Mercury Porosimetry
Advantages and Limitations

Herbert Giesche
New York State College of Ceramics
at Alfred University
Outline:

• Introduction / Theory
• The Measurement Technique
  – Tips and Tricks
  – Precision and Accuracy
• What Information do we get?
• Hysteresis
• Pore-Network Models
• Alternative Techniques
But first, “Where on earth is Alfred?”
What **type** or **size** of pore is measured?

Closed Pores  |  Blind Pores  |  Cross-linked Pores  |  Through Pores

In all cases, Hg-Porosimetry measures the largest available access to a pore, the size of the "**entrance**" towards a pore.

Most times this is substantially **smaller** than the **inner pore diameter**!
Theory

Young Laplace - and Washburn - equation:

\[ \Delta P = \gamma_{lv} \left( \frac{1}{r_1} + \frac{1}{r_2} \right) = \frac{2\gamma}{r_p} \cos \theta \]

Essentially all calculations are based on the assumption of cylinder pores.

**This is a major assumption !!!**
What are the basic parameters to be measured?

- Pressure
- Intruded volume
- Contact angle, $\theta$
- Surface tension, $\gamma$
Pressure

• Pressure transducer have to cover the entire measurement range.  
  (> 5 orders of magnitude !)

• Use several transducer with overlapping ranges.

• Avoid temperature drifts.

• Avoid accidental over-range exposure.

• Calibrate and check with “Standards”
Volume Measurement

- The “antique” techniques:
  - Optically
  - Contact wire
  - Resistance wire

- Nowadays used in essentially all instruments:
  - Precision capacitance bridge
Contact angle (which one?)