Calibrating computer. 7. make two data tables

Environment, Global Warming

Calibrating Your Digital Camera1. Set up a piece of white paper so that it isequally illuminated by indirect natural light. Choose a place where the lightis bright.

The most important thing is that the paper is illuminated evenly. Choosea time and place during which it is unlikely there will be any changes in howmuch light is present. 2. Set up your digital camera so that the whitepaper fills the entire field of view. The distance from the camera to the paperis not important. 3.

Put the camera in manual mode and make thefollowing changes: a. Adjust the focus so that thecamera is focused on the white piece of paper. Once you set the focus, do not changeit. b.

Set the camera’s sensitivity toISO 200. c. Set the aperture to f/2. 8. d.

Set the image resolution to alow setting. e. If your camera has a self-timerfeature, set it so that the camera shutter opens a few seconds after you take apicture. This minimizes shake. 4. Now that your camera is focused on the paper, with the settings adjusted correctly, take a series of photos at differentshutter speeds, changing by a factor of 2. (I used: 30, 15, 8, 4, 2, 1, 1/2, 1/4, 1/8, 1/15, 1/30, 1/60, 1/125, 1/250, 1/500, and 1/1, 000 sec shutterspeeds.

)5. Repeat step 4. This will give you two sets ofcalibration photos. You will compare these later in this procedure. 6. Download all of the calibration photos onto yourcomputer.

7. Make two data tables in your lab notebook to keeptrack of the pixel value for each calibration photo. One data table will be forthe first set of calibration photos, the other for the second. 8. Measure the average pixel intensity of each photousing ImageJ. a. Start ImageJ.

b. Open the first photo using “ File/Open..

.” command. c. Click on “ Analyze” andselect “ Histogram”.

d. A histogram of the pixel valuesin the photo will open in its own window. You will use the histogram to measurethe average pixel gray value in each photo.

e. Record the Mean, StDev, Min, Max, and Mode in your data tables. StDev is short for “ standarddeviation”. Min and Max are short for minimum and maximum, respectively. Mean is another name for the average. The mean of this histogram is the averagepixel value. f.

Click on “ File” andselect “ Open Next” to open the next file. Repeat steps 3. d.–3. f. until youhave analyzed all images in both sets of calibration photos. 9. Make a calibration curve by graphing the averagepixel value (the mean of the histogram) on the x-axis and exposure time (inseconds) on the y-axis.

Your graph will have two data series, one for each setof calibration photos. a. This is a “ semi-log” plot.

10. Look at your graph and check the calibrationcurves from each set. The two curves should cross or only be a little bit apart. If there is a large amount of space between the two calibration curves or ifone of the curves has a

drastically different shape from the other, you willneed to repeat steps the whole process, making sure that the lightingconditions are the same for both sets. Taking Skyglow PhotosNow that you have finished calibration, you are readyto measure skyglow.

Pick three or four places where you would like to measureskyglow. Choose places you think will have different amounts of skyglow. a.

Make sure it is around the sametime of night and that there are no clouds. 2. Travel to your first location with all of yoursupplies.

Pick the one you think will have the most skyglow. In your labnotebook, write down the address of your first location. Include a briefdescription also. 3. Set up your camera to take skyglow photos.

Makesure the camera is in full manual mode. It is necessary to use the same camerasettings at each site you visit. These are the same settings you used forcalibration photos. a. Set the camera's sensitivity toISO 200. b. Set the aperture to f/2.

8. c. Set the image resolution to alow setting. d. If your camera has a self-timerfeature, set it so that the camera shutter opens a few seconds after you pressthe button to take a picture. This minimizes shake.

3. Lay your towel or rag on the ground, then lay thecamera down on it, with the lens pointing toward the sky. If you have a tripod, you can mount the camera on the tripod and then point the camera toward thesky. 4. Double-

check that your camera’s field of viewdoes not include the Moon, street lamps, or house lights. 5. Take skyglow photos.

6. Repeat steps 2–5 for each of the rest of the placesyou plan to measure skyglow. Using Your Calibration to Measure Skyglow1. Use the ImageJ software to measure the average pixelvalue in each skyglow photo by doing the same thing in step 8 of thecalibration portion.

Make a data table in your lab notebook, and record themean, standard deviation, minimum, maximum, and mode of each pixel valuehistogram. 2. Because all of your skyglow images were takenwith the same camera settings and exposure time, you can use the calibrationcurve to find a “ equivalent exposure time” (EET) for each skyglowphoto. The EET is how long the exposure time would have to have been undercalibration conditions to reach the same average pixel value as measured in theskyglow photo. 3. Convert the average pixel value in each skyglowimage to an EET.

Record the EET for each image in your lab notebook. 4. By converting the average pixel values of eachskyglow image into an EET, you can determine how much brighter or darker onelocation is compared to another.

