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### Explore Scientific AR152 Achromatic Refractor

A Quality 6-inch  
Refractor for  
Every Budget!



Volume 9 • Issue 3  
July-August 2015 \$6.00 US

## Cover Story: Pages 32-35

Our cover features Explore Scientific's 152-mm f/6.5 AR152, a fast, affordable, high-quality 6-inch achromatic refractor. Dr. James Dire, no stranger to high-end refractors, provides his impressions of the big refractor after using it extensively for both high- and low-magnification visual observations. The background image is from Ron Brecher's report in this issue on IP4AP's PixInsight tutorials and demonstrates the dramatic improvements he was able to obtain from applying those lessons to maximization of PixInsight's multi-scale function.



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# The IP4AP PixInsight Tutorial Series

## Take Your Image-Processing Skills to a New Level

By Ron Brecher

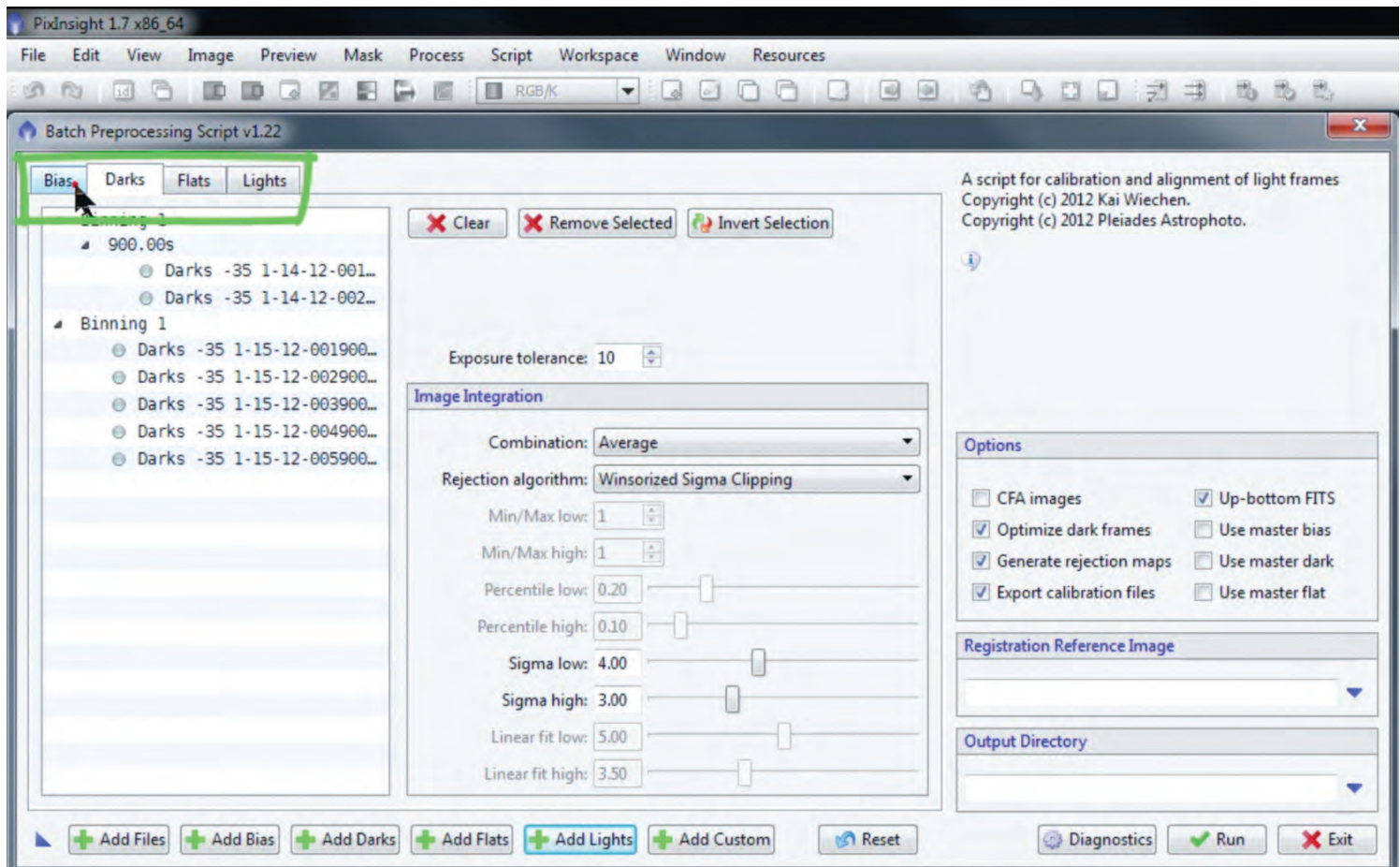


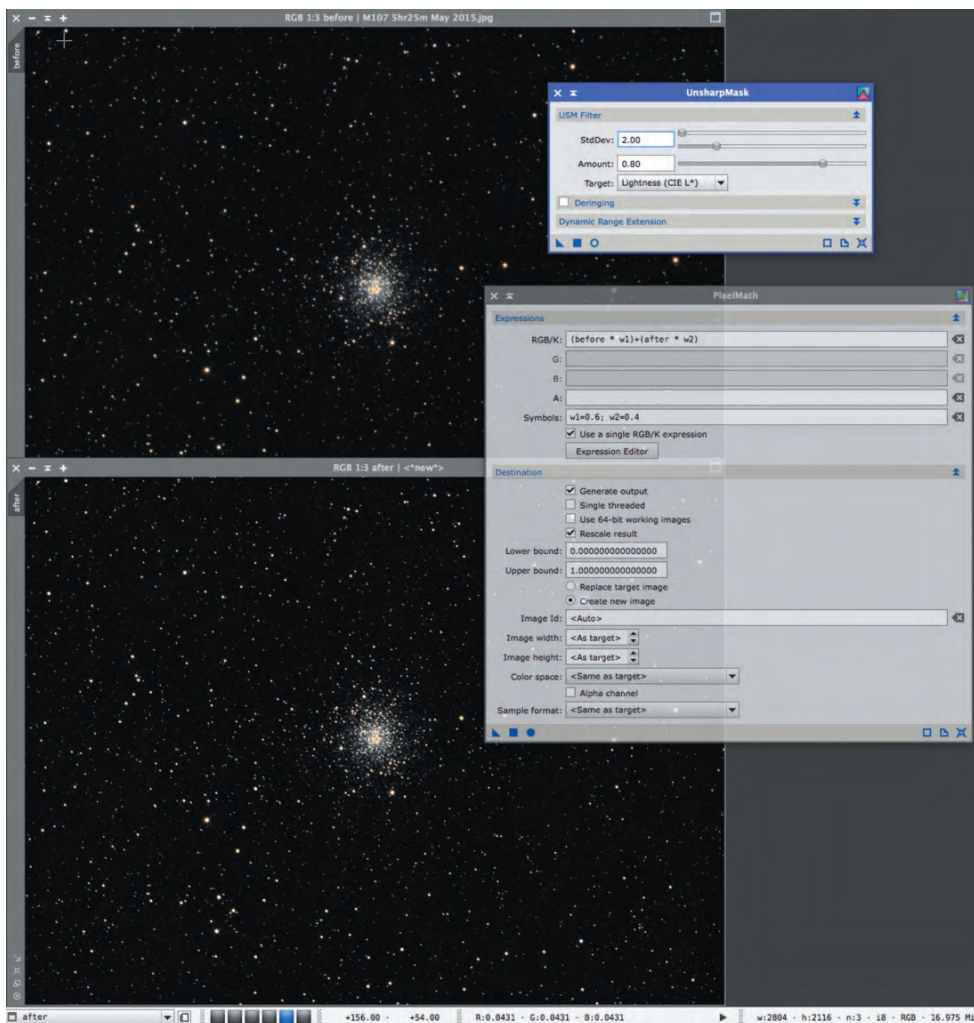
Figure 1: The BatchPreprocessing script handles all of the “data crunching” required to calibrate, correct, align, and combine a set of one-shot color or mono-filtered data, and produces master frames ready for further processing. This script is outlined in IP4AP PixInsight Part- 1, tutorial PI-6\_Stack-1.

I’m a bit of a *PixInsight* evangelist; I’ll admit it. So before I get into my review of the IP4AP’s *PixInsight* tutorial series, I am going to first explain why I consider *PixInsight* to be the most powerful and comprehensive software package for deep-sky image processing.

*PixInsight* has the ability to handle everything from pre-processing to linear processing (before stretching) and post processing (after stretching). It handles virtually every image file format up to 64-bit and has effective tools for just about anything an image processor might

want to do.

