Towards specialized instruments

… and away from unfitting instruments



- First telescope, 20$ second-hand, without having read or looked up anything
- No idea of anything
- Not really usable

- Then I found Saturn by pointing a "brown-ish star"

  ⟶ Problems began

A 3" f/10 then 4.5" f/8 fork mount
→ to dobson conversions later …

my first constraints emerge
- no car
- no driving license
- unlimited energy and a bike (I'm 25)



+ how to shrink the length of a telescope

Recherche Google J'ai de la chance

Looks like people grind mirrors ?
No time for that.
still …



+ grinding short focal length mirrors

Recherche Google J'ai de la chance


M31 + IFN
6 inch 4.3° FOV
Sept 26-8, '16
Cottage Grove Lake, OR
30m 21.2
Mel Bartels





- Confusion
- Conflicting goals
- Urge to build
- Incompatible constraints & desires
- Massive build logs consumption



The "typical" stellafane-ish dob

First 8" f/3.5 mirror (to be finished)

… still no driving license



The practical

Same 8" f/3.5 mirror
(to be finished)

Transportable-ish



In the meantime :

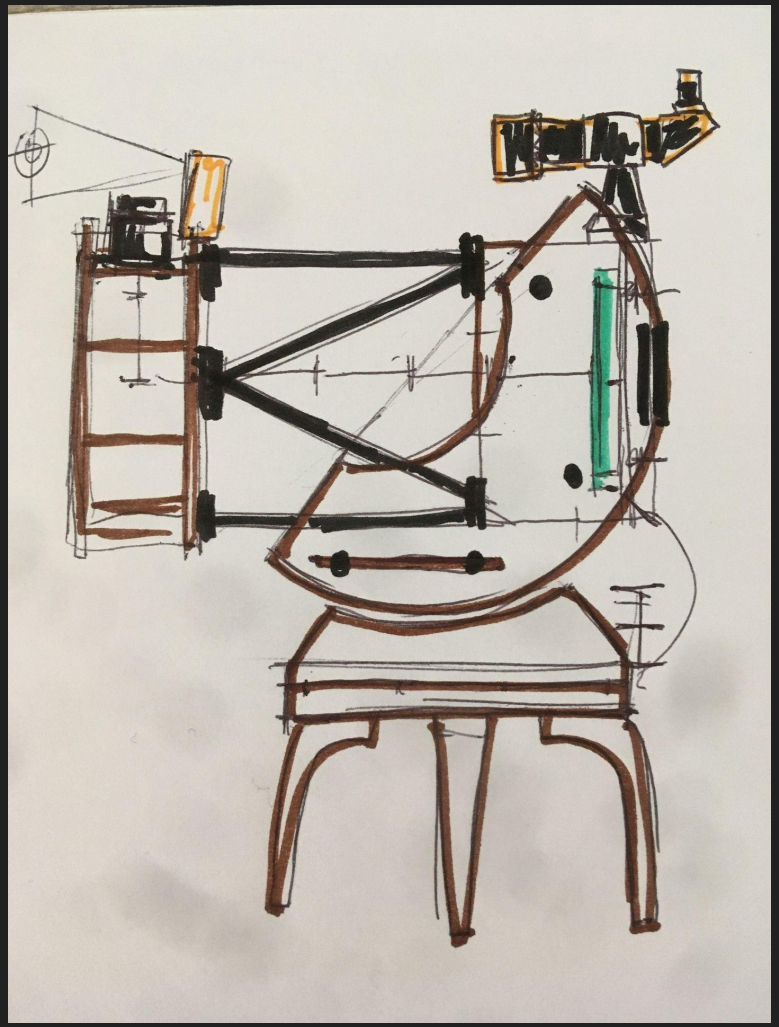
- Actual observing
- Actual dark sky
- Actual lightweight setup

Meade ST80 + 1981 moped



1 year of deep sky observing
No more car problem

Wider fields
→ bigger eyepieces
→ larger alt axis
→ coma
→ buy an MPCC
→ 🤬



Ed Jones's MPCC thread
Back to the drawing board







Hyperbolic 8" f/3.5

✅ deep sky
✅ wide fields
✅ corrected
✅ balanced
✅ filters
✅ interesting build
✅ transport

❌ planets (that's ok)

A Cool Cat in France

This project makes a Cat out of a Newt.



