

# Digital Camera

Jaeho Chong 2026



12억 5000만개, sold 150times more than digital camera



944만개

# Objective

- 여행 출사를 가기전 최소한의 사진기술을 이해하자.
- Camera History, Principle
- Camera Specification
- Camera Operation
- HDR, Exposure bracketing
- Focus stacking
- ND filter, Slow Shutter
- 별사진
- 플래쉬 사용법



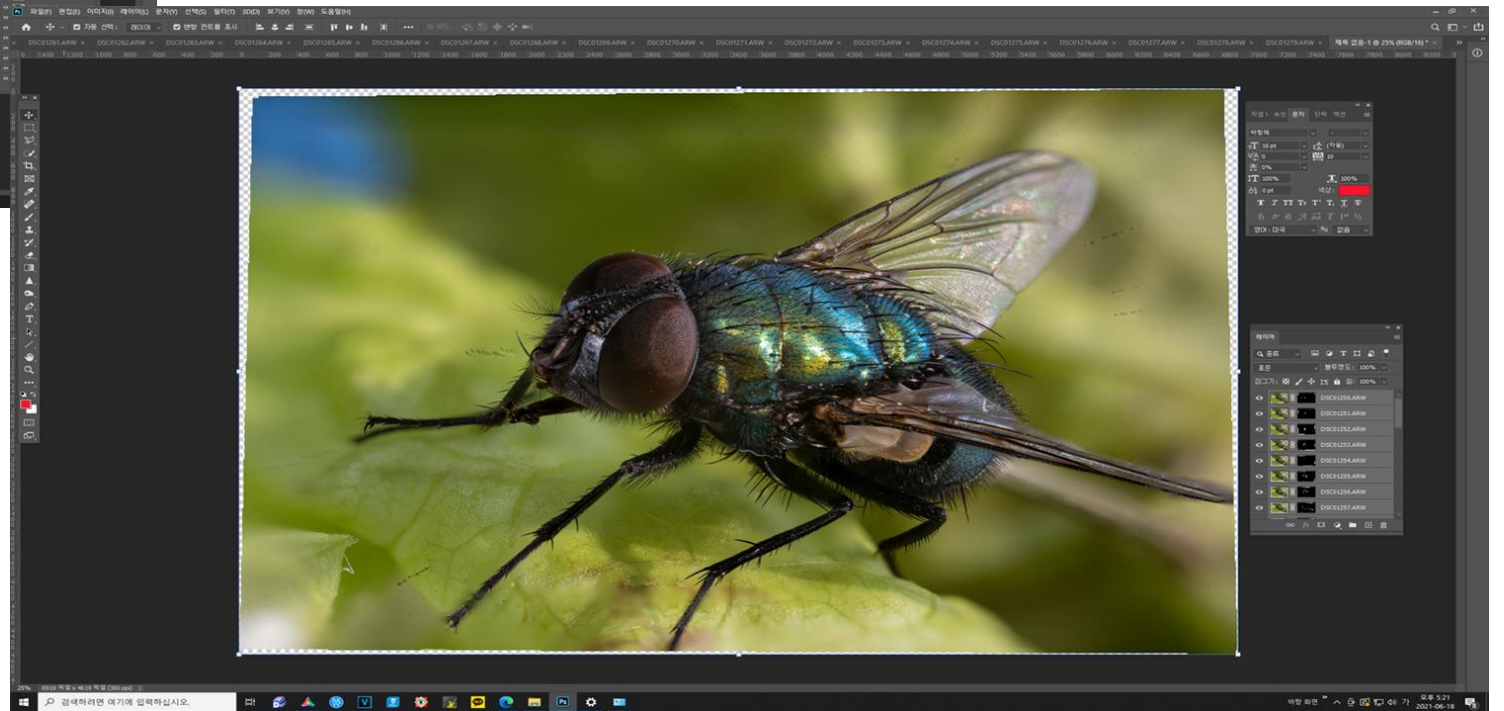
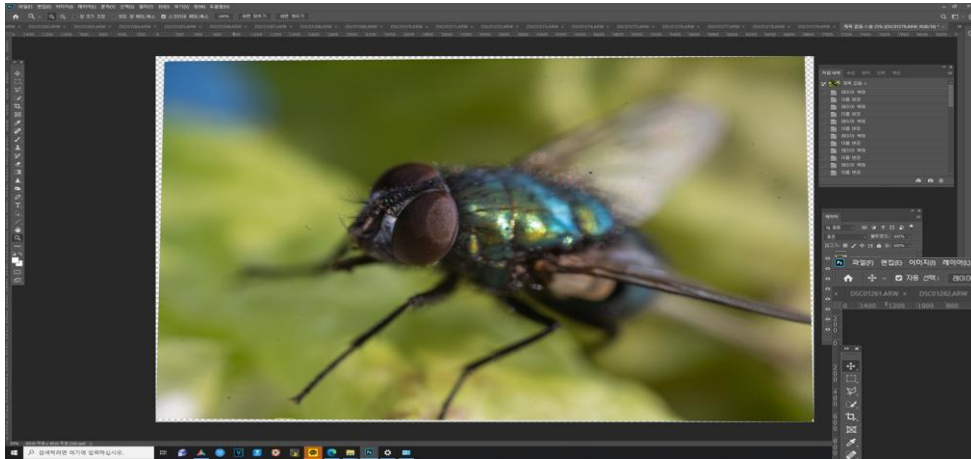
# HDR, Exposure bracketing

