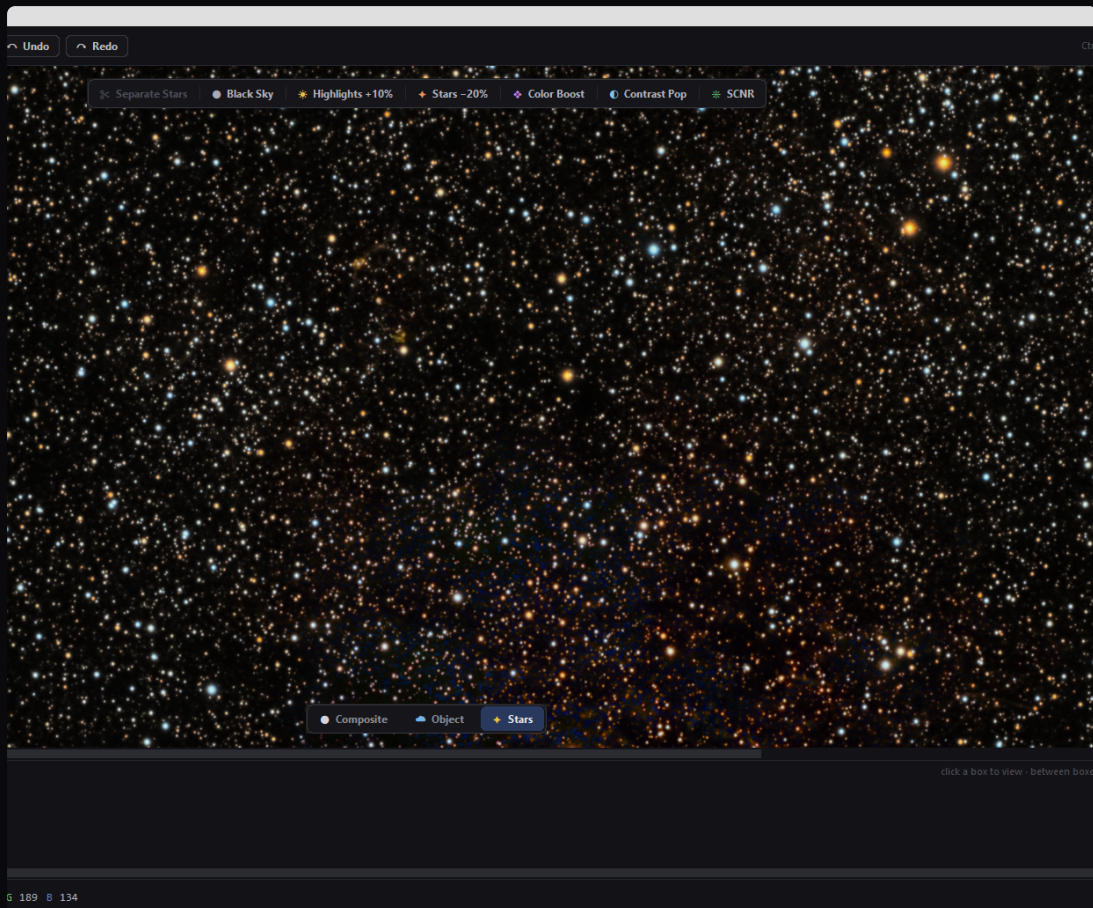




AstroPics Lab

User Manual — AI-powered astrophotography processing for Windows

Version 3.0-beta

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1 Welcome to AstroPics Lab

AstroPics Lab is a Windows desktop application for processing astrophotography images. It combines classic astronomical tools (stretching, background extraction, gradient removal, levels and curves, color calibration) with AI models trained specifically for deep-sky images: denoising, star separation, object enhancement, colorization and 2× upscaling.

The two-layer philosophy

The heart of AstroPics Lab is the separation of every image into two independent layers:

- **Object layer** — the starless nebula, galaxy or cluster background.
- **Star layer** — every star, isolated from the object.

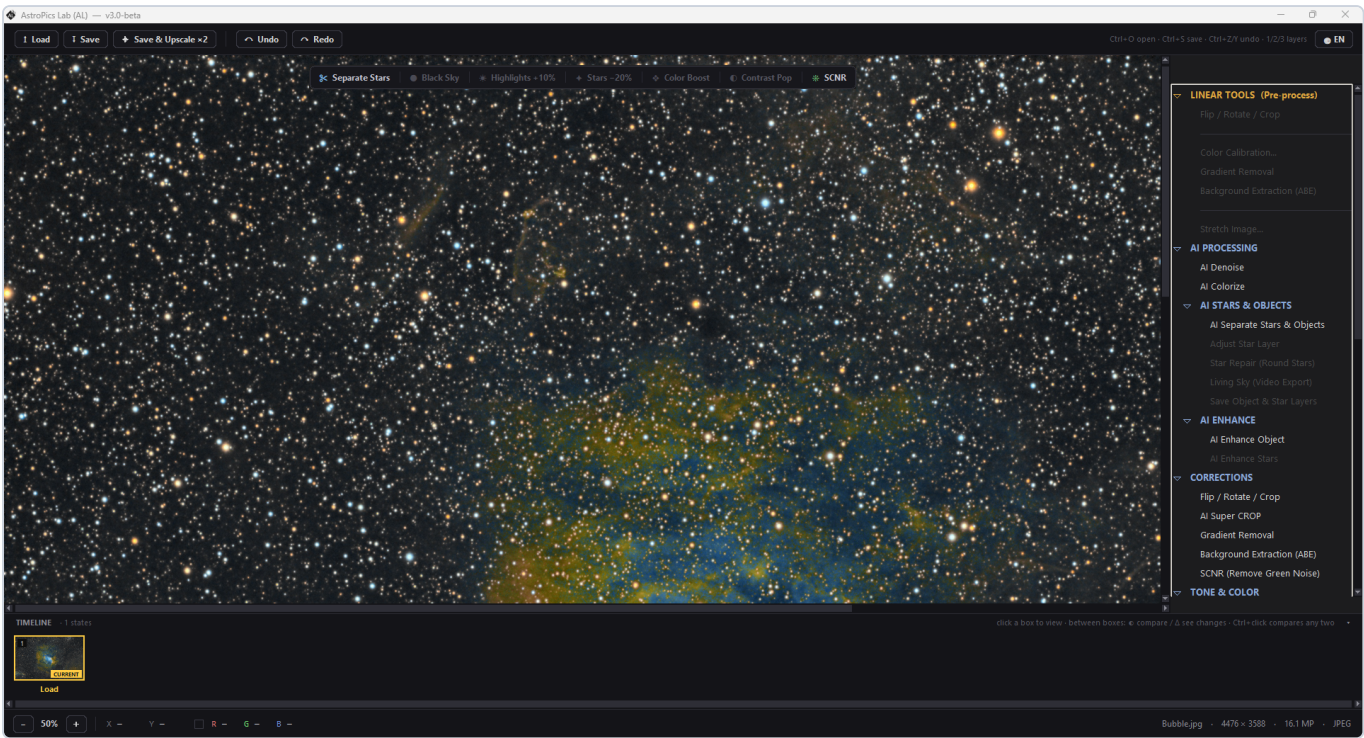
Once separated, each layer can be processed independently: you can stretch, denoise, sharpen or color-grade the object without bloating the stars, and reduce, recolor or repair the stars without touching the object. The layers are recombined on screen (and on save) with a mathematical *screen blend*, which guarantees that if you change nothing, recombining the two layers returns **exactly** the original image, pixel for pixel. The AI never invents or destroys data — it only decides where the line between “star” and “object” is drawn.

What you need

- Windows 10 or newer.
- A CPU with AVX instructions (any consumer CPU from ~2011 onward; some Celeron/Pentium mini-PCs lack it). The AI features require it — the classic tools do not.
- No GPU is required. All AI models run locally on your CPU; your images never leave your computer.

i Language. The interface is available in English and Spanish. Click the  **EN** /  **ES** button at the top-right of the toolbar to switch; the change is applied the next time you start the application.

2 The Main Window



The main window with an image loaded: toolbar (top), Quick Actions bar (floating over the canvas), sidebar (right), Timeline strip and status bar (bottom).

Toolbar

Button	What it does
 Load	Open an image (JPEG, PNG, TIFF, FITS, XISF). Shortcut Ctrl+O .
 Save	Save the current composite image. Shortcut Ctrl+S .
 Save & Upscale x2	Run the AI 2× upscaler on the composite and save the result to a new file (the canvas is not modified).
 Undo /  Redo	Step backward / forward through the processing history. Shortcuts Ctrl+Z / Ctrl+Y .
 EN/ES	Switch interface language (applied on next start).

Sidebar — the tool menu

All processing tools live in the sidebar on the right, organized in categories. Entries are greyed out until they can be used: with a **linear** image only **LINEAR TOOLS** is active (highlighted in amber); after stretching, the rest of the categories unlock; the star-layer tools unlock after **AI Separate Stars & Objects** has been run.

Category	Contents
LINEAR TOOLS (Pre-process)	Flip / Rotate / Crop · Color Calibration · Gradient Removal · Background Extraction (ABE) · Stretch Image
AI PROCESSING	AI Denoise · AI Colorize · <i>AI STARS & OBJECTS</i> (Separate, Adjust Star Layer, Star Repair, Living Sky, Save Layers) · <i>AI ENHANCE</i> (Object, Stars)
CORRECTIONS	Flip / Rotate / Crop · AI Super CROP · Gradient Removal · Background Extraction (ABE) · SCNR
TONE & COLOR	Levels · Curves · HDR · Object Color Boost
DETAIL & LOCAL	Deconvolution · Local Contrast (CLAHE) · Object Selective Brightness / Saturation / Detail / Contrast / Range · Object Retouch · Clone Tool
CREATIVE & FINISHING	Change Palette Color · Hue Remap (Curve) · Selective Color Correction · Nebula Bloom / Glow · Star Depth of Field · 3D Effect
EXPERIMENTAL	Match This Look (Reference) · Copy Look from Region (Reference)
PIPELINES	Auto Process Image · Deep Sky Full Process

Canvas and bottom bar

- **Pan** — click and drag the image. **Zoom** — mouse wheel, or the  /  buttons in the bottom bar (up to 8×).
- The bottom bar shows the current zoom, the **X/Y position and R/G/B value** of the pixel under the cursor (with a live color swatch), and the file name, dimensions, megapixels and format on the right.

Layer view pill — Composite / Object / Stars

After star separation, a floating pill appears at the bottom of the canvas with three views: ,  and . Click a segment or press  /  /  to switch. The pill keeps working while an adjustment dialog is open, so you can inspect exactly what a tool is doing to each layer.

Quick Actions bar

The floating bar at the top of the canvas offers one-click adjustments (see chapter 6 for the full list). It can be dragged anywhere on the canvas. With a linear image it is replaced by the linear quick bar ( toggle, , ).

Timeline strip

Every processing step is recorded as a thumbnail in the Timeline strip above the status bar. You can preview any earlier state, compare two states with an A/B curtain or a difference map, and restore any point of the history. Chapter 7 covers it in detail. The strip collapses by clicking its header.

Keyboard shortcuts

Shortcut	Action
Ctrl+O	Load image
Ctrl+S	Save image
Ctrl+Z / Ctrl+Y	Undo / Redo (disabled while a dialog is open)
1 / 2 / 3	View Composite / Object / Stars (after separation)
Esc	Exit Timeline compare / difference view
Mouse wheel	Zoom canvas (scrolls the sidebar or Timeline when the cursor is over them)

3 Loading and Saving Images

Supported formats

Format	Loading behaviour
FITS (.fits, .fit)	Loaded as linear data and normalized to [0–1]. Mono, Bayer-masked (RGGB/BGGR/GRBG/GBRG — automatically debayered and white-balanced) and 3-plane RGB stacks are supported. RGB stacks keep the color balance produced by your stacker.
XISF (.xisf)	PixInsight format. On load you are asked whether the file is linear (unstretched — enables the linear workflow) or already stretched (loaded as a regular image).
TIFF / PNG / JPEG	Loaded as regular (non-linear) images. 16-bit and 32-bit float TIFFs (DSS / PixInsight exports) are supported and normalized to 8-bit.

i Performance safeguard. Images longer than 5000 px on their long side are automatically downscaled to 5000 px to keep every tool responsive. A dialog informs you when this happens.

Saving

↓ **Save** writes the **composite** image (object and star layers merged) exactly as you see it on the canvas, as PNG (default), JPEG (quality 100) or TIFF (LZW). To save the object and star layers as separate files, use **AI STARS & OBJECTS → Save Object & Star Layers** (see chapter 11).

⚠ **Saving a linear image.** If you save while the image is still linear, the file will contain the raw linear data — it will look almost black in a normal viewer, because the canvas shows a *pre-stretched preview*, not the real pixel values. The app warns you first: stretch the image (**Linear Tools → Stretch Image**) if you want the file to match the screen.

