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The Nexstar Evolution 6 and SkyPortal

The Ultimate Grab-and-Go Scope

By James L. Chen



Image 1- The Evolution 6 features a newly designed single-arm architecture.



In April, 2014, I was working at a vendor booth at the annual springtime ritual that is the NorthEast Astronomy Forum, commonly known as NEAF. As such, I was an invitee to an exclusive Celestron reception of the new product introduction for the Celestron NexStar Evolution telescopes, and a new 11-inch Rowe-Ackermann Astrograph.

The Celestron NexStar Evolution represents the latest developments in the long line of Schmidt-Cassegrain designs. The Celestron NexStar Evolution line includes 6-inch, 8-inch and 9.25-inch telescopes mounted on a newly designed heavy-duty, single-arm fork mount with WiFi-based computer go-to drive systems.

The Celestron NexStar Evolution 6 was my choice to evaluate, both for this re-

view and for use in my latest book project for Springer, *The Celestron NexStar Evolution and SkyPortal User Guide*, available sometime late Summer or early Fall 2016.

Mechanically, the Evolution 6 features a newly designed single-arm architecture (**Image 1**) that is far sturdier than the older Celestron 6SE design, and is sturdy enough for use in astrophotography.

Most notable is the new go-to computer control system. Currently, many go-to telescopes have hand controls connected by a control cable attached to the base, and a power cable attached to a battery or power supply. The resulting rats nest of cables has been eliminated in the new NexStar Evolution telescopes.

No longer is the telescope user encumbered with a hand controller and its

THE NEXSTAR EVOLUTION 6 AND SKYPORTAL



Image 2 - Gradations are imprinted into the tripod's extendable legs to aid in leveling the mount at a repeatable height.

telephone-like coiled controller cable. The Celestron NexStar Evolution 6 utilizes a revolutionary cordless WiFi interface with the user's tablet or smartphone to control the telescope. The user's iPhone, iPad, or Android tablet or phone loaded with Celestron's free *SkyPortal* application, a special version of the *Sky Safari 4* Basic application, is used to control the Evolution telescope. *SkyPortal* also contains a database of information, including Celestron Audio that provides descriptions and histories of many stars, nebulae, clusters, planets, and galaxies. Additionally, a standard Nexstar+ hand controller is included with each Evolution telescope to provide an alternative means of controlling the telescope.

The Evolution 6 mount base comes equipped with a built-in rechargeable lithium iron phosphate battery. This bat-

tery, as known as LiFePO_4 , includes numerous built-in safety features, including protection against overcharging, over-discharging, and overheating. Lithium iron phosphate batteries are long-life units that, under normal usage, will last through thousands of charge cycles before replacement is needed. No longer does the user have to lug a separate battery pack to power the telescope, or have a power cable cord getting in the way during an observing session.

Lithium iron phosphate batteries offer a longer cycle life and longer calendar life relative to the more traditional battery chemistries, with the following advantages:

1. LiFePO_4 batteries have higher current and peak-power ratings than LiCoO_2 batteries.
2. The use of phosphates avoids certain environmental concerns, particularly

about cobalt entering the environment through improper disposal.

3. High charge levels and elevated temperatures (whether from charging or ambient air) hasten capacity loss of LiCoO₂ cells. In contrast, the calendar life of LiFePO₄ cells is not affected by high charge states.
4. Unlike other lithium ion batteries, LiFePO₄ can deliver virtually full power until it is discharged.
5. Another important advantage of LiFePO₄ over other lithium-ion chemistries is thermal and chemical stability, which improves battery safety.

Further, tripod refinements include gradations imprinted on the extendable legs (**Image 2**) to aid in leveling the mount on an uneven surface with a bubble-level is provided. There are eyepiece spaces provided in both the tripod (**Image 3**) and drive base (**Image 4**) of the mount. And as icing on the cake, Celestron supplies two Plossl eyepieces, a 13-mm and a 40-mm, as standard equipment.



Image 3 - Eyepieces spaces in the tripod spreader tray.

Telescope Optics

All three Evolution telescopes, including the Evolution 6, are of the Schmidt-Cassegrain design (**Image 5**), which was first

brought forth to the amateur astronomy market and popularized by Celestron in the mid-1960s. The three sizes of Evolution telescope represent realistic choices of conven-



Image 4 - More eyepieces spaces are integrated into the Evolution 6 drive base.

ience, optical performance, and portability.

