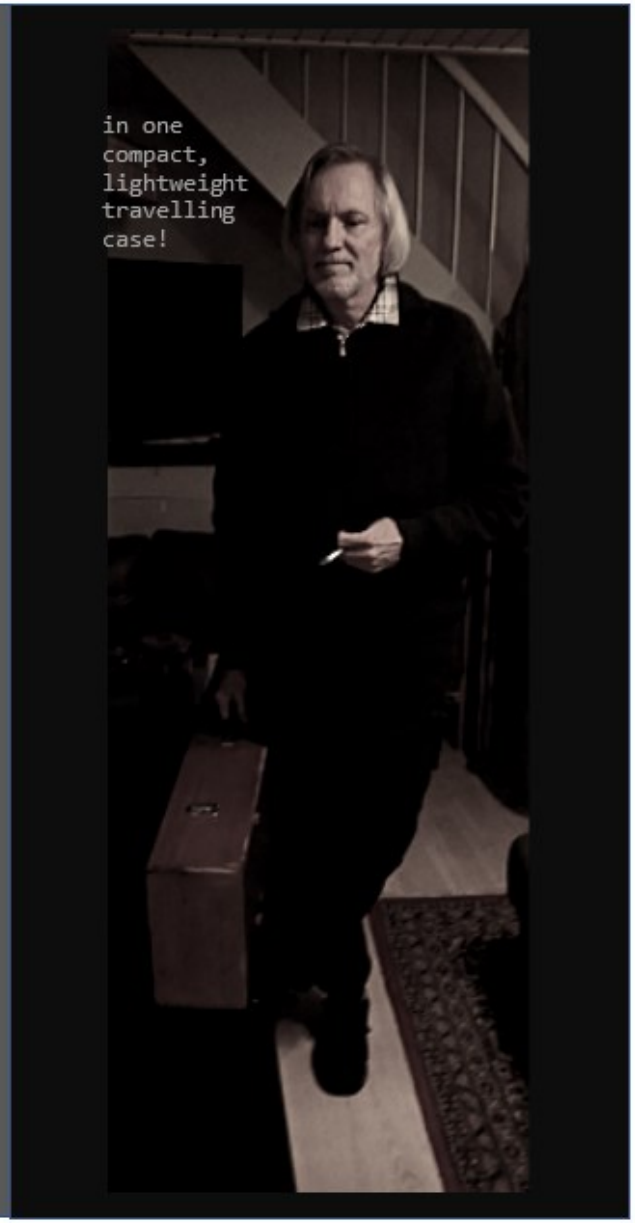
UNITRON
ASTRONOMICAL TELESCOPES

AN OPEN AND SHUT CASE OF SUPERIORITY

All this telescope….



The refractor shown here is now packaged in a new, specially designed,
lighter, more compact carrying case that's much easier to carry,
much thriftier on trunk space when you're travelling by car.

But portability is only the second most important feature of this fine instrument.
The first most important feature continues to be its downright value and upright optical excellence.

All this telescope...

The weather forecast says cold, cloudy and rainy for the coming weeks, so I thought it would be a good time to dig out and dust off my oldest refractor to take inventory of the items.

And as this is the merry month of Christmas, some unboxing is surely in order. Nothing extraordinary, but besides the nice hardware, the items do hold a lot of fond memories, -- and no better time that December to share that

An open and shut case...

So, *Open Sesame*...

Aaaand *SimSalaBim*

... Superiority 😁

Here's a couple of highlights

The objective shows at least 1/8 wave in DPAC (green light). Much better that the "diffraction limited" resolution *Nihon Seiko* guaranteed. It's housed in an adjustable cell with three "ears" for easy collimation.

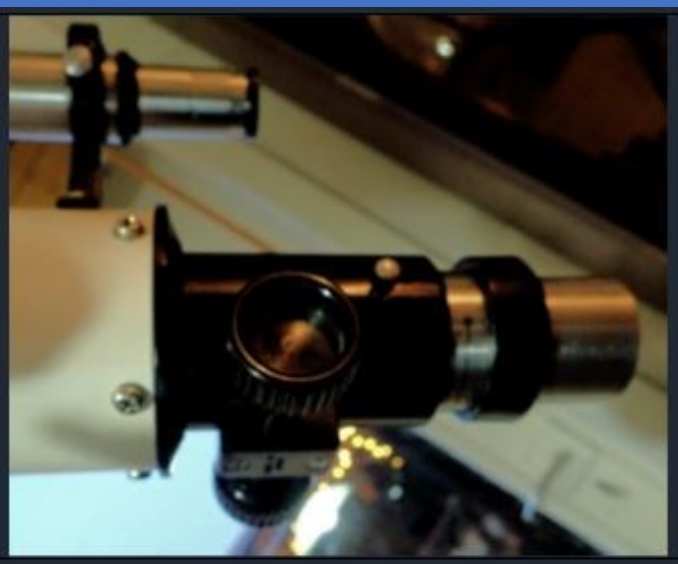
I have two 23.5mm diameter, 150mm focal length chromed brass viewfinders. One can use std. 0.965 eyepieces and comes with a 6x EP equivalent to a 25mm FL. It also accepts 8x equivalent to 18mm FL eyepieces. The other has smaller eyepieces and slightly smaller FOV, but features a nice double-cross which I prefer to use.

I've substituted the NS 3-armed metal octo-grabber with a Zeiss Telementor-like leather strap stabilizer (still have the original, of course). It is easier to collapse/expand the tripod this way, when carrying it in and out for observation. -- And the tripod of course is the adjustable height, sliding leg version, *much* better in use than the single height bending leg construction.

Some other Christmas sweets, which I'll present to you on a virtual tray, shortly....

The optical quality of the Unitron/Polarex objectives is, as you know, varying. My objective here is above average (~95% Strehl), and very good for a Fraunhofer achromat, even by todays standard. Of course, it is only measured in green, so the achromat color dispersion does degrade the view contrast somewhat.

Back then in the 60'ies, even 1/4 wave error P-V (80% Strehl Ratio) was considered excellent, and it was the goal for all Dawes diffraction limited optics, like NS. For example, these views were considered superior back then by Unitron (Mars, Jupiter, Saturn):



Of course, the usage by amateurs in the 60'ies was almost exclusively visual, so the demand for high Strehl was not close to what we came to strive for later with digital imaging. For example the bar for Zeiss telescopes was raised to 90% Strehl for the Maksutov and 95% for the APQs. And asking a very demanding guy like Markus Ludes (of APM), he'd insist that only by 95% Strehl you reach a level of good optics, by 96% very good and from 97-99 excellent. And he's talking visual here, so...

Anyway, with a small aperture high quality optic like my NS 114/128, you very often get a performance close to the theoretical limit, especially in my temperate coastal climate, where larger aperture instruments -- besides issues of collimation and obstruction -- always seem to struggle with seeing and thermal equilibrium

Returning to the Christmas goodies, here's some info on the backend of my small Unitron scope:

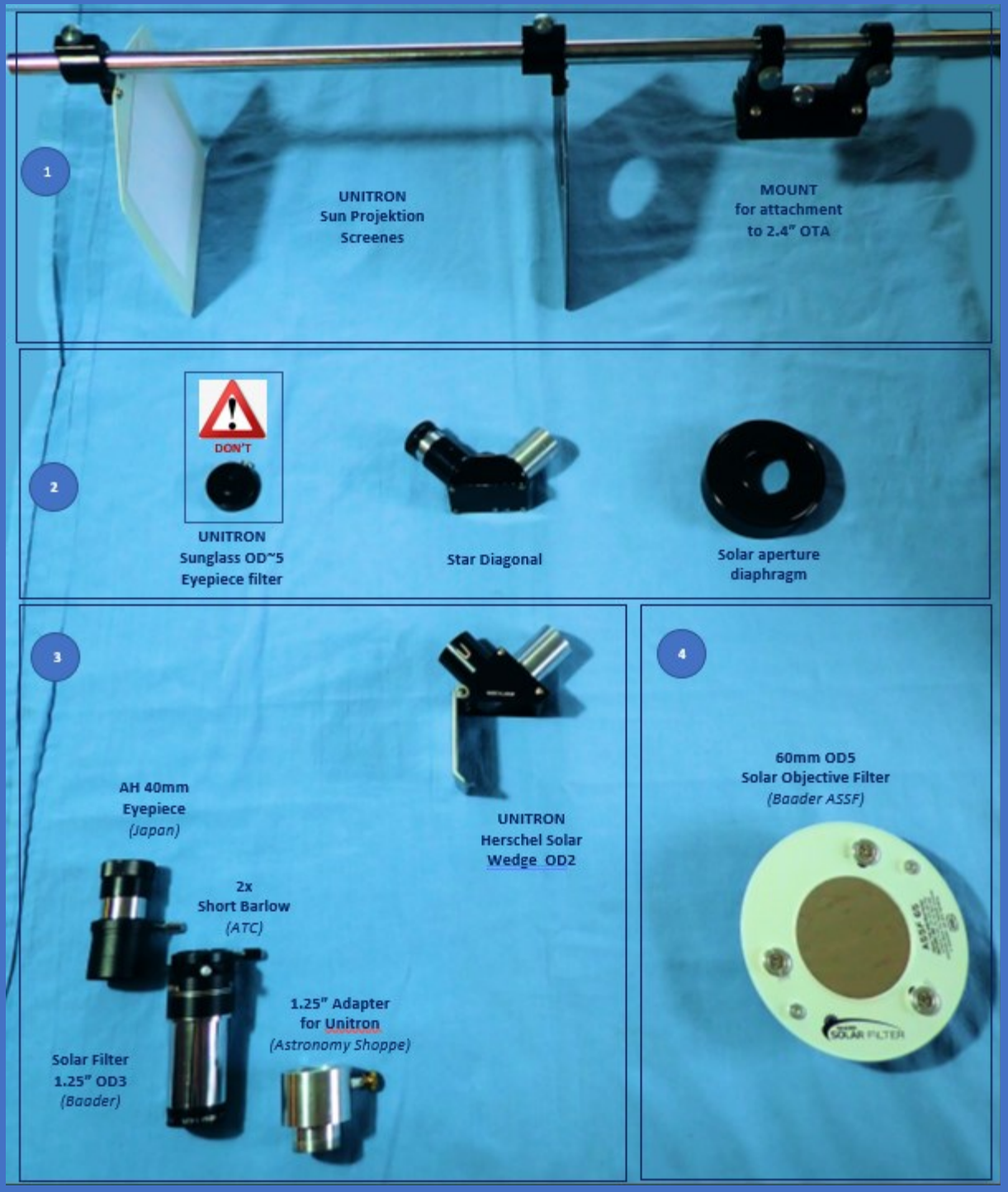
The focuser is the nice double-knob pinion type (good for a GEM mount) with a solid attachment for adjusting the tension on the rack. It has a screw for locking the rack position and a clamp for locking the draw tube. No shifting or wobbling, as can be seen with other small RP focusers.