▲ Lucas Sifoni's corrected hyperbolic Newtonian, affectionately named Kermit II, is designed to give sharp, wide-field views with a built-in field corrector.

FRENCH TELESCOPE MAKER Lucas Sifoni began stargazing with a "hobby killer," a fork-mounted, 76-mm Newtonian with Ramsden eyepieces. He knew something was wrong when he got better, more spacious views by holding a stack of loose lenses up to the tube (side note: I, too, have a drawer full of assorted achromats). He wanted the view to be sharper and wider, and this desire drove a series of optical letdowns that eventually led him to build the coolest cat(adioptric) I've ever seen.

A general assumption in observing is that the bigger the scope, the better — but there are many reasons to hang onto a small, rich-field scope. They travel better, often are easy to set up, and can soak in wider, starrier views. That "starriness" gives rise to the idea of field richness — and small, fast telescopes maximize this notion. These were the driving forces behind Lucas's projects.

So, at age 26, he ground and polished his first mirror: an 8-inch f/3.5. This was an enormous feat for a first-time mirror maker, and the result was so good that it produced outstanding planetary views despite its fast focal ratio. And with a 58-centimeter (23-inch) tube, it crammed a lot of aperture into an extremely portable 4-kilogram (9-lb) package. A passenger in the backseat of Lucas's car might be slightly cramped with the scope stowed at the person's feet. By comparison, the ubiquitous 8-inch f/6 Dobsonian typically weighs about 25 kg, travels in two pieces, and fills the whole backseat — no room for passengers.

Stunning sights of the solar system aside, Lucas still didn't find the views he was after. As the focal ratio of a Newtonian mirror trends downward, coma creeps in. To the eye, this is a radial blurring of off-axis detail that increases as you move away from the center of the field. It's worse the lower your f/ratio gets, and eyepieces with wide field stops show the distorted edges even more. Fortunately, commercial coma-correcting optics are widely available.

The f/ratio or "speed" at which a coma corrector becomes mandatory is hotly debated. But it's agreed that a good one won't come cheap, and this writer can attest that coma ramps up severely under f/4. Even those who tolerate coma might feel nausea in the f/3 ballpark — radially elongated stars that evoke the look of "warp speed" in science-fiction movies.

As a budget-strapped, wide-field observer, Lucas found the coma overwhelming in his favorite eyepiece — an APM HDC-XWA 20mm 100°. So, he grabbed a Baader MPCC Mark III (Multi-Purpose Coma Corrector for Newtons) from a local retailer and 3D-printed individual spacer rings to attach it to his eyepieces, as each requires a different spacing for optimal correction.

This cleaned up coma beautifully, though it came at the cost of sharpness across the entire field — stars never quite snapped into focus. So after one too many nights of fumbling with threaded adapter rings in the dark, he hit the online forums to see why things were amiss. There, he dug up a note from optician Ed Jones talking about the MPCC, including some computer analysis. The primary mirror's shape this Rowe-style corrector would best match wasn't a typical Newtonian parabola, but actually a *hyperbola*, a type of conic section.

Lucas asked around about making a mirror to match his MPCC. "We buy correctors to correct mirrors, you're making a mirror to match a corrector? That's nuts!" scoffed one experienced mirror maker. But Lucas used *CORRECT 3* (**https://is.gd/Correct3**), an optical ray-tracing software, to test his idea. The spot diagrams it generated were promising: sharp stars with soft fringes. Armed with a Bath interferometer, grinding out the mirror's unusual conical shape seemed quite doable.

