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John Paul Cook*, jpcook@usao.edu. *The Emergence of Algebraic Structure: Students Come to Understand Units and Zero-divisors.*

Little is known about how students learn the basic ideas of ring theory. While the literature addressing student learning of group theory is certainly relevant, the concepts of zero-divisor and, more generally, elements with no multiplicative inverse are among those for which group theory has no analog. In order to better understand how students come to understand the concepts of unit and zero-divisor, this talk presents results from a study that investigated how students can capitalize on their intuitive notions of solving equations to reinvent the definitions of ring, integral domain, and field. Particular focus is placed on the emergence and progressive formalization of the concept of zero-divisor at various stages of the reinvention process. Findings include a conceptual framework characterizing the emergence of the concept of zero-divisor and unit. This framework, in addition to documenting the emergence of these concepts, suggests that these concepts arise in direct contrast to each other. (Received September 17, 2013)