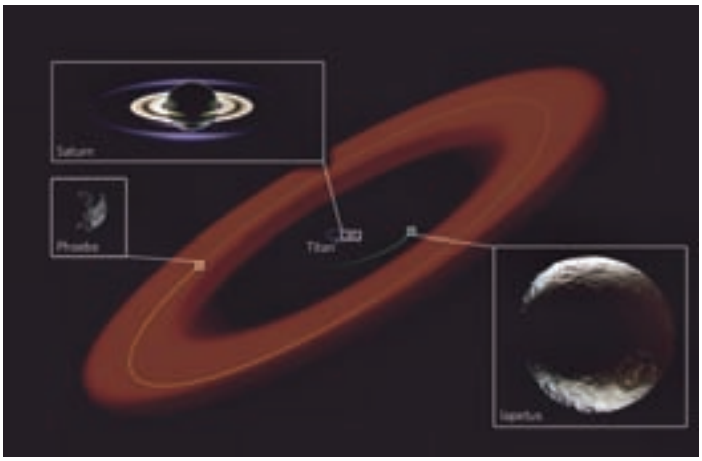

Figure 1— Saturn's mammoth ring. The orange ring is the newly discovered feature. Phoebe's orbit embedded in the ring is shown, as are the orbits of Iapetus and Titan. Barely visible in the centre is the traditional main ring system and Saturn (shown in inset). Figure courtesy Nature/NASA/JPL-Caltech.

calculated that over the history of the Solar System, Iapetus' leading hemisphere has picked up enough material from the Phoebe ring to coat it to a depth of at least 20 cm.

At this point, you are probably asking yourself why this ring hasn't been seen before, even if it is visible only in the infrared. The answer is that the ring is very diffuse. Hamilton estimates there are only ~20 ring particles per cubic kilometre! The reason it can be seen is that it's so huge — most sight lines encounter enough particles to build up a signal.

In fact, the ring's size almost prevented it from being discovered. The *Spitzer* field of view is tiny compared to the ring, and Saturn is very bright, leading to many diffraction spikes. While the ring signal was there, where it was supposed to be, the confusion of the spikes and other artifacts made the team hesitant to declare a detection. They then went to archival data, in which Saturn's irregular moons had been studied, to see if the ring signal was visible. Using a standard filtering technique, there was no ring, and the status remained unclear. Only when they used the unfiltered data was the signal (relatively) booming and the rest is history — literally. This is one for the text books.

So the next time you have Saturn in your eyepiece, spare a thought for the much bigger ring that you cannot see in optical light.

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Through My Eyepiece

By Geoff Gaherty, Toronto Centre (geoff@foxmead.ca)

Fun, Go, and Galileo: Three Low-Priced 'Scopes

For quite a while now, the least expensive telescope that I could recommend with a clear conscience to a beginner has been Orion's StarBlast: a 114-mm f/4 Newtonian on a miniature one-armed Dobsonian mount, with a price of just under $200 US. With 2009 being the International Year of Astronomy, we've seen the introduction of several telescopes below this price point, hoping to catch the eye of the budget-minded beginner. Recently, I have been looking at (and through) three of these new scopes (Figure 1).

Orion FunScope: 76-mm f/4 Newtonian

Several companies have come out with similar 76-mm f/4 Newtonians on a small version of the StarBlast mount, all selling for around $50 US. Of these, I like the Orion version best, since it comes with a red-dot finder. The SkyWatcher version has an awful 5×24 optical finder, and the Celestron version has no finder at all. Even though Orion's little scope has quite a wide field of view with its standard 20-mm Kellner eyepiece, it is hard to aim without some sort of finder.

The main advantage this little scope has over earlier versions is its nice Dob-type mount, which is smooth and solid in operation, compared to the shaky aluminum tripods usually found on beginner's scopes. The Orion can be set on a solid table, but also has a standard 1/4-20 socket on the bottom, so it can be mounted on a heavy-duty camera tripod.

Optically, its spherical 76-mm f/4 mirror leaves a lot to be

Figure 1 — Left to right: Orion FunScope and GoScope; in front: Galileoscope.

desired, but works quite well with the 20-mm and 10-mm Kellner eyepieces provided, yielding modest magnifications of 15x and 30x. This was fine for viewing our Moon and Jupiter's moons. The wide-field views of fall favourites like the Pleiades, the double cluster in Perseus, and the Andromeda Galaxy were really excellent. This telescope also proved to be a lot of fun in daylight when used as a long-distance microscope. By viewing with my back turned to the subject, it even gave erect images!

In comparison to the standard 60-mm department-store telescope, the FunScope offers more aperture, a wider field of view, a much better mount, and a more compact size. I like it!