He then posted an ad online seeking a "truly awful 8-inch mirror" to refigure and quickly found one in the form of an astigmatic, massively overcorrected f/4. Removing enough glass to push it to f/3.6, he was able to produce a conic shape rarely seen in amateur circles. After one coating, a pile of laser-cut wood, and some 3D-printed structures later, he was ready to test.

The resulting scope is beautiful and modern. By the second revision, Lucas added a homemade filter slide, dual-speed focuser, and more. He soon abandoned using tedious spacer rings to mount the MPCC. At my urging, he designed and 3D-printed a threaded interface for the corrector inspired by a similar system offered by Starlight Instruments. This essentially turned the Newtonian into a catadioptric system with a fixed corrector lens.

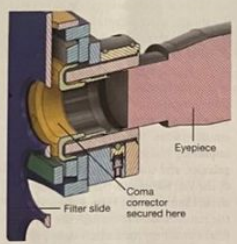
The idea may not be nuts, but the views certainly were. While there was some false color at high magnifications, low powers hid it well and the stars were tight. His HDC-XWA 20mm produced a wide, 2.8° field. This fits expansive targets like the Pleiades, the Andromeda Galaxy (M31), or the entire Veil Nebula. From dark, rural skies, he's enjoyed views of the North America Nebula (NGC 7000).

"Fast scopes are quite uncommon in France," Lucas shares, though the stunning views through his scope have driven other ATMs to get onboard. "The following summer, I had the pleasure of looking through a 10-inch f/3 Newt that Fred Burgeot, a French astronomy sketcher, had built after looking through my fast scope."

Readers can find the open-source files for Lucas's creations by name-searching him on **printables.com** or **thingiverse.com**.

■ Contributing Editor **JONATHAN KISSNER** has yet to play with *CORRECT 3* but is already aboard the fast-scope train with his coma-corrected 6-inch f/3 Newtonian.

