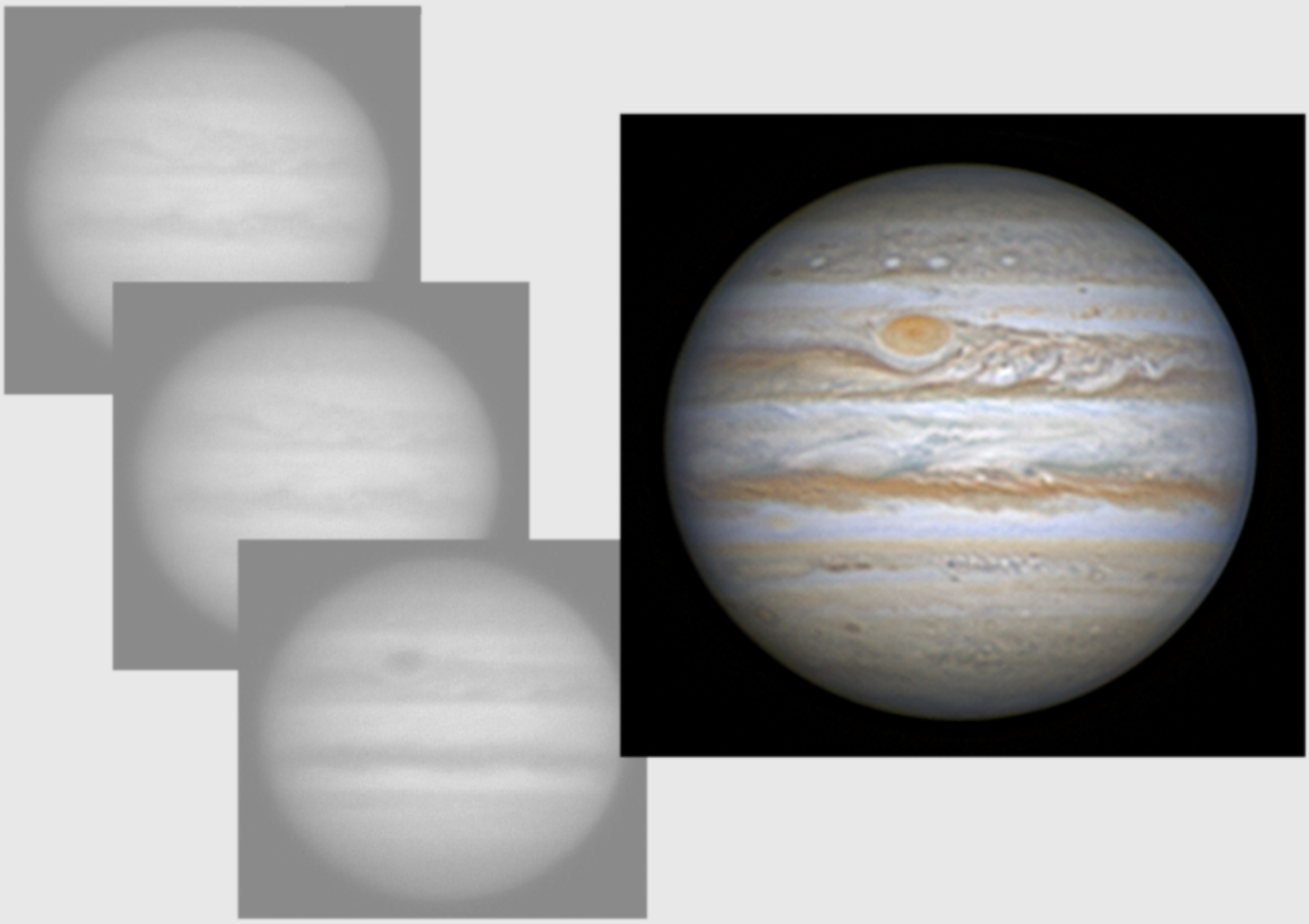
Get successful planetary images



10 steps for a correct approach to planetary imaging

A guide of the blog

THE WORLD OF PLANETARY ASTRONOMY AND IMAGING

Christophe Pellier

"*Get successful planetary images*" is a free guide offered to the readers of the blog

The World of Planetary Astronomy and Imaging

Please do not distribute it in full length. You can quote a small part if you wish (no more than one « step ») but please name me and make a link to the blog;)

Christophe

Table of contents

« How can I get good planetary images ? »

If this is a question you ask yourself, or even if you don't because they are already fine, but if you just wonder if they could be better, then here are the most important tips I would give...

