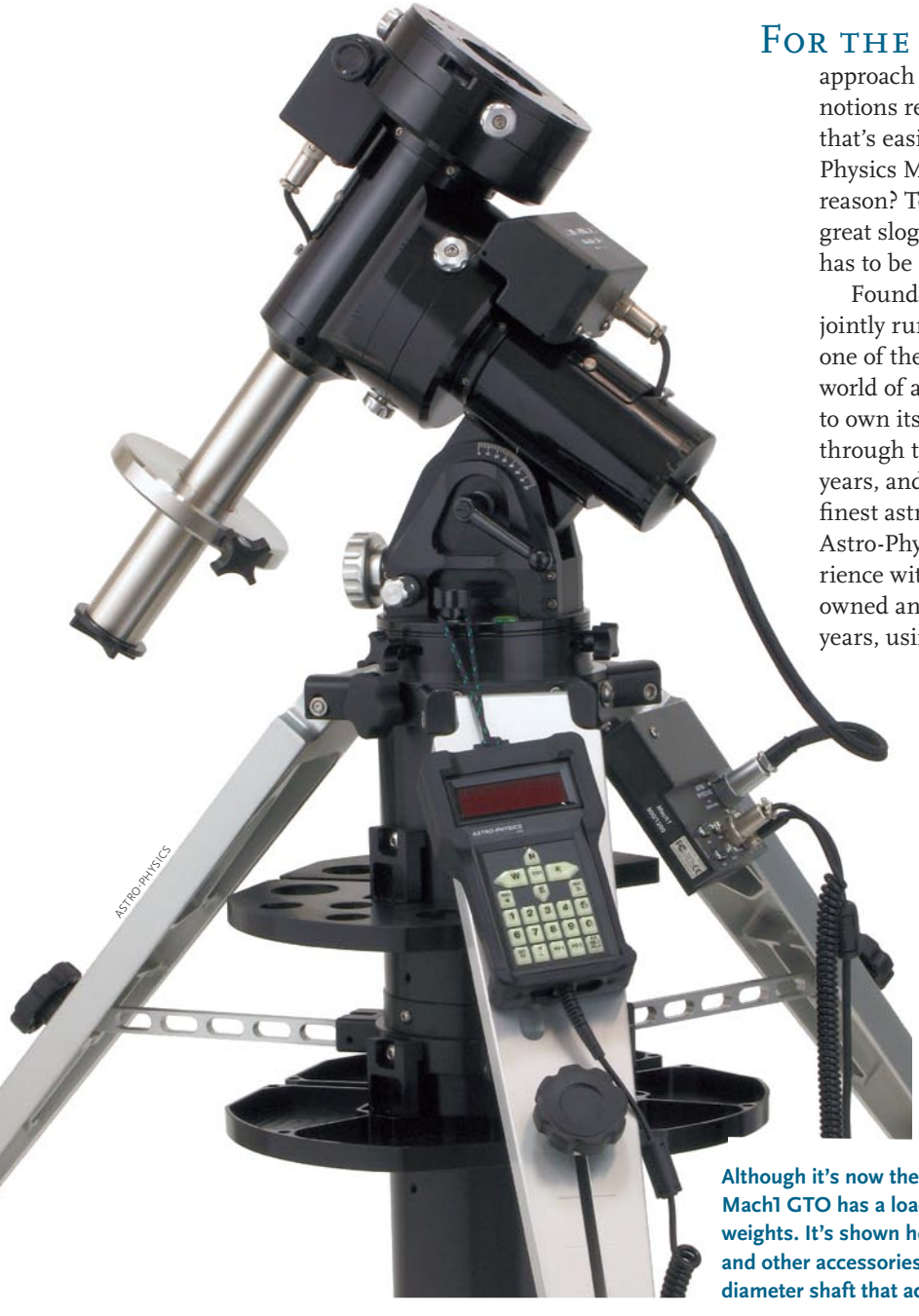
Dennis di Cicco

Staying on Track

The Mach1 GTO continues the tradition of excellence that observers and astrophotographers have come to expect from Astro-Physics.



