Tips to help you get great photos so we can make a great sculpture for you.

By using the methods described in this document, you can take photographs of your friends or family anywhere in the World and on any suitable day that is convenient for you. After you send us the photographs, we'll process them into a single 3D image for free and if you like it, we'll then use a 3D printer to make a sculpture and send it to you. You may never have to leave your home, which may be necessary if the subject(s) or you cannot risk Covid-19 exposure or for other reasons.

This may seem like a long document but we want to be detailed so that you can do a great job even if you've never done anything like this before. As with any new project, please be patient as you learn this. If you are perplexed by smart-phones, consider asking a teenager for help as they seem to be experts. If still stuck, please jot us a line. It will not take that long to read this document since much of it is pictures and there are several optional paragraphs that explain various recommendations. Please read this entire (9 page) document before you decide whether to give this a try.

For a quick overview, please see the video on our website: https://SolidMemories.net

Part 1: Setting up your camera.

With the exception of action cameras or others that only have a wide-angle lens, any digital camera with 12 megapixels or higher resolution that allows you to enter manual mode will work.

You may be surprised to hear that your smart-phone's main camera (not the selfie-camera) has a manual camera mode. For technical reasons (please read the last paragraph in this section if you want the details), the camera needs to be on manual mode so that you can control at least 9 settings. Those settings should be identical for every photo in the set and they are:

- **Focus** should be set to auto-focus.
- **White balance** for cloudy or in shadow area. A value of approximately 6500 is usually good.
- **Shutter speed** of 1/30 to 1/1000 of a second. This controls how long the light enters the camera.
- **ISO** of 100 to 150. Should be 100.
- **Bias** should be set to 0.
- **Flash** must be off. If it's on it will create hard shadows (a bad thing) and the many flashes may cause you and/or your subjects to get eye fatigue or even have a seizure – yikes.
- **Resolution** should be 12 or more megapixels per photo. This is usually automatically set in smart-phones but other digital cameras may give you the option. Selfie-cameras don't work since they are less than this.
- **Aperture** should be set to 9-10 (this usually cannot be modified in smart-phones which is OK).

Your phone may also have options for **Auto-Photos, HDR** or other image enhancing features, if so, then please turn those off. If you have an **auto-review** feature, please turn that off as you will go much faster without that delay. You may wish to turn the **shutter-sound** on as a way to confirm a photo has been taken since for most of these photos you will not be seeing the screen.

Below are some photos showing you how to access and set the above parameters on a Smart-phone.
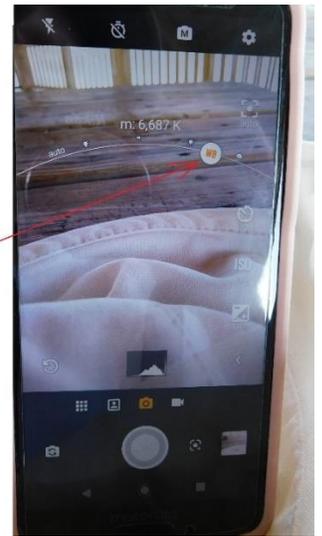

This icon and arc correspond to the focus. Please set it to auto-focus.

This icon and arc control the white balance. Please move it close to the cloud icon.

This is the ISO icon and arc, please set this to the lowest option (usually 100 or 150).
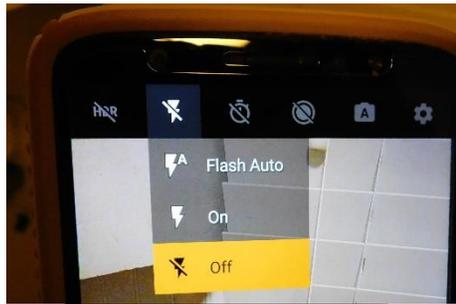
This arc controls the shutter speed. Please select 1/30 to 1/200 depending on the brightness.
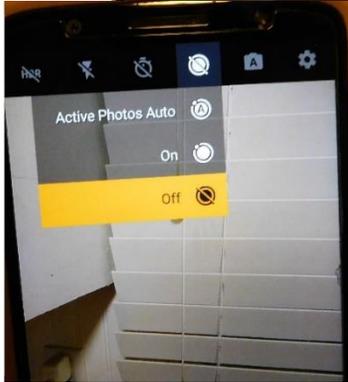
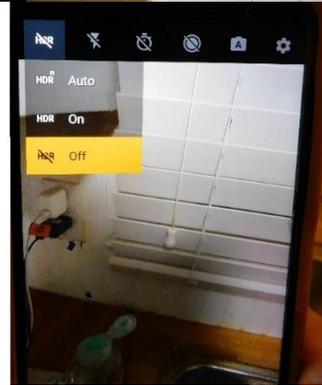This arc corresponds to the bias. Please set this to 0.0.

