# TFY4235/FYS8904

## Problemset 5 Spring 2015
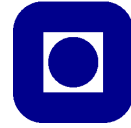
**Problem 1.**

Generate a $100 \times 100$ *symmetric* (why symmetric?) matrix whose elements are randomly distributed on the interval $[-1, 1]$.

    **a)** Use a "canned" routine (like that from LAPACK) to find all the eigenvalues of the matrix. Average the results over many samples. Find the distribution of the largest eigenvalues and show them in a histogram.

    **b)** Repeat the above calculation using an iterative method. First find the largest and the smallest eigenvalues of the matrix. Use the Lambert-Weaire algorithm (see lecture notes) to map out the remaining 98 eigenvalues to within — say — 1% accuracy. Average the results over many samples. Find the distribution of the largest eigenvalues and show them in a histogram.

    **c)** Compare the CPU time of the direct and iterative methods. How does the comparison come out if only, say, the largest eigenvalue is needed?