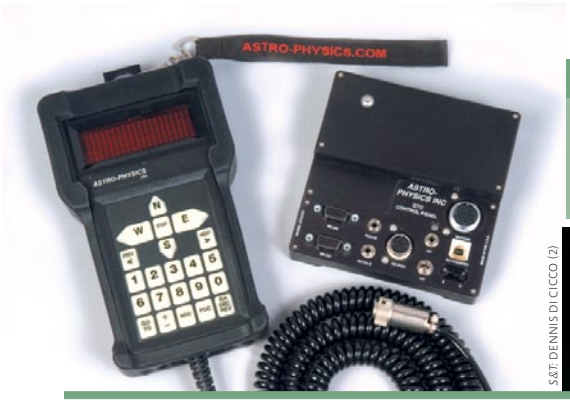
FOR THE SAKE of fairness, reviewers should approach each product without preconceived notions regarding its quality and performance. But that's easier said than done in the case of the Astro-Physics Mach1 GTO German equatorial mount. The reason? To paraphrase one of advertising's all-time great slogans, "With a name like Astro-Physics, it has to be good."

Founded by Roland Christen in 1975 and now jointly run with his wife, Marjorie, Astro-Physics is one of the most highly regarded companies in the world of amateur astronomy. And you don't have to own its products to understand why. Just flip through the pages of this magazine for the past 30 years, and you'll find that a good percentage of the finest astrophotography ever published involves Astro-Physics telescopes, mounts, or both. My experience with the company's scopes is limited, but I've owned an AP400 German equatorial mount for 10 years, using it mostly as a photographic platform for

Astro-Physics Mach1 GTO German equatorial mount

US price: $5,950. Includes complete equatorial head (no counterweights or telescope-mounting plate) with advanced Go To drive system.
Astro-Physics
11250 Forest Hills Rd.
Machesney Park, IL 61115
815-282-1513
www.astro-physics.com

Although it's now the smallest Astro-Physics German equatorial mount, the new Mach1 GTO has a load capacity of about 45 pounds (20 kg) not including counterweights. It's shown here with the optional Eagle Adjustable Folding Pier ($1,550) and other accessories available from Astro-Physics. Also shown is an optional large-diameter shaft that accepts counterweights made for the company's bigger mounts.



S&T: DENNIS DI CICCO (2)

S&T RATINGS	
Mechanics	★★★★½
Tracking accuracy	★★★★½
Go To accuracy	★★★★½

QUALITY CONTROL Even a quick glance at the Mach1 GTO's keypad and control panel reveals the quality components and construction that are used throughout the mount. The keypad comes standard with a removable rubber protective housing.

a variety of optical systems in my backyard observatory.

The new Mach1 GTO is now the smallest mount in the Astro-Physics lineup, replacing the most-recent version of the AP400, which had Go To pointing. But small is a relative term. With a total weight of 33 pounds (15 kg), including the standard counterweight shaft, the Mach1 GTO is designed for portability. (It breaks down into two main components, the heaviest weighing 16 pounds.) But it's rated for loads up to about 45 pounds (not including counterweights), with the caveat that, for a given weight, compact scopes like Schmidt-Cassegrains place less demand on a mount than do large tube assemblies like refractors.

Hindsight

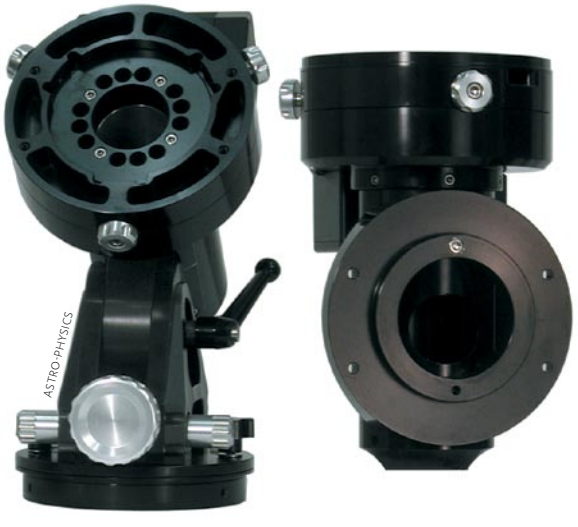
As I look back on months of using the Mach1 GTO, my strongest endorsement of it doesn't involve a single quantitative measurement. Let me explain. As amateurs have come to expect, many new products were unveiled at last year's Northeast Astronomy Forum in New York. Among the ones catching my eye were Tele Vue's "is" refractors optimized for astrophotography; prototypes of several CCD cameras with Kodak's new large-format chips; and a prototype Mach1 GTO mount. Since a review of any one of these products, by necessity, would involve some variant of the other two, it seemed ideal to review them together. The manufacturers agreed to lend us equipment, and the project got rolling soon after Apogee Instruments released the first production models of its Alta camera.