Here I show an assortment of **visual backends**: the standard 0.965 EP holder (1), a "convertible" 0.965/1.25" EP holder (2), a 1.25" EP holder (3: not common, bought from UNITRON some years back), plus a custom-made NS/T2 thread adapter (by Xavier some years ago). All these thread into the NS drawtube.

For **the Unihex,** there's the std. short drawtube (5) but also a Unihex/T2 adapter (6, also by Xavier), onto which I can screw for instance a T2 1.25" nosepiece (a) or a T2 quick change ring (6b). And there's an assorted set of standard 0.965 NS eyepieces (9) plus the larger 40mm Mono and the 24mm Erfle.

My most used visual backend the last years has been the T2 custom adapter, either with the "click on" Unihex or with a Baader diagonal and modern 1.25" eyepieces. Works like a charm!

Oh, did I mention that back-focus has never been an issue with these Unitron scopes ?



Here comes the Sun…

Viewing the sun comes with a warning from Unitron: "*One instructive experiment is to light your pipe by holding it at the focal point of a telescope directed at the sun".* Not smoking a pipe at the age of 12, I never got to execute this experiment…

For solar observation, Unitron provided several solutions:

1. A matching set of metal plates (**Solar projection screens**): a black shade plus a white screen for the projected image, both sliding onto a chromed brass rod, which can be mounted on the OTA by brackets. This was the generally recommended method, and it works fine. The set I have for the 114/128C is especially nice, because the brackets for mounting the whole projection apparatus are fixed onto a small block, which in turn can be easily mounted/removed from the OTA using just one large thumbscrew.

2. An OD5 eyepiece sun filter (**sun glass**) that can be screwed onto the top of any Unitron 0,965" eyepiece. Unitron advised using the sunglass for visual observation only up to up to 4" aperture. For photography and for visual observation with the 4" and larger, Unitron advised stopping down the aperture by mounting a solar diaphragm over the dew shield. Though all kind of eyepiece filters are of course banned in modern solar astronomy, I must admit to having used this method in my youth on my 3" Unitron with quite pleasing results. After a year or so, I became more aware of the risk though, and therefore upgraded to a 1000-Oaks front glass solar filter, which besides being safe offered much better views of the Suns photosphere.

3. A OD2 solar wedge (**Herschel sun diagonal**), which was introduced around 1958; For visual, it requires an OD3 neutral filter, but then it offers splendid views fully on par with the modern LUNT wedge. In recent years, this has been my preferred method of solar observation in white light with the small Unitron scope.

4. Finally, of course you can use a modern glass or mylar **OD5 filter in front of the objective**, which gives almost (but not quite) as good a view as the Herschel wedge.

1 Sun Projection screens

4 Modern OD5 Front filter

3 Sun diagonal Herschel Wedge

EP

2x ATC Barlow with OD3 filter

1.25" Ast. Shoppe

UNITRON
Sun diagonal
OD2 Herschel wedge

2 Sun glass Eyepiece filter

Solar aperture diaphragm

UNITRON
Star diagonal

UNITRON
Sunglass OD~5
Eyepiece filter

The Mount

"Nōlī turbāre circulōs meōs!"

Initial Position

The Unitron EQ mounts have a polar axis that (on the northern hemisphere) must be oriented due North and then tilted up by the latitude of the observer (LAT=56°N in my case) to point straight at the celestial pole (roughly at *Polaris*).

If you then rotate the declination (DEC) axis to horizontal and also place the OTA in horizontal (level) position, the **setting circles can be initiated** and locked to [0 | 24ʰ] (S at the meridian) on the R.A. and 90°- LAT (= 34° for my 56°N latitude).

Home Position

Thus initiated, when I take out the tripod, level the mount and place it in "home position" with the polar axis pointing north and the OTA on top [DEC=90, RA 6ʰ], I see Polaris in a wide field eyepiece, ready to go.

Local Hour Angle

Now, as the Earth rotates from west to east, the night sky seemingly rotates in the other direction, carrying along all the "fixed" stars, one rotation each ~24 hours. For the celestial sphere, the great circle running through the poles and the vernal equinox point on the equator has been defined as origo (0ʰ) for celestial longitude, and then a fixed value from 0ʰ to 24ʰ can be assigned eastwards, all along the celestial equator (RA: Right Ascension) for any object on the night sky.

This means that when the origo for RA on the rotating celestial "watch face" crosses your local meridian "dial" towards the south, then your Local Star Time (LST sidereal) is exactly 0ʰ, and the RA of any celestial object will equal the time until this object is going to be on your meridian dial.

Put another way, for any object on the night sky, the longitudinal offset of that object from your local meridian (called LHA= the local hour angle) is equivalent to the current local sidereal time (LST= the RA currently at the meridian) minus the RA of that specific object. I.e.: LHA= LST - RA.

R.A. Hour Circle
1 division = 10min

0 = 24^{h} (=MERIDIAN)
DEC axis level

DEC Altitude Circle
1 division = 2°

90° - LAT (=HORIZON)
OTA level

R.A. Hour Circle
Index discriminates ~2.5min (10min/3)

6^{h} RA

DEC Altitude Circle
Index discriminates ~30' (2°/4)

90° N DEC (Celestial Pole, Polaris)

As shown above, the *UNITRON* mounts have setting circles for DEC and RA, but where the larger 3" and 4" scopes have verniers that can be read to a precision of 5' DEC and 1min RA, the small 1.2" models 114/128 have simple index lines that can only differentiate down to 30' DEC and 10min RA. It seems that it would have been not much trouble to provide verniers also for the small models, but for some reason *Nihon Seiko* chose not to.

Both circles can be rotated and must be **initialized** (fixed) so that DEC=90° when pointing at the celestial pole (~*Polaris* on the N hemisphere), and RA=0^{h} (aka 24^{h}) when the declination axis is in horizontal position (i.e., the OTA is pointing at the meridian). Setting DEC to 90° minus the local latitude when in initial position, will result in the DEC being 90° in home position (assuming the mount is correctly levelled). *UNITRON* got this wrong in their manuals btw...

Thus initialized, the OTA can be **directed at any celestial object** when you know the Local Star Time (LST) plus the Declination (DEC) and Right Ascension (RA) of the object. The latitude of the object is directly set on the DEC circle. One method for setting the longitude (advocated by *UNITRON* in their manuals), is using the relation: Local Hour Angle (LHA) = LST – RA. Today LST, RA and even LHA is calculated and directly show in planetarium apps like "*Stellarium*" on your smartphone, so all the fuzz with nitty-gritty table interpolations and manual calculations of the past are gone today.

Daytime Venus

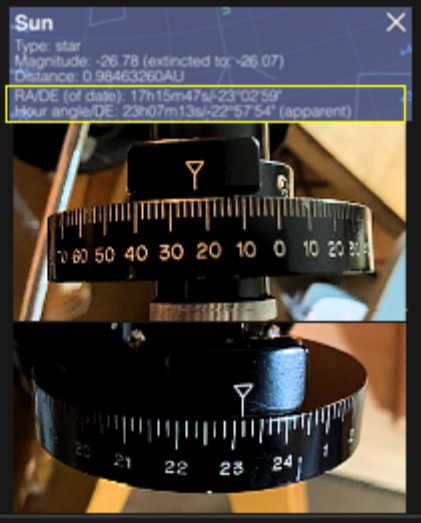
For example, to view Venus in the daytime, I just need to carry out and level the tripod (easy with slidable legs) and then rotate the mount to point north (also easy on the *UNITRON*, where the mount head can be freely rotated on the tripod base plate, and then locked in position by a wing screw.) Locating north is of course easy peasy too, using a compass app on your smartphone (or Polaris in the night).

Opening Stellarium and searching for Venus, gives me it's current position as DEC=-17°35′, RA=15^{h}30^m and LHA= 0^{h}52^m. For completeness, the local sidereal time currently at the meridian is LST= 16^{h}23^m (as seen in yet another smartphone app), confirming the LHA for Venus being 16^{h}23^m – 15h30^m =~ +0.52^m west of the meridian.

To put Venus in the field of view of my refractor I therefore need to set DEC= -17°35′ and LHA= 0^{h}52^m on the RA circle. I can then engage the synchronous motor on the RA worm, and the mount will be slowly and almost silently (very quiet on the *UNITRON*s!) tracking Venus in star time.