Some of them are already well known *(this is not a reason to lay them aside:-)))* but some others are not, because most papers or books that talk about planetary imaging reduce it to its technical aspects (the telescope, the camera, the softwares...)

But this is a world in itself and you wil have to go beyond the technique to familiarize with the planets themselves. You have not learnt everything about this captivating thing that is planetary astronomy (neither have I) !

On the next page you can proceed to the First Step !

Christophe

Step n°1: Learn about the planets you want to image

No one talks about this necessary step: how to image an object that you don't know well? This would be like writing an article about a topic you have just discovered. Success is not granted;)

Of course, mastering the technique only will allow you to get nice images. This is even enough for the stage of high resolution imaging. **But becoming well informed about planetary activity, that is to say about the details visible on the planet, will help you to progress more quickly. If you are already skilful, this might get you 5-10 % more quality.**

More over, you will be more able **to detect artefacts, equivocal details, and to evaluate more precisely the impact of some processing techniques**.

And one last thing: planetary activity is just fascinating anyway;)

In practice

You don't need to become a planetology expert;). But you need to know that Mars has clouds, clouds of different types, that the color and aspect of the belts of Jupiter and Saturn will vary a lot with the time, that Venus shows more contrasted details in UV than in any other color band...

On the Blog, one category of articles is dedicated to **planetary news** with alert of observations or ressources to understand what's going on.

On Mars, the best publication you must follow is the review *Communications in Mars Observations* (CMO) where you will find every month papers about observing Mars. I also recommend the reading of Richard McKim's work (the Director of the BAA Mars section). On the ALPO side, the *Mars Observers Cafe* by Jeff Beish contains many articles from ALPO studies.

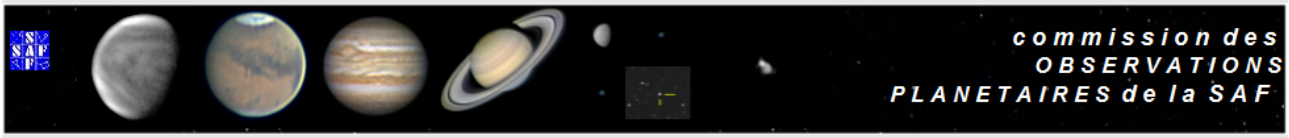
For Jupiter, the best work is done by John Rogers, Director of the BAA Jupiter section along with the JUPOS project (with our images!). His papers are a true scientific value but can still be read easily by amateurs.

Finally I want to speak about these two blogs I have discovered recently and that contain interesting informations. The Planetary Society, and The Planetary Weather report, by Leigh Fletcher (Oxford University):

The Planetary Weather Report

If you read French:

The website of the Commission des observations planétaires of the French astronomical society regularily publishes notes and articles about the actuality of planetary observations.



Return to table of contents **6**

Step n°2: Watch images – a lot, and frequently

Step 2 is the logical following of Step 1 but only on the technical side. Reviewing planetary images published by the other amateurs will train your eye.

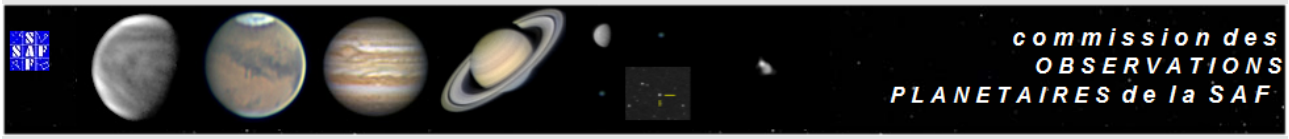
The idea is to become able to decide what images are correctly done, and those that present problems. Time only will train your eye, but keep in mind that the Step 2 must always be seen in the light of Step 1 : a good image **is an image that best reproduces the reality of the planet as you see it with your knowledge.** At the beginning do not trust too much your aesthetic impressions ; a good image must be nice to look at, but an image that your eye finds nice to look at is not necessarily a good image !