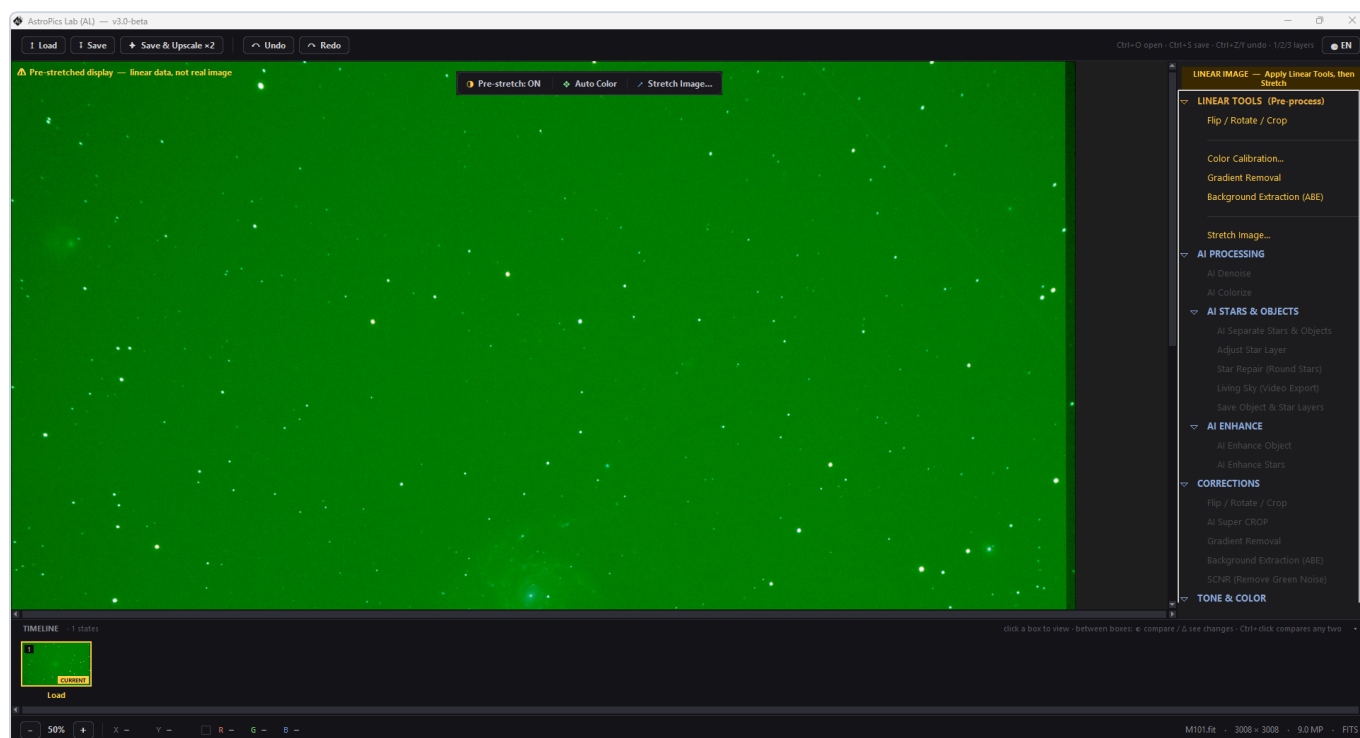
4 The Linear Workflow (FITS / XISF)

Stacked deep-sky images come out of the stacker as **linear** data: pixel values are proportional to the captured photons, and almost everything is packed into the darkest part of the histogram. AstroPics Lab keeps the data linear while you fix what is best fixed before stretching, in this recommended order:

1. **Load the FITS** and inspect it with the pre-stretch preview (§4.1)
2. **Color Calibration** — neutral background + white reference (§4.2)
3. **Background Extraction (ABE)** — remove the large-scale sky background (§4.3)
4. **Gradient Removal** — remove residual planar gradients (§4.4)
5. **Stretch Image** — the definitive, interactive stretch (§4.5)
6. **Color Correction** — fine-tune the stretched color (§4.6)

💡 While the image is linear, a yellow banner reads **LINEAR IMAGE — Apply Linear Tools, then Stretch** and only the amber **LINEAR TOOLS** category is enabled. Everything else unlocks after the stretch.

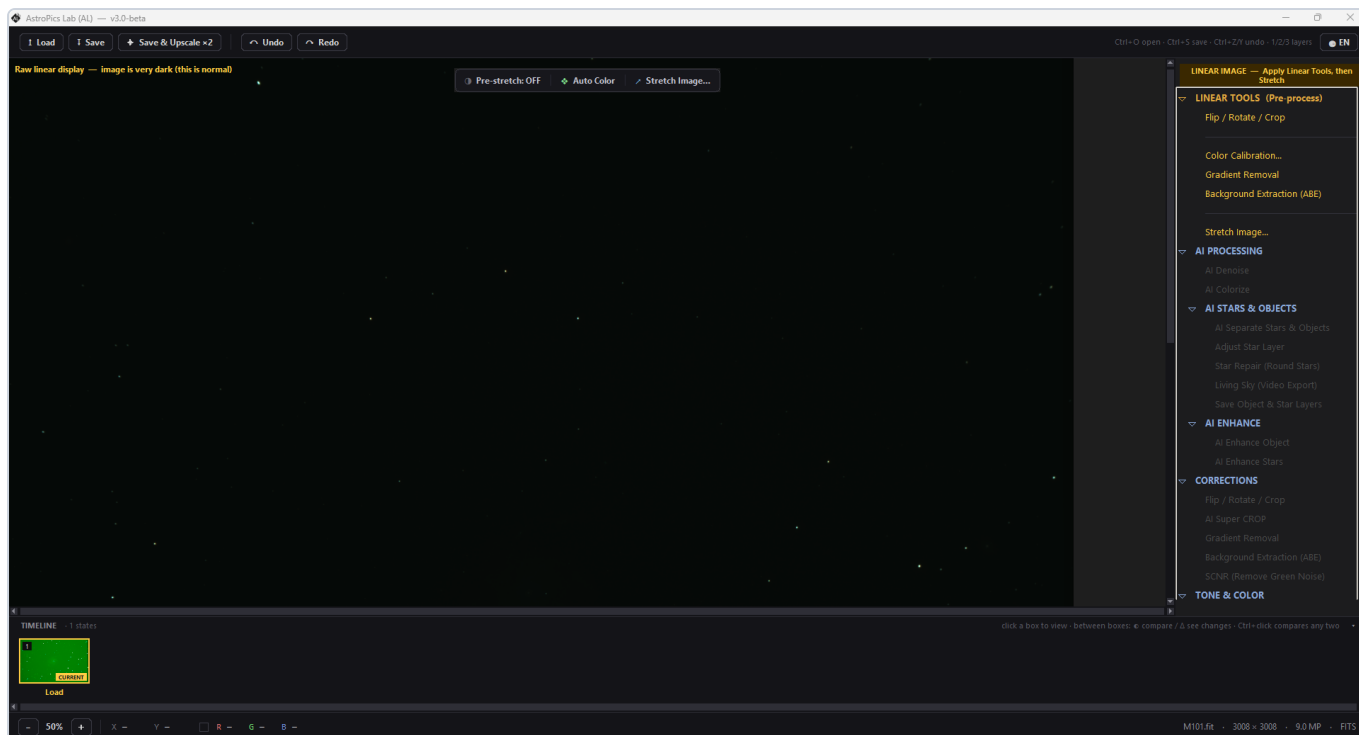
4.1 Loading a FITS file · the pre-stretch preview



M101.fit just loaded. The canvas shows the auto-stretched preview (**Pre-stretched display — linear data, not real image**), the linear quick bar floats over the canvas, and only LINEAR TOOLS is enabled in the sidebar. The green cast is normal for an uncalibrated stack — Color Calibration will fix it.

When a FITS loads, the canvas does **not** show the raw linear data (which would be nearly black) but an automatic, display-only stretch. Two indicators keep you oriented:

- The overlay text at the top-left: **⚠ Pre-stretched display — linear data, not real image** (or **Raw linear display — image is very dark (this is normal)** when the preview is off).
- The **🔘 Pre-stretch: ON/OFF** toggle in the linear quick bar. It only changes the display — the data stays linear underneath.

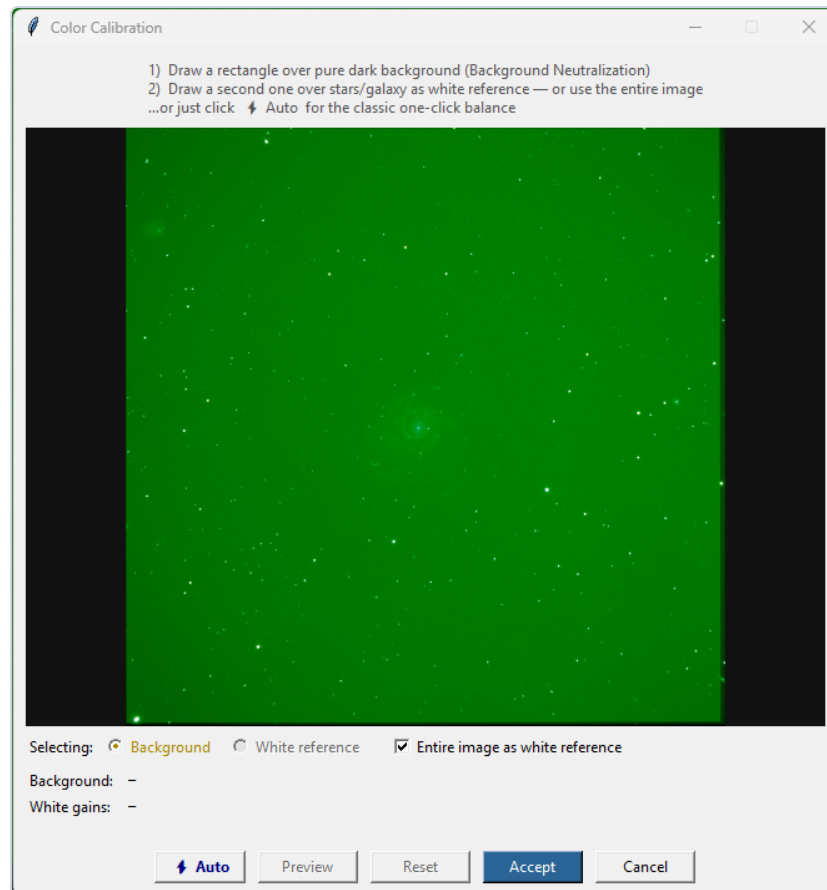


The same image with **Pre-stretch: OFF** — this is what linear data really looks like. Nothing is lost: it is simply not stretched yet.

The linear quick bar also offers:

- **Auto Color** — one-click automatic color balance (equalizes the global R/G/B means). A quick alternative to the full Color Calibration tool.
- **Stretch Image...** — opens the interactive stretch panel (\$4.5).

4.2 Color Calibration



Color Calibration: draw one rectangle over pure background (amber) and optionally one over a white reference (blue), then Preview and Accept.

Linear Tools → Color Calibration... performs a physically sensible, two-stage calibration in the style of Siril / PixInsight:

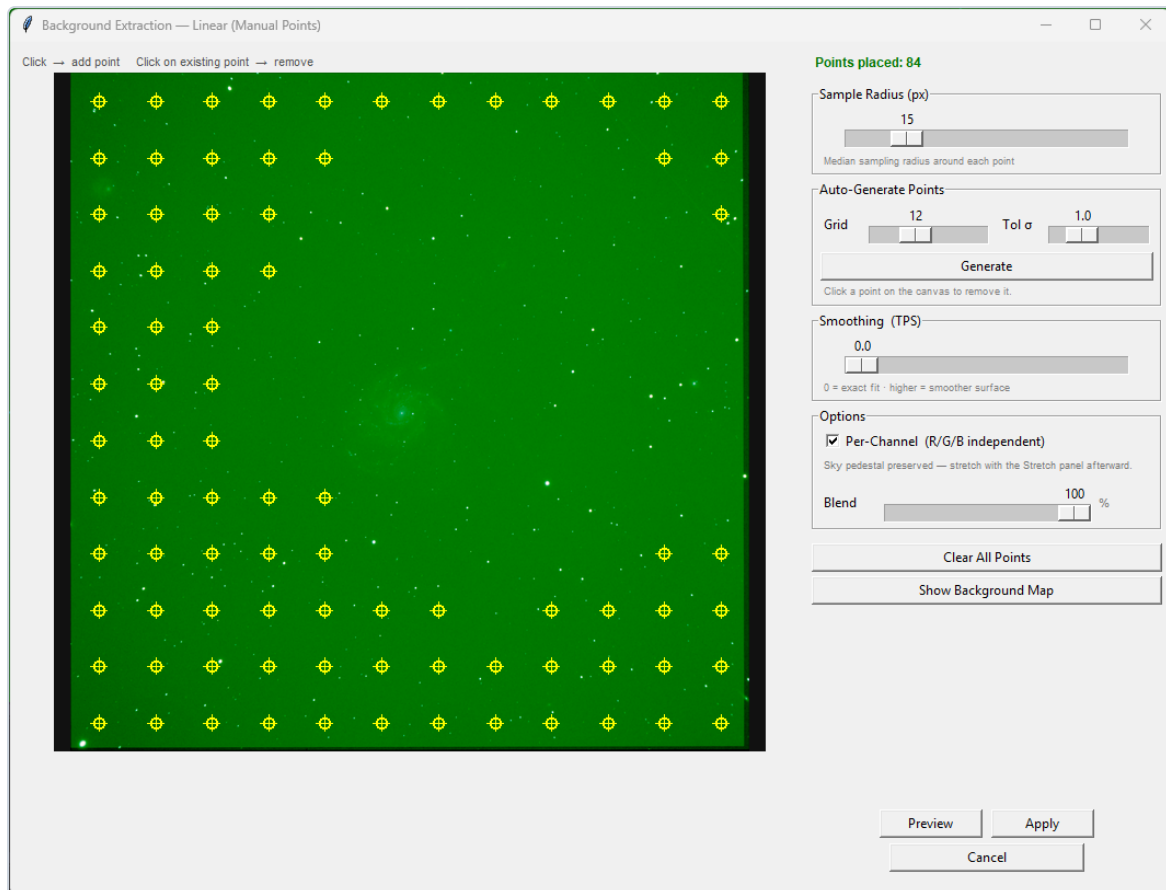
1. **Background Neutralization** — light pollution is an *additive* pedestal, so the tool measures your background sample (sigma-clipped, so stray stars are ignored) and subtracts per-channel offsets to make the sky neutral.
2. **White Reference** — per-channel *gains* are computed so that the average signal of your reference (a galaxy, a star field, or the entire image) becomes neutral white.

How to use it

1. Draw a rectangle over a region of **pure dark background** (mode **Background**, selected by default). The measured background and the offsets appear in the info panel.
2. Either keep **Entire image as white reference** checked (default, recommended for wide fields), or untick it and draw a second rectangle over your **white reference** — typically the galaxy core or a rich star region.
3. Click **Preview**, and **Accept** when satisfied. **Reset** returns to the uncalibrated view; **⚡ Auto** applies the classic one-click white balance instead (no rectangles needed).

i Why is my RGB stack green? Stacked RGB images are deliberately loaded *without* any automatic white balance, respecting your stacker's calibration. A green-dominant look before calibration is normal and expected — sensors are most sensitive in green. Calibrate here and it disappears.

4.3 Background Extraction (ABE — manual points)



Background Extraction on linear data: sample points on the sky (yellow), auto-generation grid controls, TPS smoothing and blend on the right.

