# Python Workshop
# Numpy Arrays

C.D. Langevin

U.S. Geological Survey
Reston, Virginia, USA

USGS National Groundwater Workshop, August 2012

# Outline

# What is Numpy

# Creating an Array

# Basic Operations

# Arrays and Functions

```
In [55]: T = 2500 #ft2/d

In [56]: S = 0.01 #unitless

In [57]: t = 1.0 #d

In [58]: Q = 10000 #ft3/d

In [59]: r = concatenate( (array([1]), arange(10,110, 10)) )

In [60]: r
Out[60]: array([  1,  10,  20,  30,  40,  50,  60,  70,  80,  90, 100])

In [61]: u = r ** 2 * S / 4. / T / t

In [62]: from scipy.special import expn

In [63]: wu = expn(1, u)

In [64]: s = Q / 4. / pi / T * wu

In [65]: s
Out[65]:
array([ 4.21388046,  2.74804077,  2.30686505,  2.04889705,  1.86597563,
        1.72420422,  1.60848432,  1.51076188,  1.42622927,  1.35178543,
        1.2853129 ])
```

# Universal Functions

# Indexing, Slicing, and Iterating

# Shape Manipulation