In practice

Follow especially the most recognized observers (but keep always a critical distance)

Follow the images galleries on the web (forums are nice as well, but you will find more images on galleries)

Planètes-SAF offers interactive galleries that you can browse by observer or by time period:



ALPO-Japan has been gathering images for around twenty years and is certainly the most popular. It contains many images and is quickly updated, even it does not offer search tools :

Then you will find more specialized galleries, by planets. That one of the International society of the Mars Observers (ISMO), that publishes the CMO, is dedicated to Martian apparitions and allows searching by time period or observer. The Planetary Virtual Observatory and Laboratory (PVOL) is a *professional* gallery studying the four gas giants. It offers advanced search tools by meridian longitudes.

CMO

PVOL
Planetary Virtual Observatory & Laboratory

Step n°3: Forecast good nights for your site

The quality of images is highly dependent from the *seeing* and to a less extent to the *transparency.* Not all nights are fine for planetary imaging and you can't observe every time : **how can you anticipate the best ones ?**

The experience of planetary observers reveals a few meteorological situations that favors the good seeing : a weak jetstream in altitude, the presence of a high pressure, the temperature inversion (in spring or fall), the moment of twilight and dawn, and I would add on my side : the origin of winds when they come from the ocean. These situations are not always favorable but they are those you must look for. After a time, you should be able to forecast the good nights for your site !

In practice

- When you observe, note the conditions of macro-meteorology : winds, pressure, jetstream. Don't pay attention to absolute temperature or humidity, and other immediate environnement data.
- Download the following weather maps of the night : pressure, ground wind, jetstream, from websites such as **Topkarten, Meteosurf, SkippySky.**

- Follow the seeing forecast on **Meteoblue**, **SkippySky, 7Timer**

- On my blog read the category "**Astronomical weather forecast**" and especially the following articles:

How to read the GFS weather forecast (to read weather charts)

Five good conditions for astronomical seeing (the best situations to watch for !)

- Keep in mind that even under mediocre nights you can get interesting images, noticeably from a scientific point of view. As an example, the **JUPOS** project needs ALL the images, even the worst ones...

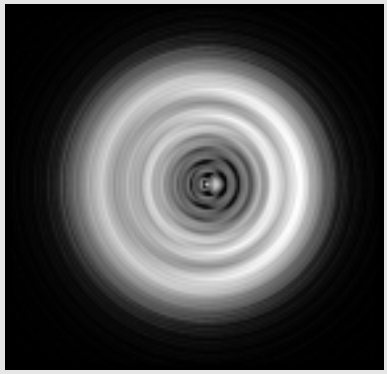
Step n°4: Collimate your telescope. Before each session.

This is one of the most shared ever tip but it stilll looks a bit neglected;). **The collimation of the telescope is absolutely required to get successful planetary images.**

If you don't collimate your telescope before each session, this is probably that your control of the operation is not good and that you are afraid of it. This is understandable because it's really a technical know-how. This is why **mastering it must be a goal for you.** To advance more rapidly sometimes you must accept to lose time at the beginning;)

In practice

- Once for all, dedicate one or more observing sessions to handle the collimation of your instrument. Make profit of nights without planets or those of average seeing (you might not be able to finalize the operation but you will experiment the settings).
- Before or after, spend some time to read about collimation on the web, on forums, papers, books, or in your local club.
- Read on the blog **my** **five tips you must know to collimate your telescope easily**
- Following the instrument you have, maybe you won't have to touch the collimation everytime, but you **must** check it.



Step n°5: Look in the eyepiece!

"So how you guys process the color of your images ?"