Please turn the flash off.

Flash Auto
On
Off

Please turn Active Photos to the off position.

Active Photos Auto
On
Off

Please turn HDR off.

HDR Auto
HDR On
Off

Here is a photo showing what these settings will look like in a DSLR camera.

M   1/30   F9.0   ISO 100
-3..2..1..0..1..2.+3

AI SERVO   (1893)

If after making the above settings there is too much light (washed-out), you can reduce that by making a faster shutter speed (e.g., go from 1/30 towards 1/1000). On the other hand, if the light is too dark, you can improve this by lowering the shutter speed (e.g., go from 1/1000 toward 1/30). If it's a very overcast day, you'll likely need a value of 1/100; if it's barely overcast you may need a value of 1/200 to 1/750.

Magnification (aka zoom). This should be off (1x on smart-phones), 18 mm on a 18-55 mm lens. As with the above settings, this must be identical for the entire photo set.

Tracking auto-focus: if this is an option, please leave it on. It allows the camera to keep the center of the object in focus

While you photograph, please leave the display on Manual (sometimes called Pro) mode so you can be sure the camera has not accidentally defaulted back to Automatic.

If you have a digital camera that is not a smart-phone or DSLR but has a menu, please enter the menu mode and select as many of the above options as possible. If your camera uses a powerful laser (such as to focus) and it is not safe to shine this toward peoples' eyes, then please use a camera that is safe for this purpose. If you have a lens hood, please remove this. If your smart-phone has a wide-angle lens adapter please remove that.

Optional reading: why must we use manual mode? The reason is because the photogrammetry software, which analyzes the billions of pixels from the many photographs you take (typically 100 photos per sculpture), assumes that any difference between two pixels in two or more photographs is because they represent different parts of an object. That assumption is violated if your camera is on 'auto' mode since the well-meaning digital camera is constantly changing the white-balance, ISO setting and shutter speed to enhance your image. While an automatically made image may look great, the photogrammetry software gets totally confused and fails when these settings vary from photo to photo. So, we must ensure that the camera settings are absolutely identical for every photo in a set. When you're done with the photo set, please return to automatic mode so you can continue to get great photos irrespective of your environment.

Part 2: Select an ideal day, time and location.

- Ideal day and time: the photography must be done outside and ideally on a totally overcast day between 10 am and 4 pm. Rain or snow will not work (obviously), but you can do this in any temperature that you, your subject(s) and camera can tolerate. A very mild breeze is OK but wind that moves hair or clothing will not work as the entire subject(s) must be still for the time needed to get all the photos.

- Ideal location: please do this in a place that you have some privacy and minimal vehicle or pedestrian traffic. Objects (whether cars, pets or people) coming into and out of the scene will confuse the photogrammetry software and those images will have to be retaken without such objects in view. Inquisitive people may stop to watch (or worse: speak to you) which may break your rhythm or cause your subjects to change their expressions (maybe laugh then sigh?), which means you have to start over. Please be safe since you are going to be in a mental zone of great concentration: only do this in a place where you are not going to step on something dangerous like ice or into a pot hole, walk into something dangerous like a large cactus or an electric fence, trip over something dangerous like a tree root, or accidentally fall off a platform or over a cliff.