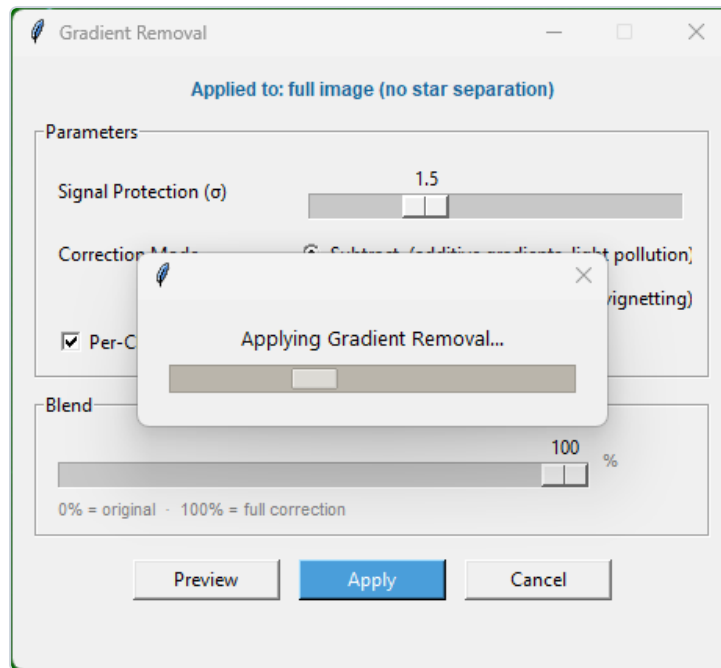
On linear images, **Linear Tools** → **Background Extraction (ABE)** opens the **manual-points** editor (automatic background detection is unreliable on linear data, so you stay in control). It fits a smooth *thin-plate-spline* surface through your sky samples — the same approach as PixInsight's DBE — and subtracts it.

How to use it

1. Click on the image to place sample points on **pure sky** (avoid nebosity and stars). Click an existing point to remove it. Aim for at least 5 points spread across the frame; more is better.
2. Or click **Generate**: a grid of candidate points is laid over the image and cells that contain signal are automatically discarded (**Grid** sets the density, **Tol σ** the tolerance — lower keeps only the very darkest cells).
3. **Sample Radius (px)** (default 15) is the radius of the median sample around each point.
4. **Smoothing (TPS)** — 0 fits the samples exactly; raise it if the background surface looks wavy.
5. **Preview**, inspect (use **Show Background Map** to see the model being subtracted), adjust **Blend** if you want a partial correction, then **Apply**.

💡 The sky pedestal is preserved on purpose — the image stays linear and ready for the Stretch panel. Keep **Per-Channel** checked to also flatten color gradients.

4.4 Gradient Removal



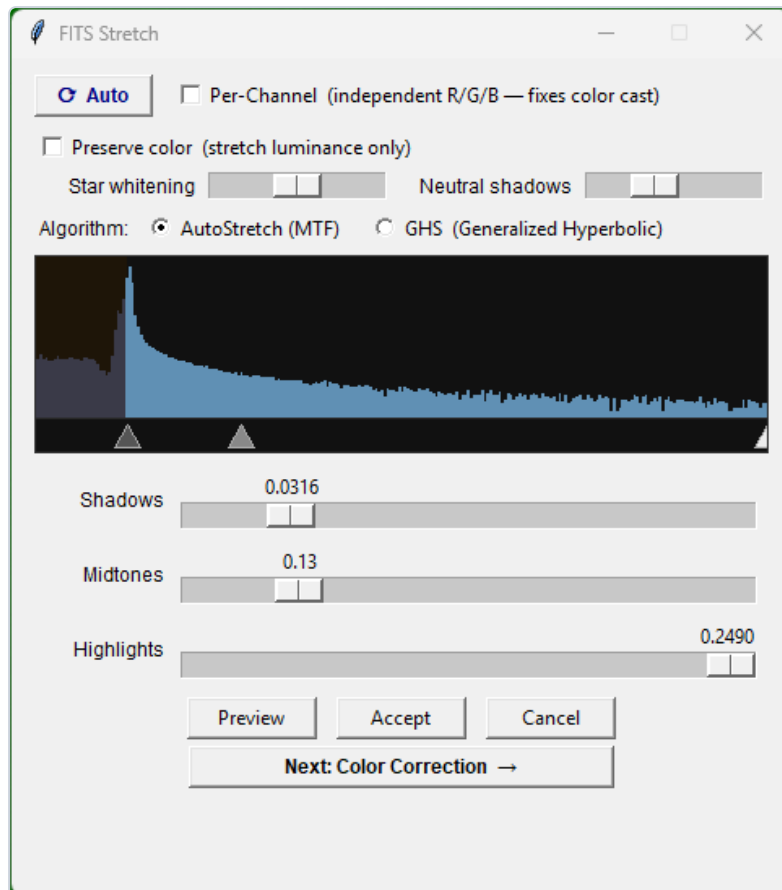
Gradient Removal: signal protection, Subtract/Divide mode, per-channel option and blend.

Linear Tools → Gradient Removal fits and removes a simple **planar** gradient (the typical light-pollution slope from one corner to the other). It is a lighter, faster complement to ABE — use ABE for curved backgrounds, Gradient Removal for a residual straight slope, or either one alone on well-behaved images.

- **Signal Protection (σ)** (default 1.5) — how aggressively image signal is excluded from the background fit; lower protects more.
- **Correction Mode** — **Subtract** for additive gradients (light pollution, default), **Divide** for multiplicative ones (vignetting).
- **Per-Channel** (default on) — fits R, G and B independently, correcting color gradients.
- **Blend** — 0% original ↔ 100% full correction.

A preview is computed automatically when the dialog opens; press **Apply** to commit.

4.5 Stretch Image — the interactive stretch panel



The FITS Stretch panel: interactive histogram with draggable markers, algorithm selector (MTF / GHS), Preserve color options and the Auto button.

The stretch is the moment your linear data becomes a visible image. **Linear Tools → Stretch Image...** (or  **Stretch Image...** in the quick bar) opens a panel built around a live histogram of your image.

Common controls

- **Auto** — computes a statistically sensible stretch for your image (it analyses the signal-to-noise ratio and targets a comfortable sky background). Use it as your starting point.
- **Histogram markers** — drag the triangular markers under the histogram to set shadows, midtones and highlights visually. The preview refreshes when you release the mouse.
- **Per-Channel** — stretches R, G and B independently; useful to fix a color cast during the stretch (mutually exclusive with Preserve color, not available in GHS mode).

Algorithm: AutoStretch (MTF)

The classic midtone-transfer-function stretch (as in Siril / PixInsight autostretch), with **Shadows**, **Midtones** (the target sky background level, 0.05–0.50) and **Highlights** sliders.

Algorithm: GHS (Generalized Hyperbolic)

The GHS stretch gives finer control over *where* the contrast goes:

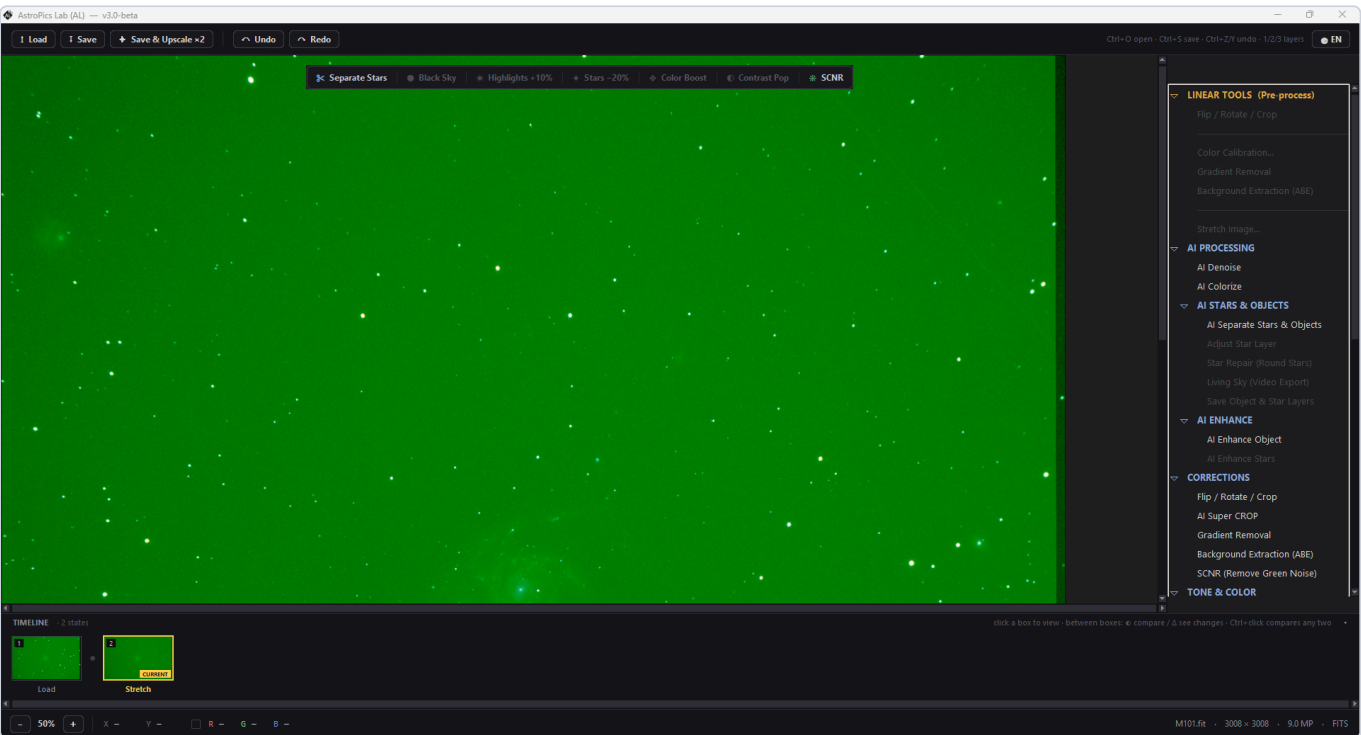
Slider	Meaning
Stretch D	Overall stretch strength (auto-computed on open so the sky lands at the target background).
Intensity b	Shape of the curve: negative = gentle/log-like, higher = concentrates contrast near SP.
Symmetry SP	The brightness level that receives the most contrast (defaults to the sky median).
Protect LP / HP	Ranges below LP / above HP are kept near-linear (protecting faint background and star cores).

Preserve color

With **Preserve color (stretch luminance only)** checked, the stretch is applied to the luminance and the original linear color ratios are re-imposed afterwards — saturated nebula color survives even aggressive stretches. Two companion sliders refine it: **Star whitening** (how quickly bright star cores converge to white) and **Neutral shadows** (desaturates the noise floor so the background does not turn into color confetti).

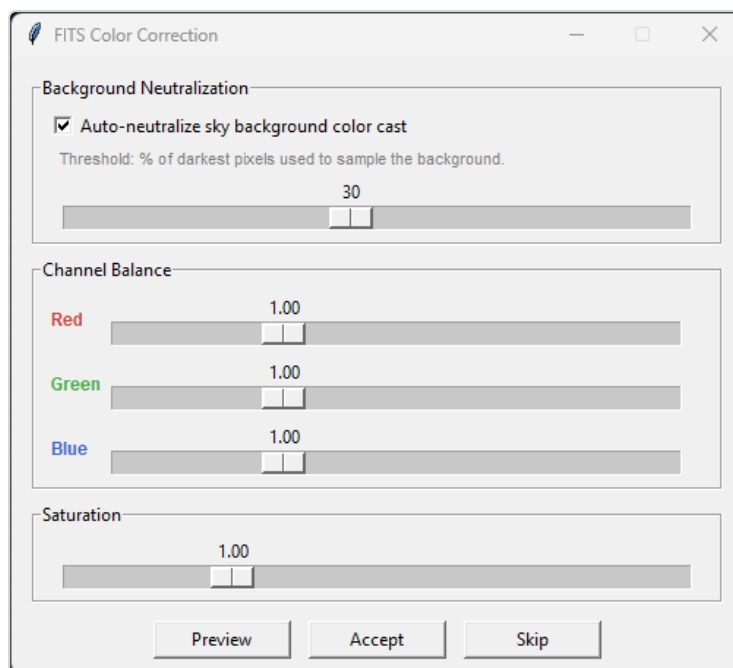
Finishing

- Preview** — recompute the canvas preview.
- Accept** — commit the stretch. The image becomes non-linear and every other tool category unlocks. One **Ctrl+Z** returns to the exact linear state.
- Next: Color Correction →** — commit and go straight to the post-stretch color panel (\$4.6).
- Cancel** — close and restore the linear image untouched.



After Accept: the image is non-linear, the banner is gone and the full sidebar is unlocked.

4.6 FITS Color Correction (post-stretch)



The post-stretch color panel: background neutralization, channel balance and saturation.

Opened by **Next: Color Correction →** from the stretch panel, this quick panel fine-tunes the stretched result:

- **Background Neutralization** — removes any remaining color cast from the sky. The threshold slider selects which percentage of the darkest pixels is treated as background (default 30%).
- **Channel Balance** — manual R / G / B multipliers (0.2–3.0).
- **Saturation** — global saturation from 0 (grayscale) to 4×.

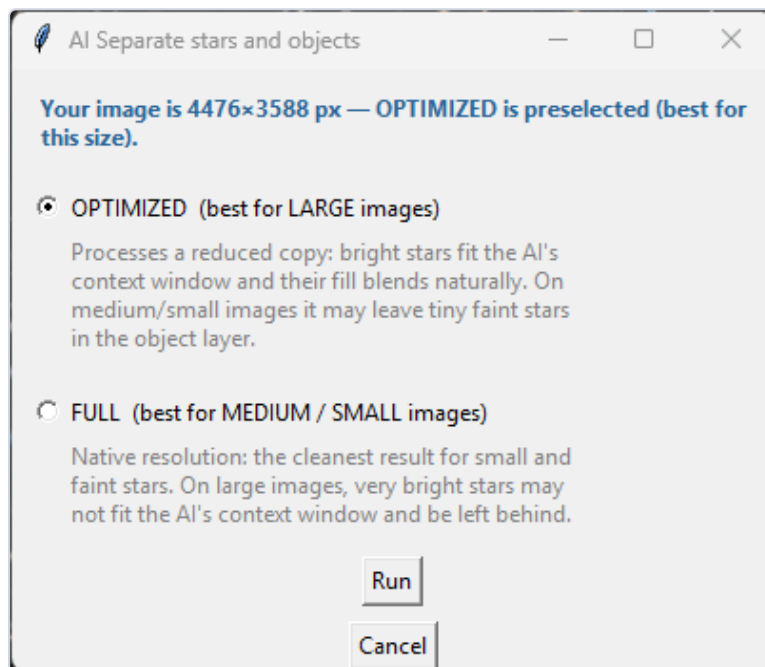
Accept commits (a single undo step); **Skip** closes without changing anything.