One of the key advantages of *PixInsight* compared to *Adobe Photoshop*, which is still probably the most widely used astro-image processing tool, is that *PixInsight* was developed “for astro-imagers, by astro-imagers,” and everything is included



**Figure 2:** PixelMath can be used to blend images before and after a process is applied. In this case, the image was sharpened with UnsharpMask and the before and after images were blended 60:40.

when you purchase it – there are no plugins or toolkits to buy although many third-party scripts may be downloaded for free. A single *PixInsight* license allows an unlimited number of installations on four different platforms: Windows, OSX, Linux, and BSD. So far, I have paid for *PixInsight* once, when I purchased it in 2009. All of the many updates since have been free of charge. Some other packages charge monthly fees, or require a subscription to be renewed annually in order to receive updates.

*PixInsight's* tools include processes, coded in C++, and scripts, coded in Java Script. This scripting capability makes *PixInsight* extremely versatile, with more than 150 processing tools currently available. Anyone can contribute a script, and the community will collaborate to improve the most useful scripts; some even get converted to processes.

One of the most important scripts is BatchPreprocessing (**Figure 1**), which takes care of calibrating images with darks, biases, and flats, debayering one-shot color images, killing hot and cold pixels, registering a group of images, and integrating them into master frames ready for post-processing.

In addition to processes and scripts, the PixelMath tool (**Figure 2**) further expands *PixInsight's* capabilities. PixelMath



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allows pixel-by-pixel mathematical processes to be applied to images. I frequently use PixelMath to blend images, for example, before and after applying sharpening. Many PixelMath expressions are also freely available for users to download, including expressions that replicate Photoshop's various Blend Modes. *PixInsight* also has excellent mask-generation tools, and PixelMath can be used to make more complex masks by selectively combining simple masks.

Two important features of *PixInsight* are Workspaces and Projects. A Workspace is like a *PixInsight* desktop. I often use the following Workspaces to keep everything organized: (1) Cleanup – for cleaning up channels with cropping and background modelization tools, (2) RGB – for processing the RGB channels alone, (3) Luminance – for processing the luminance channel alone, (4) LRGB – for combining the Luminance and RGB images, and (5) Multi-scale – for working on the large and small details in an image separately.

Projects (Figure 3) allow you to save your Workspaces, images, previews, and icons together in a single file. Once a project is saved, it can be re-opened later and bring you back to where you left off in the last session. Not only can you resume your work-flow, but you have full access to return to former history states, as well. This is similar to *Photoshop's* .PSD file, only more powerful.

Before I get carried away with the virtues of *PixInsight*, I need to point out that, like any other software package, *PixInsight* can be daunting to learn. Documentation within the program is incomplete, and what's available can be hard for a newbie to understand. Fortunately, there are excellent free resources online: video tutorials, the *PixInsight* Forum, and even written tutorials like mine (see <http://astrodoc.ca/deep-sky-image-processing-workflow/>). These resources taught me enough to know I was just barely scratching the surface of PI's capabilities. It was about that time that I con-

