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Robert E Ely* (wambulus@gmail.com), 1018 Mound St #1, Madison, WI 53715. *Conceptions of infinitesimals in undergraduate calculus students and in history.*

I will report on a few results from a questionnaire that given to 240 university calculus students. I categorized each student by the epistemological obstacles s/he experienced with respect to the foundational calculus concepts of limit, function, continuity, and the real number line. Follow-up interviews helped to clarify and illustrate these obstacles. An epistemological obstacle is a misconception that is necessarily encountered in the process of learning a target conception. The epistemological obstacles I looked for were drawn from the research of several theories of undergraduate mathematical thinking, including mathematics as metaphor, APOS theory, prototype theory, and concept images. The purpose was not only to determine the natures and frequencies of these obstacles, but to examine the combinations of obstacles the students displayed in comparison with the combinations of obstacles observed in the historical development of calculus. I may have time here only to discuss one finding: Students commonly believe in infinitesimal numbers and distances. This does not behave as a single epistemological obstacle, but as a number of different conceptions. Some of these are sophisticated, mathematically coherent, and have close parallels in 18th-Century mathematics. (Received September 25, 2006)