An alternative to the compass for polar alignment of the mount in daytime (which I learned from Thomas/Astrojensen) is to set the circles on the mount to the current solar coordinates (DEC= –23^{h}02^m and LHA= 23^{h}07^m in my example), then rotate the whole mount on its base in azimuth until you get the sun in the field of view, at which point the scope is polar aligned, and you can proceed to set the [DEC, LHA] of Venus.

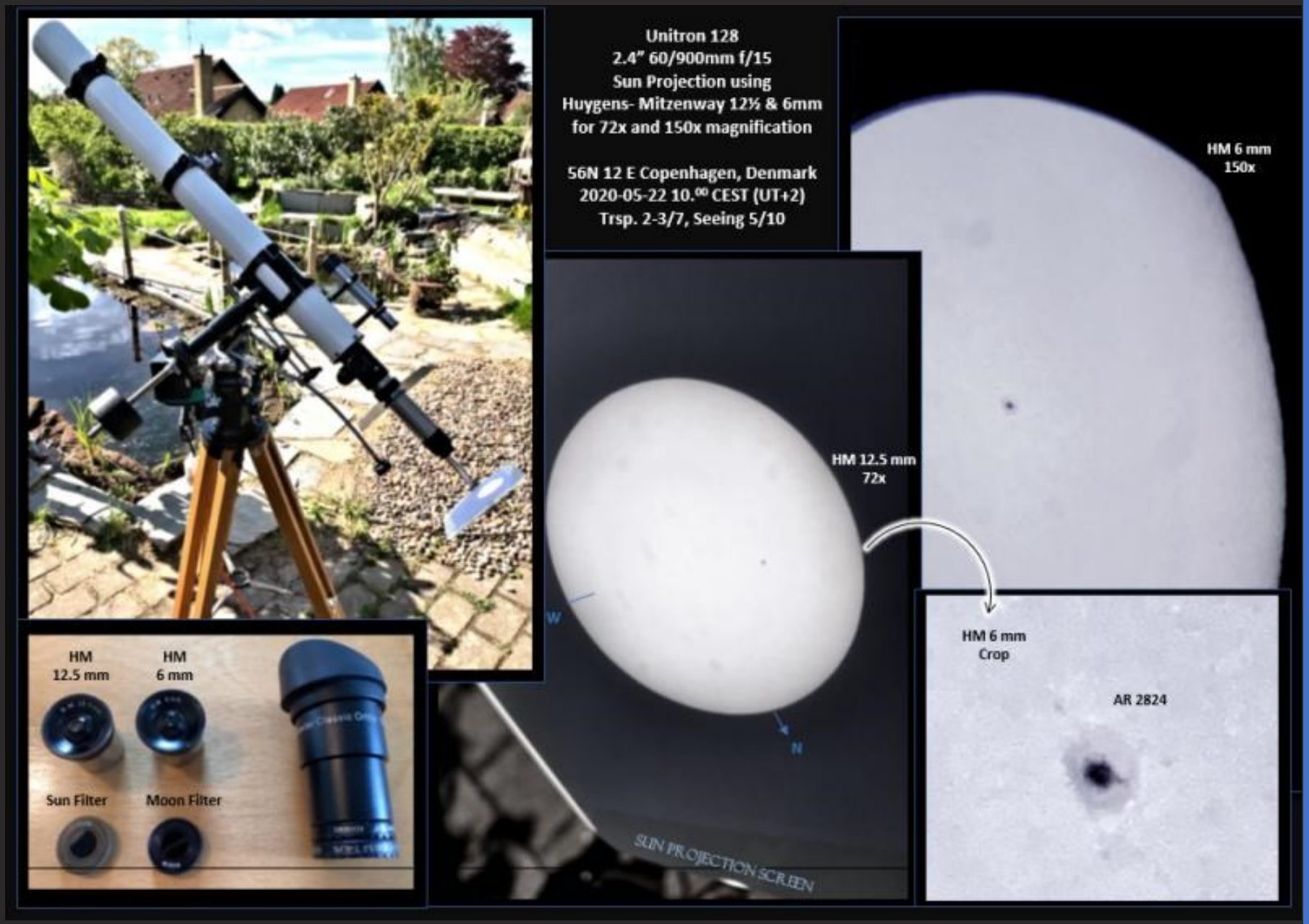
As the RA circle on the Unitron can be driven (if you have the sidereal motor), you can also start by setting it to the local sidereal time (LST = 16^{h}23^m in the example) and then engage the motor, whereafter you can use it directly as a proper RA circle, i.e., dial in RA= 17^{h}15^m for the Sun and 15h30m for Venus. For some reason *UNITRON* never described this much easier use of the RA circle in their manuals.



As previously indicated, *NS* offered several 90° angled **prism diagonals** for their series of *Unitron/Polarex* refractors: a star diagonal, the rotary eyepiece diagonal (*UNIHEX*) and a sun diagonal (Herschel Wedge), -- all inverting East<->West of the FOV. An erecting porro prism diagonal for straight through RACI terrestrial viewing was also part of the standard accessories delivered with an *NS* refractor. For RACI astronomical viewing (of primarily the Moon), I've always preferred a good roof prism, and I have an acceptable 0.965" classic one, which looks like it was produced by *NS* or one of its subcontractors (but I don't know that for sure). The roof diagonal is not as big and clunky as the porro version, and it also offers a bit brighter image.

For higher magnification views, *NS* offered 2-element **achromatic 2x amplifiers** (*Barlows*): a short one for inserting directly into a star or erecting diagonal, plus a longer one for insertion into the backend draw tube before the diagonals. Both these 2x amplifiers work OK with the 0.965" diagonals of the day. *NS* also made a 2x Barlow specifically for the *UNIHEX*, but that one did not did not work well, so I've preferred using the eyepiece rotator with modern Barlows instead. And of course a modern 1.25" diagonal with better glass and coating will squeeze out all the juice the Fraunhofer objective has to offer, yielding the widest, brightest and sharpest fields of view with this little telescope.

Solar Projection with the 2.4" Unitron



I took out my small **Unitron 128** on its motor driven EQ mount this early AM, for some solar observation: I started with an old-school solar projection observation, using the Uni **Sun Projection Screens** plus a couple of **Huygens-Mitzenway eyepieces** in 12½ and 6mm (for 72x and 150 magnification).

The HM eyepieces are of very good construction, all metal and with a couple of optional filters that screws into the bottom of the EP, -- one for solar and one for lunar observation (of course the sun filter is a no-go today, where we have more secure alternatives).

At 72x I got a full-disc projected sun image with a small but clearly defined AR-2824 sun spot, revealing the central dark umbra with the surrounding lighter penumbra; At 150 the umbra as well as the penumbra started to show some interesting details.

Later I switched to observing with the *Unitron Sun Diagonal* (Herschel Solar Wedge) plus a 18mm classic ortho. At 50x magnification the full disc view was of course sharper and more contrasty than the projected images; I can share that later.

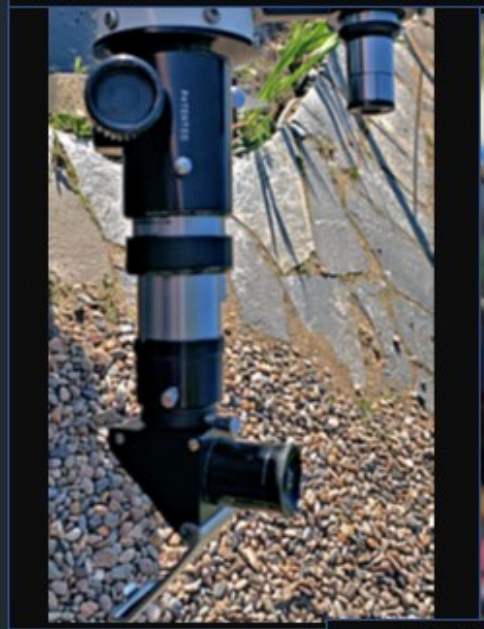
Solar aperture diaphragm,
reducing the aperture to 3cm (1.2")

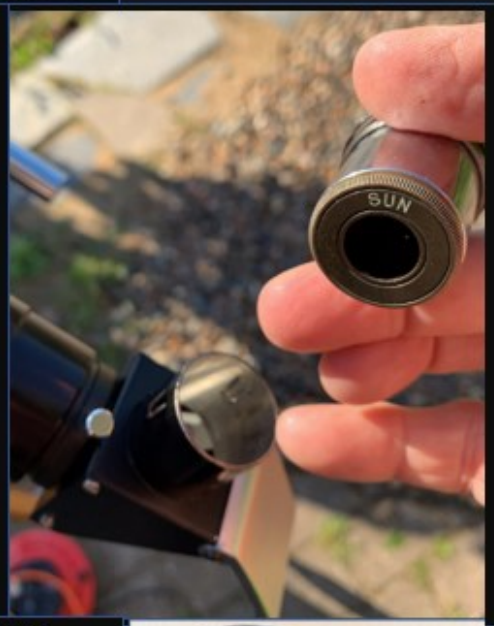
+

Hereschel Solar Wedge

+

Sun Glass ~OD3
Preferably in front of the eyepiece





Alternative:
Aperture Diaphragm +
Herschel Wedge +
Unitron Ramsden EP +
back mounted Sun Glass.

