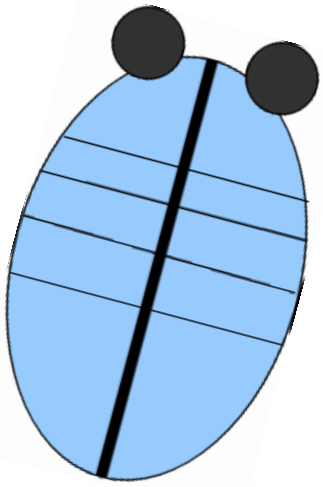
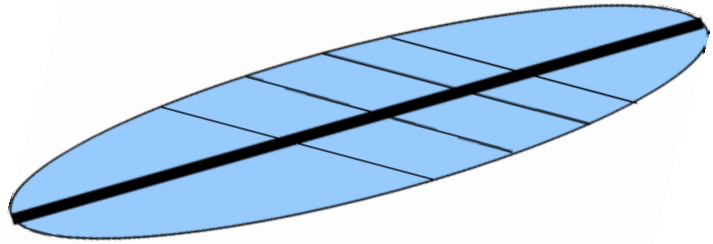
In Class Exercise: Determining Angular Shear (Ψ) and Shear Strain (γ)



Original critter, undeformed



Deformed fossil of critter

Steps for determining angular shear (Ψ) and shear strain (γ)

(1) Identify perpendicular features in the original critter or other strain marker. In some cases, you might have to 'construct' a new line to make things easier (for example trilobites don't have one single line conveniently bisecting them). Normally you would know this up front based upon your knowledge of the organism's symmetry, so you don't need an original, undeformed sample to do this analysis.

(2) Identify the same lines/features in the deformed strain marker, which is what we will be working with in steps 3-6.

(3) Choose ONE of the two originally perpendicular lines (doesn't matter which); we'll call this line A. The one you DON'T use will be called B. Construct a line perpendicular to A. Your constructed line should originate where the two original lines (A and B) cross to make life easy. Label this line C.

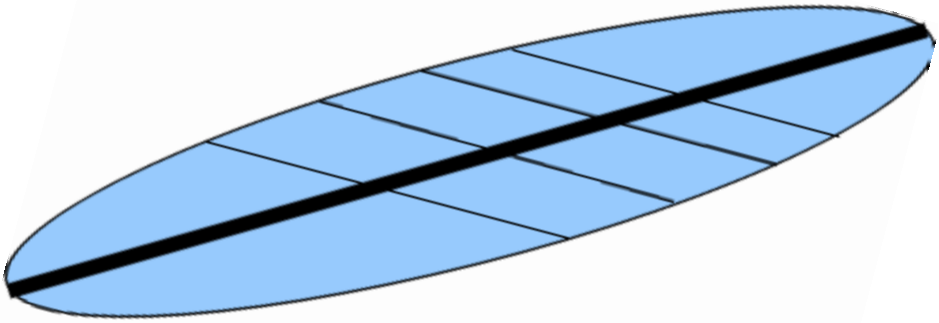
(4) The angular shear (Ψ) along line A is the *acute angle* between lines B and C. You are comparing how much a line that was originally perpendicular had to rotate to get to the current position. Measure this angle using your protractor.

(5) If the shift from the perpendicular (C) to line (B) is in the clockwise direction, the sign of your angular shear along line A is positive. If the shift is counterclockwise, angular shear is negative. Note: the sign will change depending on what line you pick as a reference, so it only matters that you have the right sign for the scenario that YOU have picked…but you must specify or label which line is the reference line!

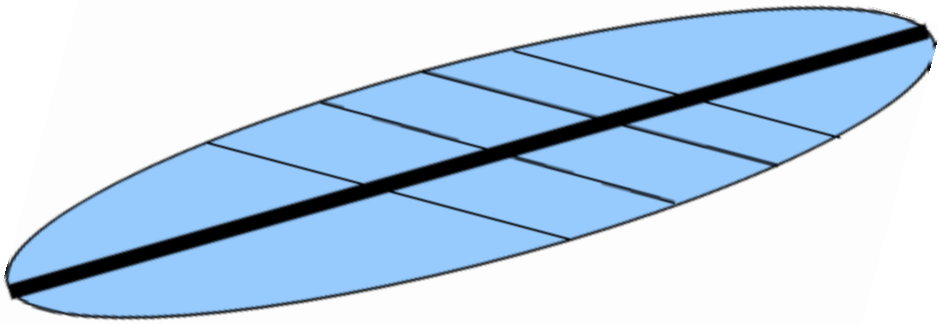
(6) Determine the shear strain: $\gamma = \tan\Psi$ (refer to notes to review relationship)

Tools needed: Straight edge, colored pencils, protractor, scientific calculator

Instructions: Find the angular shear (Ψ) and shear strain (γ) for the deformed fossil below, following along with the example presented in class.



Instructions: Find the angular shear (Ψ) and shear strain (γ) for the deformed fossil, using the alternate line as your starting reference.



Name:

Tools needed: Straight edge, colored pencils, protractor, scientific calculator

Instructions: Find the angular shear (Ψ), the sign of the angular shear (+ or -), and shear strain (γ) for the deformed trilobite. Show all work, including your constructed lines, the location of the angle (Ψ), how you determined the sign, and your equation for (γ).

Undeformed trilobite

Deformed trilobite