5 The Non-Linear Workflow

Once the image is stretched (or when you load a JPEG/PNG/TIFF), the full toolset unlocks. There is no single “correct” order, but this manual follows a sequence that works well for most deep-sky images:

1. **Separate stars and object** — do this first: every later step benefits (§5.1)
2. **AI Denoise** — clean the object layer while the noise is still untouched (§5.2)
3. **Background Extraction / Gradient Removal** — flatten the sky (§5.3)
4. **Levels** and **Curves** — set the black point and shape the tones (§5.4–5.5)
5. **Star reduction** and star-layer refinements (§5.6–5.8)
6. Enhancement, color and finishing tools as needed (§5.9 onward)

5.1 AI Separate Stars & Objects

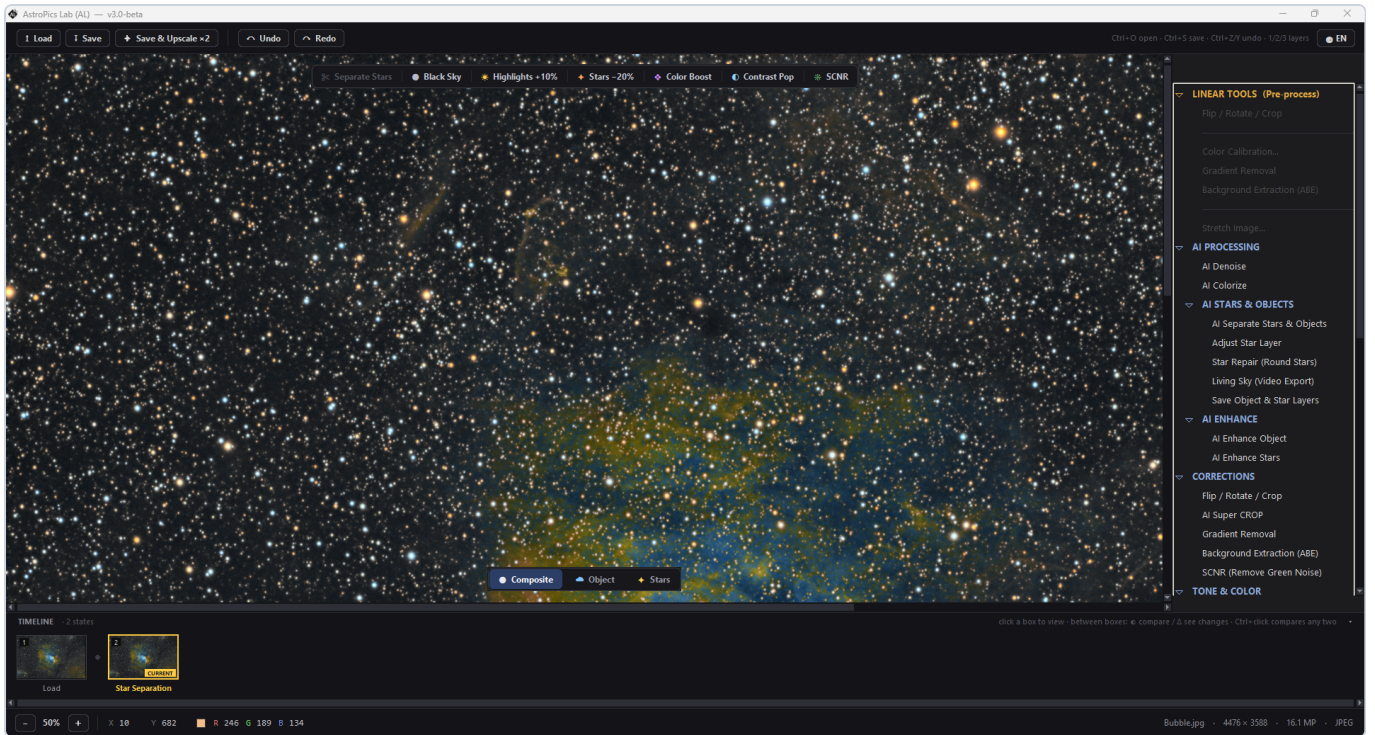


The separation dialog preselects the best mode for your image size.

AI PROCESSING → **AI STARS & OBJECTS** → **AI Separate Stars & Objects** (or the **⌘ Separate Stars** quick action) splits the image into the object layer and the star layer. Two modes are offered, and the right one for your image size comes preselected:

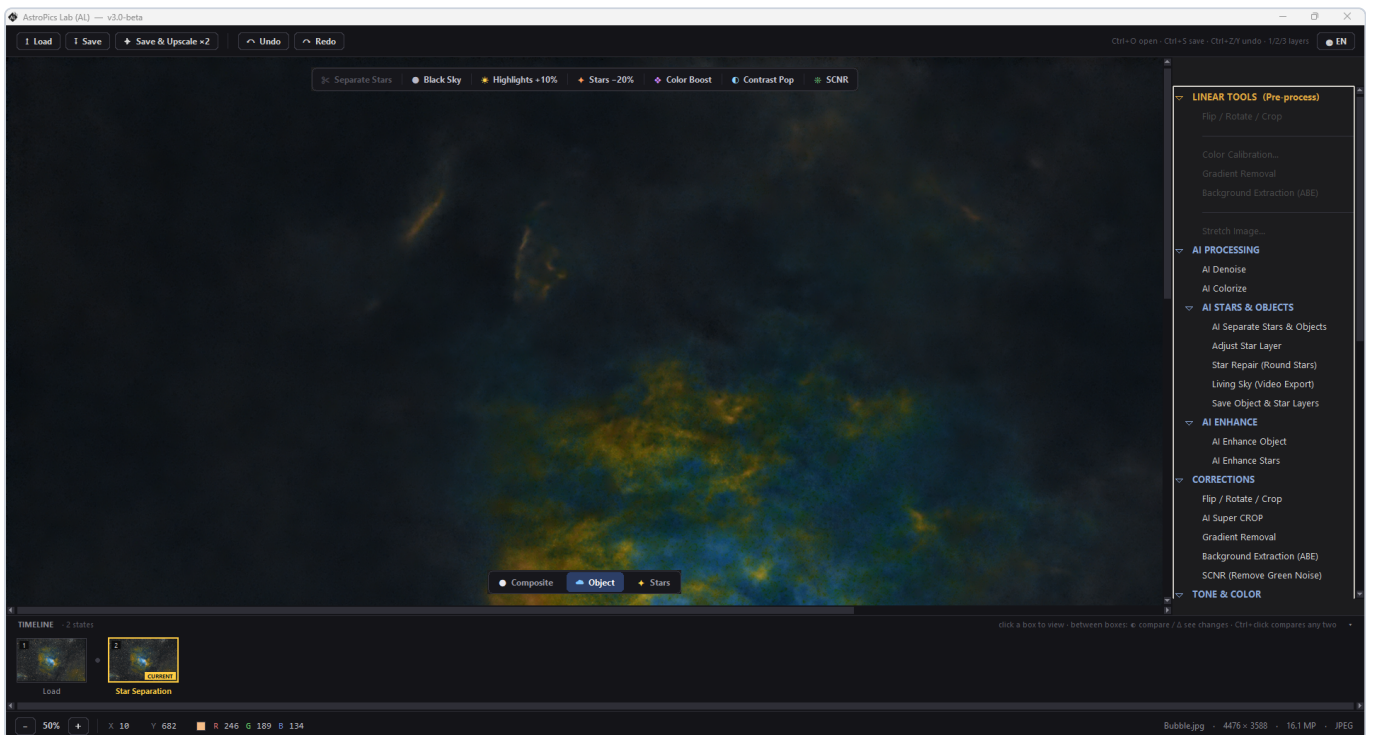
- **OPTIMIZED (best for LARGE images)** — processes a reduced copy: bright stars fit the AI's context window and their fill blends naturally. Preselected at 2500 px and above.
- **FULL (best for MEDIUM / SMALL images)** — native resolution: the cleanest result for small and faint stars.

i No pixel is lost. The AI only produces a *proposal* of the starless image. The star layer is then computed mathematically as the exact difference (in screen-blend space) between the original and the starless layer, and the starless layer is clamped so it can never exceed the original. The result: **recombining the two layers reproduces your original image exactly**. Everything the AI “removes” from one layer lands, pixel for pixel, in the other.



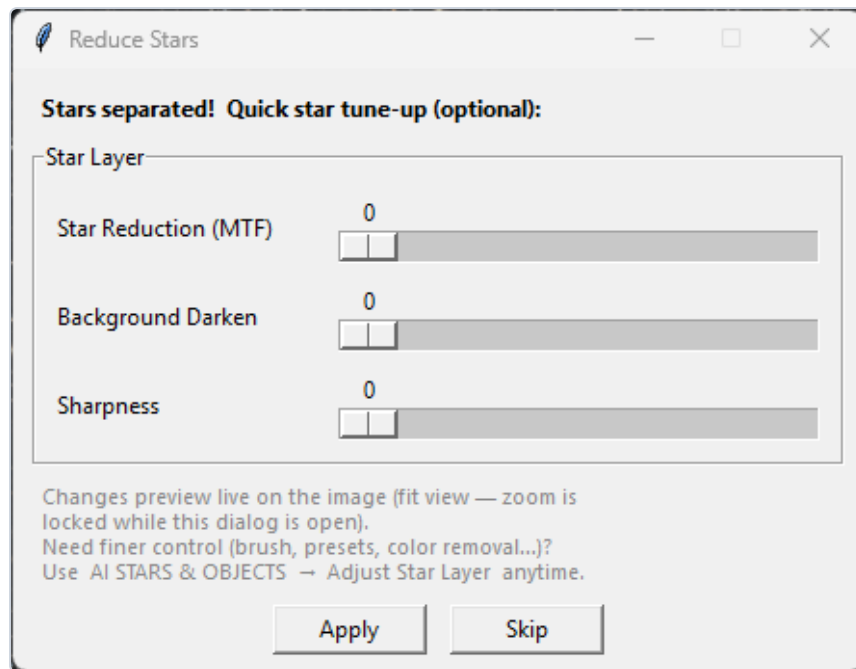
After separation: the layer view pill appears at the bottom and the star quick actions unlock.

Use the view pill (or keys **1**/**2**/**3**) to inspect the result:



The Object view: the starless nebula, ready for independent processing.

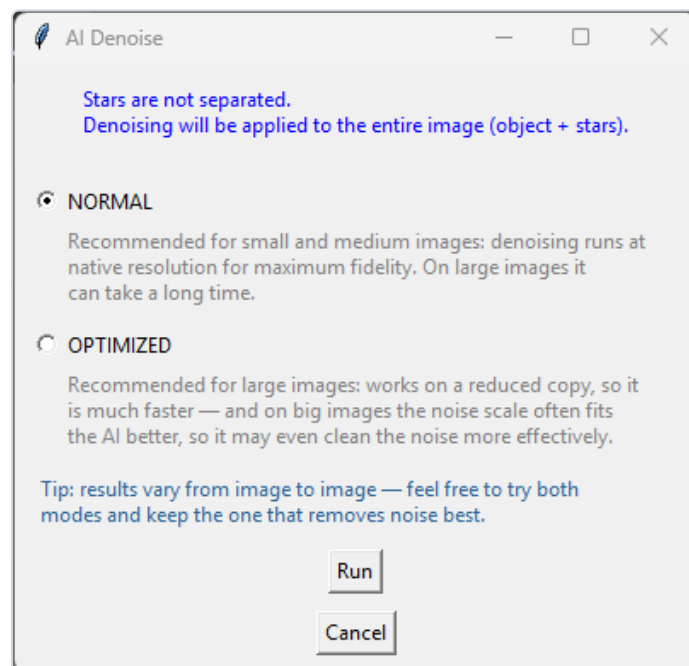
Reduce Stars — the post-separation tune-up



The quick tune-up that opens right after separation.

Right after separation, the **Reduce Stars** dialog opens with three optional sliders, all live-previewed at full resolution: **Star Reduction (MTF)** (shrinks star profiles with an inverse midtone transfer — smaller, tighter stars with no artifacts), **Background Darken** (cleans residual glow around stars) and **Sharpness**. Click **Apply** or **Skip** — you can always fine-tune later with **Adjust Star Layer** (\$5.6).

5.2 AI Denoise



AI Denoise: NORMAL (native resolution) or OPTIMIZED (reduced copy) mode.

AI PROCESSING → **AI Denoise** runs a neural denoiser trained on deep-sky images. If stars are separated, **only the object layer is denoised** — the stars keep their crispness; otherwise the whole image is processed. Two modes:

- **NORMAL** — native resolution, maximum fidelity. Recommended for small and medium images.
- **OPTIMIZED** — works on a reduced copy: much faster on large images, and on big images the noise scale often fits the AI better, so it may even clean more effectively.

When inference finishes, a control dialog lets you dose the result before committing:

- **Denoise Amount (%)** (default 100) — blends the denoised result with the original.
- **Detail** (–50 smooth ... +50 strong) — adds back a controlled amount of fine high-frequency detail on top of the denoised base.

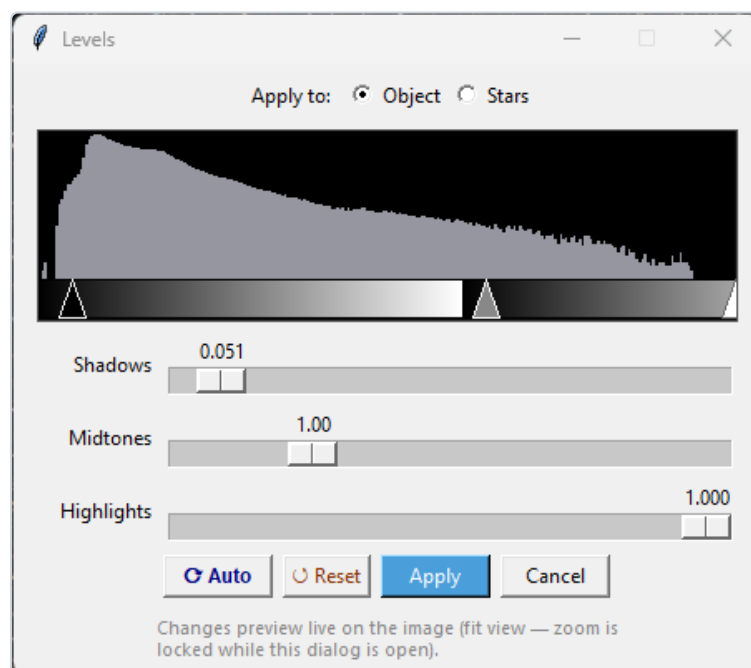
💡 Results vary from image to image — feel free to try both modes and keep the one that removes noise best. The Timeline's Δ difference view (chapter 7) is ideal for judging exactly what the denoiser changed.

