

Think It Over



This section of *Resonance* presents thought-provoking questions, and discusses answers a few months later. Readers are invited to send new questions, solutions to old ones and comments, to ‘Think It Over’, *Resonance*, Indian Academy of Sciences, Bangalore 560 080. Items illustrating ideas and concepts will generally be chosen.

Answer to Barometer problem

Answered by
Rajaram Nityananda
Raman Research Institute
Bangalore 560 080, India.

In *Resonance*, November 1997, we carried the ‘barometer problem’ originally posed by the well-known physicist, Goudsmit. Briefly, it reads “if a barometer is set up in the usual way, and the inverted tube hangs from a spring balance, will the weight of the mercury in the tube register on the balance?” At first sight, the column appears to rest on the mercury in the trough below it and indeed some readers concluded that the balance will only read the weight of the glass tube. However further thought shows that the pressure at the level L is the same outside and inside the tube, and so the trough is not supporting any extra load on account of the column. Hence the spring of the balance is the only other possibility. As Joydeep San from Calcutta puts it in his letter “...the spring balance manages to support the mercury even though the column exerts no (vertical) force on the tube ... [because] there is a vacuum V separated from the outside atmosphere by the glass tube. The atmosphere will push against this tube from the upper side The magnitude of this force is easy to calculate...”. We leave the calculation or argument to the reader – to show that the pressure difference at the top of the tube multiplied by its area must equal the weight of the column. Forces like surface tension have not been included!

Figure.