Although Celestron SCTs are available in apertures from 5-inch to massive 14-inch apertures, for maximum convenience and portability, combined with optical performance and modern electronic control technology, the Evolution 6 has a lot to offer. Its convenient size and still-ample aperture fills

the need for a grab-and-go telescope for trips to the country at a moments notice.

Newtonian telescopes are available at a cheaper price in larger apertures for deep-sky light gathering, but are cumbersome. Refractors produce images that are of better quality in contrast and sharpness, but often their German equatorial mounts are heavy

and burdensome. But if a person is only going to own one single telescope that is capable of handling multiple astronomy tasks, the Evolution 6-inch SCT is a good choice.

SkyPortal Application

At the heart of the Celestron WiFi technology is the *SkyPortal* app (**Image 6**). Celestron's newest planetarium application is an astronomy suite redefining the computerized telescope experience of the night sky. *SkyPortal* enables the backyard astronomer to explore the Solar System, 120,000 stars, 220 star clusters, nebulae, galaxies, and dozens of asteroids, comets, and satellites – including the ISS.

SkyPortal is compatible with both Apple iOS and Android devices. The user has the option of using a smartphone, a mini-tablet, or full-sized tablet. *SkyPortal* is free for download and is available from the online Apple App store and Google Play. *SkyPortal* is useful as a mobile planetarium app, even when not connected to a Celestron NexStar Evolution.

Additionally, *SkyPortal* and the smart device can be used with either the compatible Celestron NexStar Evolution telescope, or with any go-to Celestron mount with the added Celestron *SkyPortal* WiFi module.

The current version is *SkyPortal Version 1.5.17*, which supports the interoperability with Celestron's optional StarSense AutoAlign Accessory. StarSense adds the auto-aligning capability to the already extensive electronics suite of the Evolution telescopes.

When used as a planetarium program, *SkyPortal* features the following:

1. An intuitive Compass Mode enables the user to hold the smart device up to the night sky and instantly identify stars, planets, galaxies, and more. Zoom-in capability is provided to view fainter objects not visible to the naked eye.
2. A custom list of all the best celestial objects to view based on the local time, date, and location.
3. Simulation of the night sky up to 100 years in the past or future to plan a particular observing session. For example, the user can look ahead to see when Jupiter's Great Red Spot will be visible, or animate a lunar eclipse such as the "Blood Moon" to prepare the user on what to expect before setting up the telescope.
4. Hundreds of astronomical photographs and NASA spacecraft images, plus more than four hours of audio narration to learn the history, mythology, and science of the heavens.

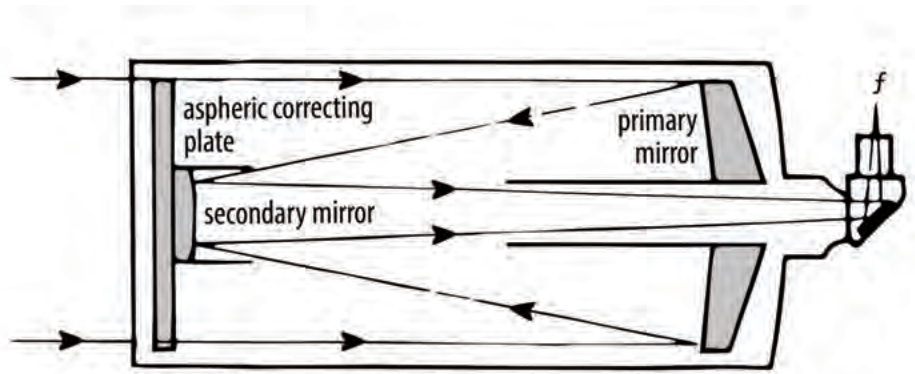


Image 5 - Schmidt-Cassegrain design (image courtesy of Adam Chen).