5.3 Background Extraction & Gradient Removal (non-linear)

Both tools also work on stretched images, from the **CORRECTIONS** category, and apply to the object layer when stars are separated (the header line of each dialog tells you). Gradient Removal is identical to its linear version (§4.4). Background Extraction switches to an **automatic** grid-based engine on non-linear images:

- **Grid Density** (8–32, default 16) — how many background samples are placed.
- **Background Detail** (1 smooth / 2 medium / 3 detailed) — the flexibility of the fitted background model.
- **Signal Protection (σ)** (default 1.5) — lower protects nebulosity more.
- **Correction Mode** — Subtract (sky glow / light pollution) or Divide (vignetting).
- **Show Background** — displays the background model that will be removed.
- **Blend** — partial corrections.

5.4 Levels



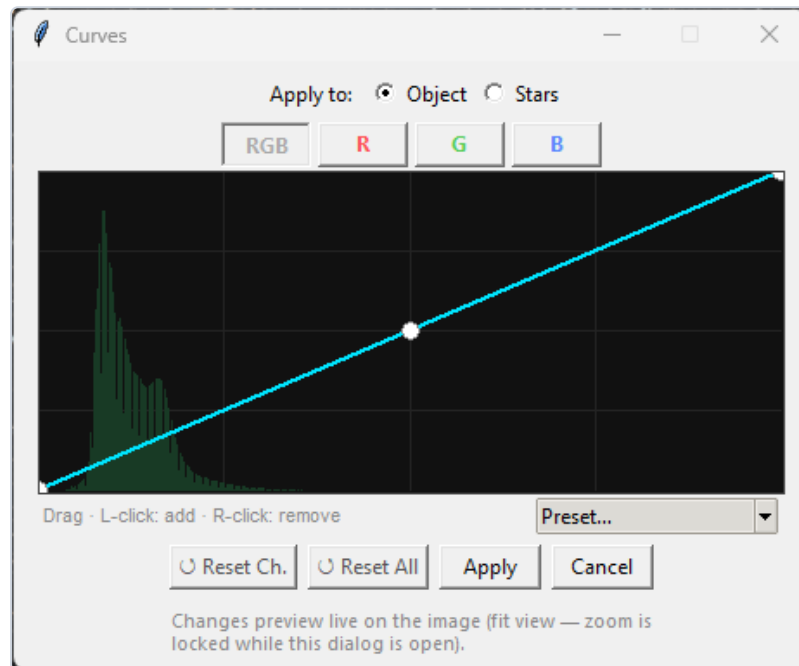
Levels: histogram with draggable black / midtone / white handles, applied per layer.

TONE & COLOR → **Levels** is the classic three-handle tool over a live histogram: **Shadows** (black point), **Midtones** and **Highlights** (white point). Everything previews live on the canvas at full resolution.

- **Apply to: Object / Stars** — with separated layers you choose which layer to adjust; the histogram follows your choice. On the star layer, the midtone control uses a star-friendly power curve that will not bloat star profiles.
- **Auto** — sets the black point just below the sky background (runs automatically when the dialog opens).
Reset restores the identity.

💡 Setting the black point on the **object layer** after denoising is the classic “deepen the sky” move — and thanks to the separation, it cannot dim your stars.

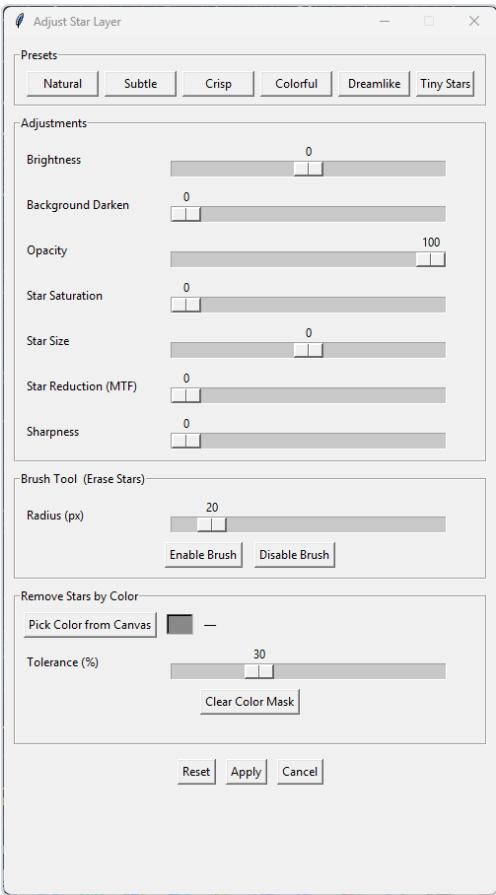
5.5 Curves



Curves: smooth editable curve per channel (RGB, R, G, B) with histogram, presets and live preview.

TONE & COLOR → Curves offers full tonal control with a smooth interpolated curve: left-click adds a point, drag moves it, right-click removes it. Buttons **RGB / R / G / B** switch the channel (each keeps its own curve); the layer selector works like in Levels. The **Preset...** menu carries ready-made shapes — for the object (*S-Curve*, *Soft S*, *Lift Midtones*, *Compress Highlights*, *Boost Shadows*) and specifically for the star layer (*Reduce Bloat*, *Star Tightening*, *Boost Star Color*, *Dim Faint Stars*, *Core Compression*).

5.6 Reducing and adjusting the star layer



Adjust Star Layer: presets, seven sliders, an erase brush and color-based star removal.

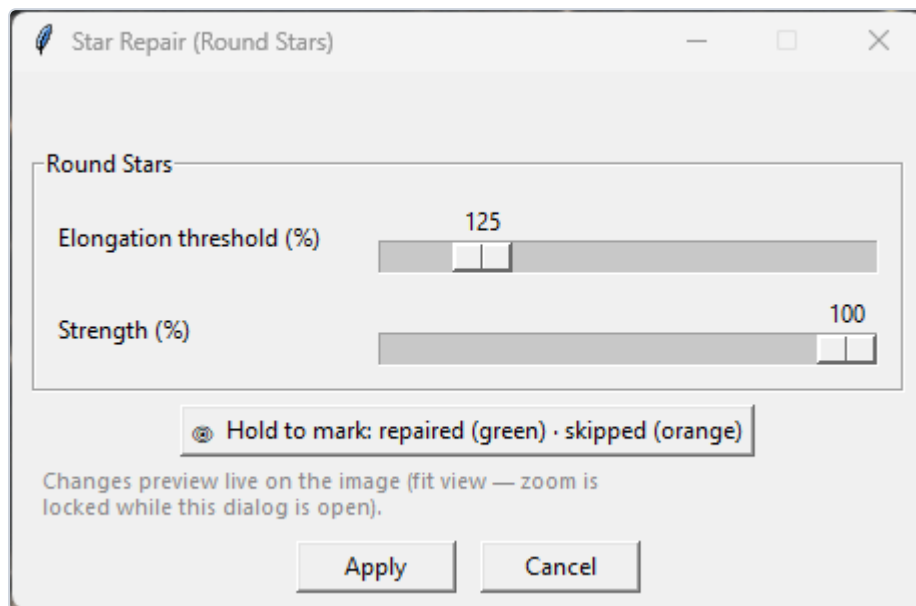
AI STARS & OBJECTS → **Adjust Star Layer** is the complete star-layer workshop. Everything previews live at full resolution.

Control	Effect
Brightness (–100...100)	Overall star layer brightness.
Background Darken (0...100)	Black-point levels on the star layer — cleans halos and residue around stars.
Opacity (0...100)	Global transparency of the star layer in the composite.
Star Saturation (0...100)	Boosts star colors (Lab chroma).
Star Size (–3...3)	Erodes (negative) or dilates (positive) star profiles.
Star Reduction (MTF) (0...100)	The star-shrinking star reducer — the go-to control for “too many / too big stars”.
Sharpness (0...100)	Unsharp mask on the star layer.

- **Presets** — **Natural** , **Subtle** , **Crisp** , **Colorful** , **Dreamlike** , **Tiny Stars** (a strong 55% MTF reduction).
- **Brush Tool (Erase Stars)** — enable the brush and paint over unwanted stars to erase them from the star layer (adjustable radius 5–150 px).
- **Remove Stars by Color** — **Pick Color from Canvas** , click a star, and every star of a similar color is masked out; **Tolerance (%)** widens or narrows the match.

For fast one-click star work, the Quick Actions bar offers **Stars -20%** (repeatable MTF reduction) and **Black Sky** (pure black star-layer background) — see chapter 6.

5.7 Star Repair (Round Stars)

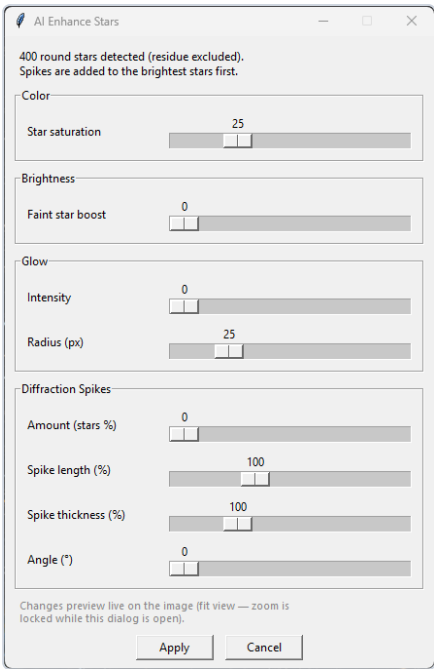


Star Repair measures every star and rounds the elongated ones.

AI STARS & OBJECTS → **Star Repair (Round Stars)** fixes elongated stars (guiding or tracking errors, coma). It measures every star in the layer, reports how many exceed the elongation threshold, and geometrically rounds them:

- **Elongation threshold (%)** (110–200, default 125) — stars whose long axis exceeds the short one by more than this ratio are repaired.
- **Strength (%)** (default 100) — how far toward perfectly round.
- **Hold to mark** — hold the button to overlay the diagnosis: repaired stars in green, skipped ones (crowded / tangled neighbours) in orange.

5.8 AI Enhance Stars



AI Enhance Stars: saturation, faint-star boost, glow and diffraction spikes in one dialog.

AI ENHANCE → AI Enhance Stars detects the round stars in the star layer and offers four cosmetic treatments (live preview, applied in a sensible order so they reinforce each other):

Group	Controls
Color	Star saturation (default 25) — richer star colors.
Brightness	Faint star boost — lifts the faintest stars without touching the bright ones.
Glow	Intensity and Radius (px) — a soft photogenic halo around bright stars.
Diffraction Spikes	Amount (stars %) (brightest first), Spike length (%) , Spike thickness (%) and Angle (°) .

5.9 AI Enhance Object

AI ENHANCE → AI Enhance Object (requires separation) runs the neural enhancer on the object layer: it recovers structure, contrast and definition in the nebulosity. When inference finishes, a single live slider — **Enhance Amount (%)**, default 50 — blends the enhanced result with the original. Judge the strength on the structures you care about and Apply.

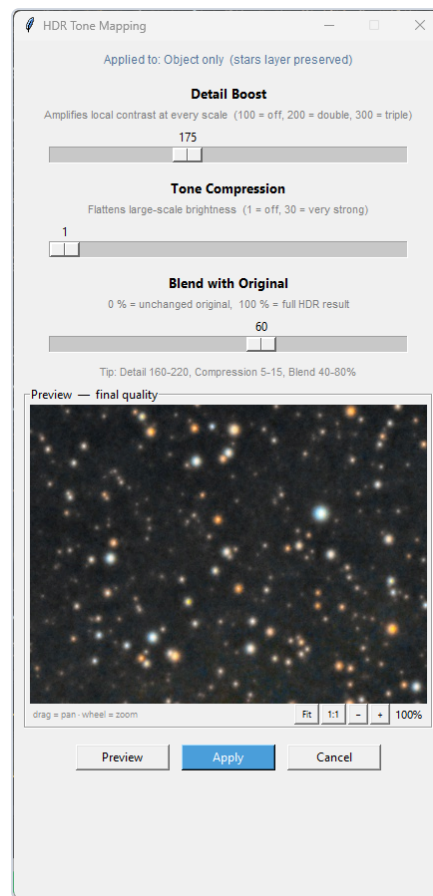
5.10 AI Colorize

AI PROCESSING → AI Colorize predicts natural color for your image with a neural model trained on deep-sky photography. It is designed for mono or weakly-colored images:

- Your luminance (detail) is always kept — only chromaticity is predicted.
- If the image already has color, the AI color is blended *adaptively*: the more saturated your original, the more of its own color it keeps.
- A green-cast removal and a saturation boost are applied automatically.

The final dialog exposes one slider (**Enhance Amount (%)**, default 80) blending the colored result with the original.

5.11 HDR Tone Mapping



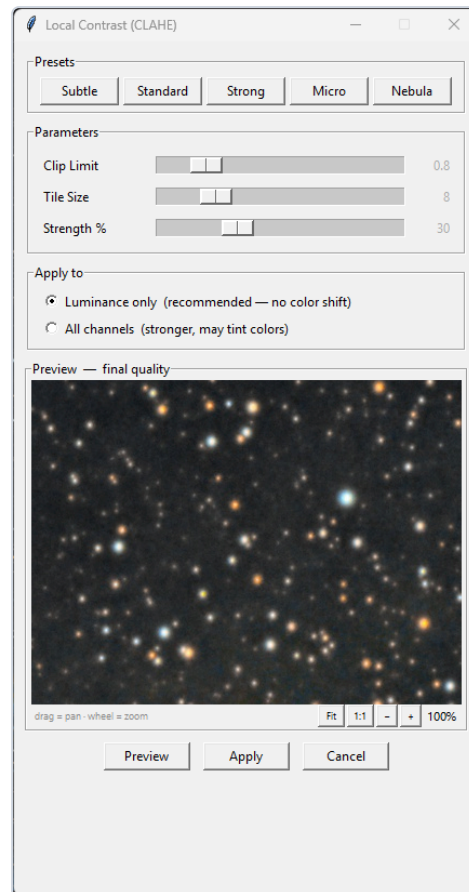
HDR: multi-scale detail boost plus tone compression, with an interactive detail preview.