You have certainly read this question once on a forum. Maybe you even asked it yourself ! (don't deny it;))

From time to time I'm amazed to see planetary images with a completely strange color balance. A bluish Jupiter, a pink Venus... And each time I wonder why the observer can't see that such tints do not fit at all the planet ?

Before looking for advanced techniques of color processing, remember that you have at home one excellent mean to discover how the planet really look like : your telescope ! Visual observing must have lost some interest since the advent of the CCD era, but I'm convinced that it at least keeps this advantage : **providing landmarks for the processing of images, something the CCD is just not able to.**

In practice

Before or after your imaging session, devote at least a few minutes to look seriously to the planet in your eyepiece. Try different magnifications.

Evaluate for yourself the color of the details you see and test the conditions of seeing and transparency.

Step n°6: Choose your equipment following your projects

What kind of equipment do you need ?

For planetary imaging you must get a camera, and filters. Ok but which ones ?

The first question you must ask yourself is: do I need a color camera or a black&white one ?

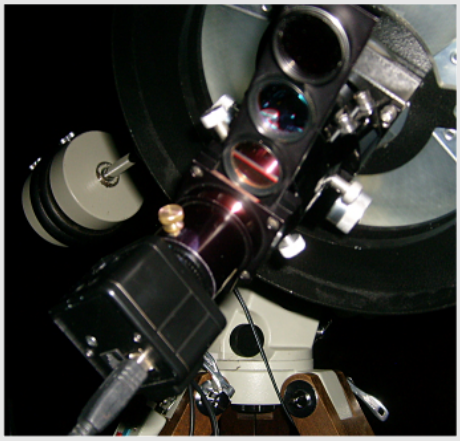
The b&w camera is clearly the tool you should get. It should make better images than a color cam and will open horizons little or not accessible at all to the color CCD: UV Venus imaging, IR on Jupiter or Uranus... **This is the tool of the advanced amateur !**

ok but now if your ambition is only to get good color images and that you don't want to mess around with filters and complicated processing techniques, buy a color one. It will make the job nicely. **Color imaging remains the most interesting way to image most of planets, including for scientific cooperation.**

In practice

Before choosing a model in particular, look at the most used, especially by the most experimentated observers. Don't try unknown models unless you have specific technical knowledges. **In particular pay attention to the sampling : does the telescope can be used at the required focal lenght ?** (see next step!)

If you have a b&w camera, you must get, at least, one LRGB filter set (try to elect one that does not contain excluding transmission bands to avoid light pollution). Then a deep red (W25 or RG610) and/or a pure near-IR filter will make images of the surface of Mars, and of inferior atmospheric layers on the gas giants.



My current camera : the iNova PLA-Mx, with the icx618 CCD

My set of LRGB filters, from Astronomik

Return to table of contents 11

Step n°7: Find the adequate sampling

Sampling is an essential parameter of the instrumentation setting for imaging.

The goal is to find what is the "good" focal length, that one that will reveal all possible details on the image, but without hindering the settings of the camera.

Here is the difficulty : a good focal length is required to resolve details. But the longer it is, and the blurrier and darker is the image. Focusing becomes difficult and the settings of the camera could get inefficient. You must find a good compromise...

