# LETTER

## **Plummet Balance**

### To the editor:

In their paper, "The Plummet Balance—A Potential Tool for Subsieve Particle Size Analysis," which appeared in your March 1981 issue (pp. 36-40) Nagaraj and Sivapullaiah have presented a very interesting application of the plummet balance. I would, however, disagree slightly with their comment regarding the time required for the plotting of hydrometer test data; the direct plotting method [1] completely eliminates calculations, while strictly adhering to all Stokes' law assumptions.

A major benefit from the plummet balance method, not stated by the authors, appears to be the potential time savings that result from the ability to make density measurements at virtually any desired depth within the sedimentation flask. The effective depth of a soil hydrometer is typically around 20 cm at the end of a test. Any reduction in this depth causes a similar reduction in the amount of time required to measure particles of a given diameter (that is, to retain a fixed ratio  $Z_e/t$ ). If, for example, the plummet could be adjusted to take measurements at a depth of only 5 cm, then particles of 2  $\mu$ m diameter could be detected in about 3 h rather than the 12 h or more required when a hydrometer is used. This would be a great convenience to laboratories that carry out large numbers of sedimentation tests daily.

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### Reference

[1] Dick, R. C., "A Direct Method for Plotting Grain Size Curves from Hydrometer Test Data," in Special Procedures for Testing Soil and Rock for Engineering Purposes, STP 479, 5th Ed., American Society for Testing and Materials, Philadelphia, 1970, pp. 126-132.

#### Author's reply

We thank Dr. R. C. Dick for his critical review of our paper and appreciate his observations and comments regarding the major benefit from the plummet balance method.

We were unaware of his work on the direct method for plotting grain size curves from hydrometer test data. However, the plummet balance method by itself enables direct plotting of the data. It is fully endorsed that the plummet balance method can be gainfully used in time savings as a result of the ability to make density measurements at any desired depth. Although this was not explicitly stated, experimental data at 20- and 11-cm depth of penetration (Fig. 4, p. 40) reveal this possibility. Further the reductions in depths cannot be made beyond the lower limit of 11 cm, since with the reduction in depth of immersion, it would be relatively difficult to take readings commensurate with the rapid settlement of particles to obtain the particle size distribution curves within the limits of engineering accuracy.

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