

# Pressure in fluids

- **Hydrostatic Pressure** (static fluid in the presence of gravity):

$$\Delta P = \rho g h$$

Here  $\rho$  is fluid density,  $g$  is gravitational acceleration,  $h$  is the depth difference between two points, and  $\Delta P$  is the pressure difference between them.

- **Bernoulli Principle** (fluid in motion, no gravity):

$$P + \frac{\rho v^2}{2} = \text{const}$$

is the speed of the fluid. The equation works only *along the flow*.

# Homework

The picture shows a simple device that can be used to measure a speed of a fluid (or a speed of a boat with respect to water). A j-shaped pipe is immersed into the fluid with its inlet directed against the flow. The fluid runs into the pipe, and the level rises. Eventually, as the pressure in the pipe builds up, no fluid enters the pipe anymore. This means that the speed just near the entrance to the pipe is  $v=0$  (this region is called stagnation point).

Find the level  $h$  to which the fluid will rise in the pipe, if the speed of the stream is  $v_0$ . You may assume this speed to be the same everywhere, except in the near vicinity of the pipe.

