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The Sky-Watcher Esprit Apos

Among the Best Apo Values on the Market Today

By Richard Wright

For some years now, I have been fortunate to work for a major vendor in the amateur-astronomy community. Imaging and astrophotography, it is fair to say, is our bread and butter, and so I am one of the very fortunate few who has found a way to make my living working on something that I love to do, and would pursue as my hobby/passion anyway were I to work in another field. Indeed, I did many years ago.

I get to “play” with a lot of equipment, often writing drivers and plug-ins for different devices that I get to hang on to and use long term for ongoing support. Unfortunately, most telescopes and astrographs don’t need specific software support, so I am to some extent on my own there. Over the years, I’ve collected a number of very nice optics for my own use, important pieces of imaging equipment I don’t normally get as part of a development project.

I’ve become very much the glass snob in some ways. Aside from a few DSLRs, most of my own astrophotography investment is in the glass. I’ve acquired an Officina Stellare RH-200 (see my review in the July-August 2012 issue of *ATT*), which I’m still very much in love with. I also am a really big fan of fine refractors.

My first quality instrument in this class was a classic Takahashi FC-76 I purchased from the son of a deceased amateur at a swap meet at the old Mid Atlantic Star Party. Like the first time I looked through a quality eyepiece (well before the imaging bug took hold), this changed my perspective on what a quality refractor was. I went through several models, attempting to purchase something “affordable”



Image 1 - Sky-Watcher's Esprit 150 set up for a night of imaging.

with more reach than my short 600-mm Tak, but always ended up selling them on Astromart or at a swap meet myself.

The bar had been raised for me. “It’s a good scope”, I’d say... but I couldn’t call it “great.” In fact, I first budgeted for and was attempting to purchase a high-end refractor from Officina Stellare when I was seduced by the Veloce RH-200 at the Winter Star Party that year. My Tak was not surpassed as my best refractor until I acquired, via trade, an 80-mm Russian LOMO Triplet, widely acknowledged to be one of, if not the finest, 80-mm refractor objectives ever made. I’d pit it against anything at that focal length and focal ratio (600 mm, f/7),

and although much slower, it rivals the Veloce in contrast and sharpness. Indeed, the Officina Stellare refractors used LOMO objectives too. All I’m saying here is that I think I’m qualified as a refractor connoisseur, or snob if you prefer, with some of my own skin in the game, to boot.

Enter Sky-Watcher to the scene. Sky-Watcher offers a wide range of scopes from visual reflectors to mid-range refractors, and a high-end family of Apos for astrophotography labeled “Esprit.” Generally, when a manufacturer tries to straddle such a wide price range from visual to imaging, they rarely succeed at the high-end astrograph stuff. (I told you I was



Image 2 - The reviewed Esprit 150 ready for first light at the Chiefland Fall Star Party.

a snob!)

When I first saw a Sky-Watcher Esprit refractor, I made several assumptions. It's white, and I don't know why, but I just don't like white scopes. They look "budget" to me; an unfair, and certainly inaccurate prejudice. The Esprit family are all Apo triplets, and I was told by Sky-Watcher USA's Kevin Lagore that they were "very nice." Kevin offered to let me borrow his own refractor, but I hemmed and hawed for awhile having my own fine set of optics and not enough clear



Image 3 - The Esprit 150 ships enclosed in a silver hard-side carrying case with handles, which is, in turn, enclosed in a well-padded shipping box.

evenings as it was.

Finally, at the Arizona Science and Astronomy Expo (ASAE) in Arizona, he caught me with a slight bit of drool on my mouth as I was looking closely at the Esprit 150 for the first time. It had a focal length of 1050 mm – not quite but nearly double my best refractor's focal length, and in my mind I was already cataloging some objects that should frame up very nicely at this focal length and a nearly 60-percent increase in image scale.

I also took note of the high-quality focuser, something many manufacturers seem to skimp on to keep the prices down, and something almost every serious imager has to replace immediately before their new scope is usable. They offered to let me shoot with it for a while and wanted to know what I thought of it. Sure, you can send it to me. I'm not a complete idiot.