By luck of the draw, the Mach1 GTO is the last of the three reviews to appear here (the Alta U9000 was covered in June's issue, page 64, and the Tele Vue-NP127is in July, page 66). I installed the new mount in the observatory, replacing the AP400. While it accepts an optional polar-alignment scope, I didn't request one because of my semi-permanent installation. It was easy enough to eyeball the polar alignment in broad daylight using elevation scales engraved on the mount's base and a true-north mark I have on my pier. Next I attached the TV-NP127is.

With a small carpenter's level, I set the mount in one of several "park" positions shown in the manual, slapped a solar filter on the scope, and turned on the power. (Astro-Physics recommends using a power supply capable of 12 to 16 volts DC with a minimum current of 5 amps.) Even with my crude polar alignment, the Sun fell well within the field of a low-power eyepiece on my first Go To command. By centering the Sun in the field and using its position to "sync" the mount to the sky, I made accurate slews to Venus and the golden-hued star Arcturus, which was remarkably easy to see near the meridian in my bright blue afternoon sky.

I then refined the mount's polar alignment using a novel method described in the Mach1 GTO's manual. It involves observing the same star after "flipping" the scope between the east and west sides of the pier with Go To slews. As it turned out, the result proved precise enough that I never tweaked the alignment further.

That evening, with the instruction manual in hand, I worked through some of the keypad's basic commands. The system is different from others I've used (notably those of Meade and Celestron), and while I won't call it



SPLIT PERSONALITY The 33-pound Mach1 GTO easily separates into two approximately equal-weight sections to aid with airline travel. The large central bores in the declination and polar axes are designed as cableways for the mount's motors, CCD cameras, and other electronic gear.

entirely intuitive, it's very easy to master. A good deal of information can be shown at one time on the keypad's 4-line, 80-character readout. And because it's a vacuum-fluorescent display, there's no worry about viewing it in cold weather — it's rated to –40°F (–40°C). Shielded from direct sunlight, the display is bright enough to be seen by day. There's a dimmer setting for night use, which some observers might still consider bright — and there's no provision for turning it off.

The large, raised keys have red backlighting and a wonderful tactile feel. Once comfortable with the keypad functions, I also set up my SBIG STV autoguider to work with the mount. This ended up being nothing more than a one-wire plug-'n'-play procedure. I decided to leave some of the mount's finer adjustments, such as backlash compensation and periodic-error correction, for another night, since I had a new CCD camera and telescope to test.

I never ended up making those refinements. The mount just faded into the background as I worked with the scope and camera. Each night I'd turn it on; press a few buttons to slew to a bright star (usually before sunset), confirming that the mount was still synced with the sky; and go about my observing. Night after night the Go To pointing, sidereal tracking, and autoguiding remained virtually flawless. The fact that the mount proved so unobtrusive as I busied myself otherwise is, in my opinion, one of its greatest qualities — especially since its setup had been so easy.

