



The editors of Sky & Telescope answer your astronomy questions.

Ideal Lube for Telescope Mounts

When I try to center something in my telescope eyepiece at high power, the mount sticks and jerks so much that it's almost impossible. I oiled the mount and that made it worse. What's wrong?

— William Turley, Chicago, Illinois

Take the mount apart, clean the oil off the bearings, and replace it with ChapStick or some other soft wax.

Oils and greases are generally the wrong lubricants here. They're meant for reducing moving friction and wear, like in your car engine. A telescope mount is not a car. What the mount needs is smoothness and controllability of *very tiny motions*.

More precisely: a telescope mount needs the minimum possible *difference* between *moving friction* and *static friction* (what amateur telescope makers call "stiction").

Waxes are good for this. An old standby is to rub candle wax on a mount's metal bearings. But candle wax can be pretty stiff. ChapStick is a softer mix of wax and oils. Vaseline is even softer. Experiment and see what works best; situations differ.



WAX IS THE WAY The motions of this beefy altazimuth mount were greatly improved by cleaning the factory grease off the bearings and applying waxy lip balm instead.

Also, make sure the telescope is nicely balanced on both axes. An off-balance load makes any mount stickier and jerkier. To keep both axes balanced at all orientations, you may need to rig an off-center counterweight on one side of a telescope tube

to counterbalance the focuser and finder-scope on the tube's other side. An optical tube assembly's center of gravity needs to be close to the tube's centerline.

Dobsonian mounts, whose bearings have broad, wide motions, need a different strategy. The accepted wisdom is that Dobsonian bearing pads should be Teflon or, better, Teflon's relative PFA (perfluoroalkoxy fluorocarbon). See the definitive article in the October 2003 *S&T*, page 122.

The weight on a Dobsonian's azimuth pads often needs to be lightened a bit by adding rings of thin plastic, such as you can cut from plastic milk jugs, around the center bolt to carry some of the load. The usual advice is don't lubricate Teflon or PFA, but there's no harm experimenting. You can always clean it off. ♦

Peculiar Velocities

If the universe is expanding and galaxies are moving away from each other, why do galaxies collide?

— Norm Pascal, Lethbridge, Alberta, Canada

When galaxies are fairly close together, their mutual gravitational pull overpowers the relatively weak expansion of space. Only on very large scales — basically, larger than galaxy clusters — does the cosmic expansion add up enough to make everything move away from everything else. So, for instance, it has no effect on the space right around us on Earth, or in the solar system, or in the Milky Way.

Think of expanding space like an ocean

that is expanding due to water welling up everywhere from below. Galaxies are ships on the ocean. You're on a ship. The farther you look, the faster you'll see distant ships moving away from you — even if each one is sitting dead in the water around it.

In fact the ships, or galaxies, are not quite dead in the water; they have their own individual motions, which are called *peculiar velocities*. For "ships" nearby, these motions dominate (partly because the ships attract each other). Only on larger scales does the expansion of the ocean predominate over everything else.

Send questions to QandA@SkyandTelescope.com for consideration. Due to the volume of mail, not all questions can receive personal replies.