet-building and planet-modifying processes throughout geological time. The strain rates at which impact events take place are exceptional relative to the timescales of most geological processes with which we are familiar. Hypervelocity impact can cause intense shock loading resulting in melting, vaporization and even plasma formation in target rocks. Beyond the >50 GPa contact and the compression locus, shock waves cause local melting and solid-state phase transformations with the creation of new structural states and mineral polymorphs. An overview will be presented with emphasis on terrestrial impact cratering. A record of approximately 200 impact structures are now proven on Earth, which is a shadow of its true historical inventory. This paucity of craters is due to Earth being an active planet and it having erased the majority of past impact evidence due to plate tectonics, volcanic activity, burial and erosion. Nevertheless, valuable examples have survived: we will tour some of them and explore the intriguing products of hypervelocity impact as we strive to understand these extreme processes. Via geochronology, we will also link the timing of impact crater formation with the stratigraphic record and explore two case studies: the Late Ordovician and the Jurassic-Cretaceous boundary, both which coincide with periods of global environmental stressing.

Abridged BIO

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John is Director of the Planetary and Space Science Centre at the University of New Brunswick. He currently manages a research team of eight, comprising research scientists, engineers, graduate and undergraduate students and staff. The team's research activities focus on investigating planetary materials, frictional melting, impact cratering mechanics, the geology of the Moon and Mars, and processes associated with hypervelocity impact and shock effects. He currently directs the Canadian (International) Regional Planetary Image Facility (RPIF), where the focus is on managing the Earth Impact Database. John received his BSc in Geology from Cardiff University (Wales) and his PhD in Earth Sciences from Cambridge University (England). He held the Canada Research Chair in *Extreme Deformation and Planetary Materials* from 2006-2018, and is currently a co-investigator on the science teams for NASA's Mars Science Laboratory (MSL) and the upcoming European Space Agency's ExoMars rover missions.