Earth's accretion, core formation, and core composition

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The Earth accreted in a series of increasingly large and violent impacts, which caused large-scale melting of its mantle. This allowed the core to segregate from the mantle during accretion, undergoing high pressure (P), high temperature (T) metal–silicate partitioning reactions that set the modern-day compositions of the core and mantle. This talk presents a series of interconnected projects that describe these processes and their effects on core composition. Equations of state of iron-rich materials are compared to the seismologically-determined density of the core to constrain its light element abundance, high P-T metal–silicate partitioning experiments are used to study the behavior of Ni, Co, V, Cr, Si, and O during core formation, and a suite of 100 N-body simulations are presented to show a probabilistic assessment of terrestrial planet accretion. From these studies, a chemical model of core formation is built that allows calculation of Earth's core composition as it formed, based on the growth history provided by the accretion simulations and the measured partitioning behavior.