As argued in a recent article in *Science*, this is an interesting moment in the history of science education in the U.S. A confluence of factors creates the opportunity for much needed changes in the teaching, learning and assessment of science across K-16+. While there is much left to do to realize the vision of science learning in the NRC’s 2012 Framework report, including design of assessments aligned with the 2013 Next Generation Science Standards, science education is well positioned to meet the challenges that have been posed. The last decade has seen a number of advances in conceptualizations of the design and use of assessment, as well as significant research and development in the field of science assessment. This presentation will consider what proficiency in science now means and provide examples of the thinking that exists regarding science assessment design, interpretation and use. This includes work on the redesign of the College Board’s Advancement Placement science courses and exams in Biology, Chemistry and Physics, as well as work on technology-enabled assessment tasks and systems. These and other cases will be used to exemplify what’s possible, as well as the work that still needs to be done, to validly assess proficiency in science. We will also consider some of the implications of this work for research and development in science assessment, and for science education practice and policy.