By coincidence, the focuser on Harvey, my 1980 model Celestron 14, failed about ten days ago; I will post here what I did about it, in case anyone has a similar problem and is interested in the experience. I offer no guarantees that what worked for me will work for you, or that your problem is the same as mine. The mechanical arrangements are a bit difficult to visualize, and the ASCII graphics required to do a picture would be very messy, so I will try to make do with text description.

1. THE SYMPTOM: Turning the focus knob did not change the focus.

2. THE DETAILS: (Discovered by partial disassembly.) The focus knob in essence contains a captive nut, that is threaded onto a threaded stud, that protrudes from the back of the primary mirror support, through a hole in the back casting of the C-14 optical tube assembly. Turning the knob pushes or pulls on the stud, causing the mirror support to slide back and forth on its central support tube, changing focus.

The problem was, that the mirror-support end of the stud had become unfastened from the mirror support.

The "stud" is actually a length of thick-wall hollow tubing, threaded internally and externally. The external threads engage the captive nut. The internal threads are used to secure the stud to the mirror support, on one end, and on the other end to carry a machine screw and washer that (evidently) limit the amount of forward travel of the focuser before the captive nut is unscrewed from the stud. What had happened was that the machine screw, that holds the inner end of the stud to the mirror support, had become unthreaded. The mirror-support end of the stud is not round -- it is machined to have two parallel flat surfaces, which fit into a matching groove on the back of the mirror support, like a square peg in a rectangular hole. The bottom of the groove has a hole drilled through it, for the machine screw, which comes through from the other side of the mirror support. When the screw becomes unthreaded, the flat surfaces of the stud slide out of the groove, so that even if the screw is still in place, and even if you can engage the threads by twisting the stud from outside of the tube, there is no way to tighten it down all the way -- the stud won't simultaneously rotate and fit into the groove.

3. THE FIX: Take the mirror/mirror-support assembly out of the OTA, clean stud, slot, threads, and screw, put the stud in place, tighten the screw down with a wrench, with Lock-Tite or something similar used to make it unlikely that the problem will recur. Then put everything back together.

4. THE FIX -- DETAILS: I did all this on my bed, with the cat locked out of the bedroom, with a nice clean box sitting handy by as a place to put the corrector plate while I was working on the rest of the stuff.

First, I unscrewed three screws visible from the outside of the rear of the OTA, which hold a non-rotating black boss in place between the focus knob and the back of the OTA. The "boss" proved to be a housing for a couple of bearings, within which the moving parts of the knob twirled.

Second, I unscrewed a setscrew going through the side of the knurled focus knob. With it loosened, the knurled part of the knob could be pulled off, exposing the captive nut (a round piece of brass, that the knurled part slides over), and the outer end of the threaded stud.

Third, with the bearings removed, I could unscrew the machine screw and washer from the outer end of the stud, and unscrew the captive nut completely, leaving just the stud protruding from the back of the OTA.

Fourth, I unscrewed the stud completely from the internal machine screw -- the one that had become unthreaded. (The machine screw was only unthreaded part way, enough for the flats on the end of the stud to slide out of the groove.)

Fifth, I put the stud, machine screws, and captive nut in solvent to clean while I proceeded with disassembly.

Sixth, I used a black felt-tip pen to mark the retaining ring that holds the corrector plate into the front of the tube, and the tube itself, to show their relative orientation. The black mark barely showed against the black paint of the parts.

Seventh, carefully and in small increments, I removed the eight machine screws that hold the retaining ring in place.

Eighth, I removed the retaining ring. It had some cork on its inside face.

Ninth, I marked the front of the corrector plate and the OTA with a felt-tip pen, to show their relative orientation. I kept the mark confined to the part of the glass that was covered by the retaining ring.

Tenth, I took a deep breath, gripped the outside of the secondary support, and lifted out the corrector plate and secondary. There were some bits of cork used to support the edges of the corrector; I made sure they stayed in place. I put the corrector aside, carefully. There was more cork on the face of the front casting that the corrector sat on.

Eleventh, I unscrewed the two locking nuts that hold the mirror in place for transporting the OTA. These are located on the back of the

OTA, 120 degrees apart from the focus knob. The mirror/mirror-support assembly was now free to slide back and forth on the central tube. There was no need to mark relative orientation of mirror and tube, that was determined by the stud itself.

Twelfth, I determined that the mirror would not slide off the central tube until I removed a split ring that fitted into a groove in the outside of the tube. I removed the split ring.

Thirteenth, I reached down inside the OTA, curled my fingers around the edges of the mirror, and slid it off the central tube.

Then I had a problem. The mirror wouldn't quite fit through the hole in the front casting of the tube; I suspect the front casting was put in place after the mirror was installed. It was in essence an interference fit between the mirror and the cork gasket that the corrector sat on. The gasket was not quite of uniform shape, and I found a place where the mirror would fit out, when turned so that its mechanical axis was at right angles to the mechanical axis of the tube. If that hadn't worked, I would have had to put the mirror back on the tube, and then either make a wide place in the cork gasket or remove the upper casting entirely.

Fourteenth, I finished cleaning the parts in solvent, dried them, and lightly greased the threads that the captive nut rode on, with silicone lubricant.

Fifteenth, I slid the flats of the stud into the groove in the mirror support, coated the threads of the machine screw with Lock-Tite, turned the screw into place, and tightened it with a wrench.

After a pause for my jangled nerves to settle -- and for the Lock-Tite to dry -- I reassembled everything with no further problems, in an order that was the reverse of taking it apart. I was very careful to tighten the screws that held the corrector in place in small increments, to alternate between screws on opposite sides of the tube, and not to overdo it. When I next used the telescope, I found the collimation was unchanged. I've had it out five times since the repair, so it looks as if the operation was a success.

There were a few things I didn't do...

First, I noted no lubricant at all between the central bore of the mirror support structure and the outer surface of the central tube -- those are the surfaces which slide past one another as the telescope is focused. Since the focus had worked fine for twenty years, I saw no need to add lubricant. These surfaces seemed to be black-anodized aluminum. I have heard that some SCTs use lubricant at this location, and was a little surprised not to see any.

Second, I had enough of ProtoStar's black flocked paper at hand to line the entire inside of the tube. I decided not to, on three grounds. First, I was worried about solvent outgassing from the cement backing of the paper, particularly since Harvey's OTA is often left in either a vehicle or a garage where it gets pretty hot. Second, I was worried about lint from the paper settling on the optics. Third, I have looked through the system many times, and did so again before this disassembly, and there are no direct or specularly reflected paths from the focal plane to the inside of the OTA -- that is, you can't see the OTA inner wall from the focal plane. Thus there appeared to be minimal problem with reflections in any case. I might more reasonably have lined the inner wall of the central tube -- that you can see from the focal plane -- but it would have meant applying the flocked paper in rather a cramped space. So I didn't. There is also some visible black surface at the outer periphery of the secondary (which is much smaller than the secondary obstruction -- the extra width being a baffle against stray light). However, reflections off that surface are at normal incidence, and seemed unlikely to be a problem.

I think I was both careful and lucky in this procedure. Your mileage may vary.