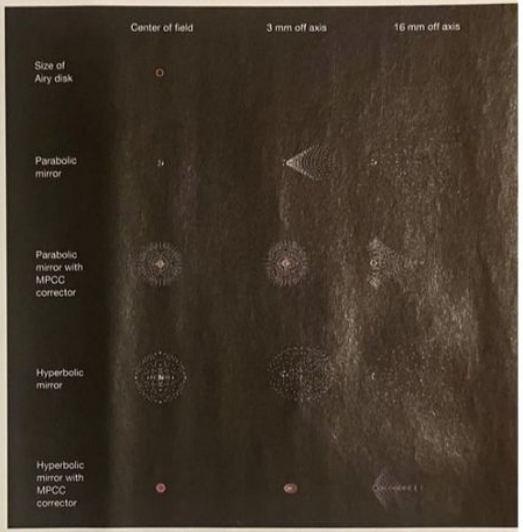






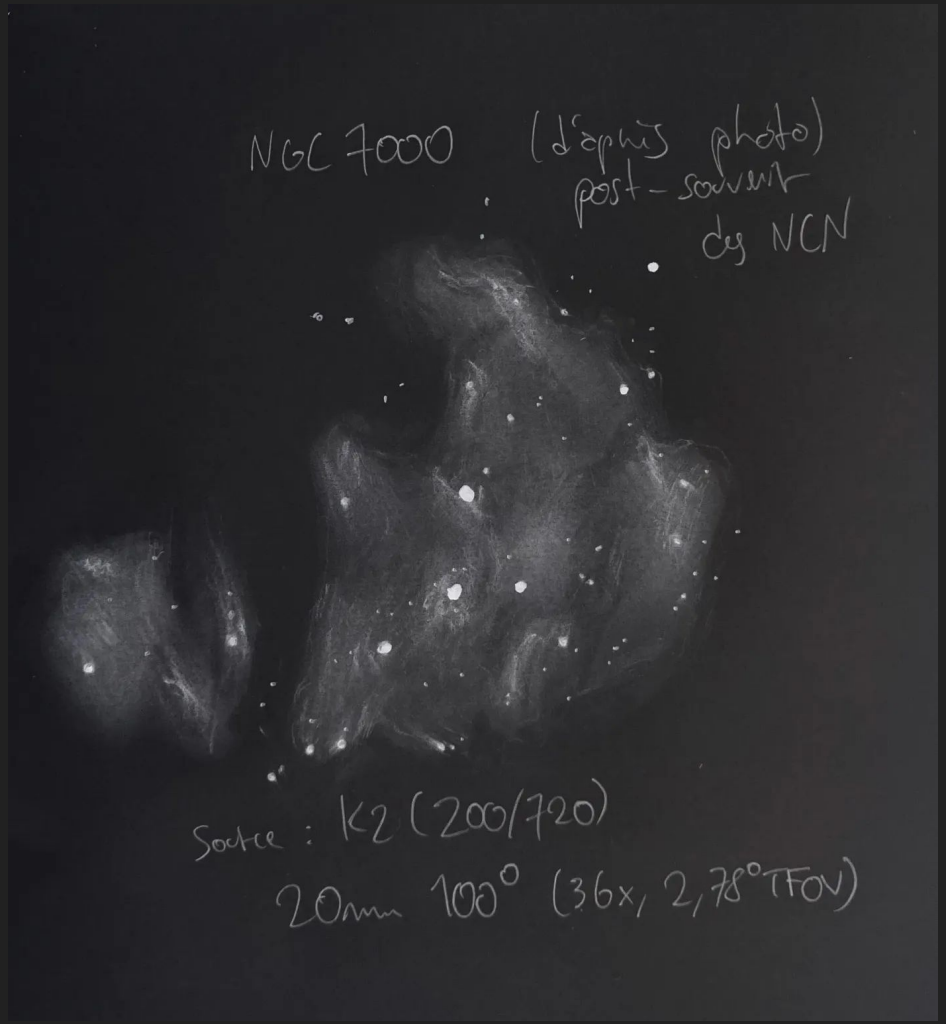
▲ *Left:* The upper tube assembly of Kermit II showing Lucas's homemade 2-inch filter slide and dual-speed Crayford focuser. *Middle:* This cutaway view shows the guts of the focuser. Note the threaded adjuster that the coma corrector screws into and the homemade filter slide. *Right:* The focuser seen with its drawtube removed to show the embedded coma corrector mounted at a fixed distance. This arrangement makes each eyepiece come to focus at the proper spacing for the corrector to be most effective.

ALL IMAGES ARE COURTESY OF LUCAS SIFONI.



▲ These spot diagrams produced with *CORRECT 3* show the star shapes in two telescope systems with and without the MPCC corrector. They simulate star images at the center of the field as well as 3 and 16 millimeters from the center which correspond to the edge of the fields in the author's 8-mm Plössl and APM 20-mm eyepieces. Optical aberrations smaller than the size of the Airy disk appear as a pinpoint star.

SHARE YOUR INNOVATION
Enthused tinkerers interested in having their work featured here can share their projects at workbench.kissner@gmail.com.



Yes, it's NGC 7000

❌ but it doesn't fit the field

→ wider please



6" f/2.8, integrated corrector
17mm 92 E.S. eyepiece





✅ wide enough
✅ corrected

~ hike-able
~ bike-able

❌ planets (that's ok)



Fits in my winter jacket's pocket

📈 very likeable

📉 annoying to assemble

… again the "looks like a dob" pros & cons



… still refigured the mirror because a good joke is better with a super crisp moon





28mm f/4
The eyepiece is the focuser
Can be collimated
Real secondary
Not really usable
"Small dob" constraint,
pushed far enough

What doesn't work for me :

❌ one-size-fits-all
❌ the standard dob
❌ the standard mirror
❌ planets (there are star parties for that)