My first night out was at the Chiefland Fall Star Party. New equipment ... you know



Image 4 - The Esprit 150's beefy focuser features a 1:10 fine-focus knob and an extra rail to prevent flexure under heavy loads. Shown also is the included field corrector securing a Canon 60Da.

how the curse goes right? The first and only pristine night I had – I arrived late to the dance – I could not use the scope as I had forgotten an important set of bolts that held my mount on the portable pier. To be fair, I had just flown in from a show out west and immediately packed up and left for Chiefland in a hurry. A trip to ACE hardware the following day rectified that situation, and I managed to have everything ready for the next evening. I put it atop a Paramount MYT (**Image 2** – it looks ungainly, but the MYT had no problem with it), and used a Canon 60Da that I had rented from borrowlenses.com.

The evening was off and on and hazy, so I was not impressed with my images overall until early in the wee hours of the morning when there were a few clear moments. Two five-minute subs on the Horsehead Nebula were all I could manage between the clouds. I was impressed. The stars were as small and tight as I could hope for in any optic and reminded me of how I loved the tight sharp stars in my LOMO triplet. Except, wow, look at that image scale! No blue fringing, no big halos. It left me pining for a better run under better weather. Before we get to that though, let's take a look at what comes in the box.

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Image 5 - Closeup of the Esprit 150 focuser locking lever.

Out of the Box

The Esprit (pronounced Espree – it’s French you know) 150 is a big, hefty refractor. Inside a well-padded shipping box, I found a silver carrying case with handles enclosing the main optical-tube assembly (Image 3). The inside is custom foam fitted for the OTA itself. All the accessories were in a separate box, which included the field flattener, as well as a finder scope and a 2-inch diagonal, just in case you actually wanted to look through the thing with an eyepiece.

The scope comes with everything you need for DSLR astrophotography right out of the box, except the camera itself. As anyone familiar with refractors can tell you, you really have to have a field flattener with any refractor. This is just Optics 101. Sometimes you can fudge it if you have a small enough imaging chip or the focal length is long enough, but today’s most commonly used imaging cameras almost always sport APS-C sized chips, or close too it. Ideally, a flattener should be custom designed for a specific focal length and focal ratio, and Sky-Watcher has done just this. Instead of making you shop around for a suitable field flattener, they have included their own custom flattener with the system, which was “specially designed” for the objective.

The included Canon DSLR adapter (you can get Nikon or Sony adapters, as well) places the camera’s chip at just the right distance from the flattener for a flat field all the way across even a full-frame chip.

Everything threads on. This scope was



Image 6 - The slight rounding in the corners and a darker band at the bottom of this flat were produced by the author’s unmodified Canon 5D Mark III, not the optics of the Esprit 150. Still excellent, though.

clearly designed by people who truly know imaging, and I’ve seen my share of scopes that were obviously put together by bean counters picking cheap components from a catalog somewhere who may have even looked through one once. I think we have all owned one of these in our time with this hobby. The Sky-Watcher team clearly includes an experienced imager.

The Focuser

The focuser is also a mark of distinction for this scope. As I noted before, low-cost astrographs are often shipped with focusers selected more with an eye to keeping costs down rather than to function, which is really counterproductive – you end up spending more to replace the focuser after the fact anyway. Grrrr!

There are a couple of very nice features about the Esprit focuser. Of course, there is the standard 1:10 knob for fine focus (Image 4). That’s become a given. The focuser is also quite beefy, with an extrarailing on the top to keep it from flexing under heavy loads. I’m confident it can handle my new FLI Pro Line, and I plan to test that theory after this article goes out.

A lever on the bottom (Image 5) applies force to the gear system, not pressing against the tube, for a shift-free locking mechanism. I did experience some shift laterally, but only an arc second or two – the shift was not back and forth. Sky-Watcher USA has since told me they have a new-and-improved focuser that eliminates even this small shift. Point is, I did not lose focus when I clamped it down, a welcome



Image 7 - The Pleiades – 15 five-minute subs at ISO 800 captured with an unmodified Canon 5D Mark III via the Esprit 150.

change from a brand or two which will remain nameless here.

Two sets of locking collars can also be loosened allowing you to spin your camera, or the focuser itself, to any orientation you like. This is useful for when you want to frame up an object a certain way, or maybe to make the locking knob easier to find in the dark or to position the fine focus on the side of the scope where it is most convenient.

