Focusing on the Experiment

by Hank Hogan, Contributing Editor

Hardware-based drift compensation is helping to maintain microscope focus over long periods of time.

For Alexey Khodjakov, a researcher at the New York State Department of Health's Wadsworth Center in Albany, it wasn't a question of if but when he would lose focus. Following cells as each divided into many, he and colleagues in his lab conducted experiments for 72 or 96 hours, zeroing in with a research microscope on mammalian cells that were typically 5 to 10 µm thick. The depth of focus depended on the optics, but it was usually less than 1 µm. When the air conditioning cycled on, the focus would move up or down by a micron or two — enough to cause problems.

Traditional focus-maintaining solutions didn't work, so Khodjakov turned to a relatively new technology, hardware-based drift compensation. Microscopes using the technique solved his problem and allowed him to collect data for 96 hours or longer.

Khodjakov used a Nikon system, but systems also are available from Olympus

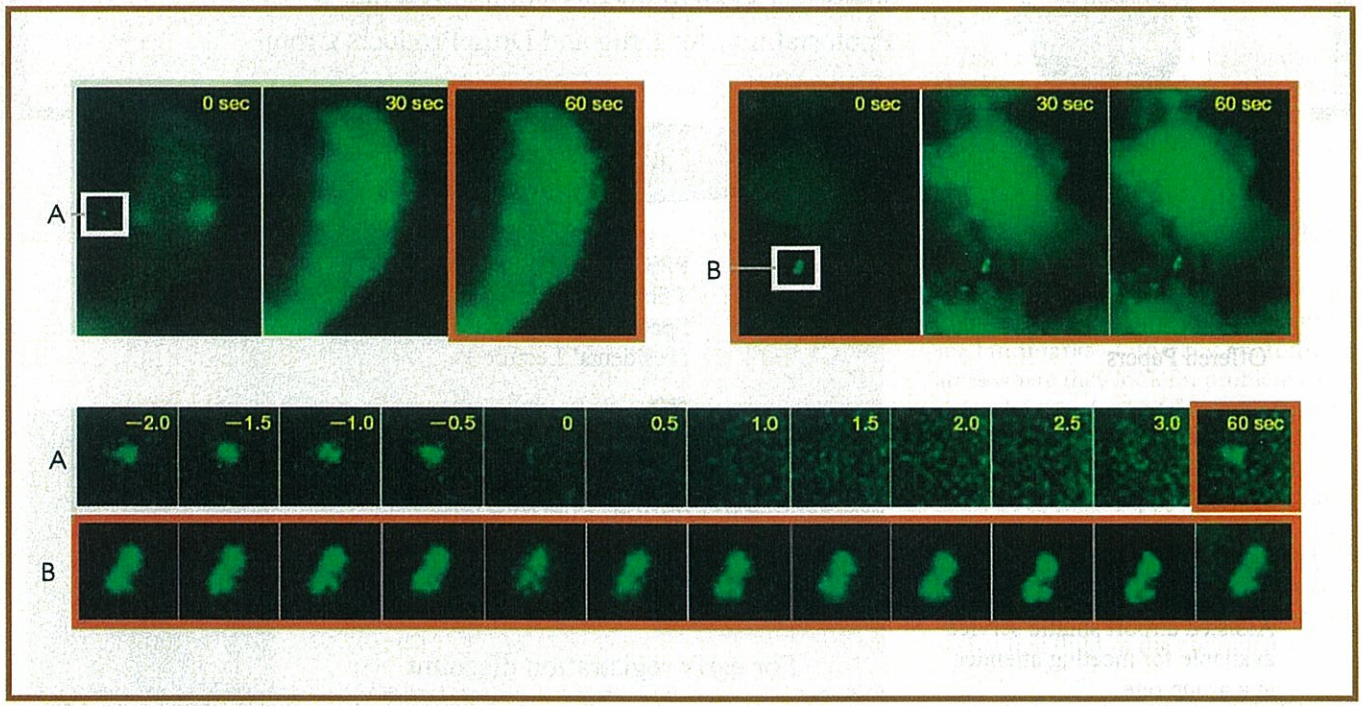

Figure 1. These shots of rapid calcium imaging show how a drift-compensation system — in this case, from Nikon — can correct for thermal changes. Two particles adhered to the coverslip are tracked from 2 s before to 60 s after the addition of the reagent. (A) did not have drift compensation, while (B) did. As a result, (B) stays in focus while (A) goes out until the drift-compensation system is turned on 60 s after the reagent is added.