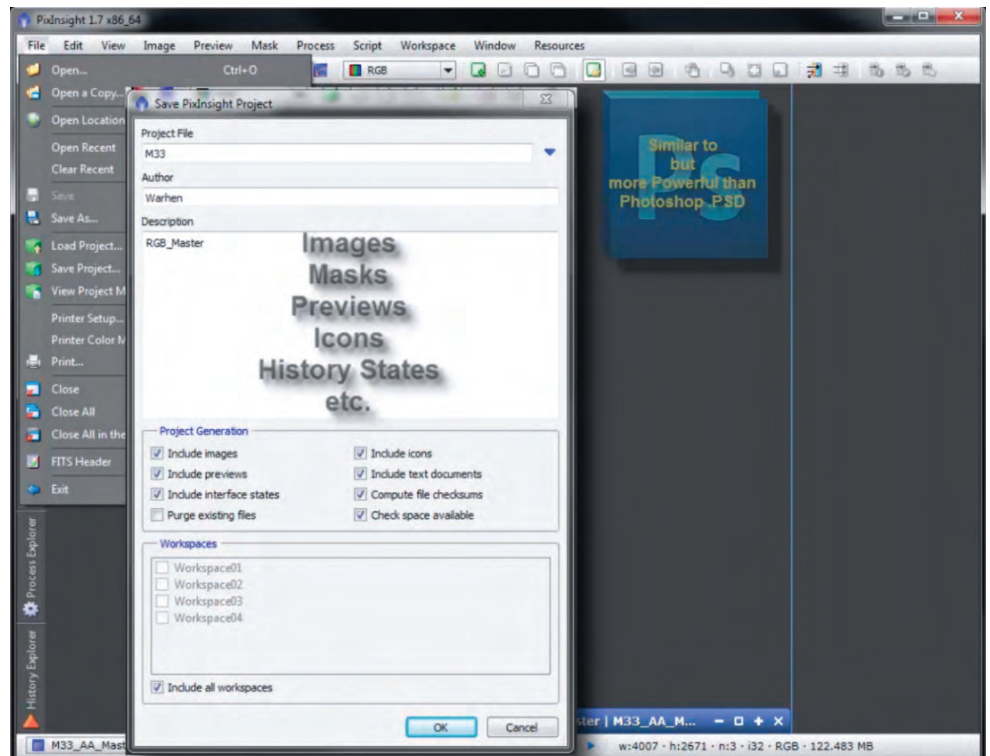


Figure 3: This IP4AP screen shot shows that a PixInsight project contains all of the images, masks, previews, icons, history states, and other settings so that you can easily pick up where you left off. Projects can store multiple Workspaces – another useful feature of PixInsight that makes it easier to organize files. Project files are conceptually similar to Photoshop .PSD files.

sidered buying the IP4AP.com tutorial series created by Warren Keller with Rogelio Bernal Andreo, both accomplished astrophotographers in their own right.

I'm a try-before-you-buy person, and was pleased that the first six tutorials in IP4AP *PixInsight* Part 1 (Figure 4) are free and available at the click of a mouse ([http://www.ip4ap.com/pixinsight\\_part1.htm](http://www.ip4ap.com/pixinsight_part1.htm)).

Excluding the introduction to the series (P1-0), the free tutorials include more than 30 minutes of information about *PixInsight*. I learned things about the user interface that I hadn't figured out for myself in my previous four-plus years of using PI. So, I decided to buy the first series. After devouring the information in it, I purchased the second, and then the



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### PixInsight Part-1

Part-1 of our series will get you comfortable navigating in PixInsight. You'll learn how to Reduce, Align, and Combine quality master files; and while still in the linear space: repair Gradients with ABE and DBE, achieve proper color balance with ColorCalibration, and restore sharpness with Deconvolution.

PI-0 Introduction, Our earlier series, What's New at IP4AP, Intro to PixInsight 7:10min
PI-1 Primer-1 Philosophy, Introduction to the User Interface, PI Community, Automatic Updates, Global Preferences, Toolbars, Explorer Windows, Menus 7:21min
PI-2 Primer-2 The User Interface continued- Explorer Windows, Tool Bars, Overall functionality 7:18min
PI-3 Primer-3 The User Interface continued- the Screen Transfer Function, New Instances 7:22min
PI-4 Primer-4 The User Interface continued- Processes, Previews, Real Time Previews, Intro to Masks 7:03min
PI-5 Primer-5 The User Interface continued- More Masks, the Process Container, the Image Container 6:54min

Figure 4: The first five chapters of Part 1 of the IP4AP PixInsight Tutorial Series are free and can be downloaded from [http://ip4ap.com/pixinsight\\_part1.htm](http://ip4ap.com/pixinsight_part1.htm). They provide a thorough introduction to the user interface.

third series. I still regularly consult the tutorials for fine details about complex topics like deconvolution, multi-scale processing, and noise reduction.

Each tutorial in the three-part IP4AP *PixInsight* series is from four to eight minutes long and focuses on one or two PI processing tools. There are a total of more than 60 tutorials. The information is provided by the narrator in a clear, slow voice, with very good illustrations onscreen, including call-out boxes, zooming, and other tools for emphasis. One of the things I really like is that the tutorials recommend specific settings, or ways to determine them, for various PI tools (called processes or scripts, as noted above). The authors don't shy away from advanced topics like stitching mosaics, blending narrow-band data, and multi-scale processing. These are covered in consecutive tutorials.

One of the mini-series that really took my image processing with *PixInsight* to a new level was on multi-scale processing (Figure 5). In multi-scale processing, an