TONE & COLOR → HDR compresses large-scale brightness differences while amplifying local detail — the classic cure for burned-out galaxy cores and nebula hearts.

- **Detail Boost** (100–300, default 175) — amplifies local contrast at every scale.
- **Tone Compression** (1–30, default 1) — flattens large-scale brightness.
- **Blend with Original** (default 60%).

Adjust while watching the embedded pan/zoom preview panel, then **Preview** on the full canvas and **Apply**. Suggested ranges: Detail 160–220, Compression 5–15, Blend 40–80%.

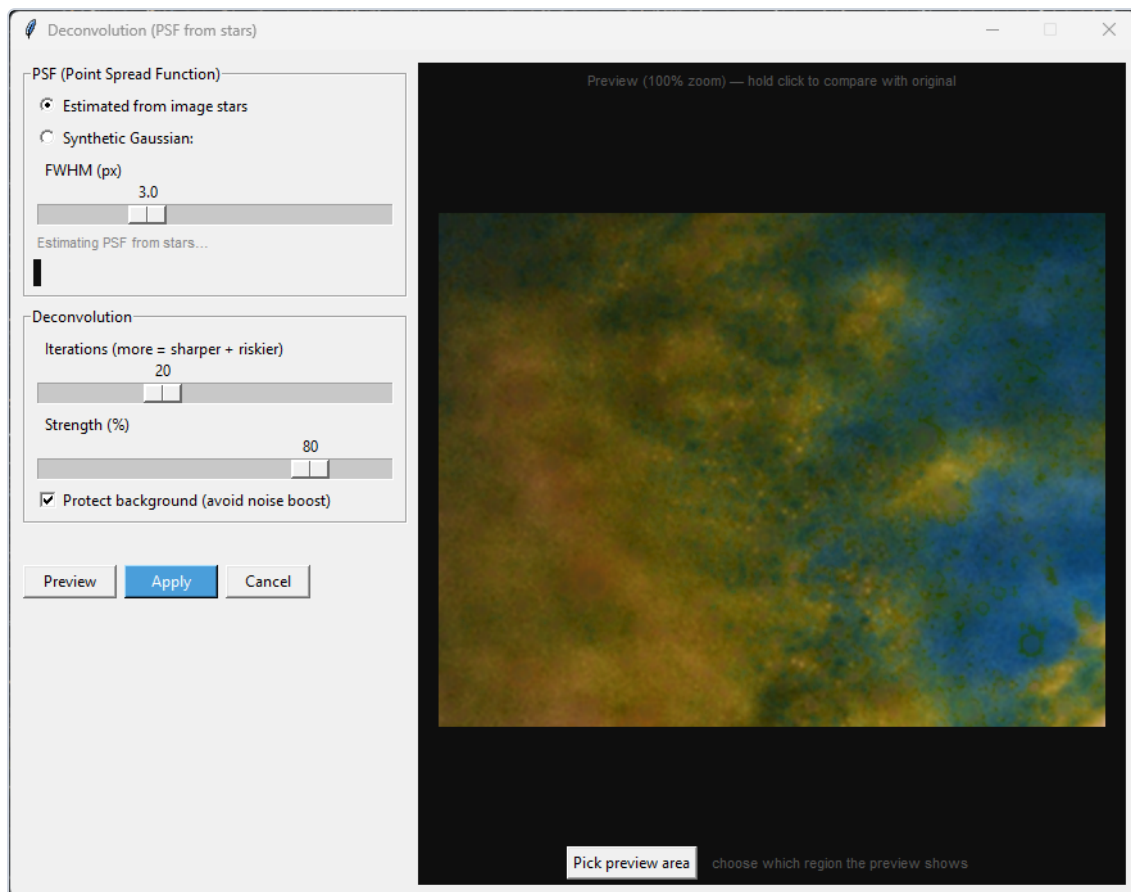
5.12 Local Contrast (CLAHE)



CLAHE with presets, clip/tile/strength parameters and the interactive detail panel.

DETAIL & LOCAL → Local Contrast (CLAHE) applies adaptive histogram equalization for mid-scale “texture” contrast. Presets (**Subtle** , **Standard** , **Strong** , **Micro** , **Nebula**) cover most needs; the parameters are **Clip Limit** (0.2–4.0), **Tile Size** (grid N×N) and **Strength %** . Keep **Luminance only** selected (default) to avoid color shifts. Applies to the object layer.

5.13 Deconvolution (PSF Sharpen)



Deconvolution: PSF measured from your own stars, 100% crop preview with press-to-compare.

DETAIL & LOCAL → **Deconvolution (PSF Sharpen)** recovers detail smeared by seeing and optics, using Richardson–Lucy deconvolution with a PSF **measured from the stars of your own image** (or a synthetic Gaussian if you prefer — set the FWHM manually).

- The right-hand panel shows a fixed 100% crop; **hold the mouse button on it** to compare with the original. **Pick preview area** lets you click anywhere on the canvas to move the crop.
- **Iterations** (5–50, default 20) — more is sharper but riskier.
- **Strength (%)** (default 80) — final blend.
- **Protect background** (default on) — avoids boosting noise in the empty sky.

💡 Run star separation first: deconvolution then sharpens the object with zero risk of ringing around stars.

5.14 SCNR (Remove Green Noise)

CORRECTIONS → **SCNR (Remove Green Noise)** removes the green cast typical of stacked images (average-neutral SCNR, like PixInsight/Siril). One slider — **SCNR Intensity** (default 60) — with live preview; it applies to both layers. The Quick Actions bar has a one-click *** SCNR** at the standard 60%.

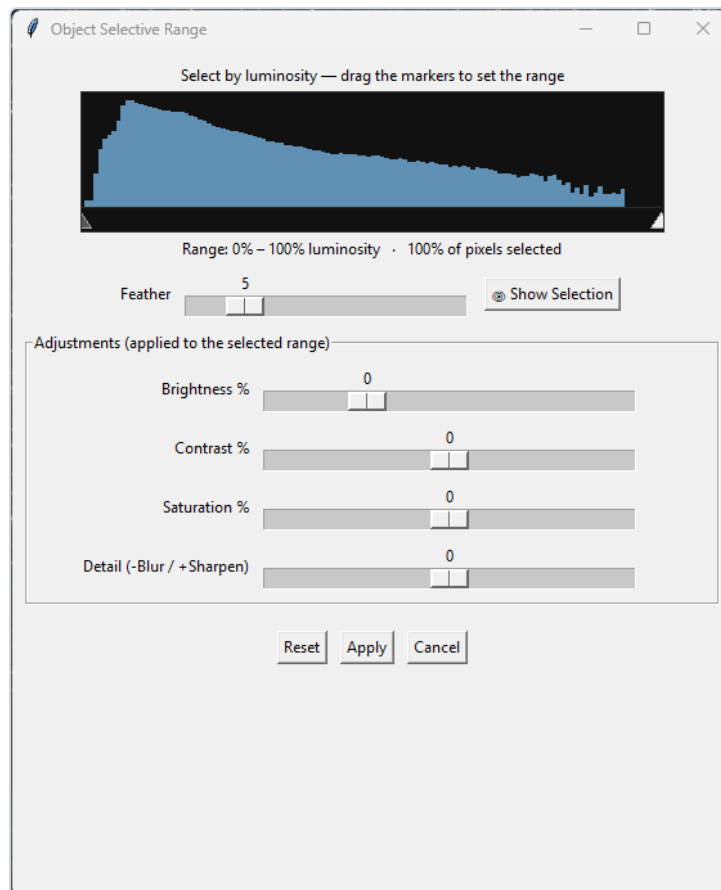
5.15 Object Selective tools & Object Retouch

These tools (all require separation) adjust the **object layer only**, selectively:

Object Selective Brightness / Saturation / Detail / Contrast

Four dialogs sharing the same design: the object is divided into four luminance bands — **Faint Region**, **Low-Mid Region**, **Mid-High Region** and **Bright/Core Region** — and each band gets its own slider. A **Tone Mapping Scheme** selector redefines the band boundaries (percentile schemes), and each band has a press-and-hold **Show Mask** button so you can see exactly which pixels it affects. Typical use: lift the faint outer nebulosity without touching the core, or add contrast only to the mid-tones.

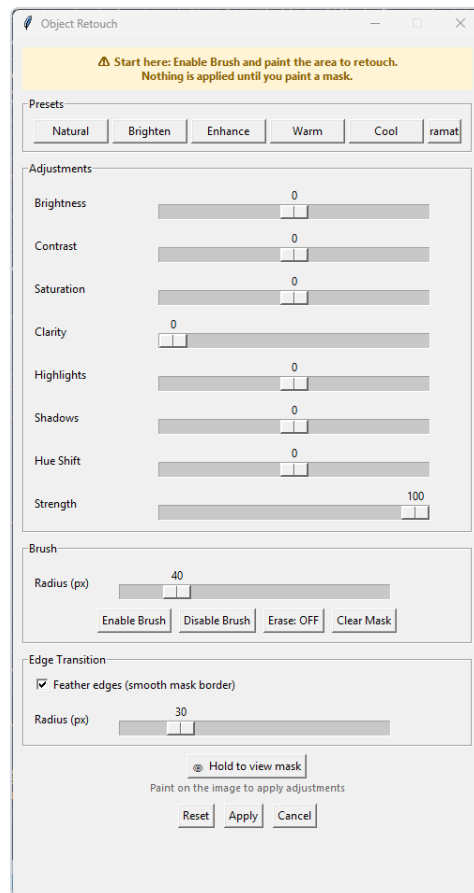
Object Selective Range (Luminosity)



Selective Range: pick a luminosity range on the histogram, feather it, and adjust only that range.

Instead of fixed bands, you select a **custom luminosity range** by dragging two markers on the histogram (with adjustable **Feather**). Four adjustments apply only inside the selection: **Brightness**, **Contrast**, **Saturation** and **Detail**. **Show Selection** previews the mask.

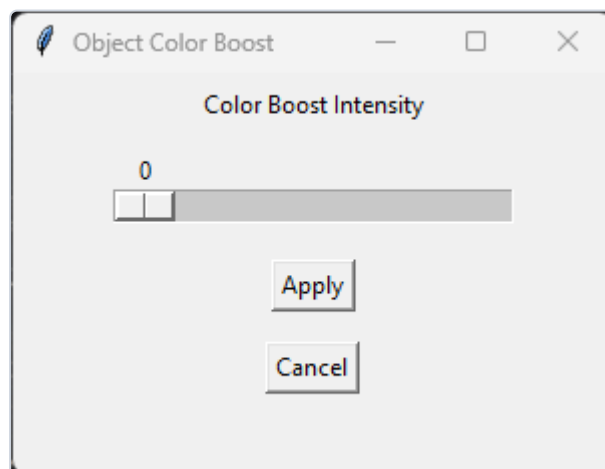
Object Retouch (Local Adjustments)



Object Retouch: paint a mask, then apply local adjustments only where you painted.

A brush-based local editor: **paint a mask** over the area to retouch (adjustable radius, erase mode, feathered edges), then use the sliders — **Brightness**, **Contrast**, **Saturation**, **Clarity**, **Highlights**, **Shadows**, **Hue Shift**, **Strength** — or the presets (**Natural**, **Brighten**, **Enhance**, **Warm**, **Cool**, **Dramatic**). Nothing is applied outside the painted mask.

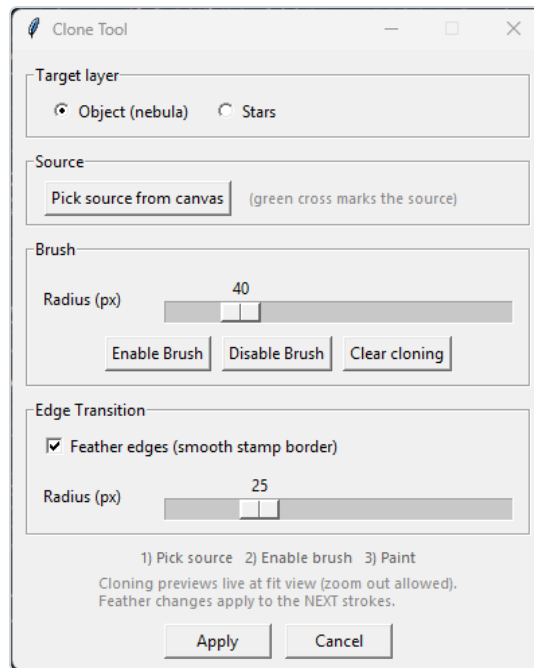
Object Color Boost



Object Color Boost — vibrance-style saturation for the object layer.

A one-slider vibrance for the object layer: saturation is boosted mostly in the midtones, protecting highlights and the sky background.

5.16 Clone Tool

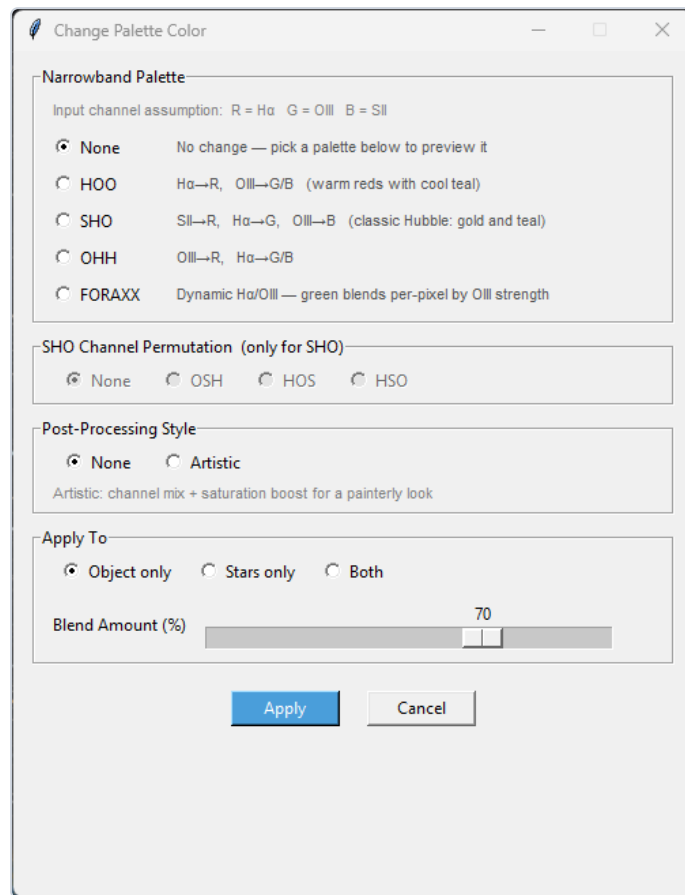


Clone Tool: classic aligned clone-stamp on the object or star layer.