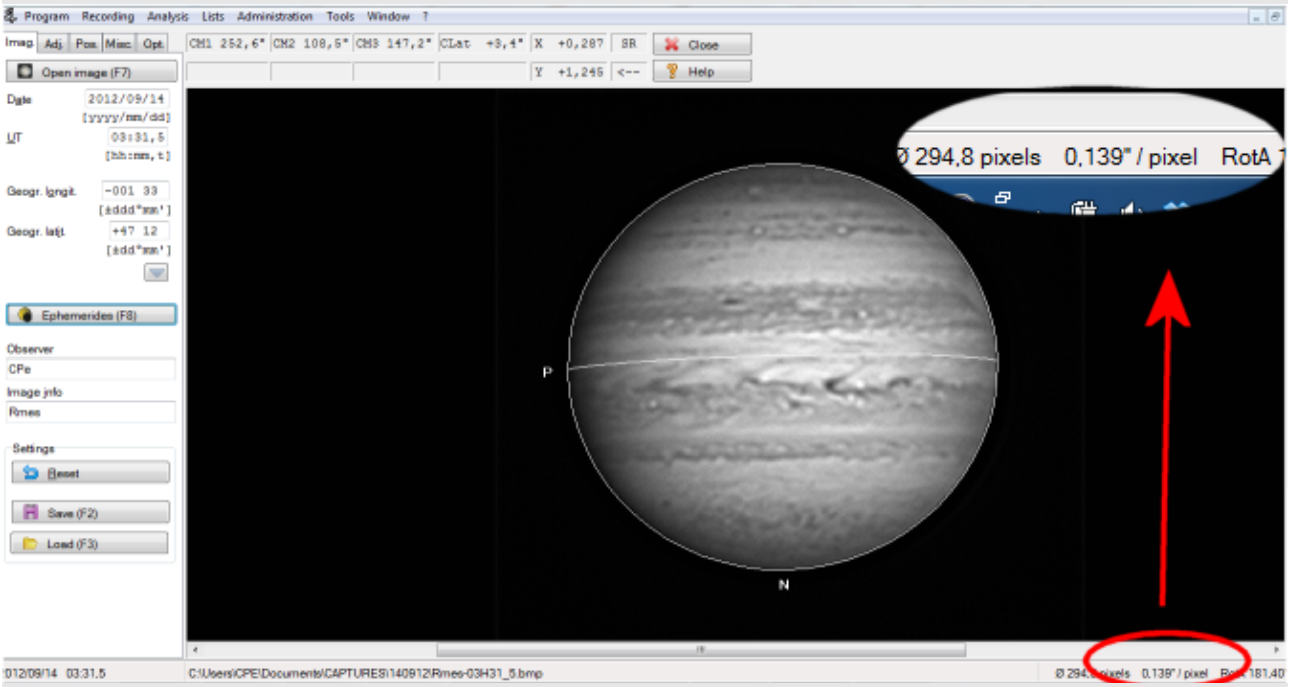
In practice

What kind of equipment do you have ? Small or average diameter (maximum 250 mm), but of high optical quality : don't hesitate to extend the focal length. With a big diameter, makes profit of the high resolution of the telescope to keep a reasonnable focal length, but then you will have very efficient camera settings.

What planet do you want to image ? Small, but very bright (Mars) : get a bigger F/D ratio. Of large diameter, but dimmer (Jupiter, Saturn) : keep an average sampling.

What are the conditions ? If seeing is not good, do not hesitate to reduce focal length, and even to use the binning mode of the camera.

Read on my blog my article **What is sampling ?**. Take an existing image and use WinJupos to avoid complicated calculations.



Step n°8: Find focus

Focusing is another key step of planetary imaging. You should not be amazed to pass **a lot of time trying to find focus.** On the computer screen the planets seen by the camera in live mode are noisy, shaky, dim. How can you be sure that the focusing is correct ?

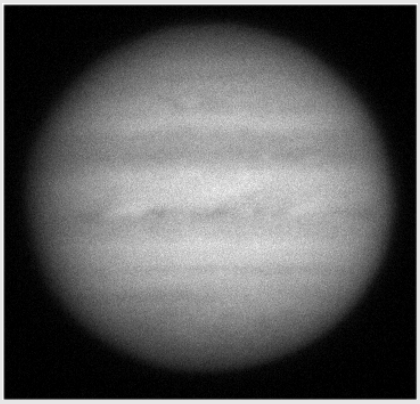
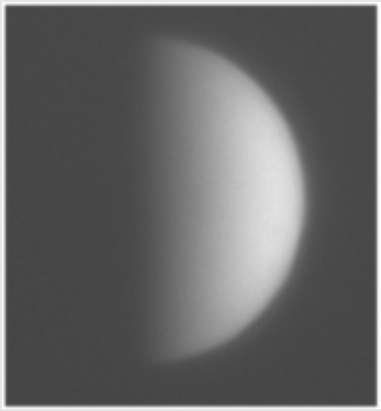
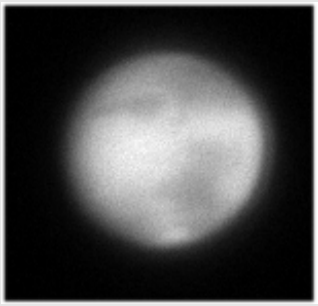
In practice

Pay attention to the limb of the planet (**the limb being the frontier between the enlightened disk and the background space,** not the terminator that separates the dayside from the nightside of the planet). Mercury, Mars and Venus are more easily focused this way (ok, on Venus this is even the only mean;)).

