On 21 August, 1999, several observers went to Fremont Peak State Park, near San Juan Bautista, California. The main target was the 9-day Moon, and we planned a telescope comparison test: One of us recently acquired a new Astro-Physics "Stowaway", a 92 mm f/4.9 Christen-triplet refractor whose extremely fast focal ratio, coupled with a focuser with a large amount of forward travel, has already earned nicknames of "Stubby", or "The Stump". Early testing by the owner showed very fine images. I have a 15-year-old Vixen 90 mm f/9 fluorite refractor which is also known to do very well -- many people consider the 90 mm units the best of the Vixen fluorites, and mine is certainly a good one. So we had planned a side-by-side comparison on lunar or planetary detail at first opportunity. Now was the time.

I will observe my usual safety courtesy of not naming owners of pricey hardware, though the Stowaway's owner is a regular in the places I will post this report, and I suspect he will identify himself. He is in any case a good friend among my observing companions, with many telescopes, and a much more experienced lunar and planetary observer than I am. I have discussed with him in broad terms what I am about to report, and the fact that I am about to make a report. I encourage him to add any elaborations or corrections he may feel necessary.

Comparison testing was made difficult by the different focal lengths of the two telescopes: We could not null out the effect of eyepieces and Barlows by using the same ones. Besides the objective, my Vixen 90 mm's optical path included a Vixen 1.25-inch prism-type star diagonal and a 5 mm Pentax SMC-ED Orthoscopic eyepiece, for a magnification of 162. I had tried an 8 mm Brandon (101x) and a 4 mm Meade Research-Grade Orthoscopic (202x), but settled on the Pentax for the best view for conditions. At that magnification, seeing was not perfectly steady, but it was occasionally so: When I looked at a stars, I could see Airy discs with the first diffraction ring generally visible but usually in motion.

To achieve comparable magnification, necessary for the Stowaway to perform at its best, my friend needed a Barlow lens. He ended up with combinations of a 4.8 mm Nagler, 7 mm Nagler, and 7.5 mm Takahashi eyepieces, with 2x and 2.5x Barlows whose types I forgot to record. I don't think he used the 2.5x with the 4.8 Nagler, so magnifications ranged from 120x to 188x. He did use a star diagonal, I believe a MaxBright mirror-type. He has a lot of experience, and a lot of eyepieces and Barlows, including Zeiss Abbe Orthoscopics, and had an invitation to borrow stuff from my eyepiece box as well; these were his choices to do best with his telescope.

Differing eyepieces certainly can account for differences in image quality, not just because of different designs, but also because of

different numbers of air/glass interfaces, each of which presumably adds more scattering. My setup had 10 air/glass interfaces -- four in the objective, which is separated, two in the prism, and four in the eyepiece. With the Barlowed Naglers, the Stowaway had twelve -- two in the objective (whose mating surfaces are joined with "soft" cement) two in the Barlows, and eight in the eyepiece. I am not sure how many air-glass surfaces are in the Takahashi eyepieces.

Note also that we had only one example of each telescope type. Notwithstanding, both Vixen and Astro-Physics are generally acknowledged to produce instruments of consistent high quality.

Temperatures were shirt-sleeve and pretty constant. Both telescopes had been equilibrating for an hour or more by the time we were down to serious testing. Thermal effects are likely do not affect results.

Most of our testing used the Moon. We swapped views frequently. I left the Vixen set up as described, my companion changed eyepiece and Barlow combinations often. The main areas I looked at were the floor and immediate ejecta blanket of Copernicus, the hummocky terrain west of Copernicus toward the terminator, the floor of Clavius, the curved wrinkle ridges on the east side of Mare Humorum, which were just coming under the terminator at the time of the observation, and another pattern of wrinkle ridges west of Fra Mauro, at about 2-6 degrees south, 32-36 degrees west. (All directions are selenographic, in which Mare Crisium has an easterly longitude and Mare Oriental a westerly one.) I am sure the Stowaway owner looked the same things, but I believe he placed more emphasis on the floor of Copernicus than I did. Our tests continued for some two hours, and were only occasionally interrupted by looks at other things, or by views offered to passers-by.

