

Close-up and Macrophotography

Getting close

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Agenda for the evening

- Welcome and introductions
- Overview definitions of macro, micro, and close-up
- Discuss how to get closer to your subject
- Demonstrate tools for macro photography
- Discuss the techniques for macro shots
- Touch on lighting techniques
- Critique some example shots
- Wrap-up by 8 PM

Learning Objectives

At the end of this session, you will be able to:

- Define macrophotography, microphotography and close-up photography
- List means for getting closer to subject
- Discuss benefits and problems with each means
- Discuss gear options for macrophotography
- Apply techniques to stabilize your camera for close-ups
- Discuss options to control and optimize depth of field
- List lighting options for close-up & macro photography

History of Macro Photography

- 1830s Fox Talbot made first quality images through a low-power microscope
- Early 1900s close-up photography blended science and art – insects and flowers
- 1950s extension tubes and bellows were used; first true macro lens in 1955
- SLRs in the 1960s allowed a better view of subject and close-up medical photography became common
- Nikon developed “affordable” macro lens and ring flash for intra-operative medical photography

Keys to Macro & Close-up

- Stability
- Razor sharp focus
- Depth of field
- Lighting – not tonight



Macro Photography

- Macro photography allows extreme close-ups at life-size on sensor (1:1 ratio)
- Micro photography (photomicrography) is done through additional optics to allow great magnification of the subject
- Key is closeness to the subject
 - Add a magnifying lens (mistakenly called a close-up filter)
 - Move lens farther from the sensor plane (extension rings / bellows)
 - Use a dedicated macro lens
 - Very close focus distance
 - Edge-to-edge sharpness

Cost of getting Close

Close-up lenses - \$13 – 30
 Extension tubes - \$10 – 300 (\$100)
 Bellows - \$40 – 1400 (\$130)
 Lens - \$470 - 1400

Close-up and Macro Photography

- Extreme close-up shots near 1:1 size
- Specialty macro lenses
 - Close to subject – extension tubes help
 - Close-up adapters/lenses
 - Lens reversal
- Stabilization is critical
 - Tripod, remote shutter release, mirror lock-up
- Extremely shallow depth of field
 - Want small aperture and slow shutter speed
 - Consider “Focus Stacking” software
- Good lighting

Magnification Ratio

- How large is the subject on the sensor compared to real-life
- Some define “true” macro as 1:1 or greater
- Sensor size : life size (1:2 means image is ½ life size)
- Calculations: $R = (t + f)/f$
 - R = magnification ratio
 - t = total distance between lens and mount
 - f = focal length of lens

$$R = (100 + 30)/100 = 1.3x$$

Why are my close-ups so bad?

- Lighting
 - Too little light
 - Shadows
- Sharpness
 - Lens selection – too close for lens minimum focus distance
 - Camera shake – lack of proper stabilization
 - Focus – to and fro movements – lack of proper stabilization
 - Depth of field – distance, lens and aperture

How to shoot macro

- Identify your subject
- Consider lens selection and minimal focus distance
- Set-up tripod so lens is at its approximate closest focus distance
- Use remote shutter release
- Consider background and lighting
- Fine-tune focus by moving camera (focus rail)
- Use manual focus, live-view (magnified)
- Set small aperture for maximal depth of field
- Expect long shutter speed if ISO is low
- Consider supplemental lighting

Lens Characteristics

- Prime or zoom
- Focal length (mm)
 - Angle of view
 - Reach
 - Magnification
- Maximum aperture (f-stop)
 - Speed
- Focusing speed
- Image stabilization
- Minimal focus distance

Aperture trumps focal length

Macro Lens Characteristics

- Very close minimum focus distance
- Very sharp image across field

Macro Lens Choices

- Multi-purpose
- Single purpose

Stabilization Gear

- Your tripod is your most important accessory
- Tripod
 - Aluminum versus carbon fiber
 - Height – maximum and minimum; weight
 - Stability
 - Leg sections, locks, elevator, and other features
- Head
 - Pan (3 axis) head, ball head, (or gimbal)
- Focusing rail
- Quick connect – ARCA Swiss versus proprietary
- Monopod and other stabilization devices – not helpful
- Spend the money now or spend more later!