On the gas giants look for details a bit more contrasted. If you are lucky to see a shadow of satellite on Jupiter it will be very easy. But otherwise, find a belt or a belt limit a bit more contrasted. Focusing on the Galileans is possible but I find that is must be verified by looking at the details on the globe. Saturn is easier : focus on the rings !

On harder targets like Uranus and Neptune, you can even launch the processing of very short movie files (like around 300 raw frames), and look if the limb of the tiny disk looks sharp with a bit of sharpening.

Do not hesitate to re-focus the blue filter : modern LRGB filters sets are supposed to be parfocal but in practice the focus point is blue light is different mainly because of the presence of lenses in the light path.

Some raw frames... Jupiter in IR : focus on the details of the equatorial zone. On Venus there is no detail to see but the limb is highly contrasted. Mars is maybe an easier case : both limb and details have a good level of contrast.

Step n°9: Learn how to set your camera

Your camera is certainly a very performing tool but there is so many settings to touch ! Can we find what are the most importants ?

There are several kinds of cameras and the idea is of course not to describe them all here, but some approches must be correct whichever you have chosen...

In practice

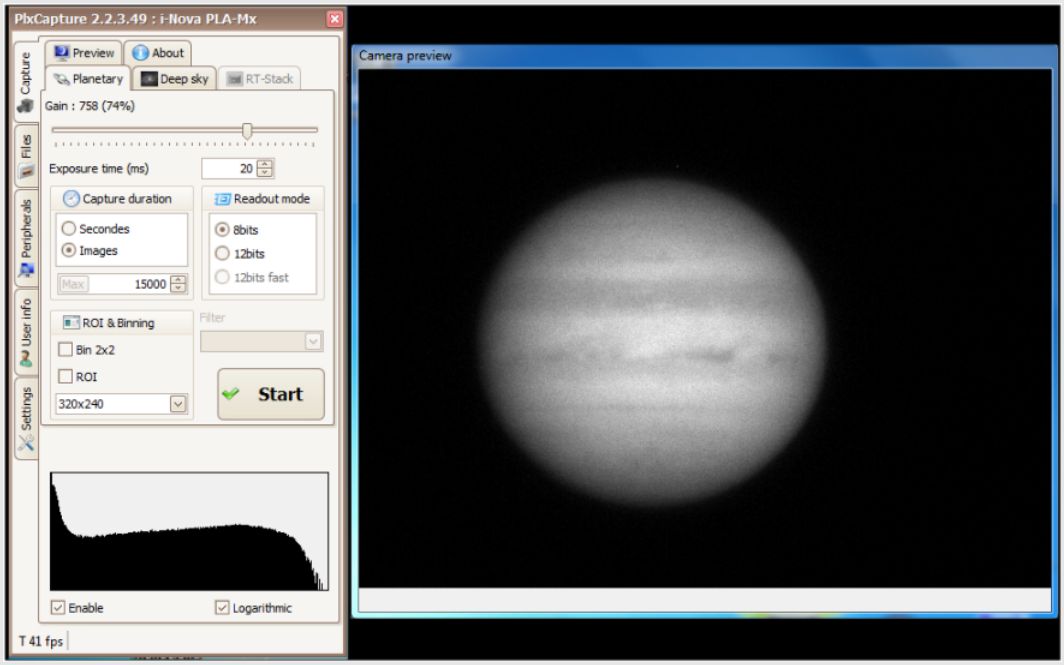
The first quality of a planetary camera is to record videos with the highest possible speed (the frame rate per second – fps). The fps is then the parameter you must favor **But there is a limit : the level of exposition of the raw frame :** it is not very adequate to use a fps so high that the image would get too dark (underexposed) : the final result should remain noisy. **So you must find the best compromise here again.**

The exposition is not chosen in itself : it is a consequence of these first two. Other settings such as gamma, contrast, luminosity, might not be touched at all ; on some cameras their modification might even make artefacts appear on the image.