OBS: Quote Nihon Seiko:
"Extreme care must be exercised when using the sunglass without Herschel Wedge"

Without a Herschel wedge, the beam from the telescope objective is, as you know, very hot, even in a small 2.4" refractor, and even using an aperture diaphragm, so any equipment at the focuser end will receive concentrated heat that may crack glass and cause irreparable eye damage. Back in the 60'ies, for that mode of operation, *Nihon Seiko* (NS) mandated an aperture diaphragm on all refractors larger than 2.4", and only for glimpses in brief periods of time. That's how I observed the sun the first couple of years, before I could buy the Herschel wedge... Today, observation with only an OD3 sunglass as filter on the eyepiece is of course strictly a no-no due to the risk of severe eye damage.

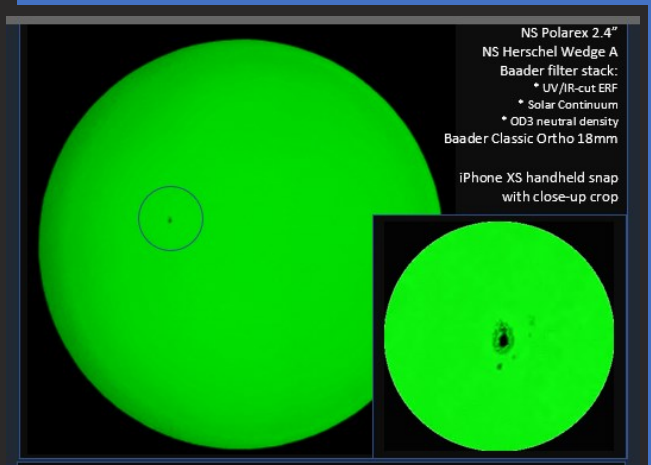
As safer alternatives, NS recommended solar projection (as previously described) and also direct viewing using a Herschel solar wedge in conjunction with the sunglass, -- as Terra described, and which I have shown below. In my recent observation I used a classic 12.5mm Huygens-Mitzenway eyepiece with a OD3 sunglass screwed into the bottom of the eyepiece. NS provided a 25mm Ramsden which can be used for solar projection and also for direct viewing on a Herschel wedge with their OD3 filter on top of the eyepiece. The beam coming out of the solar wedge is still warm, so I prefer the OD3 filter going before the eyepiece glass.

With a few tweaks, the NS Herschel wedge can be converted to use higher quality modern filters and eyepieces. -- I'll show that in my next post

I've adapted my Herschel wedge in the following ways (my model is *"A for Unitrons"*, -- there is also the model *"B for 1.25” eyepieces”):*

- I've switched out the model A 0.965" EP holder on the wedge with an Astronomy Shoppe 1.25" replacement
- bought a modern 1.25" filter stack for solar observation from Baader:
  UV/IR-cut for energy rejection resulting in a cooler beam
  540nm green *Solar Continuum* (SC) contrast booster for achromats
  Neutral density OD3 for 1000x light intensity reduction
- use a modern set of 1.25" classic orthoscopic eyepieces (BCO) for observation

Sometimes I use a 1.25" yellow 495nm longpass filter in combination with a single pol filter instead of the 540nm green SC in the stack; it gives an (optionally) brighter and more "natural" looking visual image. Here's the setup:



A couple of handheld smartphone snapshots from this AM; The visuals at the telescope were significantly sharper and more contrasty than a handheld snapshot can show. Also, there was a layer of high cirrus plus some atmospheric turbulence, so far from ideal for solar observation. Anyways :-)

The Unihex has some internal reflections, so though convenient, it's not great for solar obs. A modern diagonal shows significant improvement. The NS Herschel wedge is great though, fully on par with a Lunt ditto, IMHO. Today, the view at mag. ~100x stayed sharp and full of detail, while pushing the small scope further up to 150x resulted in a soft view.

3-inch *UNITRON*

Here's a couple of pictures of my **3" 75/1200mm f/16 photo-equatorial Unitron**, model 145C with synchronous motor drive, 8x30mm viewfinder, 10x42mm visual tracker (guidescope) plus accessories for camera attachment and solar observation.

This "Big Brother" to **the 2.4" 60/900mm f/15 equatorial Unitron** was my first astronomical telescope bought back in 1975 at the age of 15, from money earned through jobs I took during summer vacations.

CARL ZEISS JENA

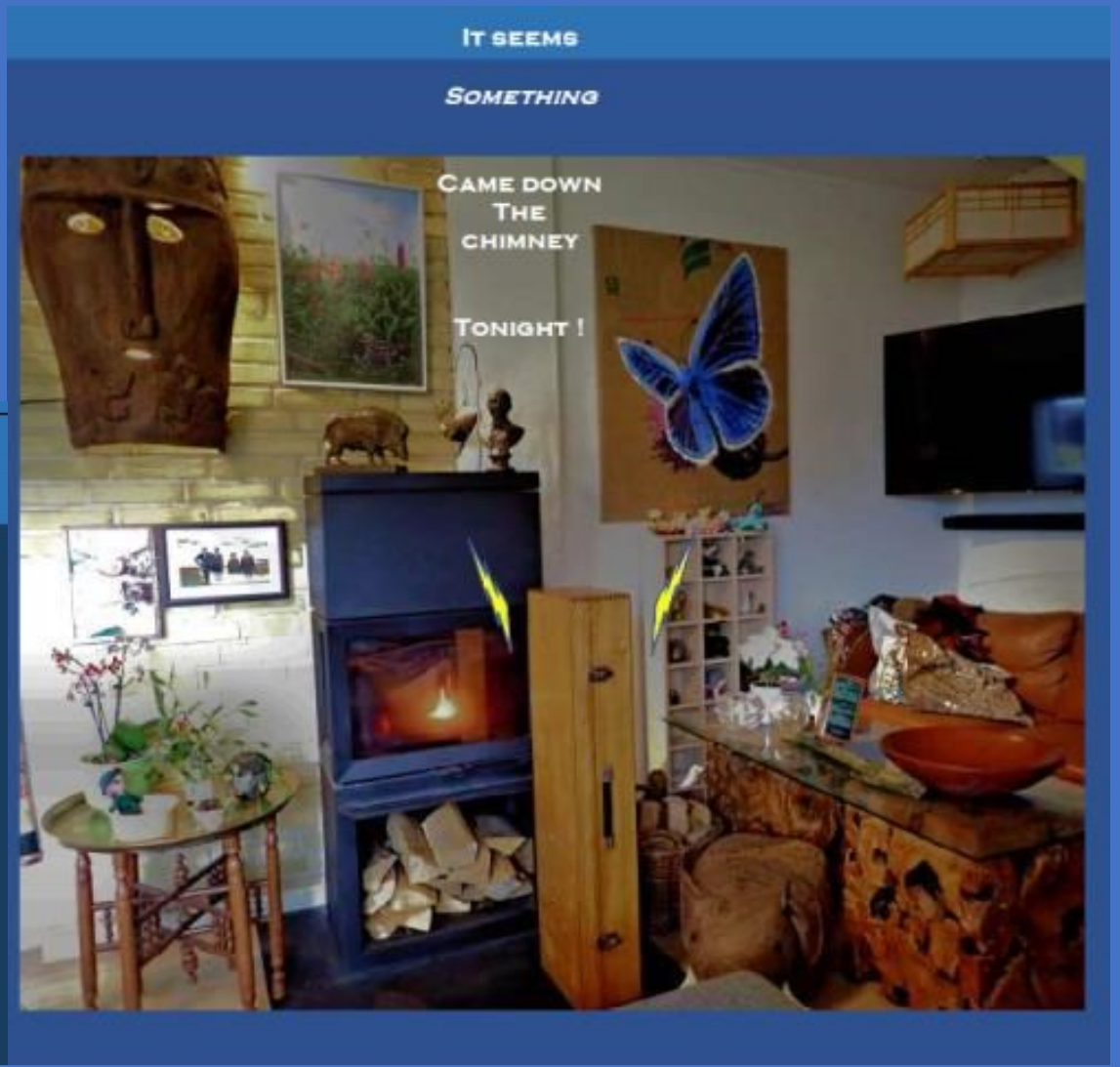
Maybe a Zeiss…?

Another year...

And so, one year has come and (almost) gone. -- A lot has changed, some for the worse, some for the better,

The global climate change is bringing warmer and more humid weather to our costal temperate latitude, so less opportunity for astro observations, at least in fall and winter. Here's the look out our window right now: a temperature of 0dg C, with fine sleet slowly descending, and a forecast of 6-12cm snow by nightfall.

But the solar cycle is gearing up the coming years, with a lot to enjoy and discover. And then, for all the changes, some things remain the same -- *"plus ça change, plus c'est la même chose"* as they say in France. I'm thinking of our classic equipment, books, observation logs, experiences and memories, -- those we can always enjoy and share inside, by the fireplace – and



It's starting to look a lot like Christmas...

A new morning, and a new view out the window at my back yard; -- more snow as the forecasted promised, and a fine opportunity to spend some time with, tadaaa...

As Terra keenly observed: yes, a NS box for the 114 Uni refractor, -- but (as Carlos correctly predicted), it has indeed been customized to accommodate my CZJ Zeiss C63/840 Telemator plus it's baby brother the C50/540 Teleminor. And then some accessories...

Here's a view out our bedroom window this morning; Cloudy and cold, but with no stars up there, -- so my wife decided to put up some all by herself. Thank you!

Z-Bolt ASTRO-10 XT
Astronomy Low Temp
515nm Green Laser Pointer.

Only LP that has worked from my 56°N Latitude suburban light polluted backyard.

CZJ Zeiss
8x30 Deltrintem 1Q

Binocular, often used in connection with the Z-Bolt GLP from my suburban backyard.

OH YES!