Optional reading: why must this be done outside but not under direct sun light? Once the camera is in manual mode with a low ISO (in turn a critical part of photogrammetry analysis), everything in the photo will seem dark unless you are outside. Although you can get images in direct sun, this will cause hard shadows that can hide detail and if you choose to have the sculpture printed in color those areas will look black. Plus, if there is a shadow on your subject this might move if it is coming from you or if you take too long to do the photography – both of which will confuse the software. A cloudy day is perfect since there is ample light but no hard shadows. Flashes are a "no-no" – there would be way too many and this would give everyone a migraine, seizure or worse.

Part 3: Practice your technique.

Hopefully our how-to video gave you a good idea of what the motions will be to take the 96 photos for a typical session. Here's a review.

Step 1: figure out how big the clock-face should be. You do this by asking your tallest seated subject to make a chicken-wing shape of her/his arm so the elbow is pointing at your, you then move closer or farther from that person so that you can just barely touch her/his elbow with the fingers of your extended arm.

Step 2: draw the numbers of a clock-face around the subjects. This is optional.

Step 3: Go to the 3 o'clock position and begin taking 8 photos at each number on the clock face.
- o You will take two photos at each level: one is a far-away picture (to get the big-picture) from the subjects in which you will flex your elbows and hold the phone near your body. The other photos is close to your subjects such that your arms are fully extended.
- o There are four levels for each number on the clock. These are spaced evenly between a point that is just above the head of the tallest subjects to a level that is just below your belt (very close to the level of the seated subject's belt). As you approach the bottom levels, please ensure your posture is good so you do not hurt your back, knees or lose your balance.
- o For the top level, please tilt the camera down slightly but for all other levels ensure the camera is pointing straight ahead.

Below is a photo from the animation showing the clockface and 4 levels. In this snap-shot, the photographer friend has the smart-phone in the far-away position on level 2.

Other tips:
- Turn auto-review off, you will go much faster without this feature.
- Use an SD card so that your photos are saved to it which can save you a lot of time in transferring the photos to your laptop computer.
- Start at the 3 o'clock position and move clockwise. This is so you can get all of the face photos first before the expression changes too much.
- Only look into the screen for the top level to ensure you are still in manual mode.
- Hold the camera in landscape position (horizontal).

- Use the edge of volume button to take a picture and listen for the shutter sound to confirm the picture was taken.
- Avoid touching the screen with your finger or having it brush against your clothes as this may flip you out of manual mode.
- Move as fast as possible but come to a complete stop when you take a photo.
- It may help to imagine yourself playing a trombone in a marching band since the moves are almost the same (albeit a very enthusiastic trombone player who partially squats with each of the 4 long notes).

Optional reading: why can't we just take fewer pictures or at least just one per level? SUPER question.
- To get a 360-degree view of the subject from top and bottom angles, we need to have at least 3 but preferably 4 levels at each of 12 stations.
- The reason for having *both* the far-away and the close-up photos for each level is because most smart-phones have an aperture (F-stop) of 2 which means they can only have near *or* far things in focus at once, unlike DSLR cameras which are able to have *both* near and far objects in focus at once. Photogrammetry software can only orientate each photo if it knows how it fits with the other photos and determines this based on the details around the subjects (the trees, cars, side of buildings) so it needs to have a good focused image of distant objects. It also needs to have a good detailed image of the subjects. While a DSLR camera with a F-stop of 10-15 could do the job with only 50 photos, since a smart-phone has an F-stop of 2, the software needs about 100 photos so it can orientate each photo and also extract maximum detail about the subjects from the photos.

Part 4: Use proper clothing, props and select a pose.

Clothing: almost all clothing is fine with a few exceptions related to light-artifacts. Any clothing or items on the subject(s) that reflect light will cause glare artifacts and prevent those photo(s) from being used by the photogrammetry software, which may remove key details. Here's a list of items to avoid:
- Jewelry that reflects light such as those with gems or made of metals with the exception of wedding or engagement rings (but big gems may need to be covered with a little cloth if there is a lot of glare). Earrings, bracelets and chains may be problematic if they are large, sparkle or reflect light.
- Clothing that reflects light such as safety vests, leather jackets, some satins, big metal belt buckles, big metal buttons or zippers and reflective decorations (e.g., broaches, studs).
- Glasses (prescription, reading or sun-glasses) with glass. If someone wants to wear frames-only without glass lens that is fine so long as the frames are not reflective.
- Hats, helmets, veils, scarves etc.: though popular, hats cast a big shadow over the face and we lose key details. Very small head coverings without a brim (such scarves and religious coverings) are fine. Solid military-style berets may work so long as only the ear is covered, but if they have shiny objects on them this may make photos of the head unusable. Helmets never work since almost all reflect light. Veils are not possible since the semi-transparent nature cannot be captured by the 3D image.
- Make-up: this is usually fine with the exception of glitter that can create light artifacts and large eyelashes which may cause a shadow over the eye. If you plan to have a full-color sculpture, then please wear whatever you wish. If you plan to have a monochromatic white sculpture then make-up will not create an effect that some wearers are aiming for e.g., it will not make the cheekbones look higher.