5. Night Vision Mode that helps preserve eyesight after dark.

Fifteen categories of go-to objects are available in SkyPortal:

1. Tonight's Best,
2. Sun & Planets,
3. Moons,
4. Asteroids,
5. Comets,
6. Satellites,
7. Named Stars,
8. Bright Stars,
9. Nearest Stars,
10. Double Stars,
11. Deep Sky Objects,
12. Messier Objects,
13. Caldwell Objects,
14. Constellations, and
15. Asterisms.

By selecting any one of these categories, the user is presented with a list of objects

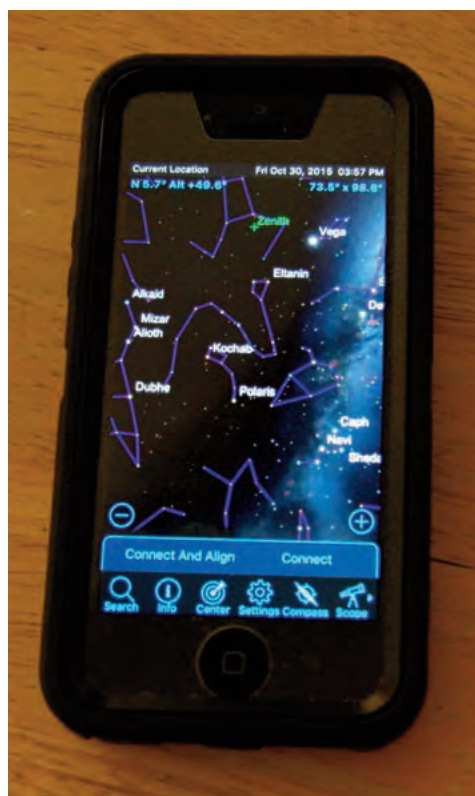


Image 6 - SkyPortal app on the author's iPhone.

from which a go-to search can be accomplished.

The second technique is to simply tap the fingertip on a star on the Sky Chart, thus placing crosshairs on it, and then tapping “GoTo” on the command line of *SkyPortal* (**Image 7**) This works well with go-to searches for stars.

If the user knows the name of the object, *SkyPortal* allows the direct input of the name and a go-to search can be initiated.

Alternatives and Upgrades to SkyPortal

For many owners of an Evolution 6, the capabilities of *SkyPortal* are sufficient to keep them happy for years. 120,000 stars, plus 220 of the best-known star clusters, nebulae, and galaxies in the sky are available. It displays the Solar System's major planets and moons using NASA spacecraft imagery, and includes the best-known 500 (or so) asteroids, comets, and satellites. It accurately shows the sky from anywhere on Earth, at any time up to 100 years in the past or fu-

ture, and lets the user identify stars, planets, and constellations with the smart device's GPS, compass and/or gyroscope.

But many owners may feel limited by the capabilities of *SkyPortal*, especially considering the extensive deep-sky capabilities of the NexStar+ hand control (**Image 8**) provided as standard equipment with each Evolution telescope. The Celestron NexStar+ AZ Hand Control is a standard accessory on all current altazimuth mounted NexStar telescopes, and is compatible with the Celestron SLT, LCM, SE, and CPC computerized telescopes.

With the push of a button, the user can access NexStar+ hand control's huge database of over 40,000 celestial objects, automatically slewing to objects from a variety of catalogs, including the Messier, NGC, Caldwell, and SAO brightest stars. The planets, as well as a list of the most popular objects, are also included.

Not sure what to look at? Sky Tour provides a selection of the most popular objects for the date and time of night.

A variety of alignment procedures are pre-programmed into the NexStar+ Hand Control, including SkyAlign, Auto 2-Star, 1-Star, 2-Star, and Solar System. A variety of tracking rates (sidereal, solar and lunar) and slew speeds are available. Slew rates can be chosen at 1, 2, or 3 degrees per second, or choose speeds as low as 2x or as high as 64x.

This hand control includes Flash Upgradeable Technology, allowing users to upgrade its software via the Internet. Access the Celestron website and the latest upgrades can be found on the Support Tab.

One of the benefits of *SkyPortal* versus the NexStar+ hand control is the method of upgrading the software. The NexStar+ hand control requires a connection to a PC computer and adjustments to port assignments and addresses. In other words, a little computer knowledge and technical skill that some users may lack. There is a risk of frustration and failure with the process of upgrading a hand control. Updates with smart devices are a simple download of the latest app version. The app has already been vetted by the app store, and the user is assured prior to the download that the app will work properly and install properly. There is little or no risk associated with upgrading an app on a smart device.