Camera Stabilization

- Quality tripod and head
 - Size and weight
 - Aluminum versus carbon fiber
 - Heads
 - Pan and tilt – three planes
 - Ball head
 - (Gimbal head)
- Other stabilization – (monopod, bean bag, noodle, window mount, rifle-stock), Gorilla-pod
- Proper hand-held technique – difficult for macro
- Image stabilization (in lens or some cameras)
 - Not usually used for tripod macro work
- Mirror lock-up or timer
- Remote shutter release

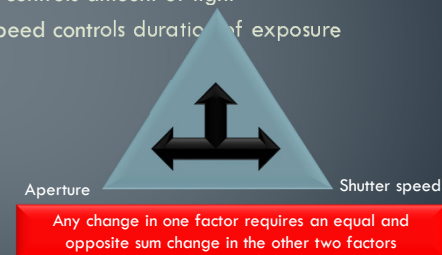
Trouble-shooting a blurred image

- Is subject in focus?
 - Did subject move?
- Is anything in focus?
 - Did auto / manual focus fail?
 - Was there camera shake?
- Is the depth of field adequate?



Exposure Control Triangle

- Three elements control exposure
- ISO sets sensor sensitivity
- Aperture controls amount of light
- Shutter speed controls duration of exposure



One "stop" or EV (exposure value) implies a doubling or halving of exposure.

f-stop Pro and Con

High f-stop

- Small aperture
- **Wide depth of field**
- Slow shutter speed
- Diffraction softening
- ~~Star effect in bright light~~
- ~~Motion effects~~

Low f-stop

- Large aperture
- **Narrow depth of field**
- Fast shutter speed
- Freeze action
- Minimize camera shake

Therefore, to use a small aperture at a low ISO we need a longer shutter speed – stabilization gear is necessary.

Depth of Field



- Distance between nearest and farthest objects that are in **acceptable** focus
- Precise focus is at a single point in a plane
- Any plane nearer or farther the light point on the sensor will appear as a circle
- When focus of the circle is sufficiently small to appear to be a single point, we say focus is acceptable
- The actual size of the circle is called the “circle of confusion”
- The distance of the subject that yields an acceptable circle of confusion (i.e., a point) before and behind precise focus is the depth of field

Determinants of Depth of Field

- Image magnification
 - How the camera sees the subject
 - Sensor size – larger = more DoF
 - Effective focal length – longer = less DoF
 - Distance – closer = less DoF
- Aperture
 - Set f-stop
 - Larger opening (lower f number) = less DoF

Depth of field is **very** short

- Relatively long focal length
- Close to subject
- Large aperture

Keep focal plane **parallel** to subject!



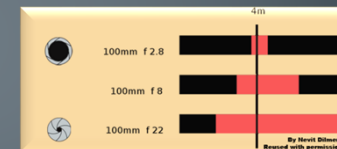
Macro photography – Depth of Field

- Determinants of depth of field
 - Apparent magnification
 - Distance from subject
 - Focal length
 - Aperture
 - Large = less depth of field
- Focal plane and angle of subject



Depth of Field

- At closest focus distance and maximum magnification, depth of field is determined primarily by aperture



Actual DoF Table for 100mm Macro

	F2.8		3.5		4		5.6		8		11		16		22		32	
U	ND	FD	ND	FD	ND	FD	ND	FD	ND	FD	ND	FD	ND	FD	ND	FD	ND	FD
101	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	1.9665	2.0348	0.588	2.0430	1.0530	2.0484	1.0355	2.0602	1.9100	2.0594	1.8752	2.0598	1.8282	2.0598	1.7658	2.3110	1.6840	2.4717
3	1.2871	1.1128	0.2841	1.3193	1.2822	1.3193	1.2750	1.3221	1.2511	1.3255	1.2310	1.3255	1.2060	1.4116	1.1712	1.4942		
4	0.9930	1.0071	0.9914	1.0068	0.9904	1.0068	0.9884	1.0140	0.9810	1.0199	0.9733	1.0284	0.9527	1.0407	0.9481	1.0587	0.9284	1.0853
5	0.7960	0.8041	0.7951	0.8050	0.7945	0.8056	0.7922	0.8080	0.7890	0.8114	0.7845	0.8162	0.7783	0.8221	0.7697	0.8332	0.7580	0.8479
6	0.572	0.5704	0.5736	0.5700	0.5740	0.5698	0.5743	0.5688	0.5752	0.5676	0.5765	0.5658	0.5784	0.5632	0.5811	0.5597	0.5850	0.5548
7	0.476	0.4751	0.4766	0.4746	0.4771	0.4747	0.4773	0.4742	0.4778	0.4735	0.4785	0.4725	0.4796	0.4710	0.4811	0.4690	0.4833	0.4662
8	0.429	0.4284	0.4296	0.4282	0.4298	0.4281	0.4299	0.4278	0.4302	0.4273	0.4308	0.4266	0.4315	0.4255	0.4325	0.4241	0.4340	0.4222
9	0.394	0.3936	0.3944	0.3935	0.3945	0.3924	0.3946	0.3922	0.3948	0.3920	0.3951	0.3924	0.3956	0.3915	0.3965	0.3909	0.3972	0.3796
10	0.369	0.3687	0.3693	0.3689	0.3694	0.3680	0.3694	0.3684	0.3698	0.3682	0.3698	0.3688	0.3697	0.3683	0.3697	0.3687	0.3694	0.3604
11	0.344	0.3438	0.3442	0.3437	0.3443	0.3430	0.3444	0.3430	0.3446	0.3424	0.3449	0.3428	0.3453	0.3423	0.3457	0.3428	0.3453	0.3405
12	0.333	0.3328	0.3332	0.3328	0.3332	0.3327	0.3333	0.3326	0.3334	0.3325	0.3335	0.3323	0.3337	0.3320	0.3339	0.3328	0.3335	0.3321
13	0.322	0.3218	0.3222	0.3219	0.3223	0.3219	0.3223	0.3217	0.3223	0.3219	0.3223	0.3219	0.3223	0.3219	0.3223	0.3219	0.3223	0.3217
14	0.315	0.3140	0.3151	0.3148	0.3152	0.3148	0.3152	0.3147	0.3153	0.3146	0.3154	0.3145	0.3155	0.3143	0.3157	0.3140	0.3160	0.3138
15	0.307	0.3069	0.3071	0.3069	0.3071	0.3069	0.3071	0.3068	0.3072	0.3067	0.3073	0.3066	0.3074	0.3064	0.3076	0.3062	0.3078	0.3059

