Astrophotography

- Devansh Jain

One of the important elements of sky observation is astrophotography. To take good quality photographs, you need many advanced instruments and most of these instruments are not manufactured in India. Naturally, astrophotography becomes a costly affair. Yet, with all the available gadgets, you can take better astrophotographs with a little bit of creativity. Nowadays, with the advent of digital cameras, amateurs can take good astrophotographs and process them digitally to get better results.

For astrophotography, you need an SLR (Single Lens Reflex) camera. In an SLR camera, we can fit lenses with different focal lengths. As exposure time in astrophotography is very long (35 to 40 minutes depending on the type of film and several other factors), batteries are consumed very fast. The light from stars is very dim. Hence, the camera shutter must be kept open for periods ranging from a few seconds to a several minutes. However, since the Earth is rotating, the sky moves slowly from east to west. Hence, the images of stars appear to be streaks, instead of points. The speed of the sky with respect to the Earth's surface is one degree per four minutes. Because of this movement of the sky, astrophotography is really a challenging task. To get point-like star images, the camera must be moved with the speed of the sky. If the camera is steady on the camera stand pointing towards a dark sky and the shutter is kept open for a few minutes, we will get *star trails* on the film. Usually a 50-mm lens or a small focal length lens is used to take photographs of star trails. Such photos look attractive and it is the best way to begin astrophotography.

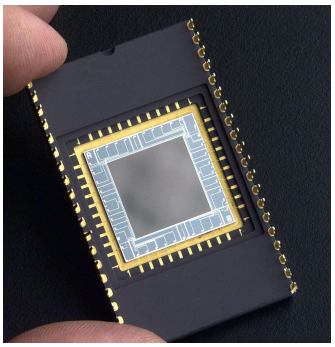
For point-like images of stars, the *piggyback* method is used as this method is relatively easy and you do not require any fancy instruments other than your telescope and SLR camera. The telescope which you are going to use must have an equatorial mount. If an altazimuth mount is used instead of an equatorial mount, the images of stars towards the edges of the photograph will

show trails and the images in the centre will be point-like. This is called *field rotation*. Take a relatively bright star in the field and at maximum possible magnification, keep that star in the center of the field. This star is known as the guide star. If the telescope has a motor drive on the RA axis,the star can be kept at the centre of the field through the motor drive; else with the slow motion control one can keep the guide star in the centre. Throughout the exposure, the guiding star must be at the centre. Through piggyback photography, several constellations and the Milky Way band can be photographed.

Prime-focus photography is the third type of astrophotography, which is relatively difficult. Using prime-focus photography, star clusters,nebulae, and galaxies can be photographed. In this type of photography, the camera is fixed at the place of the

eyepiece. The camera is placed without its lens. Here the telescope works as the lens. The guide star is selected from the same field of the camera. To photograph planets and the details of the surface of the Moon, eyepiece projection photography is done. In this type of photography, a camera with the lens is fitted in front of the eyepiece. A long extension tube is placed between the eyepiece and the camera lens. This type of photography is considered the most difficult. A powerful guide telescope and a very sturdy mount are essential.

In the last two decades, serious amateur astronomers are turning towards *CCD photography*. Charge Coupled Device (CCD) is an electronic device in which photo-detectors are used instead of film. These photo-detectors are called pixels. In one



CCD camera, there are about 200 thousand to 2 million (20 lakh) pixels. The light falling on each pixel is converted into an electric charge. All the electric charges are converted into an image in a computer. With the help of a computer, the image can be processed, manipulated and enhanced digitally. The market price of CCD camera is anywhere from Rs. 25,000 to Rs. 2 lakh. The cost of software and other gadgets add up to your expenses. CCD cameras are not manufactured in India. However, they can be imported. CCD cameras are a distant dream for amateurs in india. Let us hope that in a few more years, CCD will be easily available in India.