



Photography of Skulls / Crania for Two-Dimensional Facial Reconstruction

By: Philip J. Sanfilippo

When asked to photograph a skull or cranium for two-dimensional facial reconstruction by the forensic artist, the photographer needs to have a complete understanding of the process to produce a finished product that is suitable for use by the forensic artist. First, let's establish the difference between the skull and the cranium. The American Heritage Dictionary defines the cranium as, "the portion of the skull enclosing the brain", and defines the skull as, "The framework of the head of vertebrates, made up of the bones of the brain case and face." For forensic purposes, the presence or absence of a mandible, or jawbone will define the difference between a skull and cranium. When the mandible is present, it is considered a skull and when absent a cranium.



Being prepared for the uniqueness of each photographic session is essential. When planning, it is good to have a method that you follow regularly. When I'm planning a shoot, especially when it is away from my home studio, I develop a list of items that will be needed. I try to do this in a linear fashion, listing equipment needed from camera to background or vice versa. Planning your shoot properly will eliminate the headache of not having the equipment needed to render good photographic results.

This is a sample list that you might be able to use in your photography.

1. **Camera System.** Without going into a lot of detail here, we'll just say that the camera system should be one that you are familiar and comfortable to work with. The film format should be 35mm or larger. (For most applications of this type of photography, 35mm is quite sufficient.) Photographs with 1:1 reproduction ratio can be made with good detail and little "graininess," as long as the correct film is selected.
2. **Film.** Slower speed, higher contrast films are preferable since they will render the sharpest photographic images under most circumstances. Their slow speed should be of little or no concern since a tripod will be utilized. If the finished image is to be made into a photograph, negative film is preferable to use since this type of film, generally speaking, has higher latitude for error. Additionally, prints from negative film are usually less expensive than prints from transparency (slide) film. If the finished product is to be projected or copied on a laser printer, transparency film should be used. Keep in mind the exposure latitude of the film. Accurate metering and exposure bracketing are recommended.
3. **Tripod.** Any brand will do. Just make sure that the tripod is very sturdy and of the appropriate height to do the job at hand.
4. **Flash/Floodlight System.** A minimum of two (2) lights is needed here. This is to ensure "flat lighting." Again, the system you choose should be one that you are familiar with and can operate comfortably. You will need stands for the lights, power and sync cords, light modifiers, such as umbrellas or soft boxes (if you use them), and if using flash, a remote activation device.
5. **Meter.** If using a flash system, you will need a good quality flash meter. If using floodlights, you can use an incident/reflected light meter or, if your camera is so equipped, the in-camera meter. If using a floodlight system, use of an 18% reflective gray card for metering is recommended.
6. **Spirit Level.** This is used to ensure that the camera is level at the time of exposure.
7. **Table for Subject.** This is where the skull or cranium will be situated while photographed. The table should be sturdy and as level as possible.
8. **Background Stand.** Inexpensive portable background stands are commercially available. If you don't have access to a background stand, one can be fashioned of wood or you can improvise using materials that you have on hand. The background stand, like so much of the previously mentioned equipment, must be sturdy. If the background falls during a photography session, this might result in the skull or cranium falling to the floor and being damaged.
9. **Background.** Seamless Paper, also known as the paper background, is a good inexpensive material to use here. Choose your color(s) wisely.



If the artist is asking for a “high key” photograph, select a light colored background. If a “low key” photograph is sought, select a dark background. Brightly colored backgrounds, such as bright red, should be avoided unless used for a specific illustrative purpose. Their use can be seen as inflammatory which may result in the photos being excluded from presentation in court.

10. **Device for Positioning Subject.** It is possible to use a tabletop tripod for positioning the subject. The skull or cranium is securely attached to the tripod with soft, pliable modelers’ clay. Failure to attach the subject securely may result in the subject falling and becoming damaged.
11. **Device for Leveling Subject.** A torpedo level, or a line level, that is attached to a twelve or fifteen inch ruler work well.
12. **Scale.** The ABFO #2 ruler works well in this application. A “Helping Hands” device, which is available at Radio Shack, will hold the scale securely at the selected plane in the photograph.
13. **Photographic Subject.** In this instance, the skull or cranium.

