Through the Lens

A guide to digital photography for computer enthusiasts. After the click of your camera, you're only half done!

Focus Stacking

by Lynda Buske

The depth-of-field you get with a photo–the amount of your image that appears in acceptable focus–is controlled by three factors: lens aperture, lens focal length, and distance to the point of focus. To maximize depth-of-field, use a small aperture, a short focal length, and a long distance to the point of focus.

While you can influence your depth-of-field with these three factors, you can't always get the depth-of-field you want. This could be because of artistic concerns such as framing and relative size of near/far objects, or physical considerations such reaching the limit of the aperture or focal length of your lens. Another possibility is you are in a low light situation and cannot use a small aperture to create a long depth of field.

You can circumvent the limitations and increase the amount of your image in acceptable focus through a technique known as focus stacking. You take multiple images focused at different distances and then combine them using software so that the sharpest parts of each image are used to create a composite with an extended depth-of-field.

Close focus

Far focus

Focus stack of 40 separate images

Considerations/issues

- **Focus breathing:** with many lenses, the focal length changes as you change the focus distance. In the example above the candle in the "Close focus" image appear larger than the "Far focus" image. Objects that change size are a challenge to focus stacking software.
- **Movement in frame:** You can't successfully merge images if objects in the image move between frames.
- **Exposure:** use manual exposure to ensure the exposure doesn't change between shots. This makes it easier for the focus stacking software to blend images.
- **Tripod:** while possible without using a tripod, focus stacking software works best if the camera doesn't move.
- **Amount of change in focus between shots:** It can be an exercise in trial and error figuring out just how much change in focus distance you should have between shots. Some cameras, such as the Nikon D850 and Nikon Z-series cameras can help. They have a focus stacking mode that can automate the process of taking multiple images while changing the focus between frames.
- **Software:** Some focus stacking software is simply better than others.

While it can be challenging, a successful focus stack can give you an image with an overall sharpness you simply can't get through any other means.

Some focus stacking software

Free

- CombineZP - http://combinezp.software.informer.com/
- PICOLAY - http://www.picolay.de/

Paid

- Helicon Focus - https://www.heliconsoft.com/heliconsoft-products/helicon-focus/ (US$30/year, US$115/lifetime. Up to four computers for non-concurrent use.)
- Zerene Stacker - https://zerenesystems.com/cms/stacker (US$89. Up to three computers for non-concurrent use.)

Full photo editors with focus stacking capabilities

- Adobe Photoshop https://www.adobe.com/ca/products/photoshop.html (US$10/month for Photoshop/Lightroom bundle. Up to two computers for non-concurrent use.)
- ON1 Photo RAW 2021 https://www.on1.com/products/photo-raw/ (CA$138. Concurrent use on on up to 5 Windows or MacOS computers)
- Affinity Photo - https://affinity.serif.com/en-gb/photo/ (CA$70. Concurrent use on all computers you own. Separate licenses required for Windows and MacOS)

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