

## Reply

RALPH G. ELDRIDGE

*Technical Operations, Burlington, Mass.*

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The comments of Lieberman and Katz are most appropriate and serve to inform readers of the *Journal* more fully on the operations of the ARF Particle Counter. In reply to their comments, I would like to make the following remarks.

First, I wish to state the basic criteria of my calibration scheme. Because my interest lies in the sampling of natural water aerosols, I decided to design the calibration for water droplets. I also decided that the calibration scheme should be simple and applicable over the drop-size range of 1 to 64 microns in diameter. Glass microspheres were used in my calibration scheme because they are optically similar to water droplets in the visible spectral region; both glass and water have real indices of refraction—no imaginary component. The method of calibration was to correlate experimentally the response of the Particle Counter to various size glass microspheres of different indices of refraction with the actual size of the transparent sphere. By employing simple optical principles, the response of the Particle Counter to water aerosols is predicted from a simple empirical relationship. The advantage of my calibration scheme is that it is simple—guided by basic optical principles, and supported with experimental evidence.

Lieberman and Katz are correct in their comments regarding isokinetic sampling. Given the time and need, this is the ideal approach to the small monodispersed sampling problem. However, this technique requires rather sophisticated apparatus.

With regard to the counting rate of the mechanical

counter, the response time is not important when this counter is overloaded. In practice, saturation of the mechanical counter is determined when it fails to respond to every rotation of the glow-tube counter. When this situation occurs, the diluting mechanism is placed in the sampling inlet tube.

It was most reassuring to read the remarks of Lieberman and Katz on the problem of dilution of liquid droplets. Their suggested interpretation of the drop-size distributions presented in Table 3 and Fig. 4 is most appropriate. I certainly concur with their interpretation.

Finally, Lieberman and Katz found my use of the word "inherent" in connection with sampling errors inappropriate. I did not wish to imply that the sampling errors were fixed in a permanent sense (as is the exact definition), but rather to indicate those errors which are a part of the instrument and flow configurations of the apparatus. The nature of instrumental and sampling errors, which they described so clearly, were those to which I referred.

I wish to thank Lieberman and Katz for their comments on my paper. The measurement of natural cloud and fog drop-size distribution is of personal interest. The ARF Particle Counter is an instrument which is based on sound principles and can contribute pertinent data to experimental programs. Lieberman and Katz have been most generous in giving us insight into the operation of the Particle Counter—insight which only the designers can give.