Now that we have a list of items that we need, we’ll assume that we have the items on hand and are ready to set-up for the photographic session. The first thing that we want to assemble is the table where the subject is to be photographed. The background stand is to be placed behind the table with the background running down to the table top, across the table, and down the front. See figure 1 for illustration.

Once the background is set, the subject should be assembled for photography. If you have been supplied with a skull that is not assembled, you must do the assembly. If the forensic artist has provided you with a skull or cranium, which has various length rubber cylinders, attached, do not remove them unless instructed to do so. These are called “landmarks” and are used to show skin depth at the point where they are affixed. The mandible will fit to the cranium in a natural manner in most cases. That is, you will be able to determine proper alignment by sight. Semi-Permanent assembly is made by use of Duco brand cement and cotton. Temporary assembly is made through the use of modelers’ clay. These mediums are also used to simulate tissue at the joints between the cranium and mandible. When assembling the mandible to the cranium, there are two things to keep in mind. First, when using the clay or cement and cotton to attach the mandible, ensure that no part of that medium can be mistaken for part of the skull. And second, remember to allow for a natural appearance. People do not normally walk around with their teeth clenched all of the time. Allow the mouth to be slightly opened, as a

person’s mouth would be while in a relaxed state in life. This may be accomplished by using approximately 2-3 mm of modelers’ clay between the upper and lower front teeth. When dentures or bridges are supplied, but not assembled, fit them into place using modelers’ clay to simulate tissue depth. Visually check for an accurate fit between the upper and lower dentition.

When the skull is assembled, or in case a cranium is the subject, it must be attached to the device that you are to use for holding the subject as it is photographed. If you are using a tabletop tripod, it is recommended that you use one that can be adjusted up and down as well as for angle of orientation. It must again be emphasized; the subject has to be affixed securely to this device to avoid being overcome by the earth’s gravitational forces. That is, to avoid shifting or worse, accidental falls.

Once affixed, the subject is to be placed on the table and leveled. First, the subject is to be leveled to the “Frankfurt Horizontal Plane.” This is accomplished by drawing an imaginary line from the left side porion to the bottom of the left side orbital lobe (eye cavity). The porion is the part of the cranium, which is located at the top of the external acoustic meatus or ear hole. This imaginary line is then placed on a level plane. If for some reason the left side of the subject cannot be used, substitute the right side porion and lobe. Now ensure that the subject is vertical by leveling it across the face. This is done by drawing an imaginary line that connects the lowest portions of the orbital lobes. This line is then oriented in a level plane. The tops of the orbital lobes can be substituted in cases of damage or deformation. Now check the “Frankfurt Horizontal Plane” to make sure that the subject has not shifted while leveling across the face. Any leveling device can be used here, but experience shows that either a torpedo level or line level that is affixed to a twelve-inch ruler will be the most convenient.

Now that the subject is level and ready to be photographed, we will work our way back to the camera. The next step is to set-up the lighting system. No matter which type of lighting system is used here, remember, flat, even lighting on the subject is the most useful. The lights should be on 45-degree angles from the subject respectively. The light they produce should fall on the subject at the same intensity from both sides. This will be determined by your meter readings. If using a flash meter, be sure that you are not influencing the meter reading by either casting a shadow or reflecting light from your clothing. When using a flash meter, the sensor should be held as close as possible to the plane of focus to ensure the most accurate reading. When using floodlights and an incident/reflected light meter, position an 18% reflective gray card as close as possible to the plane of focus and take a reflected light reading from that card. In “high key” photographs, a background light can be used to increase contrast between the subject and background. If using two flashes that are designed as “on-camera” flashes, one is to be hard wired to the camera using an appropriate sync cord. The second flash is activated remotely with a device such as the Wein



brand “Hot Shoe Slave.” If using flashes in Multi-TTL mode (if so equipped), refer to the manufacturer’s instructions for proper wiring directions.

The camera system will be readied when the subject and lighting are set. Visually, determine the front of the subject. The camera is to be set-up perpendicular to the subject. The distance from the subject to the camera is determined by the focal length of the lens you have selected. The camera is to be oriented in a vertical format if possible and is to be leveled in all directions. Once level, the center of the viewfinder of the camera is placed to intersect the nasion suture of the subject. This is the line that is seen at the bridge of the nose of the subject. If any height adjustments are to be made, do not do so by changing the camera angle. This will result in distortion of the subject’s features. Instead, change the height of the camera in relation to the subject.

