

**ESS 590 B Spring 2008**  
**Introduction to Heat and Mass Flow Modeling in Earth Sciences**

**Problems to help learn Matlab**  
**Due Thursday April 10**

**1. Rock ages**

An Earth Science grad student, working with a Professor from Oz, collected 5 rocks that had been dropped by a retreating glacier. Using cosmogenic exposure-age dating, she plans to determine a retreat history of the glacier.

She finds that the average exposure age of all 5 rocks is 30.8 kyr.

Rock 1 has been exposed longer than rock 2, by 1/10 of the exposure age rock 4.

Rock 2 has been exposed longer than rock 3, by 1/4 of the exposure age of rock 3.

The average exposure age of rocks 1 and 4 is 18.5 kyr.

The exposure age of rock 2 is only 1/6 that of rock 5.

- Derive 5 linear equations relating the 5 exposure ages, using the information above.
- Explain in prose how your the equations are related to your known information.
- Write a Matlab script that sets up a matrix equation using your 5 equations, and then solves the system of equations to find the exposure ages of the 5 rocks.
- Thoroughly document every line of your Matlab code, explaining what all the variables and coefficients are, and explaining what every calculation is doing.

BONUS CHALLENGE (no points though).

- Can you suggest an explanation about rock 5?

**2. Plotting stuff**

- Without using “for loops”, generate a 10×15 matrix (10 rows and 15 columns) called **M**. The entry in row *i* and column *j* is the square root of  $i \times j$ .
- Treating the matrix as a map, and the entries as elevations at those points on the map make a contour plot of the contents of matrix **M**, and add a colorbar so that a viewer can figure out the heights of your contour lines.
- Thoroughly document every line of your Matlab code, explaining what all the variables are, and explaining what every calculation is doing.