ANOTHER CZJ ZEISS

TELEMATOR ...

CZJ Zeiss

Telemator OTA
With achromatic C-objective 63/840
Res .power: 1.8", Lim. Mag: 11^{m}5

Mounted on Parallactic GEM TM
RA 0-24h scale 4^{min}, DEC 4x 0-90° scale 1°
Tangent lock & slo-mo: 30^{min} / 7.5°
2VS tripod with bubble level & acc. tray

Rotatable finder scope D 42mm, F 150mm
Achromatic objective + 20mm Ortho eyepiece
7.5x magnification, with crosshair. Lim. Mag: 10^{m}7

4x EP turret
With 40-H, 25-O, 16-O, 10-O EPs
And many other backend options!

So now, as for my Telemator:
Let's light up this candle!

Here's my Telemator on the parallactic TM launch pad / mount, and with the 2V tripod below, ready for takeoff. I've added a custom OTA ring from AOK-Swiss to hold my ZBOLT GLP at night and a TV *Sol-Searcher* in daytime.

The Zeiss finder is as good as they get for a D=42mm f/3.6 achro scope (7.5x @ 8°), but it's not RACI, so I often use just the Zeiss turret with the H-40 Huygens (21x @ 1.9°) or a TV55 Plössl (15x @ 3.1°) in the large port, in conjunction with my 8x30 Zeiss bino (8x @ 8.5°).

The motorized drive is almost a necessity for the kind of observations I prefer: sitting down on my astro-chair with the hands free to handle my maps for star hopping, to sketch what I see or to snap photos, mostly a-focally using the iPhone on top of my eyepieces and/or the night vision IIT device. Also, my experience has been that the 2v tripod with metal tray (securely fastened) - when set up - is both a much more stable and a more practical solution as compared to the leather strap spreader on the early 2v, which Zeiss delivered with the Telementor T1 OTA.

I usually carry out this grab-go setup in 2 steps:

- first the mount + tripod,
- and then the OTA.
-

The mount + tripod goes out my door frame to the garden as is, without collapsing the legs.
Easy peasy!

As for the performance of the Zeiss Telemator, in the end you know: *it's all about that glass...* https://youtu.be/aLnZ1NQm2uk

"*Oh, surely the Zeiss has the 'boom boom' that any boy chases: all the right junk, in all the right places; And yes the magazines, working that Photoshop, you know that **** ain't real, so raise you Zeiss'es up, cause every inch of them, from bottom to the top, are perfectly designed and made ...*

And really, don't worry about the size, cuz boys like a little more booty to hold at night..." etc.

But besides the "boom boom" of the Zeiss build and mechanics, it's really all about that glass. So I'll go ahead now and show you the glass of my Telemator here:

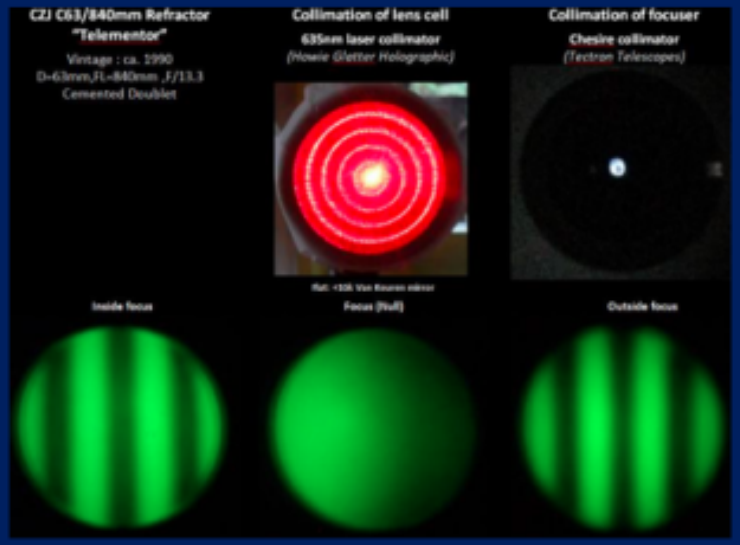
"The world's smallest professional telescope"!

Thomas, I'll immediately acknowledge and adopt your very fitting characteristic of the CZJ Telementor/Telemator. This high praise is based on not just the unsurpassed quality of design and build of the materials and the mechanics of tripod, mount and OTA, but also on the outstanding figuring and polish of the optics in Zeiss objectives and eyepieces.

But as Zeiss wrote in their instruction for School and Amateur Telescopes: *"Full utilization of the possibilities offered by an astronomical telescope can only be achieved if appropriate accessory units are used".*

The CZJ Telemator has a type T2 OTA with the objective cell mounted on an inner tube that focuses smoothly by a Crayford-type friction wheel. The objective is a C63/840 Fraunhofer-type achromat cemented doublet with Zeiss T* AR multicoated crown-flint BK7/F2 glass and a secondary spectrum of S2N=2.4 (as compared to the earlier AS63/840, which is an Steinheil-type air spaced doublet with an uncoated short flint leading KzFN2/BK7 yielding a half-APO S2N=1.8; The AS objective is mounted in an OTA with R&P focuser).

The difference in secondary spectrum between two designs of f/13.3 objectives: AS63~1.8 and Telementor C63~2.4, is not striking when observing; Yes, the AS appears bit sharper on objects like the sun, moon and planets (due to the smaller CA) but there is still a bit chromatic aberration visible as compared to a true apochromat objective.



Just as important as the color correction of the objective is the figuring and the polish of the glass. I have DPAC-tested the objective in my Telemator here to be a good 1/10 wave in green with no trace of zones, as can be seen in the enclosed image.

This result places it in the very best end of the Zeiss C63/840 objectives I have tested, but the other objectives have also been good, tested to at least ~1/8 wave, with only slight aspheric or zonal errors.

I prefer the T2 design over the older T1 with helical focuser; The T2 OTA has a generous internal focus range of 104mm, and the focus plane stays put during focusing (whereas the T1 helical focuser is limited to a moving 35mm). The T2 tripod has a metal accessory tray that – when fixed securely to the legs – provides a very solid base for the mount (whereas the T1 tripod has a 3-leather-strap "spider spreader" that is easy to carry out but provides a wobblier base).

I much prefer the TM design over the basic Telementor T; The TM has a *driven* RA plus DEC setting circles, so once the sidereal time is set on the *moving* RA circle, you can for the rest of the observation period directly dial in the RA and DEC for any celestial object (whereas the Telementor mount is without motor and thus has a *fixed* HA plus DEC setting circles, where you must calculate and set the Hour Angle for each new object throughout the night; This is easily done with a modern app on your smartphone though, but still...).

The TM furthermore has a high quality 7.5x finder scope with limiting magnitude $10^{m}7$ (whereas the T has a naked eye gun-sight device, which only works on bright celestial objects). Most important, of course, the TM (like larger the Zeiss Ib mount) has the option of activating the 220V/50Hz synchronous motor drive on the RA axis when you have located an object, whereafter the mount steadily and faithfully tracks the object, liberating the observer to sit down and leisurely observe, draw, image etc. (In contrast to the Telementor mount, where you are limited to using the tangent slo-mo rods for continuous manually tracking the objects, and as these have limited motion range, the HA slo-mo rod must be "reset" each 30 minutes, -- which I find a PITA for longer observations. This nuisance, btw., was corrected by Zeiss when they designed the Ib motorized mount to use worms instead of tangent-rods for slo-mo on both axes., – perfect! thank you :-).

By setting the latitude to 90°, the T and TM GEM mounts can easily be configured to ALT-AZ mode, -- but I've never seen a use for that, apart from terrestrial observations.

And indeed, Zeiss offered a wide selection for choice of tripods and piers, basic and motorized mounts (all configurable in EQ or AZ mode), OTA focusers, extenders and adapters, achro and APO objective designs, planet and wide field eyepiece types, Barlows, diagonals, binos and turrets, filters for sun, moon, and planets, and more...

All of the highest quality aimed at education and study, such as for use with an eyepiece spectroscope to determine stellar temperatures/types and evolution, with a position ring and eyepiece micrometer (optionally with dark field illumination) to measure double star position angles as well as coordinate differences and distances between adjoining astronomical objects, with projection screens or a solar filter to study the sun's photosphere, eyepiece hairline-cross inserts for object centering and guiding during photography, and more... But I'll stop my description here, and let some pictures talk instead:

Carl Zeiss Jena offered a range of telescopes with different designs, builds and finish. *Nihon Seiko* is often praised for its many accessories, but in comparison to CZJ, they pale in range as well as in innovation and quality.

Look at the CZJ offers in scopes and optics (objectives, eyepieces), in mounts and tripods, in focusers and extenders, diagonals, turrets and binos, Barlows, micrometers, filters, spectroscopes, projection screens, Colzi and Herschel wedges, cameras... the list goes on and on. And this is just some of the inventory as of the 1980-1990'ies. CZJ Zeiss has a long history of astronomical telescope making, going back to the late 1800 century!

PS: I know all this is high praise for one small telescope, and as in general I'm not a fan of hyperbole, let me as a closing remark just state that I have come across other small refractors that have been close to or even rivaled the Zeiss Telemator on some points, be that build or optics. These have all been classic refractors from Japanese producers such as Nikon, Vixen, and some Nihon Seiko (and interestingly, those few rivals learned the trade from no other than... Zeiss). But the thing is, I have not met another product line so innovative, diverse, complete and consistent in high quality as the CZJ Zeiss astronomy equipment.

"If you're looking for faults, use a mirror, not my refractor..."