Imitation of the standards is great for learning
    But produces scopes I don't use

Current separate "real observing" goals

Widest fields
→ Wallace does it

More aperture
→ Gromit will do it
(16.5" f/2.8 porthole, in progress)

Always a telescope / didactic instrument
→ Feathers
(76mm mini dob)



New goals around "immersion in the night"
and "sharing a quick view" during outdoor activities

I want a telescope for :

- night bike-camping
- night hiking
- long distance trail running

Non-goal : being useful to someone else



This kind of practice
But with better instruments

3D printing hard & flexible materials
+ laser cutting
+ solid carbon rods
= cheap + light + specializable + replicable

Money in **one** great mirror set
Design one scope body per use-case

→ Corrected 6" f/3.5



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night bike-camping

bike = az mount ?
bike = riser
weight is okay
size is okay
multiple eyepieces
vibrations are damped

the dob is viable

night hiking

single eyepiece
3-segment folding hiking rods
→ structurally use them ?
water bottle as weight ?
vibrations are damped
must pack flat-ish

a step away from the dob

trail running

no eyepiece
intense vibrations
almost no focuser
must pack flat
nothing can move
use rocks to balance
fatigue
→ easy assembly
repeatable alignment

more radical design



Visit the Skies

- Lightest Portable Reflector Telescope
- Lowest Number of Assembly Parts
- Triangular Structure for more Stiffness with less Weight
- Highest Luminosity and Resolution per Weight & Size
- Non-Corrosive Composite Materials and Alloy Fasteners
- Smooth Tracking Behaviour
- Gravity plus Elastic Balance Tuning System
- Quick Set Up & Take Down
- Low Center of Gravity
- Low Wind Sensibility
- Iris Baffle, Shelter Tent, and Lightshroud Option
- Single Arm OTA & Truss OTA possible
- 12inch Versions fit in Backpack or Bike Bags
- Bigger optical Sizes possible



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Analog Sky

HEART

80mm f/5 | stargazing-optimized binocular telescope

Deepen your love of the night sky

80mm lenses for more stars and detail

World's lightest 80mm binocular telescope

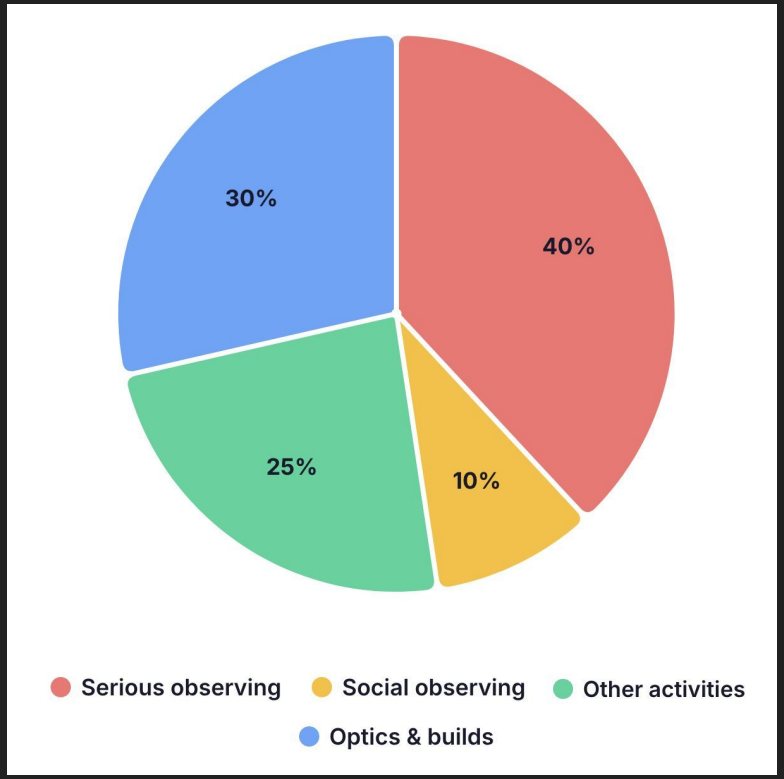
2" eyepieces and filters for ultra-wide views