5. Determine which of your skyglow locations had thesmallest EET. This is the location with the darkest skyglow. Review of the LiteratureFor most of Earth’s history, our universeof stars and galaxies has been visible in the darkness of the night sky. Fromour earliest beginnings, the display arrayed across the dark sky has inspiredquestions about our universe and our relation to it. The history of scientificdiscovery, art, literature, astronomy,

navigation, exploration, philosophy, andeven human curiosity itself would be diminished without our view of the stars.

But today, the increasing number of people living on earth and thecorresponding increase in inappropriate and unshielded outdoor lighting hasresulted in light pollution—a brightening night sky that has obliterated thestars for much of the world's population. Most people must travel far fromhome, away from the glow of artificial lighting, to experience theawe-inspiring expanse of the Milky Way as our ancestors once knew it. Light pollution is light that isnot being efficiently or completely utilized and is often pointed outwards orupwards and not downwards. Also known as skyglow, light pollution occurs fromboth natural and human-made sources. The natural component of sky glow has fivesources: sunlight reflected off the moon and earth, faint air glow in the upperatmosphere, which results in a permanent low-grade aurora, sunlight reflectedoff interplanetary dust(also known as zodiacal light), starlight scattered inthe atmosphere, and background light from faint, unresolved stars and nebulae, which are celestial objects or diffused masses of interstellar dust and gasthat appear as hazy smudges of light.

Natural sky glow is well quantified. However, in the discussion of sky glow it is mainly human-made sources that areconsidered. Electriclighting also increases night sky brightness and is the human-made source ofsky glow. Light that is either emitted directly upward by luminaires orreflected from the ground is scattered by dust and gas molecules in theatmosphere, producing a luminous background. It has the effect of reducingone's ability to view the stars. Sky glow is highly variable depending on theimmediate weather conditions, the quantity of dust and gas in the atmosphere, the amount of light directed skyward, and the direction from which it is viewed. In worse weather conditions, more particles are in the atmosphere to scatterthe light, so the sky glow becomes a very clear effect of wasted light andwasted energy.

Skyglow, while it is a problem for almost everyone, is mostly problematic toastronomers since it lessens their ability to view the night sky. Sky glowincreases the illumination of the dark areas of the sky, which reduces the differenceof stars or other objects against the dark sky background. Astronomerstypically like very dry, unclouded, dark nights for observing. An average suburbansky is 5 to 10 times brighter at the top than the natural sky. The top beingthe angle that points upwards, or 180°, from the observation area.

In citycenters, the top may be 25 or 50 times lighter than the natural background. Thereare three types of skyglow, each falling on a spectrum. Technically speaking, three main types of light pollution include glare, light trespass and skyglow (alongwith over-illumination and clutter). Glare, produced by uncontained lighting isa risk, for older people. Glare scattering in the eye blinds you temporarilyand leads to dangerous driving conditions, for instance. Light trespass occurswhen undesired light enters one’s home, for example, by shining undesired lightinto a bedroom window of someone trying to sleep. Lightpollution doesn’t just affect astronomers.

The negative effects of the loss of the night sky might seem insubstantial, however evidence links the brightening night sky directly to negative impactson human health and immune function, on hostile behavioral changes in insectand animal populations, and on a fall of both quality and safety in ournighttime environment. Astronomers the first to discover the negative impactsof wasted lighting on scientific research, but for all of us, the negativeeconomic and environmental impacts of wasted energy are obvious in everythingfrom the electric bill to global warming. Thereare ways of measuring sky glow. This is not easy, because many factors areinvolved in sky glow.

One must not only consider the lighting, but also the dispersalof the light emitted from the source of that light, the light reflected fromthe ground and its dispersal, as well as humidity and the interaction of lightwith aerosols (particles in the atmosphere that may be caused by manufacturedpollutants, fire, volcanic eruptions, etc.), all of which can change in aninstant. Thereare multiple ways to help the cause. Aside from houses, street lamps are one ofthe most prominent causes of light pollution.

The worst ones are the lamps witha strong blue radiation, like Metal Halide and white LEDs. Change from the nowwidely used sodium lamps to white lamps (MH and LEDs) could produce an increaseof pollution. This increase will worsen known and unknown effects of lightpollution on human health, environment and on perception of the night sky byhumans. Thisis an important topic to bring to attention. There are epidemiological evidenceof increased breast and colon cancer risk in workers from light pollution.

Aninhibition of the pineal gland function with exposure to the constant light(LL) regimen promoted carcinogenesis whereas the lack of light impedes thecarcinogenesis. Thereare many different ways to help decrease the amount of light pollution.

Themost important thing to do is to reduce light leaving your home and to directit down, not up. These aren't the hardest things to do and can even help to money. Using dimmer light switches also can help.

Light pollution is a serious issue; it is widespread and has many negative side effects. Additionally it doesn't just harm scientists; it causes many diseases and conditions. It also affects the sleep pattern of nocturnalanimals.