I've described my use of the CZJ Star Spectroscope (SS) in more detail here: https://www.cloudyni...ion /?p=7972906. I have been able to use the SS visually on the brightest stars, thereby qualitatively determine their Secchi type spectra, and that was a fun and educational exercise.

The CZJ SS could be used down to 2m on my Telemator, while studies of fainter stars would require a larger aperture (say, ~ 6"-8"). For really detailed spectrum studies though, I had to switch to an SA100 grating on my simple mono camera, and have software like Rspec help me display and analyze the captured spectra.

All that said, if today I HAD to choose between, say the Zeiss E50/540 and the Vixen FL55S/440, or between the Zeiss AS80/840 and the Vixen FL-80S/640, I would choose the Vixens as my OTA for their superior APO optics; -- but I would sorely miss the build quality of the Zeiss OTA and I would still chose the Zeiss Ib over the Vixen SP-DX mount for easier grab-go setup.

But all this is personal preference based on specific observing conditions and choice of set-up and tools. And anyway, I would still rely heavily on my Zeiss accessories for the actual use of these OTAs... But that's a story for another day 😊

"These instruments have played me so many tricks that
I have at last found them out in many of their humors."
-- W. Herschel

A fully loaded CZJ TM-mount on 2V tripod, with Zeiss Telemator as main scope and Zeiss Teleminor piggy-back as sidekick.

In the Teleminor focuser is the Baader/Zeiss RACI Amici diagonal, with an ATC M44/1.25" 40mm EP.

The Telementor backend is the CZJ RACI Amici 4x EP turret, with an ATC M44 32mm EP plus Zeiss 25mm OPMI and CZJ 16 + 10mm orthos

The CZJ correct image porro diagonal is one solid heavy-weight hunk of glass, weighing in at more than half a kilogram (compare that to the skinny NS CI-porro at only ~100 gram).

The CZJ color-filter revolver screws onto the top of any Zeiss 0.965" eyepiece (when the eyecup has been unscrewed); It allows easy selection between 5 color filters: ND/grey, red, yellow, green and blue, whereby you can quickly enhance color contrast to identify specific details in extended objects -- typically used on planets such as Mars (non-dust clouds: blue, dark rocky areas: orange/red) and Jupiter (belts & GRS: blue, festoons & polar regions: red).

The CZJ star prism diagonal has two M44 ports that on the EP side can accommodate native M44 eyepieces (Zeiss, ATC) as well as 2" and 0.965" eyepiece adapters. It is of high quality, but I normally prefer the Baade r /Zeiss RACI Astro-Amici diagonal, which also - by use of suitable adapters - can accept eyepieces of all sizes (M44, 2", 1.25", 0.965").

Whenever I hear the word Telescope, I reach for my revolver...

My use of some CZJ Zeiss visual backend accessories

The single most used CZJ visual backend on my Telemator (as well as on other of my former and current telescopes, such as the Vixen FLs) has been the CZJ Zeiss Amici turret. Amici diagonals are often seen described as "not suitable for astronomy observation"; As a generalization, this is just plain wrong, – and must be stated by people who have only tried cheap low quality variants of this design.

As with everything Zeiss designed, their specifications called for a very high quality in materials and workmanship, and the Amici turret is no exception. The Zeiss Amici diagonals were made for high magnification astronomical use, with a roof edge cut precisely to Zeiss norm (rt/-2 arcsec), fully multicoated, and installed in a solid metal housing. There is a small variation in finish and I have come across some prisms that have been damaged or knocked out of collimation , but the best of the Zeiss prisms are essentially perfect with totally invisible roof.

I currently have two excellent Zeiss turrets (one for my Telemator and one for the 4" APO, plus a Baader 2" Amici diagonal (also made to Zeiss spec.). The use of a good Amici diagonal makes star hopping so much easier and fun, so today I mostly use just a GLP and my 8x 30 bino for pointing the scope, and then rely on my wide field Eps on an Amici diagonal to locate the objects. No need for a finder scope, really.

I use my Amici diagonals for all kinds of visual observation, – the Sun, Moon, stars, DSO, even the planets (which can however be "spiked" if you place them directly on the roof. So don't do that :-)

For snapshot images of solar system objects, I normally shoot straight through with the camera, but for image intensified views (night vision on DSO afocally on top of the eyepiece) I always use one of my Amici diagonals.

The CZJ Zeiss Bino-Viewer comes with a 1.5x Barlow and has a diopter-setting for both eye-tubes, plus a 55-75mm adjustable eye distance. I've had great views of the Sun and Moon using this accessory, but if – like me – you prefer observing from a sitting position, the 45° angled viewer is not ideal.

I ended up selling it and buying a 90° Baader/Zeiss Mark V bino-viewer, which – besides the CZJ 0.965" eyepieces – can also accommodate 1.25" EPs like my 2x ATC K32mm and 2x Zeiss 25mm OPMI that gives just breathtaking views of the Sun and Moon.

The CZJ Zeiss Position-Circle is a very convenient and accurate means of rotating reticle eyepieces for precise measurement of double star position angles (PA). This circle provides 360° precision rotational capability for any application. You simply loosen the knurled lockscrew, and rotate the attached accessories to the desired angle. It works also as a handy accessory for adjusting camera rotation or for just obtaining the best viewing position through the diagonal during visual observation.

The PA circle device is made of solid Brass, and finished in satin black lacquer with white filled engraved markings. Beautiful! I use this setup with a 16mm orthoscopic eyepiece with a crosshair insert. – CZJ Zeiss offered crosshair inserts for the 6, 10, 16 and 25mm ortho eyepieces.

The CZJ PA-Circle is also a superb way to smoothely and securely rotate a visual backend (such as a loaded diagonal) into a convenient position for viewing.

Here's a bit of what Zeiss wrote as introduction to their user manual for the Telementor:

"The School Telescope 63/840 was developed as a combined observing- and measuring equipment for use in education. At the same time the resulting technical design meets the requirements of amateur astronomers, especially since a wide range of astronomical accessories can be used."

And then it goes on to list the many design and build decisions that underpin this main goal. I will not reiterate those here (unless you really want me to), but suffice it to say that of all the technical characteristics envisaged by the Zeiss School Telescope, aperture is not mentioned, nor are any of the intended objectives with the setup dependent on aperture (so to speak).

The point here being, that basic astronomy: spherical geometry and astrometry, basic Sun, Moon, planet, asteroid and comet observation, stellar spectroscopy, double and variable star measurements, asteroid and comets observation, -- all this is perfectly possible with a small refractor with the right accessories of high quality. It can even be argued (as Zeiss indeed did) that a more capable but also larger, heavier and less robust telescope would be more cumbersome and risky for a school class to handle, both in transport, setup and use.

And then of course the price for one C-63 Telementor back then in DDR was around 1.5x the monthly wage for an industrial worker, while a bigger and more refined observatory-type scope like the AS-100 would have cost ~8 times that amount. Times the number of primary schools in DDR. So there...

"The key to success is the ability to adapt"

And so, indeed, the ability of any telescope to accept physical and optical extenders, reducers, benders and rotators is crucial to the flexibility and ultimately the usability of the instrument in terms of performance as well as ergonomics. Already the basic design of the Telemator comes with built in rotatability of its finder, the Amici turret and the PA-circle/prism diagonal systems, and this fundamental flexibility is further enhanced by the CZJ quick change system (dovetailed ring + change-over adapter), which also offers full rotation.

Since the closing of the CZJ Astro Division back in late 1995, it has become increasingly difficult and expensive to acquire Zeiss telescopes and accessories. Luckily, there are alternatives. I am in the possession of an interesting letter signed by Thomas Baader in 1996 where he explains that the Carl Zeiss telescope production now unfortunately has been closed, but that his firm - Baader Planetarium GMBH - has been chosen by Zeiss to continue the customer service of Zeiss Amateur Telescopes. He explains that the business transfer includes the remaining Zeiss spare part stocks, the most essential large machine tools plus a complete optical test laboratory enabling Baader to undertake all future repair and servicing of Zeiss telescopes.

As of ~2010, most of the Baader stock of original CZJ Zeiss telescopes and spare parts were sold, but Baader has continued to produce components made to exact Zeiss specs, both mechanical (such as the M68 extenders and quick-change/ring system) and optical (such as Amici, Herschel and T2 prisms, Abbe Barlows and GPCs, binos and even some objectives and eyepieces of Zeiss design). Furthermore, with the use of a M44/T2 adapter, you can get access to Baaders own long list of T2 accessories, including extenders and quick-changer/rings, eyepiece holders (standard, helical, quick-lock), -- and much more...

Some of my backend adapters and optics

With the Telemator, I mostly use the CZJ Amici Turret complete with a Zeiss eyepiece set for visual DSO, and the modern Baader/Zeiss Mark V bino viewer for solar and lunar observations.

I have a M44/T2 adapter on the Turret so that (like on the Mark V bino) I can use it with the Baader/Zeiss GPCs (glass path correctors) to eliminate prismatic color fringing and at the same time select an appropriate barlowing factor of 1.25x, 1.7x or 2.6x.

I normally use a Baader/Zeiss spec 1.25" Amici diagonal on the Mark V bino, and also when I when I just want a quick mono viewing through the Telemator. For mono viewing I can also use the GPC's or just the Zeiss Abbe 2x barlow for a quick boost of magnification.

My most used eyepieces on the Telemator are the ATC K-32mm and the Zeiss OPMI 25mm (both 1.25") plus the CZJ 0.965" Orthoscopics in 16, 10 and 6mm FL.