Props – which can include chair(s), benches, balls, guitars, roses etc. – are all fine….so long as they don't cause a glare. This is usually not a problem on an overcast day, but if you are going to try this in the shade of a building and the sun is shining, reflections from nearby building or car windows may enter your area and cause problem unless you cover up things that reflect light with cloth or other material.

Body's pose

When selecting a pose, the most important consideration is to choose a pose that someone (person or pet) can hold for the 2-3 minutes needed to get the 100 photos. Unless a pet or a child less than 2 years old is sleeping, it may not be possible to include them using this method. Adults who cannot sit perfectly still such as those with some neurologic conditions (e.g., essential tremor, Parkinson's disease, Tourette's syndrome) may not be good candidates for this method, but if only the hands are affected then we may be able to sculpt those manually if the software gets confused. If you are in our area and we are using our 72-camera synchronized rig after the Covid-19 pandemic ends, that's ideal for those who are unable to remain still for 2-3 minutes as we can get 360-degrees worth of photos in less than 1 second.

Standing rarely works since even the slightest sway can create double images such as two left-ears, two left feet and other strange forms. Sitting is better but it's essential to have the subject(s) with full back support, not sitting on the edge or middle of their chairs without back support.

If there are two or more subjects, there will be less movement if they are cuddling or touching in a close way. This is especially good for infants and young children who should sit on an adult's lap and/or be held by an adult (or if multiple children then tucked close together). Young children may be best imaged if their heads are on the chest of an adult so they don't wiggle around too much. Two or more adults should have their bodies close (though heads not necessarily touching) and if possible, bodies touching to prevent sways and double images.

Holding onto an object may work if that object is held by two points (e.g., a basketball between a hand and a leg; a rose held with two hands) but the arms should be close to the body with the elbows touching the trunk so there is minimal sway.

Head's pose, eye gaze and expression.

The subject(s) should either close their eyes or pick a spot to look at and stare at it, blocking out noise or visual distractions and just focusing on it. BUT: that spot should be somewhere within the sculpture such as looking at an object or looking at someone else's nose (both subjects will laugh if they try to gaze into each other's eyes as you are taking 100+ photos, so the other person's nose is a better place from them to focus). In contrast, gazing outward such that the sculpture looks like a traditional bust, trophy, 2D photograph or selfie is discouraged unless you and the subject really want an outward gaze. The reason is because these sculptures are like fine art – not everyday photos or portraits – and in the fine art tradition, a natural pose often reveals the subject's most endearing features and emotions.

The most practical expression is a smile. The reason is because this photography activity is weird: almost everyone starts to laugh at some point…. especially if they start with a serious expression and you tell them not to smile! But, if the moment calls for a non-smile and the subject(s) are willing to go for it, then try to go 2-3 minutes without laughing yourself and it might work.

Obviously, people need to breathe -- we encourage that! Breathing may cause mild artifacts in the chest area but we can smooth those out during editing. Please ask that subjects avoid taking big sighs if possible, if they do then delete those photo(s) and retake them.

Practice then go for it. Do a dry-run so the subject(s) know what to expect but without taking photos. Then do the real-thing, but if it doesn't work then redo. Thankfully, digital photos are free so there is no waste of film.

Please remember what we cannot accept:
- We cannot accept any photos of any human private parts regardless of age or extent. This includes the exposed chest of a newborn girl or anyone's bottom. This may seem overly cautious, but it's impossible to draw a line for a

given age when things may not be acceptable. But, if the newborn girl is in her 'birthday suit' but sleeping next to her parent such that her chest and bottom are not exposed, that's fine.