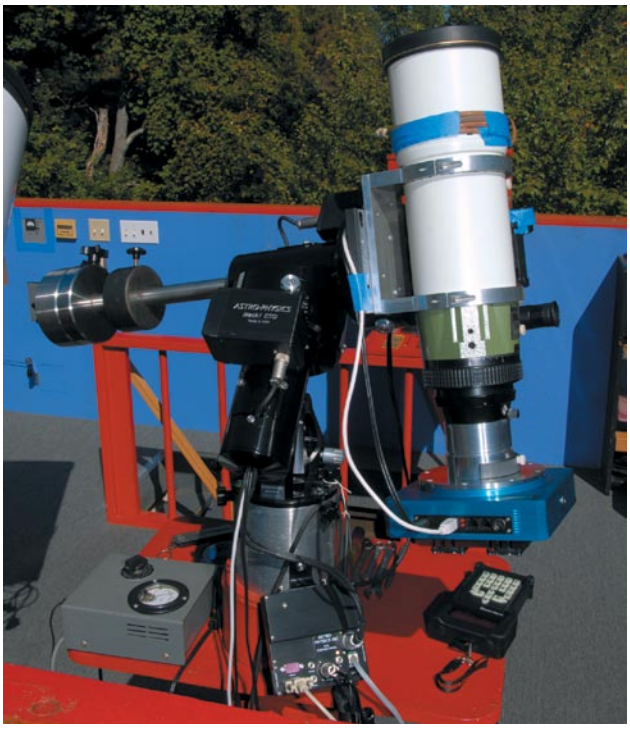
Industrial Art

The Mach1 GTO is a beautiful piece of hardware. Not only are the fit and finish top-notch, but the design and extraordinary craftsmanship exude an obvious expectation of quality. Where plastic knobs would suffice, Astro-Physics has fabricated stainless-steel and aluminum parts, which enhance form as well as function. Where simple right-angle corners would work, milled angles and recessed pockets add an integrated flow to the design.

The mount's tracking and Go To pointing are among the most accurate I've ever tested. At the end of each night I'd park the scope and turn off the power. Whether an hour, day, or week elapsed until I'd power up the mount again and "resume from park," it would have perfect sync with the sky — even to the point of "hiding" stars behind my finderscope's crosshairs when I'd check the alignment by slewing to them in a bright twilight sky.

Such Go To pointing precision comes in handy when shooting photographic mosaics, making a sequence of deep exposures of the same field on multiple nights, or hunting difficult targets by eye. Indeed, my confidence in the Mach1 GTO's pointing accuracy resulted in an observation for my personal record book.

In a clear noontime sky last January 7th, I decided on a whim to look for Comet McNaught. A slew to Altair placed this bright star dead center in the field of a 19× eyepiece on the TV-NP127is telescope, so I was sure the comet would be centered when I slewed to its position. But I didn't see it. So I boosted the magnification to 75× and repeated the jump from Altair to the comet's position. After a moment, I spotted the comet, aided in part by the knowledge that the mount's precision had put it at the center of the field. The observation was posted on our website, and it encouraged others, including McNaught himself, to successfully hunt for the brightening comet in a daylight sky.



S&T: DENNIS DI CICCO

TEST BED The author used the Mach1 GTO in his backyard observatory, where it fit into the same pier collar he'd made for his 10-year-old AP400 mount. It was tested with scopes as large as a 5-inch refractor and a short-focus 8-inch astrograph; it's pictured with the 100-mm f/4 Pentax lens and Apogee U16M CCD camera used for the photograph on the next page.

Astrophotography Niceties

Astro-Physics has engineered this mount for today's astrophotographers. Cables can be routed from the top of the declination shaft through internal passageways to ports on the declination and polar housings. This works very well and eliminates the likelihood of a wire catching on something as the mount slews or tracks.

The periodic error of the right-ascension drive is specified as 7 arcseconds or better. The mount I tested had less than 5, and it could be reduced further with software (as built into the drive system or in cooperation with third-party programs such as CCDWare's *PEMPro*). Since I autoguide long exposures, I found this unnecessary, but it's there if you like to work with short, unguided images.

Another powerful feature for astrophotographers is

something the company calls "meridian delay." I suspect that if photography had been invented before the equatorial mount, the German design might not have become as popular as it has. The reason is that many German equatorial mounts have limited ability to track uninterrupted across the meridian — which is where all celestial objects appear highest in the sky and are best photographed. With many German equatorials, when an object is tracked to the meridian, the scope must be flipped 180° on both axes to resume tracking into the western sky (this also rotates the field of view 180°). Typically a Go To–equipped German equatorial won't even allow your scope to slew to the "wrong" half of the sky.

The Mach1 GTO, however, can rotate its polar axis a full 360° without running into itself. That's not saying that a telescope will have the same clearance, but in some positions it can swing considerably beyond the meridian to point into the "opposite" side of the sky. And the meridian-delay feature allows you to reach these locations with a Go To command. This makes it easy to set up photographs that track across the meridian without interruption. It may sound like a small feature on paper, but I found it extremely useful in the field — as long as I used it carefully, since it does have the potential for slewing the telescope into the pier or mount.

