GEOL 454 Sample term projects

Hypothesis: Bedrock slopes with similar lithology but different aspect will exhibit different intensities of weathering.
Or, north-facing slopes will exhibit greater weathering intensity than south-facing slopes.
Testing the hypothesis: Measure multiple indicators of weathering intensity (% lichen cover, spatial density of joints, small-scale surface irregularity, mineral alteration) on ten 1-m^2 areas for each aspect and statistically compare the two populations. The sample sites should be close to one another (e.g., opposite sides of the same hogback) to limit variability introduced by differences in mineralogy.

Hypothesis: Median grain size decreases downstream along the Poudre River.
Testing the hypothesis: Measure the intermediate axis of 100 clasts at 10 sites along the Poudre. You will have to choose a similar depositional feature at each of the 10 sites (e.g., riffle, alternate bar, or point bar). Also, because other factors such as valley width and depth, streambed gradient, and proximity to a rockfall source can also influence grain size, you will either have to hold these constant (preferred) or account for them using multivariate statistics.

Hypothesis: Glacial valleys have wider bottoms and steeper side slopes than fluvial valleys in the Front Range.
Testing the hypothesis: You can choose two or more major river valleys in the Front Range (e.g., Poudre, Big Thompson, Boulder, North St. Vrain, Clear) and choose ten sites above the terminal moraine and ten below the terminal moraine at which to measure valley-bottom width and average side slope. This will be easiest to do if you have GIS skills and access to GIS software. You can test for differences in mean values between the two populations. Valley-bottom width also tends to increase with drainage area, so you should plot valley-bottom width versus drainage area and evaluate whether the glacial and fluvial populations have different or similar trends.

Hypothesis: Shales, which are more readily weathered and eroded than sandstones, produce thicker soils in the Front Range.
Testing the hypothesis: Many other factors influence soil thickness, including slope angle and aspect, so you'll need to hold these variables constant by choosing portions of a slope with a similar angle, and where shales and sandstones occur in close proximity. Dig several very small pits to gage total depth of soil over each type of bedrock and use statistical tests to compare the mean of each population.

Hypothesis: South-facing slopes will be steeper than north-facing slopes.
Testing the hypothesis: This is most easily done using GIS software. You can choose a river, such as the Poudre, with a predominantly east-west orientation. At 10 sites along the river, compare the average gradient of north- vs south-facing slopes and then compare the mean values for the two populations. Factors such as lithology and bedrock structure, jointing, and elevation (climate, vegetation) will also influence slope gradients, so you will need to use geologic maps to assess lithology and structure, and visit the sites to assess joint density and vegetation cover.