

Taare sadak par

You can help quantify light pollution!

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Are you from a cursed, busy city like Delhi or Mumbai that has so much of light pollution that we are becoming almost like inhabitants of the planet Lagash of “Nightfall”?¹

If so, whenever you have visited a planetarium, you must have come away wondering where all the stars that were shown in the Planetarium had gone – we do not really get to see so many stars from our city skies.

Unasked, nature gave us an inspiring vista surrounding us, a half dome filled with thousands of twinkling stars, whose very beauty would make us forget all the petty everyday life hassles that humanity has been increasingly facing since its creation. Where have all those stars gone? Creepy fingers of light have been spreading their tentacles over the skies, slowly eating those stars away.

Very recently, I had visited Nainital, to attend a very inspiring Star Party titled Milky Way Voyage, organized by amateur astronomers Ajay Talwar, Nilesh Vayada and the NGO involved in Astronomy Popularisation – Science Popularisation Association of Educators and Communicators (S.P.A.C.E.). The star party was very generously helped by the Astronomy Observatory located on the Manora peak of Nainital, the Arya Bhata Institute of Observational Sciences (ARIES). There were many amateur astronomers who had volunteered to give their observing and telescope expertise to help people enjoy many deep-sky wonders from such skies and through handmade amateur telescopes.

What skies, the region of the observatory has! Looking up at the Milky Way from this location and tracing its various dark lanes with just naked eye observations, one feels a personal connection with our home Galaxy and its 100 billion stars.

Here is an astrophotograph taken by Atish Aman of the Amateur Astronomers Association, Delhi. The Milky Way and its dark lanes photographed against the dome of the 40 inch telescope of ARIES.

¹ In Isaac Asimov’s science fiction story “Nightfall”, the planet Lagash belongs to a six star system. All locations on the planet always receive light from one or other of the parent stars and have therefore no night – people do not ever experience total darkness. However, Nightfall does occur once every 2049 years when the single star visible on one side of the planet is eclipsed for a long duration.



Photograph titled “Milky Way Voyage” By Atish Aman of Amateur Astronomers Association, Delhi.

Many of us, when we first start learning a little about stars and skygazing, come across a classification of stars into different **magnitudes**. We learn that Hipparchus of Greece, in about 150 BC, classified all the stars that he could see, into six different magnitudes. Hipparchus assigned a magnitude of 1.0 to the brightest stars that he could see and a magnitude of 6.0 to the faintest.

The magnitude system introduced by Hipparcus, is now refined to include the faintest stars visible through state of the art telescopes and also to fit the more exact quantitative brightness of stars as measured through modern day instruments. However, when we first look at stars in the sky and wish to make any quantitative statement about them, it is yet useful for us to use simple eye estimates and think of the faintest stars visible from really dark sites, as magnitude 6 stars. Manora peak near Nainital was one such location where one could chart out all the magnitude six stars that nature gave to us. Coming back to the city of Nainital itself, made many of those faint stars vanish, leaving far fewer stars in the sky! You can imagine the sad state of mind I was in, trudging back to Delhi and missing out on even more stars ☹

Here is an astrophotograph that I took (with help from Ajay Talwar and Vikrant Narang), of skies from the main city of Nainital.



Constellation Leo from the city of Nainital, with many faint stars (and some camera smudges) visible, but, not real dark skies

And now, for the cursed skies of Delhi! There are times when it seems that Venus, the brightest object in the sky other than the Sun or the Moon, is the only celestial object likely to be visible from the polluted night skies of Delhi ☹



Venus seen against a model of a PSLV rocket, in the Nehru Planetarium, New Delhi

How many regions are left near cities and towns of India where those magnitude 6 faintest, naked eye visible, stars can still be seen? What is the faintest star that can be seen from your location, on any given day? Would you like to make an estimate and see

for yourself? This will not be just an idle exercise. By making that estimate and submitting your observations to a pool of data being collected from all over India, you can contribute towards a project of quantifying light pollution from different regions of India.

Here are some useful guidelines for you, to make these estimates and submit your data to nehruplanetarium@gmail.com. However, do keep checking the website

http://nehruplanetarium.org/IYA2009/taare_sadak_par.htm

for continuous updates on this project.

First, to get started on this project, print out some of the useful images from this article, or the website mentioned above, or images that you may be able to create using easily available planetarium software. These images will help in identifying stars of different magnitudes from regions of the sky that contain well known constellations.

And then, keep a small torch covered with red cellophane paper, handy, to view the images in relative darkness.

Let us get started with this project, sometime in the month of April, 2008.

We should follow that excellent example set by the poem of Gopal Prasad Vyas : “*Ek khaat bichaalo aangan mein, leto, baitho, aaraam karo*”