WHAT WE LIKE:

- Extremely rigid for its size and weight
- Superb Go To pointing and tracking accuracy
- Powerful "meridian-delay" feature (see text for details)

WHAT WE DON'T LIKE:

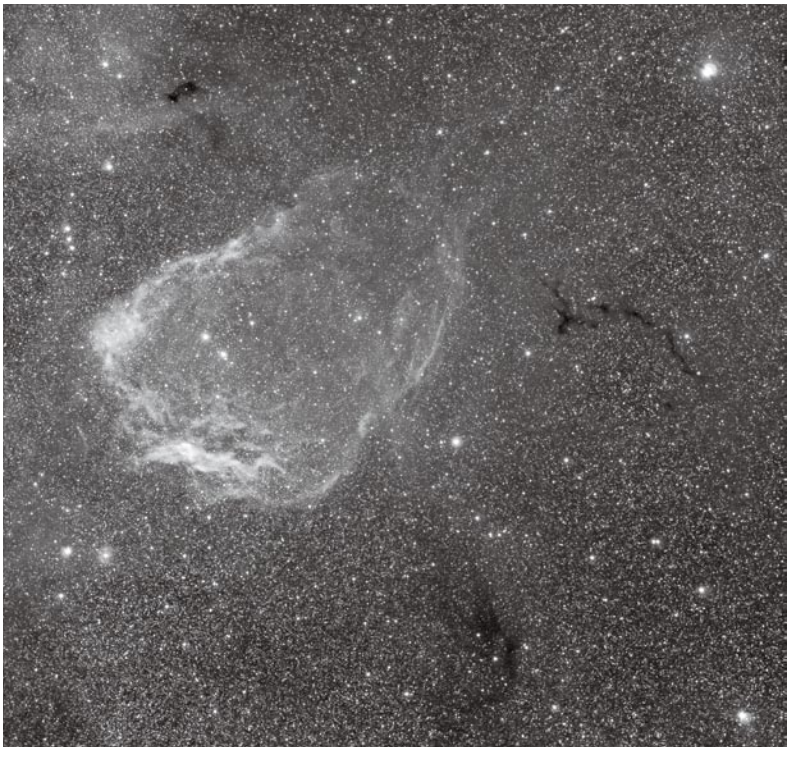
- Keypad display can't be turned off, and even "dim" setting is relatively bright

Because the control system for the Mach1 GTO is the same one Astro-Physics uses on its larger mounts, it works with time-tested, third-party software that's been developed for advanced imaging and remote observing. Marjorie Christen also told me that the included software for controlling the mount with a PC should be upgraded substantially by year's end. The mount's control system has two RS-232 serial ports for connecting it with computers, though these are all but history on modern laptops. I tested the mount's external operation with Software Bisque's *TheSky* using a Belkin USB-to-serial converter. This too was a plug-'n'-play operation that worked perfectly.

Setting circles are also becoming a thing of the past, and there are none on the Mach1 GTO. Since most everything I've used setting circles for — polar alignment, advance planning of observations, and locating objects in the day or night sky — can be done with even greater accuracy using the Mach1 GTO's electric slewing and digital position readouts, I can't really say I miss them.

Everything most amateurs have come to expect from an advanced Go To system and then some is available with the Mach1 GTO. Its extensive catalogs of deep-sky objects, double stars, and solar-system objects (including the Sun) can be "filtered" by brightness, size, and so on to create custom tours within constellations. A "What's Up Now" function takes you on a random walk through the Messier, *NGC*, and *Index Catalogue* databases, which can be a lot of fun. The catalogs and even the mount's operating firmware can be updated with downloads from the Internet. And you can set horizon and "safe zone" limits to prevent the mount from moving your telescope to unwanted positions. You'll find more details than I have room to describe here of these features and others at the Astro-Physics website.

If you're in the market for a quality, midsize German equatorial mount that's highly suited to portable and permanent installations, you should definitely consider the Mach1 GTO. I can't imagine anyone being disappointed with its performance. The nameplate says "Astro-Physics," and after months of using it, I know it's good. ✦



S&T: DENNIS DI CICCO & SEAN WALKER

RETURN ENGAGEMENT The Mach1 GTO's precise Go To pointing made easy work of shooting the same field on multiple nights, returning to given coordinates with such accuracy that images could easily be aligned and stacked. This 5°-square field in Cepheus holds the large emission nebula Sh 2-129 along with several prominent Barnard dark nebulae, including B150 at right, B152 at upper left, and large B354 near the bottom. Exposure time through a hydrogen-alpha filter totaled 5 hours on two nights. North is up.

Hunting down stars, planets, and deep-sky objects in the daytime sky is just one of the seemingly off-the-wall things that senior editor ***Dennis di Cicco*** *relishes doing.*