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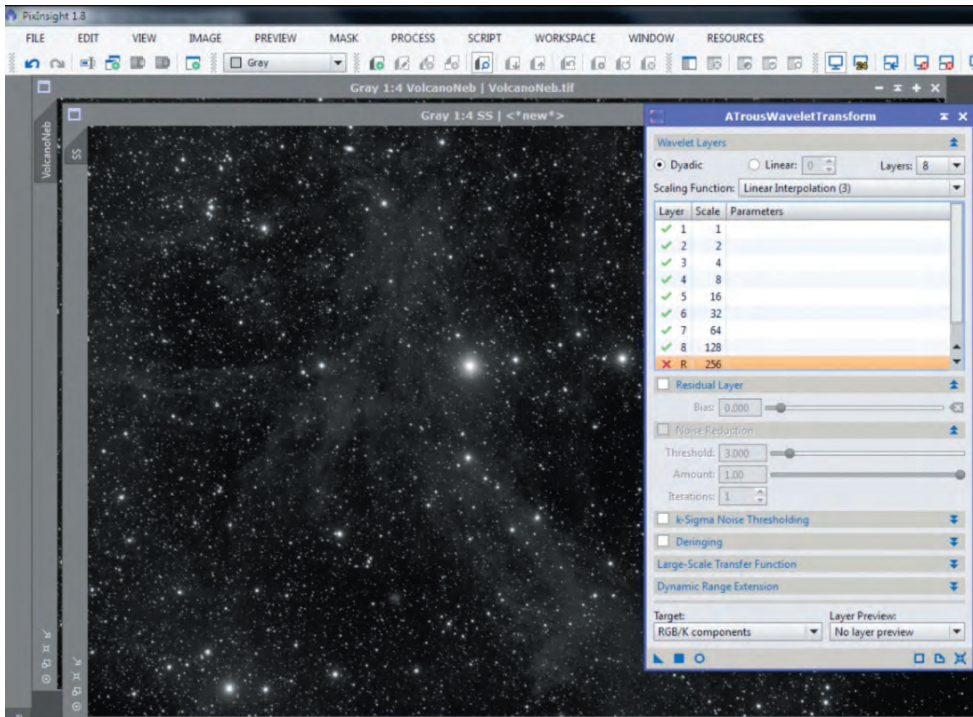


Figure 5: This screenshot from the third series tutorial designated “PI-14\_Multiscale-2” shows how small-scale structures can be extracted from an image. The tutorial goes on to show how large-structures can be isolated, permitting separate processing of large and small-scale features, which can then be recombined using PixelMath.

image is broken down into several images based on the scale of details. For example, an image containing only small features, like stars, can be extracted from the parent image. This small-scale image can then be subtracted from the parent image to create a large-scale image. The two parts can be processed separately and then recombined. For example, color saturation and sharpness of stars can be increased while large-scale nebulosity can be smoothed and made more contrasty.

The Parts 1 through 3 of the IP4AP

*PixInsight* tutorial series are available either as an online subscription or on DVD. In addition to their 22 to 27 individual tutorials, each series part includes images and web links referenced in the tutorials. Among the things I found especially helpful were the sets of processing icons that Warren uses, which can be imported directly into PI and used in your work-flow. Part 2 also includes a sample PI project that can be downloaded so you can learn PI even if you don't have your own data to work with.

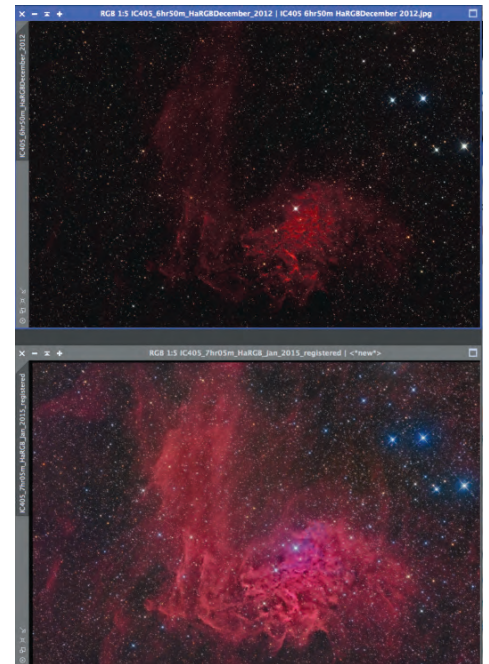


Figure 6: The proof is in the pudding! The same data processed by the author before (top) and after (bottom) learning how to use multi-scale techniques from IP4AP.

Every new user of PI – and probably most experienced users – will benefit from the IP4AP tutorials from [www.ip4ap.com](http://www.ip4ap.com). For a very modest cost, they helped me build my PI repertoire and improve my images immensely. In the context of paying thousands of dollars for equipment, computers, and software, IP4AP's tutorials provide outstanding value for the money. I would recommend them to anyone who is serious about harnessing *PixInsight's* vast capabilities to make beautiful space photos (Figure 6). **AT**



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