DETAIL & LOCAL → **Clone Tool** is a classic clone stamp for removing artifacts (satellite trails, hot pixels, star residue). Choose the target layer (object or stars), **Pick source from canvas**, enable the brush and paint: the first stroke locks the source→destination offset (Photoshop-style aligned cloning) and a green cross tracks the source as you paint. Stamps are feathered (**Edge Transition**) and always sample the *original* layer, so strokes never compound. Everything is replayed at full resolution on Apply.

5.17 Creative & finishing tools

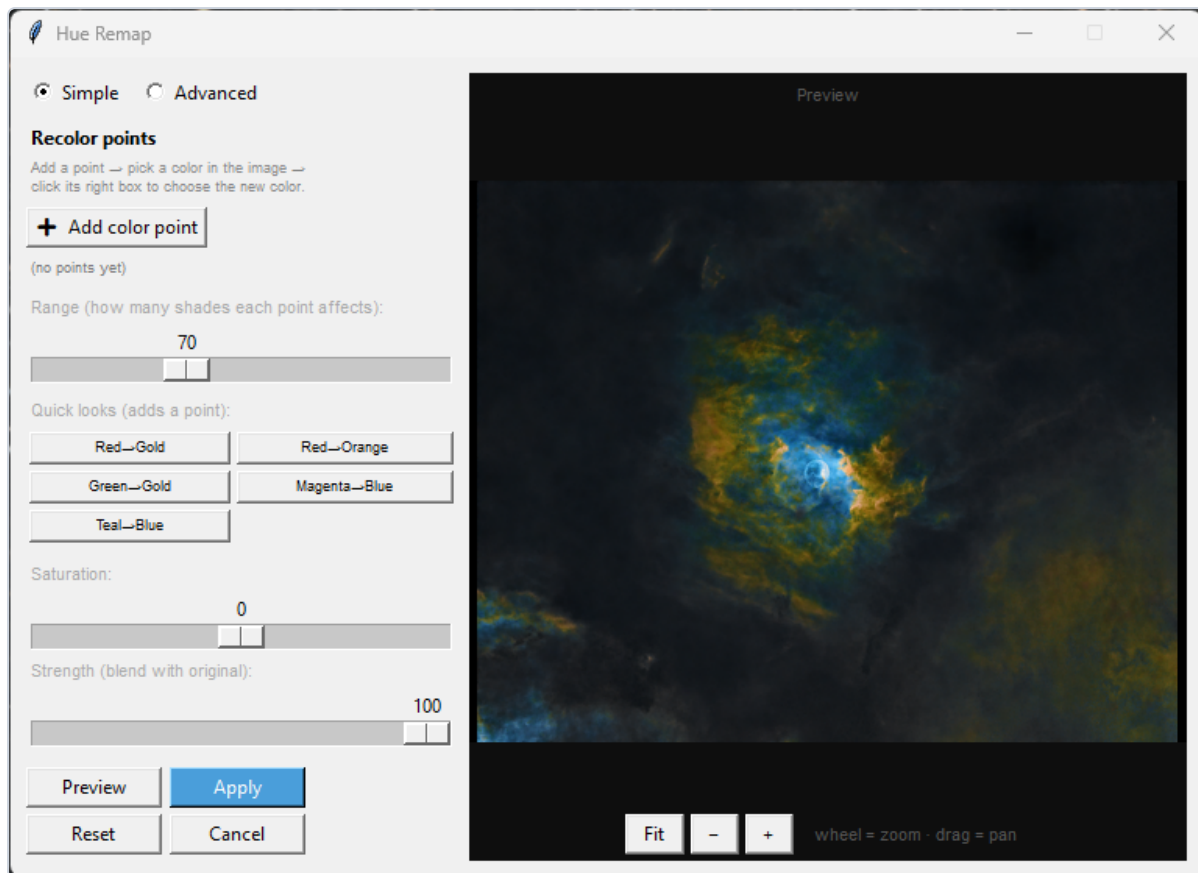
Change Palette Color



Narrowband palettes with per-palette descriptions, SHO permutations and blend control.

CREATIVE & FINISHING → **Change Palette Color** remaps your color channels to the classic narrowband looks: **HOO**, **SHO** (Hubble palette, with optional channel permutations OSH / HOS / HSO), **OHH** and **FORAXX** (a dynamic per-pixel H α /OIII blend). Luminance is preserved and the effect is signal-weighted so the sky background stays neutral. Choose the target (**Object only** recommended — palettes on stars produce green stars), dose with **Blend Amount**, Apply.

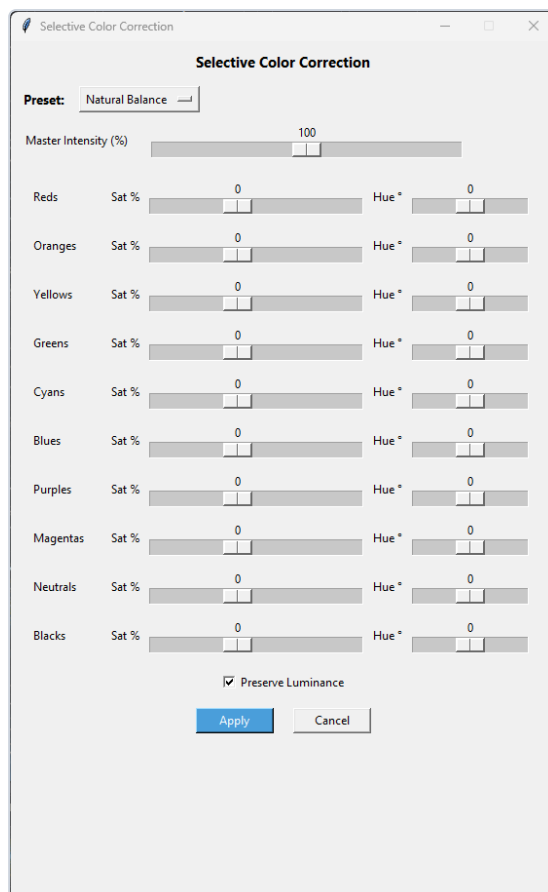
Hue Remap (Curve)



Hue Remap: pick a color in the image and choose what it should become.

Retargets specific hues without touching anything else. In **Simple** mode: **+ Add color point**, click the color in the embedded preview, then click the right-hand swatch and choose the replacement color; **Range** controls how many neighbouring shades follow. Quick-look presets (**Red→Gold**, **Green→Gold**, **Magenta→Blue** ...) add ready-made points. **Advanced** mode exposes the full hue-transfer curve. Luminance is preserved; **Strength** blends with the original.

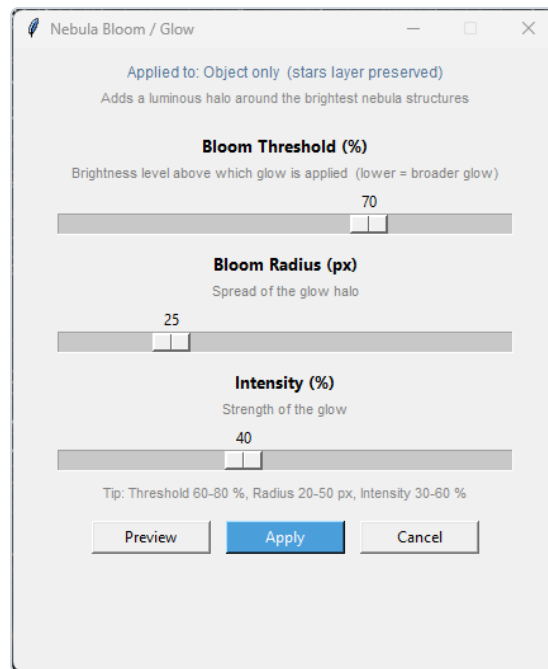
Selective Color Correction



Ten Lightroom-style bands, each with saturation and hue-shift sliders.

Lightroom-style HSL panel with ten bands — **Reds, Oranges, Yellows, Greens, Cyans, Blues, Purples, Magentas** plus **Neutrals** and **Blacks** — each with **Sat %** (−40...+60) and **Hue °** (±10) sliders, a global **Master Intensity**, presets (**HOO Boost**, **OIII Boost**, **Warm Nebula**, **Cool Nebula**) and **Preserve Luminance** (on by default). Applies to both layers.

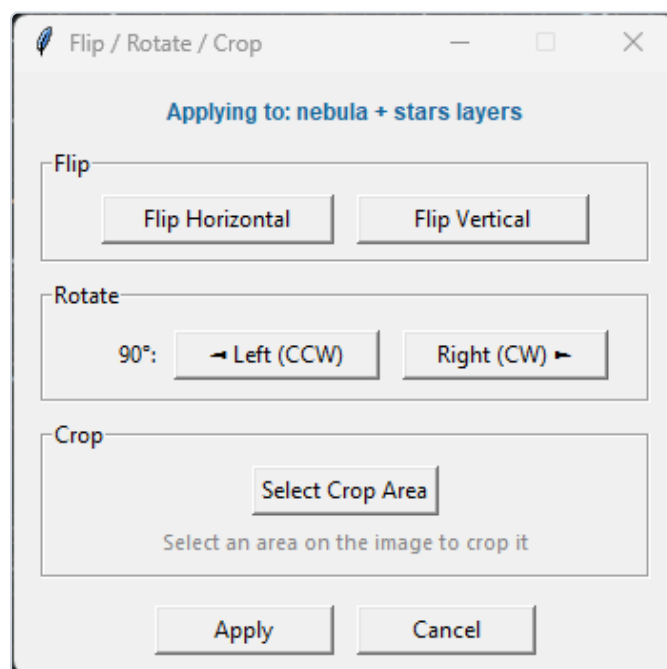
Nebula Bloom / Glow · Star Depth of Field · 3D Effect



Nebula Bloom / Glow — a soft halo over the brightest nebulosity.

- **Nebula Bloom / Glow** — adds a photogenic glow above a brightness threshold (**Bloom Threshold** , **Bloom Radius** , **Intensity**).
- **Star Depth of Field** — defocuses the star layer while the object stays sharp, creating a sense of depth (**Blur Radius** , **Strength**).
- **3D Effect** — removes the stars that overlap the brightest object zones, making the nebula pop in front of the star field (one 0–10 level slider).

5.18 Crop, Flip / Rotate & AI Super CROP



Flip / Rotate / Crop — applies to every layer (and the linear master) at once.

Flip / Rotate / Crop (available in both LINEAR TOOLS and CORRECTIONS) mirrors, rotates in 90° steps, and crops by dragging a rectangle on the canvas. All layers are transformed together, so the separation stays perfectly registered.

CORRECTIONS → **AI Super CROP** combines cropping with AI: draw a rectangle (**Select Area**), optionally tick **2x Upscale (object)** and/or **Enhance (object)** , then **RUN** — ideal for turning a small galaxy in a wide field into a full-frame close-up.

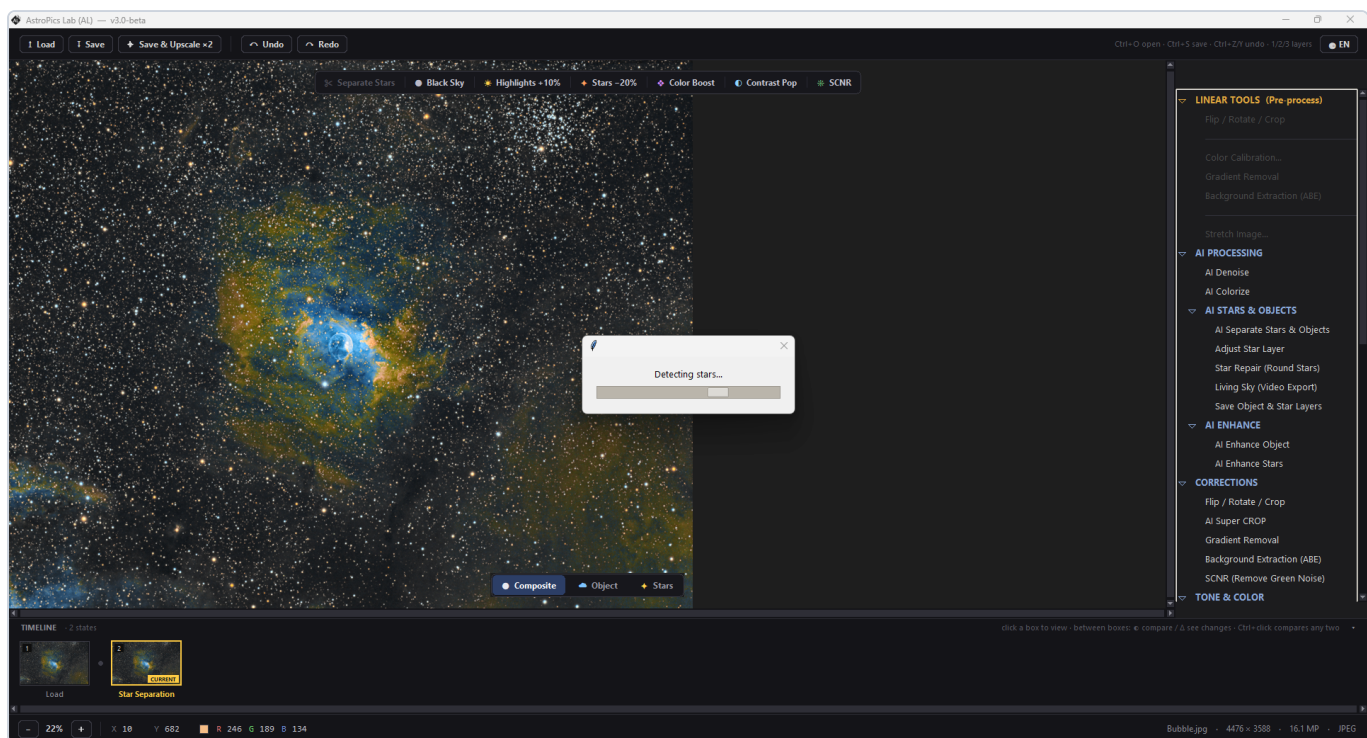
6 The Quick Actions Bar

The floating pill at the top of the canvas provides curated one-click adjustments. Each is a single undo step and shows a confirmation toast. Actions that need the star layer stay greyed out until you separate.