- We cannot accept any photos that have hand or arm gestures, body poses or written text or symbols that imply or show violence, domination over or cruelty towards people or animals.

Part 5: Please send us the photos.

A typical photo set has 100 high quality (3-9 MB per photo) which is too much for email so please use a drop-box service then send us a temporary link (Contact@SolidMemories.net) with folder-level permission so we can access and download the photos. Google-drive® is free and very popular, and there are other such services. Please remember: we will never sell, share or publish your images unless you give us explicit written permission (we will also never publish or sell your email). Once we are done making the 3D image, we will delete the individual photos from our computers.

Terms and considerations.

- We do not charge for making a 3D image and you have no obligation to purchase anything.
- We wish you all the success in the World, but taking photographs may be dangerous based on your environment, your subject's medical conditions or your medical conditions. Some examples (not exhaustive) follow in which case it is your decision whether to proceed and we can take no responsibility for the outcomes.
  - o If you live in a dangerous location (e.g., hidden electrical wires, electric fence, animals roaming freely, trip hazards, fall hazards including obstructions or ice, uneven or slippery surfaces), you or others may fall, walk into something or the object your subject(s) are sitting on may collapse.
  - o If you have a condition that could get worse by bending over or standing up straight, that condition could be worsened by this activity. If you have a condition that makes it hard for you to safely walk around someone and vary the level of your head while standing, this may be a dangerous activity. For example, if you have back, hip, knee, neck, ankle, muscle, balance or nerve problems.
  - o It is possible that you may get fatigued, drop and damage or destroy your camera or other property or accidentally hurt others while doing this. You may accidentally bump into and hurt someone while you are focused on the subject(s), or may not see someone walking towards you who is distracted or visually impaired and walks into you and causes harm to herself/himself, you or others. Accidental trauma from this activity that affects you, the subject(s), bystanders or others passing by could result in chronic pain, disability, psychological harm or even death.
  - o Although we advise that you take every precaution in selecting an environment, photographer and subject(s), Solid Memories LLC will not be held responsible for any physical or psychological injuries that you or others incur regardless of the severity or consequences, nor be responsible for any damage to personal property or related problems from doing any of the activities described in this document, website or ongoing communications such as email for guidance clarification. Please only proceed at your own risk.
- Although we will not accept any nudity in the photos, we will accept photos of women or girls without head coverings. If getting such photos is illegal in your Country or community, or if any type of photography or transmission of such photos to or from us is illegal, please do not participate; we will not know where the photographs are taken, the local laws or customs and cannot advise on this.
- When we send you a 3D image that is a result of processing the photos you share with us, we will do so to the same email that you sent the images to us by using 'reply' as a way to avoid making typos in your email address such that we may inadvertently send images to someone else. In the unlikely event that we send the completed image to someone else and discover this, we will inform you when we become aware of this and, as follows, we will attempt to confirm that the image has not been kept, copied, posted or shared but we cannot guarantee the recipient will honor those requests so only proceed if you are willing to accept this small risk. In the event that you receive an

image intended for another customer please contact us within 24 hours of discovering such an error; do not keep, copy, post or share that file; and please delete that email.

- We cannot provide translations of this document, if needed please have it translated by someone competent in your preferred language and in American style English.
- If at any time either party, you or us, find it difficult to work together then neither is under any obligation to continue in this work relationship. In the event that we have invested time and use of equipment or material prior to your request to purchase a final product, you are under no obligation to compensate for our time, use of equipment or material. If you have requested a final product based on being satisfied with a preliminary image of the anticipated final product, and we then invest additional time, equipment or material to generate this, you may not be eligible for a refund based on our discretion. In the event of a dispute, resolution will be sought in Courts at our headquarters which is in North Charleston, South Carolina, USA.
- By using any of our products or services you agree to these terms.

Final pep talk:

Most people CAN do this. The rewards are enormous: a timeless sculpture of your loved one(s) in a pose that you and they love, that is taken at a place and on a day at your convenience anywhere you wish. ***Good luck!*** 😊