First (Real) Light

A few weeks after my Chiefland experience, I took the Esprit 150 down to my dark-sky site in Okeechobee county Florida. This time conditions were much better, at least until the Moon came up half way through the night. I had two nights to turn this baby loose and see what she could do and planned to use two



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Image 8 - This unscaled crop from the center of Image 7 reveals exceptional stars, especially considering that the author focused the scope by hand.



Image 9 - Even this crop from a far corner of Image 7 shows perfectly round stars.

other cameras. First, I have an unmodified Canon 5D Mark III. This is the big chip for DSLR imaging, and I had been told that there was almost no vignetting with this scope, even with a full-frame chip. Well, we'll see about that, I thought.

The flats were unbelievable. The screen stretch in PixInsight showed a uniform field with no variations. I converted it to a TIFF and brought it into Photoshop. Determined to find some hint that my camera was not malfunctioning, I did some "creative stretching" with curves and managed to get something to show up (**Image 6**). A slight rounding in the corners, and a darker band at the bottom.

I'd seen this darker band before on my Velloce. It's from the camera itself, but the $f/3$ light cone on that scope brings that bottom obstruction up to about one-fourth of the image



Image 10 - This image of the Orion-Running Man region was captured with a QHY10 one-shot color CCD via the Esprit 150. It is comprised of 16 five-minute subs for a total of an hour and a half of excellent data.



Image 11 - This crop of M42's Trapezium region distinctly reveals each of the four famed stars.

height. This must be why Sky-Watcher provides their own adapters with the scope, at least for the Canon cameras. The adapters are very wide and open and provide an unobstructed light path all the way down to the chip on the camera. All optical systems will have some vignetting. This is what some looks like, and I had to stretch it hard with some contorted curves to find it. Remember too, this is a Canon 5D Mark III here, a comparatively large chip. The APS-C-sized chips in a 60Da or most modified Rebel DSLRs truly will be vignetting free.

Of course, I needed a target that would do an unmodified DSLR justice, and that target was the Pleiades (**Image 7**). The results were as I had hoped – outstanding! – with one caveat. Contrary to what many may think, it does sometimes get cold in Florida in the winter-time. The temperature dropped some 25 de-



Image 12 - Thor's Helmet – 15 hours of RGB and OIII data captured with the Esprit 150 and a Starlight Xpress Trius 694 through Baader LRGB and narrow-band filters.



Image 13 - The Antenna Galaxies shot in LRGB with the Esprit 150 and a Starlight Xpress Trius 694.

grees at sunset, and as the temperature dropped, the focus on the scope shifted.

I realized shortly after the meridian flip that my pinpoint stars were getting soft and bloated. I was pretty mad at myself for not realizing this OTA was metal, and this was to be expected. It's been a while since I've used something that wasn't temperature resistant, so I was out of habit.

I refocused, as now the evening temp was pretty stable, and went on shooting until the Moon came up. I ended up tossing about half my subs for being too soft, but with 5-minute exposures, I still had 15 good well-focused subs. Only 1.25 hours of data from a night's work. Still, I shot at ISO 800, I dithered generously, and it was cold (in the 40s F), which kept the thermal noise on the DSLR low.

While I would have liked more data on this, I think it's quite good in comparison to some of my other efforts on this target, many with much more time. The veiled nebulosity came out quite well, and the stars were fantas-

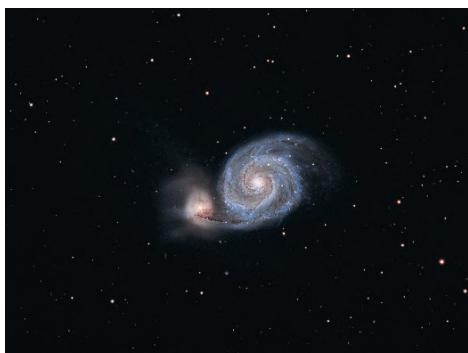


Image 14 - M51 captured with the Esprit 150 and Starlight Xpress Trius 694 under the strong luminance of a quarter Moon.

tic. Of course, the seeing was also quite good that night. I love Florida Winter imaging! Look at the unscaled crop from the center (Image 8). The stars are exceptional, especially considering I had to focus by hand.

