Geology of Iowa for Teachers
University of Northern Iowa: June 22-27, 2008
Project submitted by Mike Lazere

1. **Description of Project**
   - I will develop a series of lessons that relates chemical processes (dissolution/precipitation & solubility and chemical equilibrium) to the formation of limestone deposits, which in turn provides evidence the existence of warm Paleozoic seas in Iowa.

   - I will develop a collection of a variety of samples of limestone, including thin sections that can be viewed under a microscope.

2. **Objectives/Goals of the Project**
   - Students will provide evidence to explain the chemical composition and microscopic structure of limestone.
   - Students will investigate and develop models to explain factors that affect the solubility of gasses and solids, especially ionic compounds, in water.
   - Students will describe how temperature, alkalinity and salinity affect the solubility of CO_2 and $CaCO_3$ in water.
   - Students will apply their knowledge of solubility to explain the locations of current limestone deposition.
   - Students will explain how limestone formations provide evident= that Iowa was once covered by tropical oceans for millions of years.

3. **Classroom Implementation**
   Note: I do not plan to implement this on consecutive days, but see this as a culminating activity
   - 1-2 days: Provide students with various samples of limestone (without naming them as such). Brainstorm how ways to determine the composition of the "rocks". I will provide hammers, microscopes and hand lenses, HCl, etc, upon request. Students collect and share data. Followed by classroom discussion and review of text/internet sources about limestone.

   - **2 days:** Students will develop and carry out experiments to test 2 factors that they believe will affect solubility of solids and gasses in water, including CO_2 and $CaCO_3$. Students will collect and share data, followed by classroom discussion.

- 1-2 days: Classroom discussion about factors that influence equilibrium between dissolved and solid forms of $CaCO_3$ and predict how each of these factors will shift the equilibrium. Apply this knowledge to predict and/or explain environments that would be promote growth of animals with calcarous shells and formation of limestone. (Compare conditions in warm vs. cold seas and shallow vs. deep seas.)

4. **Evaluation of the Project**
   - Informal judgement of student interest/engagement
   - Lab write-ups and class discussions as formative assessments
   - Exam questions as summative assessment