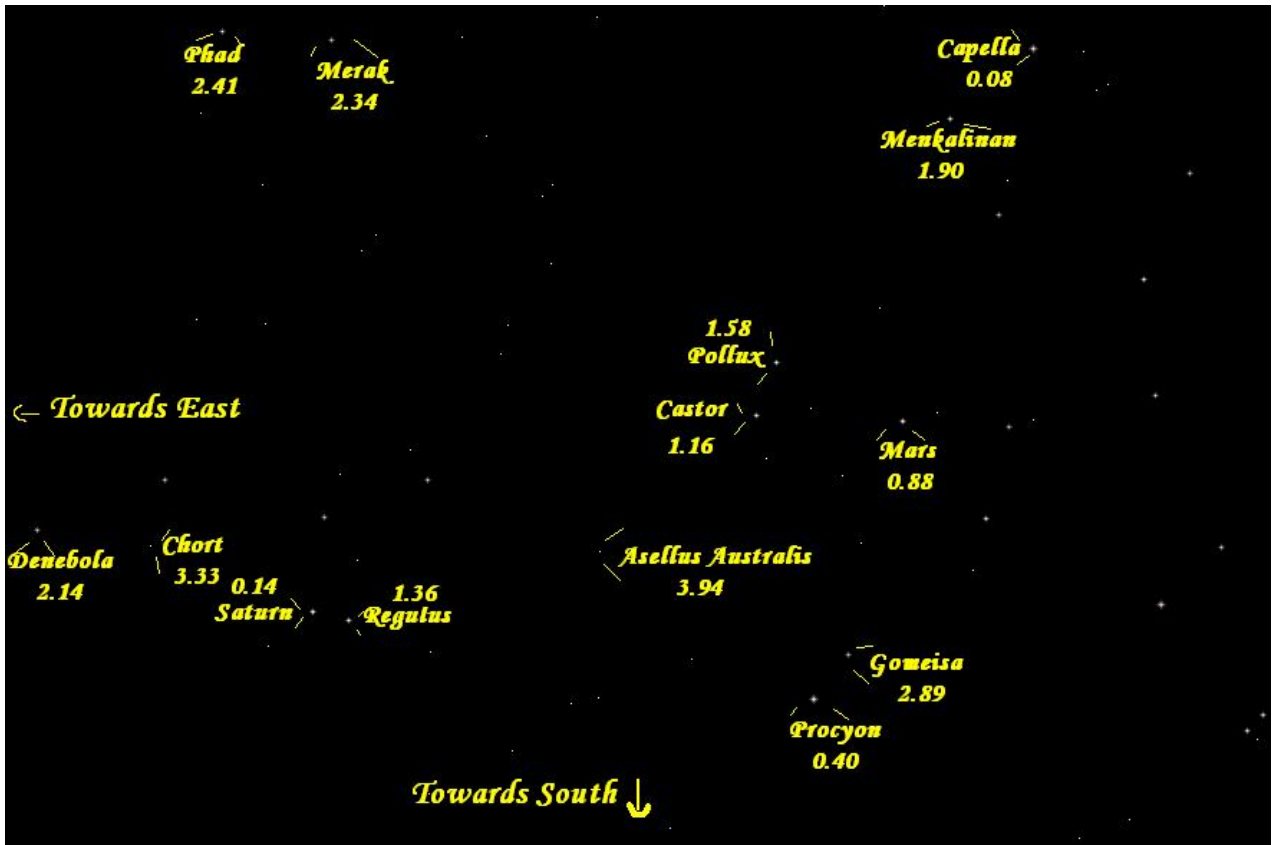
Araam karo yes, “*ek khaat bichaalo chhat par*” and then lie down, look up at the sky and make friends with stars.

Here is a likely view of the stars that you may be seeing, lying down on the *khaat*. Hold this image up in front of your eyes, orienting the directions correctly and then try to match the stars in this image with what you see in the sky. Mind, this image has been made for the evening (around 8:30 PM) of the 5th of April, as seen from Delhi. For other dates near this and for other locations in India, (but, the same time in the evening), there will be small changes of overall orientation, but, the chart should still be useful to identify the stars and constellations.



The view here is of relatively “good” skies from a highly polluted city like Delhi. Looking up and moving a little to the West, one sees the twin stars Castor and Pollux of Gemini and the whole of this large constellation, with Mars placed inside. Looking up and then moving a little to the East and a very little to the South, one encounters the stars Regulus and Denebola of the constellation Leo, where Saturn is currently placed. Capella is the brightest star visible, looking towards the North West. Looking up and moving North East, one encounters Phad and Merak of the Big Dipper (or the sages Kritu and Pulah of the Saptarishi).

Here is an image of the overhead and surrounding regions of the sky again, with some of the stars and their magnitudes labeled.



All one has to do then, is to make friends with a few of these stars and then fill in the following table.

0.0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0
Yes?					
3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0	5.0-5.5	5.5-6.0
Yes?					Yes?

The first and third row give ranges of magnitudes of stars 0.0-0.5, 0.5-1.0 and so on. One just needs to fill in a yes in the box below that, if one has seen a star in that magnitude range, in the sky. Starting from the brightest range 0.0-0.5 and going to fainter and fainter

stars, the last yes in the table, is a rough estimate of the **Limiting Magnitude** the magnitude of the faintest star that can be seen from a given location at that time. The smaller this number, the worse off is your location as far as the damage due to light pollution is concerned. This will be a report card of light pollution in your area. If you can raise awareness about bad lighting in your neighbourhood and you do see that things are changing in your surroundings in the next few years, this limiting magnitude at different times of the year will be a handle that you have to see whether we are making any improvements in our locality or making it worse, with time.

The figures above, showed several stars in the magnitude ranges 0.0-4.0. Here is an image of the same skies with many more fainter stars, as would be seen from locations away from cities. Only some of the fainter stars are now labeled in this figure.



Would you like to go on this very useful journey of making friends with stars and quantifying your neighbourhood light pollution? Please do join in this program, you and I and all of us together, can make a difference!