Manual focus is a pain, but worth getting right with a high-quality refractor. That's cheating, right? That's the center of the frame – everybody knows the stars go wonky out towards the edges! Especially with a chip that large, right? Right? Nope, not a bit. Image 9 is a crop from the far corner and the stars are as perfectly round as I've ever seen them in my best images with any other instrument.

There's no question this scope is a stellar performer for DSLR imaging, but what about for CCD imaging?

CCD Imaging with the Esprit 150

The included spacer and adapters were for Canon DSLRs with their 44 mm of back focus. To shoot with a CCD camera, I'd need a custom spacer for my particular camera to make sure the included flattener was the right distance from the imaging chip. I went to Precise Parts (www.preciseparts.com) and ordered two such adapters, one for my QHY10 one-shot color camera and the other for my Starlight Xpress Trius 694 with filter wheel and OAG (see my review of the latter in the March-April 2014 issue of *ATT*).

A window of clear skies the night following the DSRL/Pleiades test provided an opportunity to try the scope with the QHY10. I took greater care of the focus and shot M42 and the running man for nearly an hour and a half (16 five-minute subs) between occasional

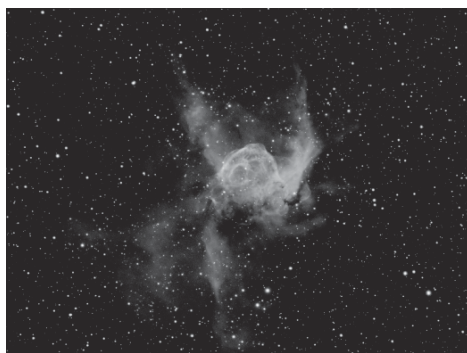


Image 15 - Thor's Helmet captured in OIII via the Esprit 150 and Starlight Xpress Trius 694.

clouds until the Moon rose. The result, Image 10, is my favorite attempt on these two objects. The colors were vivid and rich – yes, there's some processing involved for this, but there are degrees to which you have to work to get it out of the data – and the stars were sharp and well defined across the entire field. Check out Image 11, a crop of the Trapezium region, where the four famed stars remain remarkably distinct for such an expansive composition.

Image 10 reveals the beauty of a true Apo:



Image 16 - The Horsehead Nebula captured in Ha with the Esprit 150 and Starlight Xpress Trius.

All of the colors are focused evenly, so excellent results can be obtained with a one-shot color camera, be it a DSLR or a cooled CCD. One exposure gets you red, green, and blue, and you can take your chances between clouds and just grab as much data as you can. A mono camera can accommodate a non Apo, because you can just refocus for each color channel. But why do that if you don't need to?

A week-long star party a month later gave me the chance to try the scope with yet another

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Image 17 - Sky-Watcher's Esprit 80 atop a Software Bisque MYT.

CCD camera my Starlight Xpress Trius 694 mono camera with a full complement of Baader LRGB and narrow-band filter – a smaller chip, but more sensitive and incredibly low noise, it should do well at f/7, and the small pixels should really put to test this scope's resolving power. Over the course of the week, I gathered just over 15 hours of RGB+OIII data on Thor's Helmet (**Image 12**), and I could not have been much happier.

I also managed about four hours on the Antenna Galaxies (**Image 13**) in the early mornings after Thor had set. For this, I did the full complement of LRGB. Again, luminance through a non-Apo would have deteriorated the sharpness in this image.

I had just over two hours on M51 (**Image 14**) on another occasion, also captured under some strong luminance – the RGB was shot with a quarter Moon up. I've bragged that I could get great images in less time with my f/3 Veloce, but the truth is, if you have good contrast and sharpness out of the gate, this is a huge advantage ahead of when you start processing your data.

I had my doubts about shooting narrow-band at f/7, but again, a high-QE chip with low noise can make the most of a good quality refractor that delivers sharp, high-contrast images. Thor's Helmet in OIII (**Image 15**), for example, was simply outstanding.

I was equally pleased with Ha. **Image 16** of the Horsehead Nebula shows the lovely and subtle background that looks like a curtain or paintbrush strokes.