After much fussing with eyepieces, and many comparisons, the Stowaway's owner asserted that he thought the Vixen's performance was slightly better, based on contrast levels seen in lunar detail, notably on the floor of Copernicus. He stated that there was no detail that he could not see in both telescopes, but that my Vixen seemed to show it slightly better. His remarks were carefully considered, and I obtained his permission to summarize them here.

I did not at first agree. I had not found any difference in performance, but on reexamining the Copernicus area after his comments, I thought I could detect what he was talking about. I remind you again that the Stowaway owner is a more experienced lunar and planetary observer than I. The difference was in any case extremely small.

We also looked at epsilon Bootis, at these magnifications. It was

well split by both telescopes. A third person noted, and I think I agree, that the Stowaway showed a somewhat brighter first diffraction ring than the Vixen, which is a win for the Vixen, if true. The same third party also commented that the Moon appeared slightly yellower in my Vixen than in the Stowaway. I did not notice that color difference. I don't believe anyone noticed any chromatic aberration in either of the telescopes, even on such a demanding test as the edge of the Moon.

Even without the differing eyepiece / Barlow combinations, this test necessarily compares apples and oranges. The Vixen 90 mm f/9 fluorite is a fine example of a classic refractor pushed to the limit; Vixen has used the optical qualities of fluorite to achieve a faster doublet design, with less chromatic aberration, than is possible with traditional optical glasses, and has manufactured it with great care and attention to control of spherical aberration. Roland Christen, in the Stowaway, has implemented one of his well-known exquisite triplets to achieve spectacular performance in a much more compact instrument: I carry the optical tube assembly (OTA) for my Vixen 90 mm in a classy wood instrument case about 80 cm long, but the Stowaway would just about fit in a school kid's lunch box. Indeed, so compact and easy to conceal is the Astro-Physics unit that some of us think it would better be named the "Peeper". Compactness of OTA translates into reduced weight and compactness of mount, as well.

I suspect the Stowaway is more versatile for photography than the Vixen 90. I believe the former instrument has a wider, flatter, and better corrected field, and of course, it is faster. The Stowaway also has a superb focuser, a rack-and-pinion with two concentric knobs, the smaller with reduction gearing to achieve very precise focus, very useful at f/4.9. The Stowaway is easy to use at a magnification so low that it scarcely requires a finder, too, though a finder might be useful in any case, just to avoid having to keep swapping eyepieces. We joked that for so small and fast a telescope, one might have to cobble up a very special minifying finder, perhaps one that reduced objects to a half or a third of their naked-eye apparent size.

The price of the Stowaway's special qualities is, of course, the price. I believe the run of OTAs just produced cost $2400. I bought my Vixen 90 used in 1989, together with a well-equipped Great Polaris mount. The OTAs share of the package price was about $600. A new one, now, would be lots more, but not as much as a Stowaway.

In other respects, the telescopes are about equally useful. One is tempted to think of the Stowaway as better for low-magnification, wide-field views, but it is so fast that many long focal-length eyepieces give too large an exit pupil. I don't think I would be

tempted to run a 90 mm telescope at a magnification below about 20x, and I can get that, with a nice wide field, by using the two-inch end piece for my Vixen's focuser, and putting in a 40 mm Erfle. I usually use larger telescopes for deep-sky work, but I have had spectacular views from the Vixen 90 with two-inch-barrel eyepieces.

Later in the evening, as a sanity check, I looked at the Moon through some larger telescopes. At comparable magnification, an Astro-Physics 130 mm f/8 EDT refractor outperformed both of the smaller units, and the 30-inch Challenger Newtonian, with a 10-inch off-axis stop, was better still. The Stowaway and the Vixen 90 are both excellent small telescopes, but they are not magic.

Such simple telescope comparisons are statistically unreliable, and are usually controversial. Notwithstanding, I have confidence in the result we obtained for these two specific instruments: The system including the Vixen 90 mm f/9 fluorite and the 5 mm Pentax SMC-ED Orthoscopic showed fine, low-contrast lunar detail just a minuscule hair better than the system comprising the 92 mm f/4.9 Stowaway with any of several Barlow/Nagler and Barlow/Takahashi combinations, that produced comparable magnifications. Yet the Stowaway's high price bought enormous compactness, and probably special virtues for photography, that the Vixen could not provide.