3D print your own parts for instant updates and infinite customization

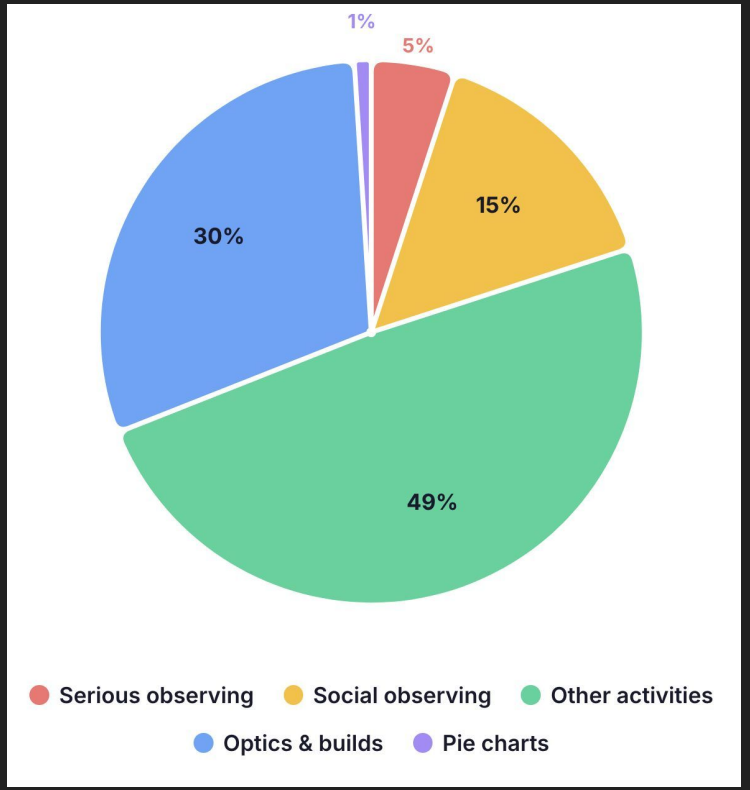


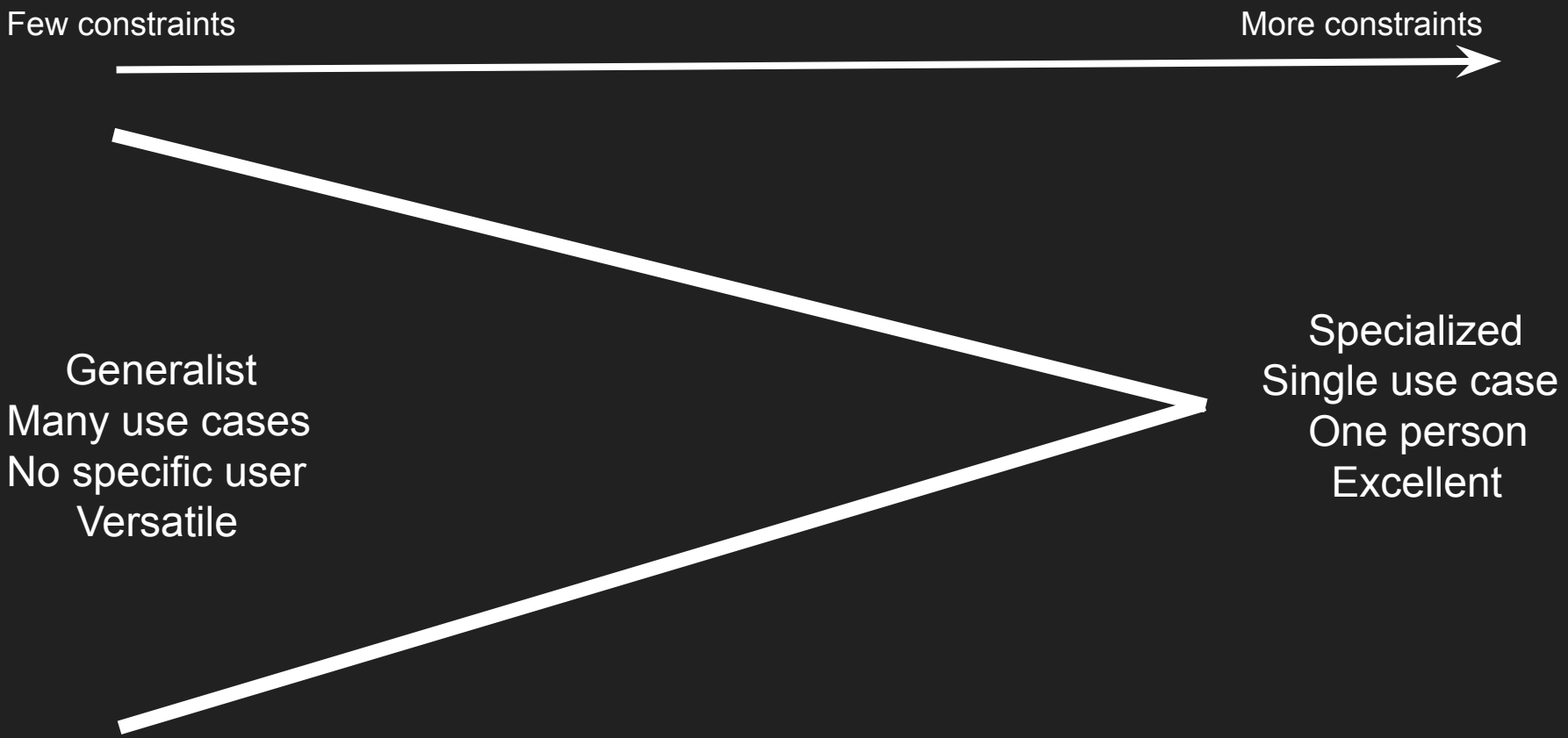
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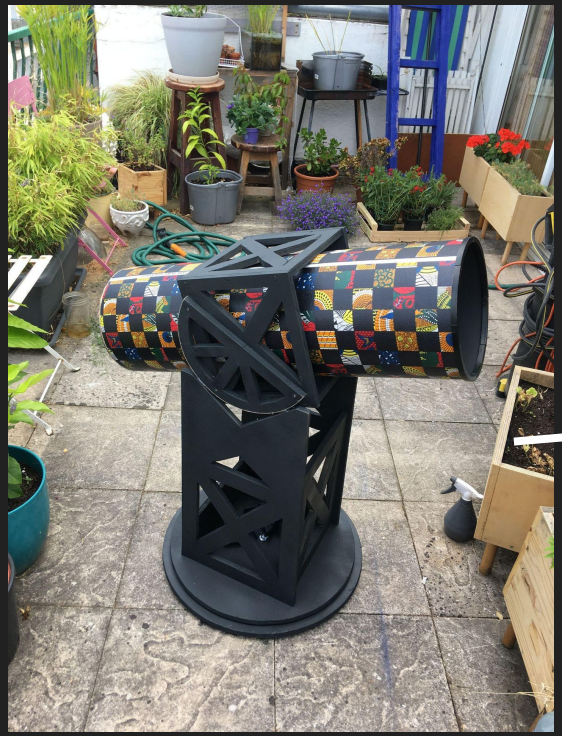
What I thought I would do



What I do




Few constraints
More constraints
Generalist
Many use cases
No specific user
Versatile
Specialized
Single use case
One person
Excellent





?



Thanks to everyone who publishes about their astronomy practice

You inspire people to jump in !