When this has been accomplished, a scale may be placed in position and photography of the front of the subject can begin. Photography both with and without the scale is recommended. Remember to bracket your exposures. After photo-

graphing the front of the subject, it would be advisable to photograph the profile of the subject. Use of the left side is recommended, but the right side can be used in cases where the left side has evidence of trauma. Before photographing the profile, the subject must again be leveled as described above. Once the subject is level, place the camera system in a perpendicular plane to the subject and proceed with the photography.

If you have any questions regarding the assembly of the skull, consult with the forensic artist or your local Medical Examiner or Coroner. When there are questions regarding loose teeth, missing teeth and/or dentures, a Forensic Odontologist should be contacted. ■

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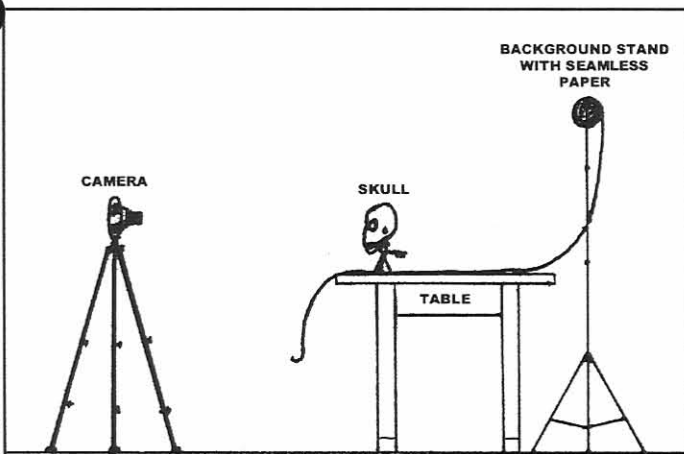


FIG. 1. Proper Set-up of Background.

Normally, the lighting system would be installed between the subject and camera. The lighting isn't seen in this illustration so view of the background and camera system are unobstructed.

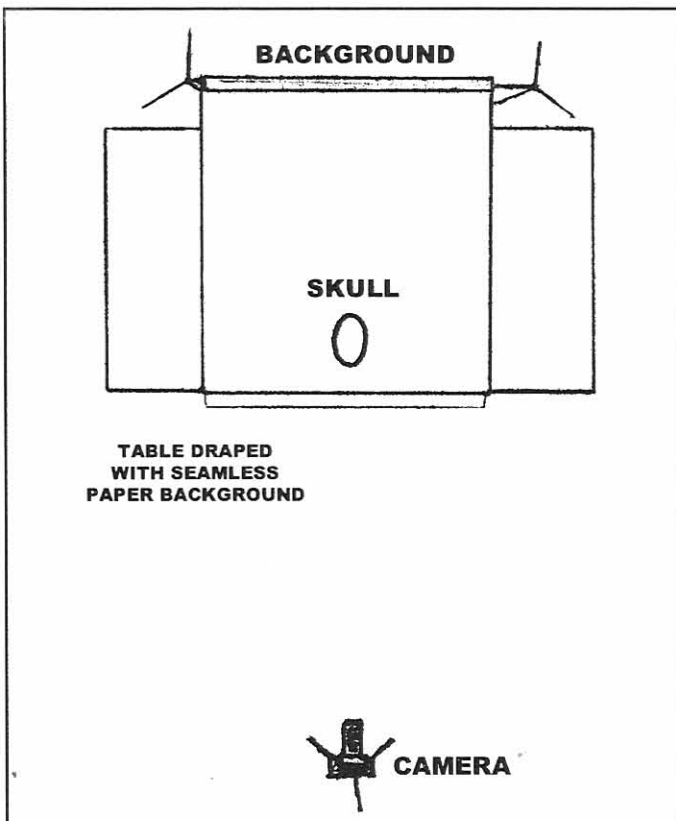


FIG. 2. Overhead View.

Once the lighting and background are in place, the camera is to be placed perpendicular to the subject. The camera must be completely level to avoid distortion.