CZJ Zeiss offered a range of extenders for M44 *Telementor/Telemator* (20,30,40,50,60,70,80mm) – here I've shown my two 80mm extenders, one in dark and one in light grey finish. The C60/840 refractors were not designed for 2" accessories (back-focus, baffling), but you can buy M44/2" custom EP adapters. Zeiss provided special M44 threaded eyepieces for wide field observation as well as 0.965" EP adapters for their line of smaller Huygens, orthoscopic and monocentric eyepieces.

For use of modern 1.25" eyepieces and equipment on the *Telementor/Telemator*, the way to go is to buy a M44/T2 adapter ring, and then use the wide range of T2 extenders and EP-holders to meet your needs.

I was rich - if not in money, in sunny hours and summer days.
Henry David Thoreau

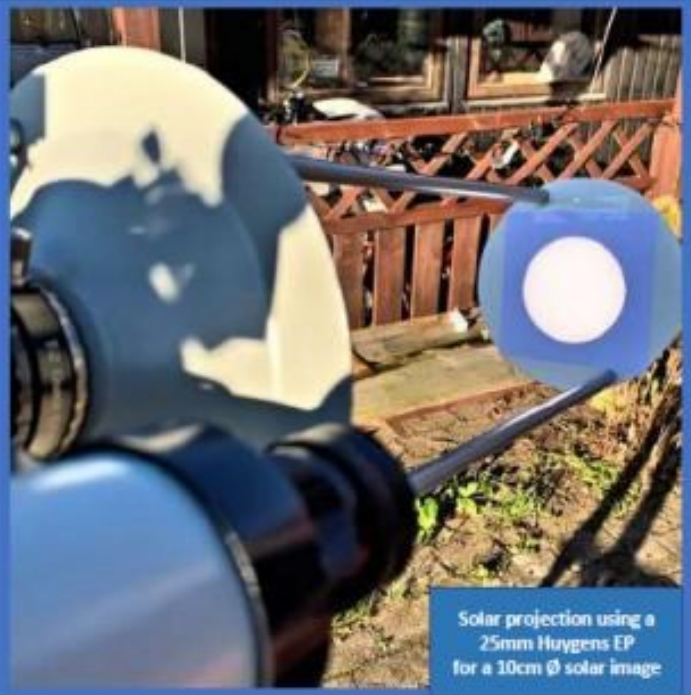
No doubt the most used method for solar observing in DDR education was the Sun Projection Screen, which allowed many simultaneous observers. The grey shade screen with a central M44 hole is first fixed to the focuser by mounting it between a H-40 EP or the Zeiss 0.965" EP holder. Then the white projection screen is fixed by two rods, - secure and simple. Typically a Huygenian H-25 eyepiece would be used for a 100mm diameter size of the projected sun disc.

For more demanding solar studies with the Telementor, CZJ provided a high quality optical flat chromium-coated objective sun filter (SFO-63) with 0.01% transmittance (OD4); Combined with a set of 5 graded ND eyecup filters (neutral densities: 0.7, 2.2, 7, 22, 70% transmittance), this could be used for visual observation at different magnifications, and without ND filter it was also suitable for solar photography. The CZJ set of solar ND-filters is shown beautifully in the image above provided by Stefan.

The CZJ SFO-filters are now quite rare to come across, so instead on my Telemator I have used a classic class-A blue-band multi-coated glass solar filter (JBM Thousand Oaks) with a 0.001% transmittance (no additional ND-filters needed) for visual observing. Alternatively Baader provides a modern 1/20 wave (95% Strehl) astro film for solar observation, both a visual (OD5~0.001%) and a photographic (OD3.8) type.

Solar observing with the Telementor

CZJ Zeiss offered several methods for observing the sun with the Telemator: both a traditional solar observing system with a Huygens eyepiece projecting an image on a screen mounted on rods behind the focuser, and also a modern high-quality glass sun filter (SFO 63) with a set of 5 neutral density EP filters. Modern 1.25" Herschel wedges can be used too.

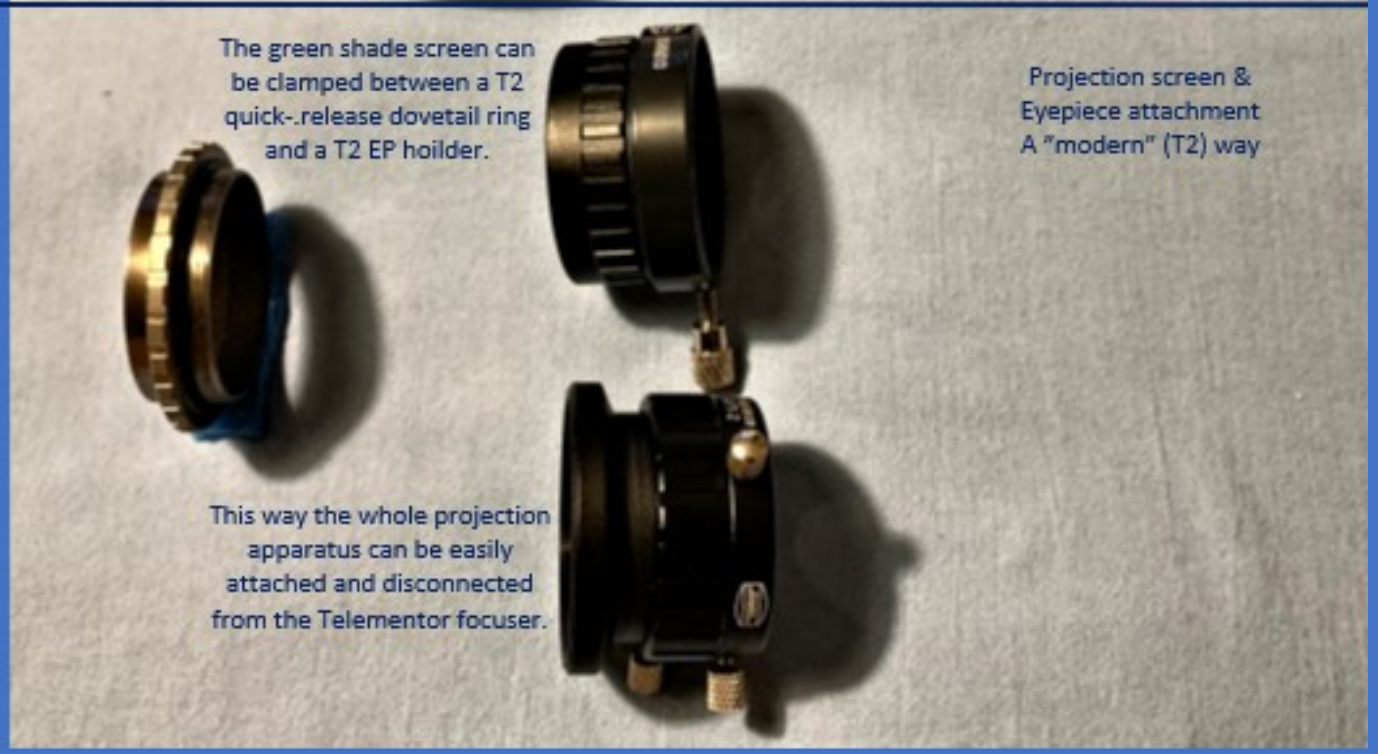


Lastly, there is the option of using a Herschel wedge on the Telementor; CZJ provided an outstanding 2" HW for larger telescopes (I use it often on my 4" APQ), but it is not well suited for the Telementor; Instead, I use the smaller 1.25" Lunt HW, which is a perfect match to the small school telescope.

Still overcast and rainy days here in Denmark, so I can't show you the Telemator in action for solar observation right now; Instead, here's a close-up of the solar apparatus attachment to the Telementor M

As for Zeiss binos, I have a few and use them quite a lot. There's much to say about these instruments, but I'll leave that for now -- apart from leaving you with a snapshot of my current inventory:

[see next 'slide']



Zeiss West 10x56 Conquest
Phase corrected Abbe-Koenig roof
Exit Pupil 5.6mm, TFOV: 7°
Weight 1 Kg
Water proff, N-filled

CZJ 15x50 Pentekarem
BaK-4 Porro prisms
Exit Pupil: 3.3mm, TFOV 4.6°
Weight: 1 Kg

CZJ 10x50 Dekarem
BaK-4 Porro prisms
Exit Pupil: 5mm, TFOV 7,3°
Weight: 1 Kg

CZJ 8x30 Deltrintem
BaK-4 Porro prisms
Exit Pupil: 3.7mm, TFOV: 8.5°
Weight: 0.5 Kg