For those who find the databases of *SkyPortal* and the NexStar+ hand controller limiting, *SkySafari 4 Plus* and *SkySafari 4 Pro* are compatible apps available for download onto smart devices and can be used with Evolution telescopes. Be aware that upgrades may lack some of the unique Celestron functionality.

SkySafari 4 Plus adds a hugely expanded database, wired or wireless telescope control, and the ability to leave Earth and fly into orbit around any Solar System object or nearby star – from the *SkyPortal* basic version. It shows you 2.6 million stars, and 31,000 deep sky objects, including the entire NGC/IC catalog. It includes nearly 18,000 asteroids, comets, and satellites with orbits that can be updated, and it can point the Evolution telescope anywhere in the sky, using the smart device's built-in WiFi. Many of the additional objects will chal-

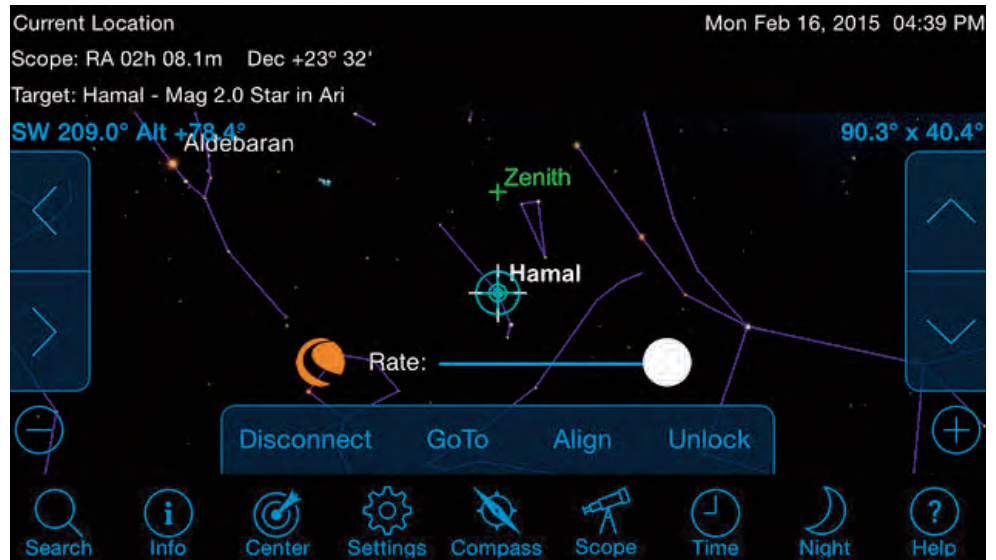


Image 7 - SkyPortal Sky Chart screen (image courtesy of Celestron).

lenge detection with the apertures of the Evolution series.

The all-new *SkySafari 4 Pro* has the largest database of any astronomy app, period. It contains everything in *SkySafari 4 Plus*, but also includes over 27 million stars from the Hubble Guide Star catalog generation 1 and 2, plus 740,000 galaxies down to 18th magnitude, over 620,000 solar system objects – including every comet and asteroid ever discovered – and a Moon map based on NASA's latest LRO data with 8x the resolution of any other *SkySafari* version. It shows the sky with sub-arc second precision from anywhere on Earth, in the Solar System, or beyond, at any time up to one million years in the past or future – yet it runs just as fast and smoothly as *SkyPortal*.

The caveat to the use of *SkySafari Pro*

is that many of the additional objects may not be within the visible or detectable capabilities of the 6-inch, 8-inch, or 9.25-inch Evolution telescopes.

Optics

In my younger days, I owned an original orange-tube Celestron C-5. It was an excellent smaller-aperture SCT, worthy of the title "Grab-and-Go" before the term came into general use. The C-5 has had a loyal following over the years, and the Evolution 6 SCT follows in the Celestron tradition of excellent optics in their smaller aperture SCT offerings.