Action	Requires	What it does
 Separate Stars	—	Runs AI star separation (\$5.1) and unlocks the star quick actions.
 Black Sky	Stars	Makes the star-layer background pure black (black point at 10%).
 Highlights +10%	Stars	Brightens the object layer 10%, masked to its top-5% luminance.
 Stars -20%	Stars	Reduces star prominence 20% (MTF) — click again for more.
 Color Boost	Stars	+ 15% saturation on the object where there is signal; background chroma noise protected.
 Contrast Pop	Stars	Gentle S-curve on the object pivoted at the sky background — deeper sky, stars untouched.
 SCNR	—	Removes green cast (average neutral, 60%).

 The bar is draggable — grab it and park it wherever it does not cover your object. Hovering any segment shows a one-line explanation.

7 The Timeline — visual history, compare & restore



The Timeline strip: one thumbnail per processing step, with the current state highlighted.

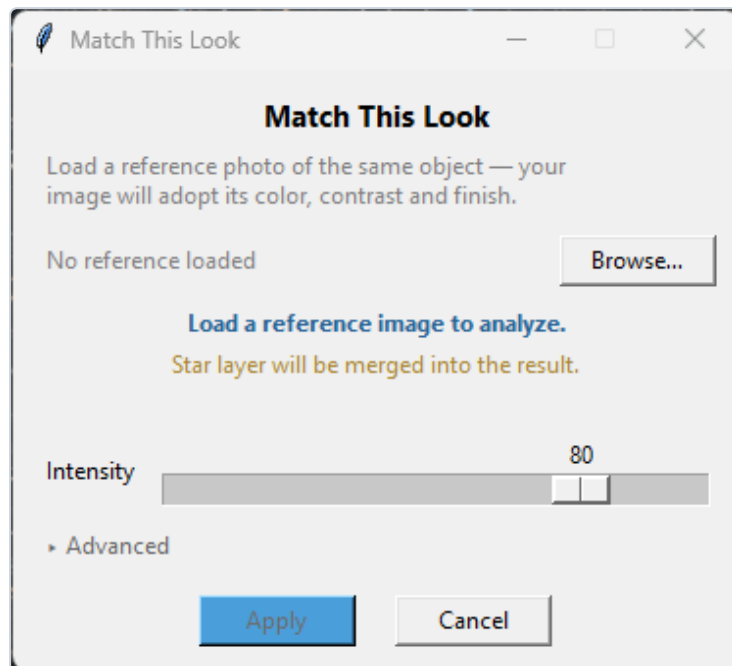
The Timeline at the bottom of the window records every processing step as a thumbnail with its operation name. It is a **visual undo history** you can explore without fear:

- **Click a box** — previews that state on the canvas (nothing is modified). A floating bar offers **Back to current**, **🕒 vs current**, **Δ vs current** and **Restore here**.
- **Hover the gap between two boxes** — two buttons appear: **🕒** opens an **A/B curtain** between those two states (drag the divider across the image; **↔ Swap** to switch sides, **Esc** to exit), and **Δ** opens a **difference map** — red = brighter, blue = darker, amber = color-only changes, with a **⚡ Boost** ×4 for subtle changes and **🎯 Ignore tone** to focus on structural changes.
- **Ctrl+click** any two boxes to compare arbitrary states.
- **Restore here** — rewinds (or fast-forwards) the history to that point. Later steps remain available as redo until you make a new edit.

💡 The Δ difference map is the most honest way to evaluate an AI step: it shows you exactly which pixels changed and how much.

8 Reference Tools (Experimental)

Match This Look (Reference)



Match This Look: load a reference photo of the same object and adopt its look in one click.

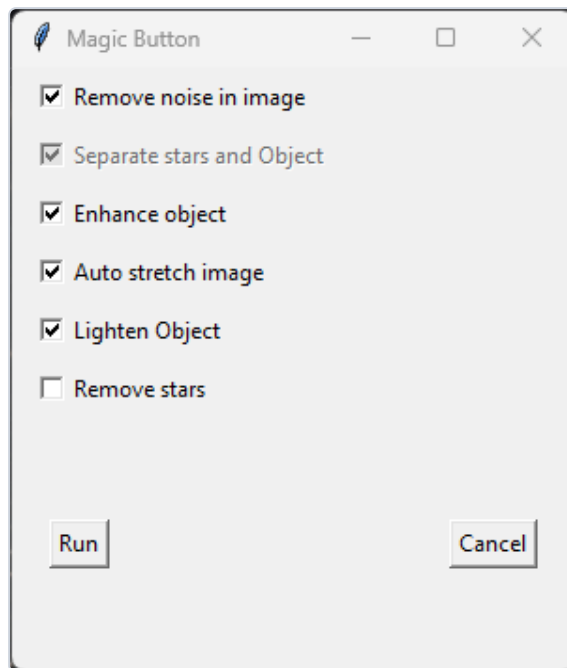
EXPERIMENTAL → Match This Look (Reference): load a finished photo of the **same object** (any orientation, scale or quality) — the app aligns it to your image, measures the tone, color, noise and detail gaps, and applies a calibrated correction so your image adopts the reference's look. The status line reports the alignment quality (*Aligned — match NN%*) and which AI steps Apply will add. The **Intensity** slider (default 80) scales the whole effect; the **Advanced** section can disable individual components (tone, color, AI denoise, AI detail). The canvas previews tone + color instantly; the AI steps run on Apply (up to ~1 minute).

Copy Look from Region (Reference)

EXPERIMENTAL → Copy Look from Region (Reference) transfers the look of a **region** of a reference image onto a region of yours: lasso the source area on the reference window, lasso the destination on your image, and the destination adopts its tone and color (statistically — your structure is untouched; rotation and scale do not matter). Dose with **Strength (%)**, keep **Protect background** on to restrict the transfer to signal, and use **Bake & next region** to accumulate several pairs before **Apply**.

9 Pipelines — one-click processing

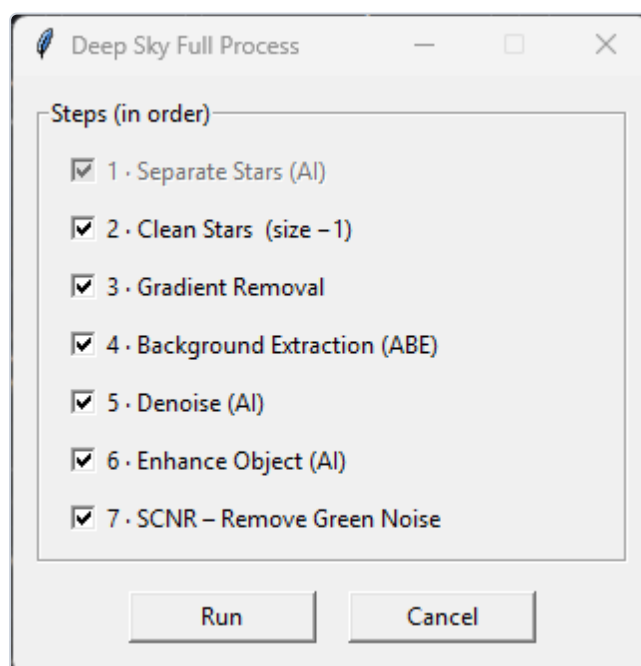
Auto Process Image (Magic Button)



Auto Process Image: tick the steps and Run.

PIPELINES → **Auto Process Image** chains the essential steps without any dialogs: **Remove noise in image** → **Separate stars and Object** (always on) → **Enhance object** → **Lighten Object** → **Remove stars** (optional; also cleans star residue) → **Auto stretch image**. Progress is reported step by step (*Step 2/5: Separate stars and Object...*). Ideal as a fast first pass — every step lands in the Timeline, so you can inspect and refine afterwards.

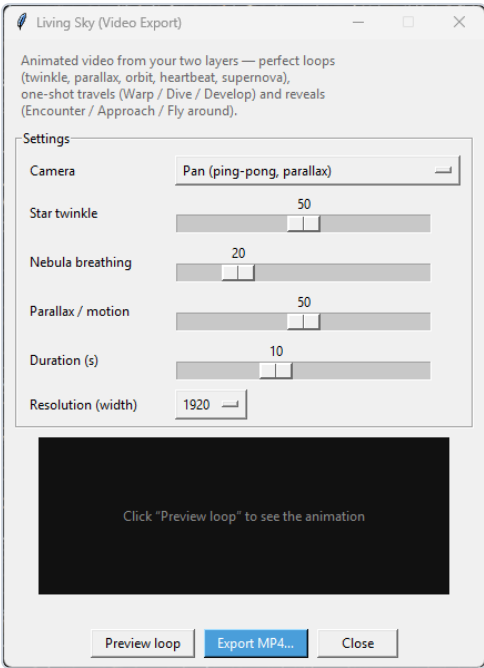
Deep Sky Full Process



Deep Sky Full Process: a curated 7-step pipeline in processing order.

PIPELINES → **Deep Sky Full Process** runs a longer, curated sequence: **1** Separate Stars (AI) · **2** Clean Stars (size –1) · **3** Gradient Removal · **4** Background Extraction (ABE) · **5** Denoise (AI) · **6** Enhance Object (AI) · **7** SCNR. Untick any step you want to skip; sensible defaults are used for every tool.

10 Living Sky — video export



Living Sky: 12 camera modes, twinkle/breathing/motion sliders, live preview and MP4 export.

AI STARS & OBJECTS → Living Sky (Video Export) turns your separated image into an animated video — the two layers move independently, giving real parallax depth. It never modifies your image.

Mode	Type	Description
Static (twinkle only)	Loop	Stars twinkle, camera still.
Pan (ping-pong, parallax)	Loop	Lateral drift; stars move more than the nebula (2.5D).
Slow zoom (parallax)	Loop	Breathing zoom with parallax.
Orbit (elliptical 3D drift)	Loop	Elliptical camera orbit.
Heartbeat (bloom + star defocus pulse)	Loop	The object pulses with a soft bloom.
Supernova (star blast lights the nebula)	Loop	A star flares and illuminates the nebula.
Warp travel (hyperspace reveal)	One-shot	Star-streak hyperspace arrival at your image.
Dive travel (fly into the object)	One-shot	Camera flies into the object.
Develop (raw data → your image)	One-shot	Your processing “develops” on screen.
Encounter (drift to the object)	Reveal	Space drift that ends exactly on your image.
Approach (from afar to full size)	Reveal	The object grows from a distant speck to full frame.
Fly around (mirror → 180° turn)	Reveal	A half-orbit around the object into the final view.

- Sliders: **Star twinkle** , **Nebula breathing** , **Parallax / motion** (its meaning adapts per mode — a hint under the selector explains it), **Duration (s)** (4–20).
- Resolution (width)** : 1920 / 1280 / 960.

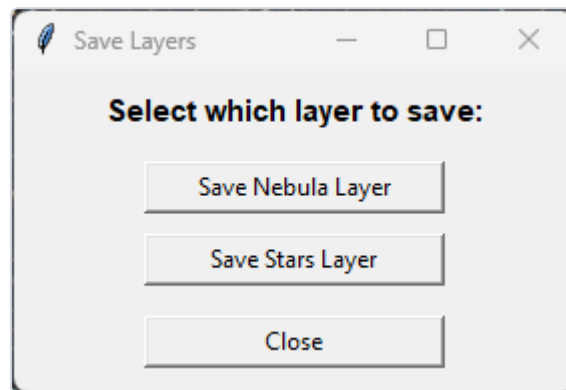
- **Preview loop** renders a fast in-dialog preview; **Export MP4...** writes an **H.264 MP4** (30 fps) that plays directly in browsers, phones and social networks.

11 Exporting Your Work

Save the composite

↓ Save (or **Ctrl+S**) writes what you see: the object and star layers merged. PNG (lossless, default), JPEG (quality 100) or TIFF (LZW).

Save the layers separately



Save Object & Star Layers — export each layer as its own file.

AI STARS & OBJECTS → **Save Object & Star Layers** exports the starless object and/or the star layer as separate files — useful to continue in other software or to keep a master of the separation.

AI upscale ×2

◆ Save & Upscale ×2 runs the neural 2× super-resolution model on the composite and saves the doubled-size result to a new file. Your working image is not modified — it is a pure export.

12 Tips & Troubleshooting

Recommended workflow recap

Phase	Steps
Linear (FITS/XISF)	Load → Color Calibration → Background Extraction (ABE) → Gradient Removal → Stretch → Color Correction
Non-linear	Separate stars → AI Denoise → ABE / Gradient Removal → Levels / Curves → star reduction & repair → enhancement, color and finishing → Save

Practical tips

- **Separate early.** Almost every tool becomes better (and safer) when it can work on the object without the stars — denoise, deconvolution, palettes, contrast...
- **Use the Timeline Δ view** after each AI step to see exactly what changed before deciding to keep it.
- **Dose, don't redo.** Every AI dialog has a blend slider — 60–80% is often more natural than 100%.
- **Undo is always exact.** Every Apply is exactly one undo step, and the Timeline lets you jump to any earlier state without losing the later ones (they stay as redo).
- **The first AI run of a session loads its model** (a few seconds, shown as *Loading AI model...*); subsequent runs start instantly.

“AI features are not available on this computer”

If the AI engine cannot start, the app explains the probable cause. Check, in this order:

- **CPU without AVX** — common on Celeron/Pentium mini-PCs and CPUs older than 2011. The AI engine requires AVX; the classic tools keep working.
- **Windows older than 10** — the AI engine requires Windows 10 or newer.
- **Incomplete installation or antivirus quarantine** — re-download and reinstall; check your antivirus quarantine (the AI model files are large and a frequent false positive).
- **Very long folder path** — move the app to a short path (e.g. C:\AstroPicsLab).

Updates

AstroPics Lab checks for new versions at startup and shows a notice when one is available. Downloads at astropicslab.com/versions.