10 Steps to get successful planetary images

A Guide of the Blog
"The World of Planetary Astronomy and Imaging"

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"*10 Steps to get successful planetary images*" is a free guide offered to the readers of the blog

The World of Planetary Astronomy and Imaging

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Christophe

« 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, your planetary images, but if you 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 gets you 5-10 % more quality.**

More over, you will be more able **to detect artefacts, spurious 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...
- For Mars, read the **CMO** revue and the notes of the **BAA Mars section** of Richard McKim. For Jupiter read John Roger's papers on the **BAA Jupiter section**. For Saturn you will find some professional papers with Marc Delcroix's participation on **his homepage.** Subscribe to the **ALPO journal**, and if you read french, follow the **Planètes-SAF website**.

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 to detect those that present problems. Time only will train your eye, but keep in mind that 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 : **Planètes-SAF**, **ALPO Japan**, **PVOL**, **ISMO...** (forums are nice as well, but you will find more images on galleries)

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 moments 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 **Weather Unisys** (for the jetstream)**, Topkarten**, **Meteosurf**. **Meteoblue** is a site where you will find astronomical seeing forecast but remember that it should be verified under the stars ;)
- Just remember however that some interesting images can still be realized even under average conditions !

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

This is one of the most shared ever tip but it still 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 session 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, you may not hav have to touch the collimation everytime, but you **must** check it.

Step n°5 : Look in the eyepiece !

"So how do you guys color process 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 correspond at all to the planet ?

Before looking for advanced techniques of color processing, remember that you have at hand 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 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... 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.

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 : can the telescope 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.

Step n°7 : Find the adequate sampling

Sampling is an essential parameter of the instrumentation setting for imaging. You can read a presentation on the blog : **What is sampling ?**

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, and then you will benefit from 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, or even to use the binning mode of the camera.

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 wavelet sharpening.

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, which is driven by the time exposure** (1/60th of a second = 60 fps)**, is then the parameter you must favor**. However, shooting at too fast of an exposure/fps can make your image too dark. This is where the gain control comes in. If your image becomes underexposed then you must increase your gain until you have reached the proper exposure. If you cannot get proper exposure by increasing the gain or the image becomes too noisy then you must reduce your fps and exposure time downwards. **In practice, learn what level of gain you consider to be the maximum acceptable (more gain = more noise) and find what is the corresponding fastest fps practicable.**
- There is no need to touch the gamma, contrast and luminosity settings. Sometimes changing them might even create artefacts on the final images.
- Finally you must learn to evaluate when the video is becoming too long to avoid a blur of the image by the rotation of the planet. Some empirical values and for a one-shot image are 1 mn for Jupiter, 2 for Mars, 3 for Saturne, 5-10 for Venus...) of course **WinJupos** will allow you to break those limits.

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, over-sharpening of the limb, etc.)
- In case of doubt, perform coherence tests : compare with other images, take several images, try different softwares...

And my last step... follow the blog;)

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

- The techniques of planetary imaging
- The actuality of the domain (events, tendances, special planetary phenomenons)
- 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