Orion GoScope: 80mm f/4.4 Achromatic Refractor

Following the success of the mini-Dob mount used in the FunScope, Orion adapted it to several other optical tubes through a standard Vixen/Synta dovetail. These include an 80-mm f/4.4 achromatic refractor and a 100-mm f/4 parabolic Newtonian, each costing $100 US, and a 90-mm f/13.9 Maksutov-Cassegrain at $200 US. I tested the 80-mm refractor version.

What do you get for the extra $50? An optically superior telescope. Because of its larger aperture, longer focal length (350 mm), and better quality objective, it delivers much sharper images with significantly better contrast. It comes with the same 20-mm and 10-mm eyepieces and red-dot finder as the FunScope. The mount is the same as well, but the tube attaches to it via a Vixen dovetail. Focusing is by a rubber-covered knob that moves the objective up and down the tube, a rather odd arrangement. I was able to detect the two major belts on Jupiter with the 10-mm eyepiece (35×), which weren't visible in the FunScope. There was quite a bit of chromatic aberration, which is only to be expected with a short-focal-ratio achromat like this, but it was not really obtrusive.

On the whole, this felt like a much better quality instrument than the 76-mm FunScope, something a serious amateur astronomer might choose as a highly portable "grab and go" scope.

Galileoscope: 50-mm f/10 Achromatic Refractor

This is the least expensive of the three telescopes, at $20 US, but by far the most interesting and unusual. The Galileoscope was designed specifically for IYA2009 by a team headed by Rick Fienberg, former editor of *Sky & Telescope* magazine.

The Galileoscope is, like Galileo's own telescopes, a small refractor with a long tube that focuses by sliding a smaller tube inside. There is where the resemblance ends; the rest of the telescope is something Galileo would have died for. First of all, the objective is a high-quality 50-mm f/10 achromat. This is an excellent lens, delivering sharp, high contrast, and colour-free images. Secondly, it comes with a nice 20-mm Plössl eyepiece, as well as an achromatic 17-mm Galilean eyepiece.

The Galileoscope comes in kit form (Figure 2). Bare bones instructions are included, but there is a nice colour-illustrated instruction booklet available in PDF format on the Galileoscope Web site at `www.galileoscope.org`. Assembly takes about 15 minutes, and is quite easy except for the care needed in assembling the small lenses used in the eyepieces. The main eyepiece is a 20-mm Plössl, yielding 25×, supplemented by a 17-mm achromatic Galilean eyepiece, a negative doublet that can be reconfigured as a 2× Barlow lens.

Figure 2: The Galileoscope in its box.

The tube of the Galileoscope is roughened and baffled on the inside, making for good contrast, and has a 1/4-20 thread on its base for mounting on a camera tripod, which is not provided. The supplied 20-mm eyepiece worked very well on its own, but less well with the Barlow, as it raised the exit pupil and made eye placement very critical. I ended up using one of the 10-mm Kellners from the Orion scopes for my best views of the Moon and Jupiter at 50x. There was a wealth of detail visible on the Moon, and I could just make out the North Equatorial Belt on Jupiter, though Jupiter was at a low altitude when I made my test. The telescope has a simple gun-sight finder moulded in, which was hard to see in the dark. A couple of dabs of white paint would help.

The down side of the scope is that the shipping charges to Canada are actually more than the telescope itself: $24 on a $20 item! It was a pleasant surprise that there were no hidden brokerage charges. It would make sense for a Centre to order a bunch of these, as there is a price reduction for bulk purchases, as well as a drop in average shipping costs. I gather a number of clubs are doing this, and then handing out the scopes to kids at star parties. A minor drawback is that it does not provide enough focus travel for a diagonal to be used, but then Galileo never used a diagonal either. In fact, diagonals for refractors have only come into common use in the last 50 years.

The kit can also be used as an optics lab, as there is an optics experiment booklet available on the Web site, plus a very nice observing guide. It can be disassembled and reassembled many times, since it uses no glue and requires no tools. This scope is extremely successful as a multifaceted educational tool, as well as being a nice little telescope, quite remarkable for its modest price.

In summary, if someone is seriously interested in astronomy, a 114-mm or larger Dobsonian is still their best entry point. For an older child or someone who is not quite sure about astronomy, the scopes reviewed here all provide an inexpensive first step, which is much more pleasant than the standard shaky Christmas trash scope. In general, you get what you pay for, and the GoScope at $100 is much better than the FunScope at $50. The Galileoscope is really something special: an educational tool that is also a successful telescope.

Geoff Gaherty recently received the Toronto Centre's Ostrander-Ramsay Award for excellence in writing, specifically for his JRASC *column,* Through My Eyepiece. *Despite cold in the winter and mosquitoes in the summer, he still manages to pursue a variety of observations, particularly of Jupiter and variable stars. Besides this column, he writes regularly for the* Starry Night Times *and the* Orion Sky Times. *He recently started writing a weekly column on the* `Space.com` *Web site.*