I. Objectives

1. Simulate folding and faulting of sedimentary rocks caused by compression and extension.
2. Predict and analyze the results of a physical model of sedimentary compression.
3. Speculate how various material properties will affect your results.

II. Introduction

If you have ever driven a major highway through the mountains, you have seen roadcuts exposing spectacular cross-sections of the underlying geology. Leaving Denver on I-70 and headed for the mountains, you drive through a massive road cut through a formation called the Hogback which runs along both the east and west margins of the Rocky Mountains. This cut exposes some of the lithified sediments that underlay the marginal basins, at least until erosion has carried away the upper layers (see: www.panoramio.com/photo/24896460). Further west near Georgetown, dramatic folds and faults in the underlying granites can be seen. Today's lab will explore how some of these structures are formed.

III. Materials

Squeeze boxes, gray and colored graded sand, 2 lb bag of flour

IV. Prelab Definitions

1. syncline

2. anticline

3. plunge line

4. dip

5. normal fault

6. reverse fault

7. thrust fault

8. allochthonous

9. en echelon

V. Lab Procedure

Part A: Sand Layers, Uniform Thickness, Sand Only

1. Fully extend the plunger. Place all of the plunger pegs in the holes of the dowel.

2. Add multiple layers of alternating gray and colored sand. The layers should be the same thickness and approximately 5 mm thick.

3. Compact the sand layers from as you add them. Add enough layers so that the box is approximately half full.

4. Before compressing the plunger predict which geologic features you expect to form.

5. Carefully compress the plunger to the first peg. Clearly draw what you see in the box below. Color the layers and clearly label the oldest and youngest layers, and any folds and/or faults that form.

6. Repeat until the plunger is compressed to the fifth peg. Draw and label each step in the boxes below.

7. After you have drawn the final step, ask the instructor to check your answers.

8. Answer the discussion questions for Part A.

PEG 1
PEG 3
PEG 5

Part B: Uniform Thickness Sand and Flour Layers

9. Fully extend the plunger. Place all of the plunger pegs in the holes of the dowel.

10. Add multiple layers of alternating gray sand and flour. The sand and flour layers should be ~5 mm thick.

11. Compact the sand layers from as you add them. Add enough layers so that the box is approximately half full.

12. Before compressing the plunger predict which geologic features you expect to form.

13. Carefully compress the plunger to the first peg. Clearly draw what you see in the box below. Color the layers and clearly label the oldest and youngest layers, and any folds and/or faults that form.

14. Repeat until the plunger is compressed to the fifth peg. Draw and label each step in the boxes below.

15. After you have drawn the final step, ask the instructor to check your answers.

16. Answer the discussion questions for Part B.

PEG 1
PEG 3
PEG 5

Part C: Variable Thickness Sand and Thicker Flour Layers

17. Fully extend the plunger. Place all of the plunger pegs in the holes of the dowel.

18. Begin with a ~1 cm thick flour layer. Add multiple layers of alternating gray sand and flour. The flour layers should be ~1cm thick and sand ~5mm thick.

19. Compact the sand layers from as you add them. Add enough layers so that the box is approximately half full.

20. Before compressing the plunger predict which geologic features you expect to form.

21. Carefully compress the plunger to the first peg. Clearly draw what you see in the box below. Color the layers and clearly label the oldest and youngest layers, and any folds and/or faults that form.

22. Repeat until the plunger is compressed to the fifth peg. Draw and label each step in the boxes below.

23. After you have drawn the final step, ask the instructor to check your answers.

24. Answer the discussion questions for Part C.

PEG 1
PEG 3
PEG 5

VI. Lab Discussion

Part A

1. What geologic features formed? Was one more common than the others? Explain.

2. Did your predictions and results differ? Explain why or why not.

Part B

3. What geologic features formed? Was one more common than the others? Explain.

4. Did your predictions and results differ? Explain why or why not.

5. How do the results differ from Part I?

6. Are the different material layers affected differently by compression? Explain.

Part C

7. What geologic features formed? Was one more common than the others? Explain.

8. Did your predictions and results differ? Explain why or why not.

9. How do the results differ from Parts A and B? Explain.

10. Are the different types of materials at different thickness layers affected differently by compression? Explain.

11. Other than sand or flour what other materials could be used? Why?

12. How would these materials change the results?

Lab courtesy of Dr. Jim Washburne