As an owner of three apochromat refractors, it is difficult for me to find fault with the Evolution 6 optics. Right out of the box, the NexStar Evolution 6 was delivered



Image 8 - Celestron NexStar+ Hand Control (image courtesy of Celestron).

with its collimation being spot-on. No adjustments were necessary.

Optically, perfect diffraction rings exist both inside and outside of focus, although not refractor-like with the presence of the central secondary mirror. With the proprietary StarBright XLT coatings, double stars, star clusters, nebulae, and planetary images are bright and very satisfying to view. Stars are pinpoint. The rings of Saturn and cloud belts on Jupiter are well-defined. Views of the Moon are excellent.

Of course, reality sets in when attempting to view faint galaxies. When viewing deep galactic fuzzies, the 6-inch aperture is the limiting factor. There is a reason for the NexStar Evolution series including an 8-inch and 9.25-inch versions. Aperture limitations aside, grand galaxies such as M31 and M33 are well within the capabilities of the Evolution 6. Open and globular clusters views are very satisfying. At no time did I ever feel the need to switch to one of my apochromat refractors, which I find remarkable.

NexStar Evolution, SkyPortal, and Cold Weather

Much of this review was conducted and written during the late Fall 2015 and Winter 2016, and the research using the NexStar Evolution 6 was conducted during very cold conditions. The historic Blizzard of 2016 yielded 38 inches of snow at the author's home! The NexStar Evolution 6 used by the author was thoroughly tested in sub-freezing conditions!

As with any telescope, extreme cold weather presents challenges to telescope equipment. Motor and drive gearing lubrication thickens, drive motors are stressed, batteries lose power, and the backyard astronomer is extremely uncomfortable. The NexStar Evolution 6 performed like a champ under these harsh conditions. The only problem I encountered was with my iPhone, which started to act funny in sub-freezing temperatures. On a night with the ambient temperature hovering just above 20 degrees F, the iPhone touch screen became non-responsive, either not working or getting "stuck" performing an action. The iPhone is designed to operate in a rather benign temperature range of 32 to 95 degrees Fahrenheit. Observing in below freezing conditions required the simple act of putting the iPhone in my pocket to stay warm after performing a go-to search with *SkyPortal*. No big deal.

Overall Impressions

There is a rare term used in amateur astronomy – Fun. Many amateur astronomers get wrapped in optical specifications, optical performance, astro-imaging, and other technical stuff. Often, what attracted us to this hobby to begin with is forgotten. We forget the pure joy of viewing the heavens.

The Celestron NexStar Evolution 6 is a fun telescope. Technically, the Evolution 6 checks all the boxes. It is a high-performing telescope in a small package. It is convenient. It's easy to use. It has excellent optics. The go-to and tracking drive system works flawlessly.

Where does the fun come in? There is the old amateur astronomy adage that advises potential telescope owners to buy the biggest telescope that they will actually use. A smaller telescope that is used will see more than a large telescope that is too big and cumbersome to be used regularly. The Celestron NexStar Evolution 6 is a telescope that will get used a lot and with great enjoyment.

I recommend the NexStar Evolution 6 to the following people:

1. For beginners, it is the ultimate beginner's telescope. Small and light enough to use regularly and without hesitation. Easy-to-use and very capable. With *SkyPortal* and its built-in Celestron Audio and information screens on many objects, it is highly educational.
2. For families, the Evolution 6 is a wonderful educational tool, owing much to the aforementioned built-in informational system of major and significant stars and deep-sky objects.
3. For experienced amateurs and telescope owners, it represents a great alternative for a grab-and-go telescope. No batteries to lug around. No control or power cables to trip over or, worse yet, leave behind at a remote site. The convenience of using a smartphone or tablet to control the Evolution 6 is a major plus.
4. For aging backyard astronomers who can't move and set up their 100-plus-pound big telescopes anymore, yet still love to observe the night sky, the NexStar Evolution 6 is a great, lightweight, high-performance and affordable alternative.

My last recommendation is quite meaningful, since this review is appearing around the time of my birthday. Turning 64 years old means my beloved Celestron NexStar 11 GPS feels heavier and seems harder to move than it did even a year ago. It certainly seems heavier and bulkier now than it did when I bought it 10 years ago. In comparison, the NexStar Evolution 6 is a dream to move outdoors for viewing. And its FUN! **AT**