The Little Brother

The Esprit 150 is the largest refractor in the Esprit line, and based on my experiences



Image 18 - The Esprit 80 in its included carry case. Note the tennis balls cleverly positioned to serve as support points.

with it, I decided I wanted to try the smallest in the line, too, the Esprit 80. For wide-field astrophotography, I'd been using one of my 600-mm instruments or one of my Canon L-series lenses. 600 mm is just not short enough sometimes, and the Canon lenses have produced some nice results for me, but you have to stop them down quite a bit, and even then the field is just not truly flat or good to the edges. At least, not for the really discerning snob... um, connoisseur, anyway. The 80-mm Esprit is a bit quicker, too, at f/5, shorter at 400 mm, and honestly, I've never seen stars in the corner of a Canon lens image that matched what the 150 was delivering. The advertised image circle on the 80 is a little bit smaller than the 150 at 33 mm, but still plenty big for most of my CCD cameras and all but my largest DSLR (I actually tried this on the 5D, and found the vignetting still manageable at the edges). I was already thinking about a 400-mm lens, but I knew I simply had to try one of these first. And I had a particular goal in mind.

I asked Sky-Watcher USA if they could possibly send me one in time for the Winter Star Party with the intention of shooting the Witch Head Nebula. I've attempted her in my 600-mm scopes with large imaging chips, but she's a hard object to get, and every year she has defeated me. Rigel is always producing some glare off to the side, or some bug-a-boo UFO

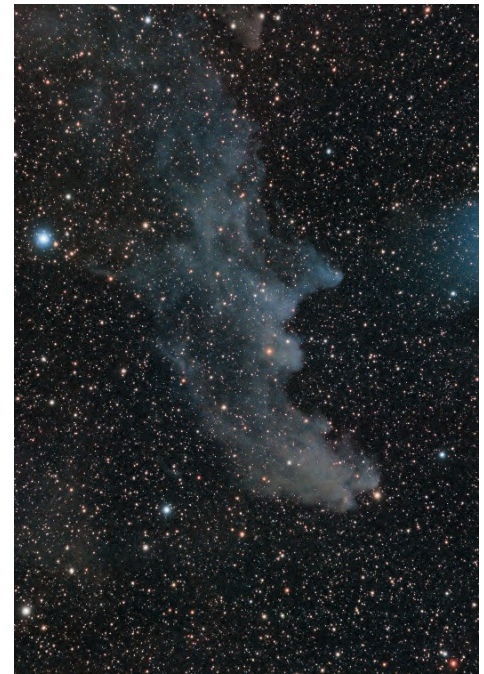


Image 19 - The Witch Head Nebula captured at the Winter Star Party with a Sky-Watcher Esprit 80 and QHY10.

internal reflections came out of nowhere. Be it the optics, the filters, a shiny camera sensor, the flattener, or a shiny edge somewhere along the train, some gremlin was always foiling my plans. Bottom line: The Witch Head had proved a truly a haunted object for me. Could the Esprit 80 finally deliver her? This was going to be the acid test.

The Esprit 80 is in every way as good a scope as its big brother, both mechanically and optically – same quality manual focuser, but with a fixed non-retractable dew shield and a screw-on lens cover like its larger sibling. Oh, and I love screw-on covers – they don't fall off! It also comes with an integrated Vixen-sized dovetail, but it has threads on the bottom so I was able to bolt it to a Losmandy style dovetail easily enough. It fit perfectly atop a Paramount MYT (**Image 17**).

I just love the cases the Espirts arrive in. I'm not sure I'd trust them to airline baggage handlers, but they are foam-lined, durable, and cut to fit the scope and accessories. The Esprit 80, in particular, had an amusing system where tennis and other rubber balls act as contact and support points to keep everything where it belonged. For shipping, these are placed inside a durable cardboard box with additional Styro-

foam.

These cases are just darned convenient for storage and transport, whether you're shipping the scope or transporting it in your own car to a star party. I thought the packaging as a whole was a very nice touch. It makes you feel you've just made a premium purchase that is going to last you for years.

My first and only disappointment with the Esprit 80 was that I could not use the same spacers that I had had made for use with the 150. Of course, this only applies to CCDs—you still get everything you need for a DSLR right out of the box. Well, they are different optics, and so the spacings have to be different if your goal is the best image quality. I suspect the 80's flattener is also doing some other corrections besides flattening. This suspicion is based on just knowing enough about optics to make me sound really smart to people who know nothing and really annoying to those who actually do know optics. In any case, follow the guidelines on spacing, and you won't be sorry.