2.0348 – 1.9665 = 0.0583
Or ~2.3 inches

0.02 inches

2.2098 – 1.8282 = 0.3816
Or ~15.0 inches

0.13 inches

Expanded Focus (Depth of Field)

- Focus stacking software
- Merge multiple overlay images at sharpest points
- Stable tripod necessary +/- focus rail
- Photoshop
 - Select images
 - Open as layers
 - Align images
 - Merge images
- Helicon Focus
 - Controls the camera and creates series of layered images
 - Merges at sharpest points

Focus Stacking

- Shoot series of images with increasing focus depth
- Vary focus by about 1/2 of depth of field
- Download to Lightroom and process tone, contrast, etc.
- Edit in Photoshop as layers
- Select all layers and edit- Auto-align layers
- Edit Auto-blend layers
- Flatten image and apply adjustments as needed; crop
- Save into Lightroom and close file

Macro Photography

- Lighting options
 - Natural light
 - Reflectors
 - Ring light / ring flash
 - Twin lights
 - Regular off camera speedlite
- Background
 - No distracting elements
 - Shallow depth of field

Cost of Illumination

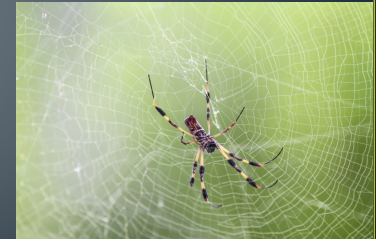
- 5-in-1 reflector - \$30
- Ring flash - \$550
- Ring light - \$110
- Multi-flash - \$900

Flower and Plant Photography

- Still subjects and a variety of lenses
- Lighting is key (consider off-camera flash)
- Wind is enemy
- Depth of field is critical
- May need dark background cloth
- Tripod and polarizing filter are valuable

Outdoor Macro Kit

- Camera, lens, tripod, remote shutter release, polarizing filter
- (Focus rail, extension tubes, bellows)
- Ring light, ring flash, or strobe
- 5-in-1 reflector
- Knee pads
- Black velvet scrap



Good to Great Photographs

- Good photographs
 - Proper exposure
 - Sharp focus
 - Nice composition
 - Good subject
- Great photographs
 - Emotional impact / visual tension
 - Creativity and style
 - Feeling and emphasis
 - Seeing and understanding
 - Unique perspective / lighting

Keys to Macro & Close-up

- Stability
- Razor sharp focus
- Depth of field
- Lighting – not tonight



Summary

- Don't forget the "keys"
 - Stability
 - Focus
 - Depth of field
 - Lighting
- Put together a "macro kit" with the tools you need
- Shoot any time, any day, any place
- Critically review your images
- Have fun on those long winter days

Summary

- The Teton Photography Club thanks you for joining us today and invites you to future presentations
- Enjoy your photographic opportunities
- Understand your photography gear
- Critically review and share your images
- Experiment with new techniques and perspectives
- Learn composition techniques
- Practice, practice, practice but most of all enjoy making photographs

Thank you for joining us!