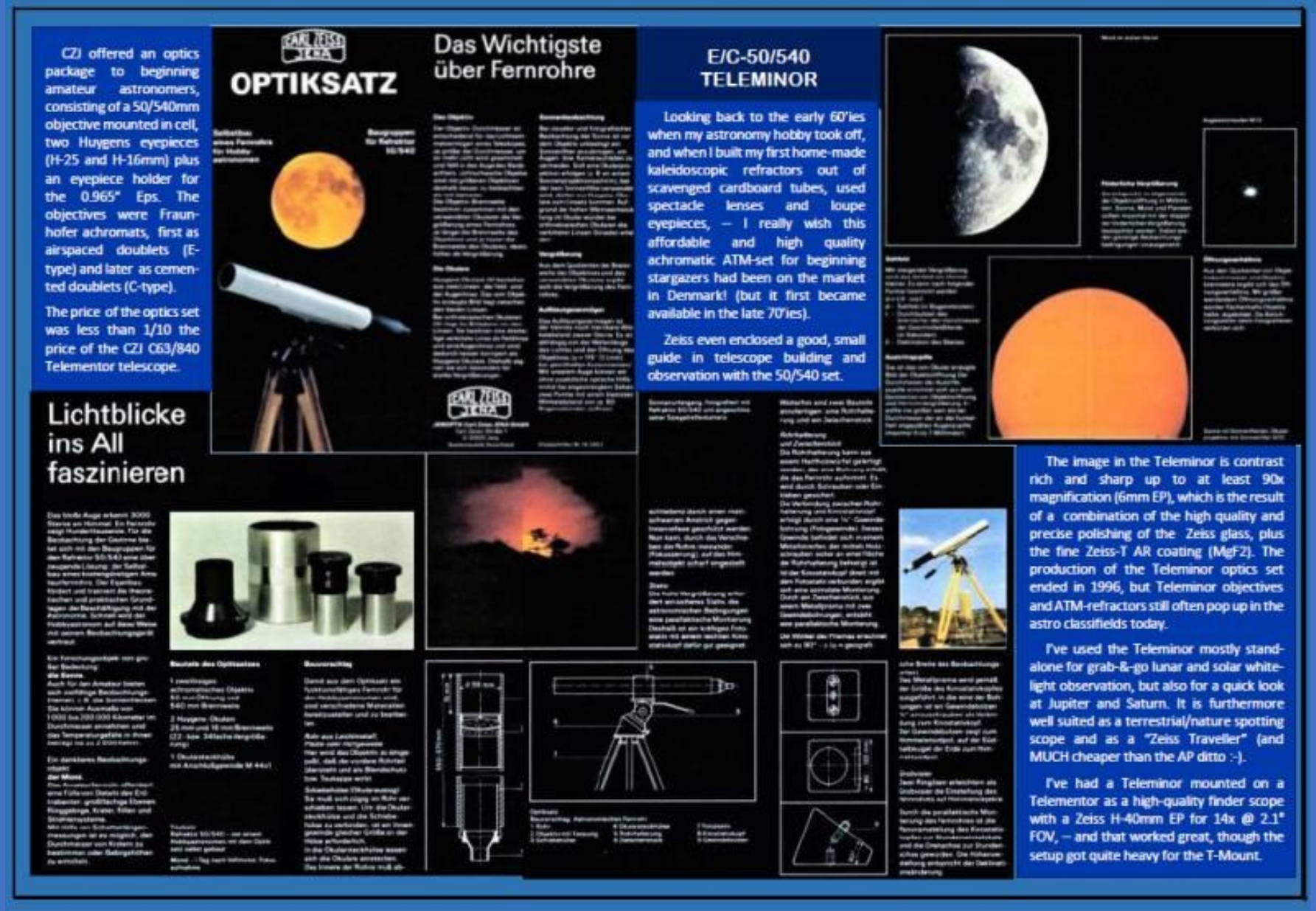
My current Zeiss Binos

For wide field astronomy (and nature alike), I now primarily use the CZJ 8x30 Deltrintem: it is light weight, has a wide FOV and very sharp and contrasty images. It is ideal as a finder in my LP backyard, and works great in conjunction with a GLP on the telescope.

For quick solar and lunar views, I often use the CZJ 15x50 on a collapsable Manfrotto stick, -- shown here with Baader AstroSolar visual film on the objectives,

For deeper star hopping and views of the night sky, I prefer the moders Zeiss 10x56 Conquest due to its superp bright, sharp and contrasty images and the unrivalled ergonomics of use.

Some classic CZJ bino accessories



Minor things can become moments of great revelation when encountered for the very first time.

Margot Fonteyn

I think most of us remember our first look through a telescope at objects like the Moon's craters, Saturn's ring, Jupiter's moons, Sun spots, the great Orion nebula, the Andromeda galaxy... etc.

For many of us back in the 1960'ies, those views came through small refractors we had cobbled together of scavenged bits and pieces of glass and cardboard tubes -- wobbly and far from achromatic, but enough to offer revelations that sparked a lifelong astronomy hobby.

Now, as of 1986, the budding amateur astronomer in the DDR had another option: an affordable ATM set which included a high quality 50/540mm achromatic objective in metal cell plus a pair of fine 25 & 16mm Huygens eyepieces with an EP holder. The CZJ "Optics Kit" offered a vastly improved starting point for ATM, than was available to most hobby astronomers at the time, -- at least here in Denmark.

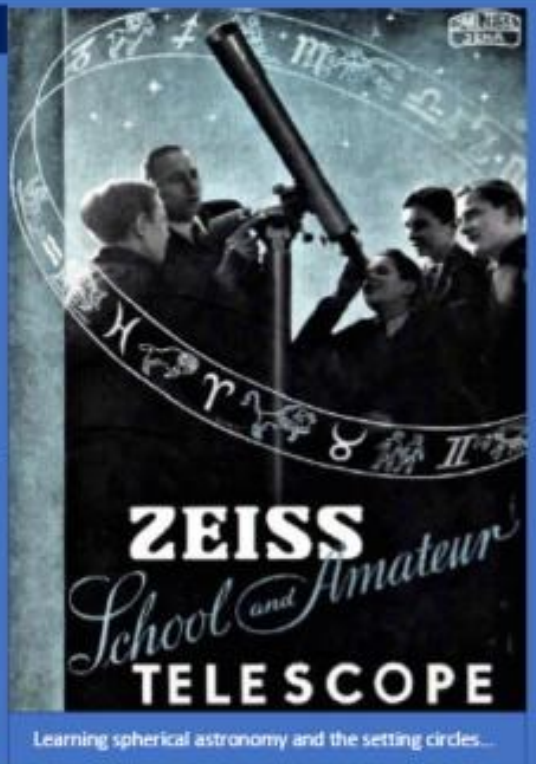
You could argue, that in "the capitalist West" a 13yr old kid (like me) had the option of saving his income from summer vacation jobs and after two years buy a "proper" telescope (like my 3" Unitron), and that - as this was hardly an option in the DDR -, CZJ had to provide the "Optics Kit" as a stop-gap solution; Which may be at least partly so,-- but still, I would have loved to have my first astro revelations using a proper achromatic telescope instead of my ATM kaleidochromatic Frankenscope...

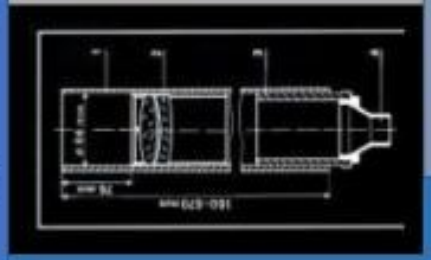
Actually, already as of 1955, CZJ offered a complete version of the small E50/540mm Teleminor telescope for beginning amateurs and schools. It came with an air spaced Fraunhofer achromatic objective mounted in a tube with internal Crayford focuser (as we know it from the later C63/848 T2 OTA). It had a M44 backend for direct eyepiece connection (H-40 or a 0.965 EP Holder) or a for a M44 mirror diagonal.

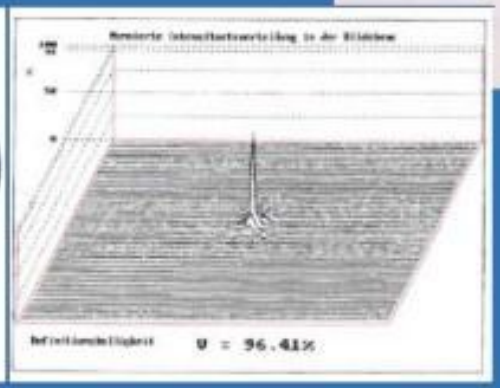
This early Schulfernrohr was mounted on a small parallactic head for use with a tabletop metal pier or a wooden tripod. I guess that not many of these were sold, as they are seldom seen today -- probably due to a combination of being too expensive for amateurs while not capable enough for educational use, and so this model was superseded by a combination of the cheap C50/540 ATM kit plus the much more versatile AS63/840 telescope.

The CZJ 50/540 ATM kit was however sold in great quantity, and often come up for sale, either as the Optics Kit or (more often) with the objective cell mounted in an ATM OTA. I've seen (and owned) several such custom "Teleminors", and the build quality has been (as expected) of varying quality. My current Teleminor is very well built, -- solid tube and focuser, properly baffled and internally blackened, and with a Zeiss dovetail, -- things to be aware of, if you consider buying and using one of these.

Nice looking back at all the warm summer memories, with my small Teleminors; I'm not using that scope so much anymore, times they are a'changing, but hey! -- We had joy, we had fun, we had seasons in the sun







Christmas Carol

So that was what lay sleeping in the telescope box I opened on December 01. 2021. -- Some refractor and accessory hardware, plus a lot of fond and warm memories of handling and observing with these fine small classic instruments. A piece of my personal Zeiss history.

The Zeiss universe, of course, is vastly bigger, and I have other personal pieces of that puzzle, hopes and dreams, choices and experiences, observations and recordings, mostly joy and fun, under the stars and in the sun.

I hope some of you have enjoyed my small classic "Xmas carol" here, and I wish you all a cozy solstice with your loved ones and a happy New Year!

Personally, the solstice is always a time of somewhat melancholic reflection for me, and a bit more so, the older I get, -- I feel the crossroads of time where the old year must die to give room for a new one. As Loreena McKennit sang:

Suddenly I knew that you'd have to go
Your world was not mine, your eyes told me so
Yet it was there I felt the crossroads of time
And I wondered why.

As an amateur astronomer (and a biologist), I don't "wonder why" really, but the awe and the beauty of life and death, space and matter, is mixed with that seasoning of melancholy, as the cool shadow in bright sunlight. All is well!