I took advantage of another feature of the Esprit imaging trains this time. Inside the adapter that connects to the flattener, there is a place to put a 2-inch threaded filter. This has numerous uses. For mine, I decided to install a Chroma Low-Glow (see the review in the November-December 2014 *ATT* issue) light-pollution filter. I knew from past Winter Star Parties that the Witch Head was going to be sliding down into some sky glow to the southwest—thank you very much, Key West!—and I was hoping this would extend my imaging time on an already faint object. I was really pressing my luck now with an extra filter in the mix, but I figured I might as well go for broke. I paired the Esprit 80 to the QHY10 one-shot color camera, for which I happened to have an appropriate spacer, and went for the gold.

How did it do? Quite well! My LOMO triplet produced a huge rainbow, probably from the flattener as I've since determined, emanating from Rigel, and even my beloved Veloce cannot shoot the Witch Head without some interference from Rigel. But the Esprit 80 delivered beautifully. F/5 is twice as fast as f/7, and jockeying for the astrophotography contest, I only allowed two hours per target. But two hours were all I needed for some nice



Image 20 - The Rosette Nebula shot through an Esprit 80 with a QHY10 one-shot color CCD camera.

showcase images. In addition to the Witch Head (**Image 19**), I also got a nice Rosette Nebula shot (**Image 20**) and a wide image of Markarians chain (**Image 21**). The Markarians chain really needed more exposure time, but as you can see, it captures the field beautifully with dozens of galaxies easily visible in the surrounding region.

Conclusions

White telescopes aren't budget scopes, and a company really can offer a wide range of scopes for many markets and still understand what it takes to make a high-quality instrument for the higher-end market. At least, it appears that way with Sky-Watcher. The synergies of a larger company also provides some economies of scale as these scopes are easily on a par with high-quality instruments costing considerably more from smaller but more recognized and specialized refractor makers.

I can honestly say that I don't think you can find a better refractor than the Esprit line in this price range. They simply destroy any of the lower-cost refractors I've bought and resold, and they are embarrassingly good compared to refractors that cost thousands of dollars more. By "embarrassingly good," I mean we are at the point where I can no longer tell the difference between these and some of the very high-end glass members of my local astronomy club are shooting through. The glass is as good as my LOMO to my ability to discern any differences here. If there is something better, it will be hard to demonstrate without special lab equipment

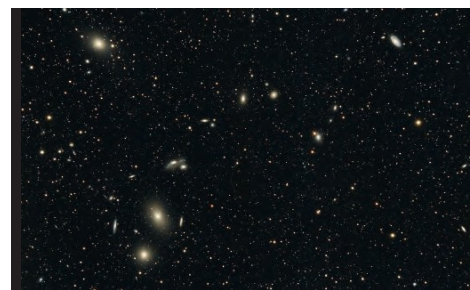


Image 21 - The Markarians Chain, also captured with the Esprit 80-QHY10 combo.

and a lot of numbers and graphs. I care mostly about my images, and I've not seen better performance from a refractor. As far as I'm concerned, the bar has been raised again.

Furthermore, I put my money where my mouth is, and I went ahead and purchased the Esprit 80 for myself. Compared to my very best optic (a once in a lifetime purchase, I promised my wife), it's not quite as fast, and its image circle is not quite as large; but it is every bit as sharp. Yes, I'll leave the deeper narrow-band and the fainter, more difficult targets to the nearly \$10,000 f/3 instrument, but this is a \$1,600 scope. I wish I'd started with one of these.

Although well known internationally, Sky-Watcher is relatively new to the U.S. market, and it's not a name that I had previously associated with top-notch optics. This is a marketing perception possibly due to the fact that they also make more budget-oriented products. You just don't expect to find Ferrari's (high-end astrographs) next to Volkswagens (Dobs, with apologies to the visual crowd) at the same car dealership. Don't be fooled by perception, though. Perhaps that perception will be changing as more people discover one of the best values in refractors on the market today.

As for the Esprit 150, it is still delivering some of my best images, and I plan to pair it with an even larger CCD sensor soon. Alas, it is still a bit more than I can sneak past my wife out of our retirement fund—I still have two boys in college—and I'm not going to trade my Veloce for it, but I will probably cry when I have to pack it up and send it back. So far, they haven't asked for it, and I'm not planning to remind them anytime soon! ☐