Finally you must learn to evaluate when the video is becoming to long to avoid a blur of the image by the rotation of the planet. Some empirical values and for a color image are 2 mn for Jupiter, 2/3 for Mars, 3 for Saturne, 5-10 for Venus...) of course **WinJupos** will allow you to break those limits.

On my Blog, read the **imaging tips** articles.

Screenshot of a Jupiter image set with adequate parameters !



Step n°10: Find landmarks for the processing of your images

Image processing is a world in itself. **Its role is to reveal the whole information present on the unprocessed images, without losing some, denaturing it, and of course without introducing artefacts.**

Ok, so how ?

In practice

Invest yourself in Step 1 & 2 ! :)

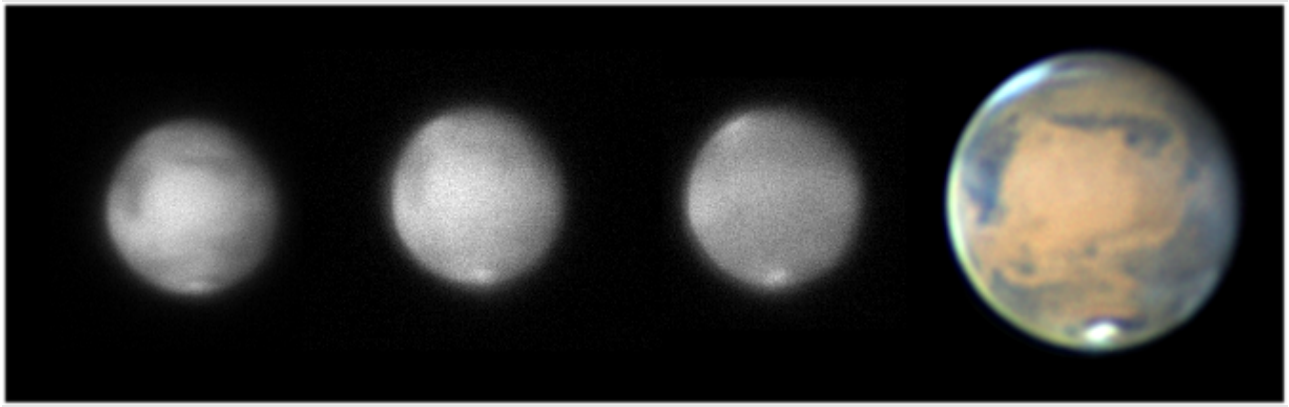
For color processing, I strongly advise you not to use those ones that give to red and infrared the importance they do not have in the reality : RRGB, IR-GB, etc. This induces losses of information, breakdown of the color rendition and even sometimes a reduction of resolution.

Know how to recognize unadequate processing at very small scale : small details must be contrasted (otherwise they are *underprocessed*) but not to the point where they would become too sharp, like laser cut (suspect *overprocessing*).

Avoid every complicated and long processing, that would see several filters applied and large cosmetic transformations (like oversizing, etc.)

In case of doubt, perform coherence tests : compare with other images, take several images, try different softwares...

On the Blog, follow these categories of articles : **Processing softwares** and **Processing tips**.



RGB Mars from 30th March 2012... from raw frames to the final image.

Follow the blog...:)

With the Blog "The World of Planetary Astronomy and Imaging" I'm going to try to inform on different directions :

The techniques of planetary imaging

The actuality of the domain (events, tendances)

Observers interviews...

It will also help me to keep on improving my own personal skills. Even after 10 years of experience I'm still learning everytime;).

In practice

Click on the banner;)

THE WORLD OF PLANETARY ASTRONOMY AND IMAGING

Many thanks to Steve Le Page for correcting the guide