Highend CCD: 14 f-stop  
중급형 CCD: 12~13 f-stop  
APS-C CCD: 10~11 f-stop  
Phone CCD: 9 f-stop

인간의 눈: 24 f-stop  
Photo paper: 6~9 f-stop  
Monitor: 10~14 f-stop



# Focus Stacking



# ND filter

비교: ND 필터 사용 유무에 따른 폭포 촬영 (ND Filter Comparison)



그냥 찍은 사진 (No Filter)

설정: 셔터 속도: 1/500초 | 조리개: f/8 | ISO: 200

결과: 거칠고 역동적인 물의 움직임 포착, 선명함  
물의 각 물방울과 포말이 생생하게 표현됨.

ND 필터 사용 (ND Filter - 30s)

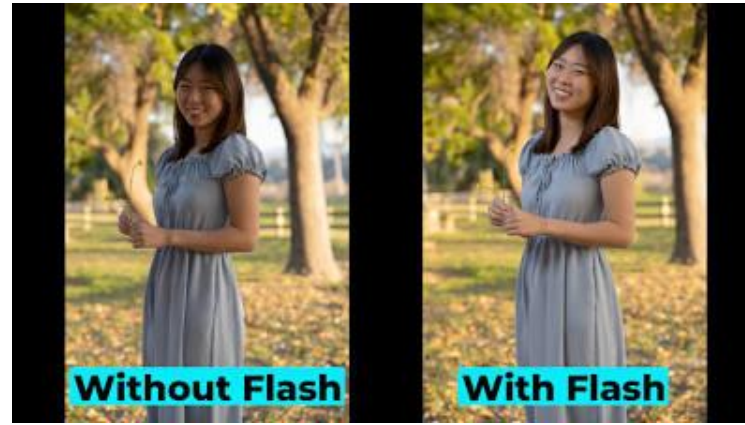
설정: 셔터 속도: 30초 | 조리개: f/16 | ISO: 50 | 필터: ND1000

결과: 부드럽고 몽환적인 비단 같은 물결, 흐름 강조  
시간의 흐름이 느껴지는 평온하고 예술적인 분위기. ✨

# 별사진



# 후라쉬 사용법

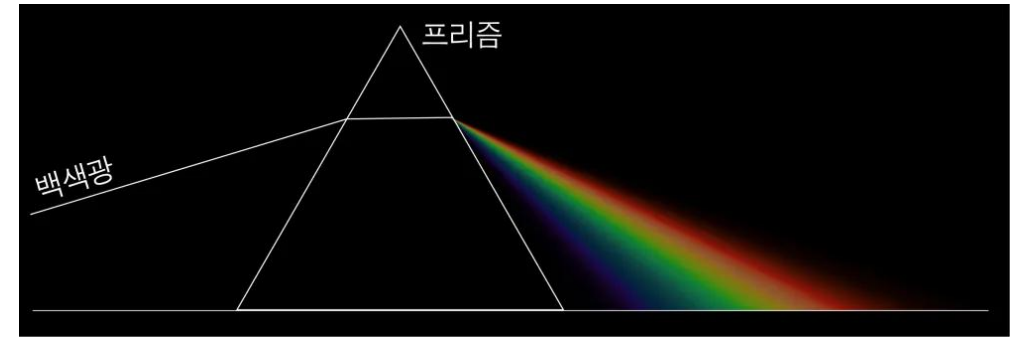


# Camera History

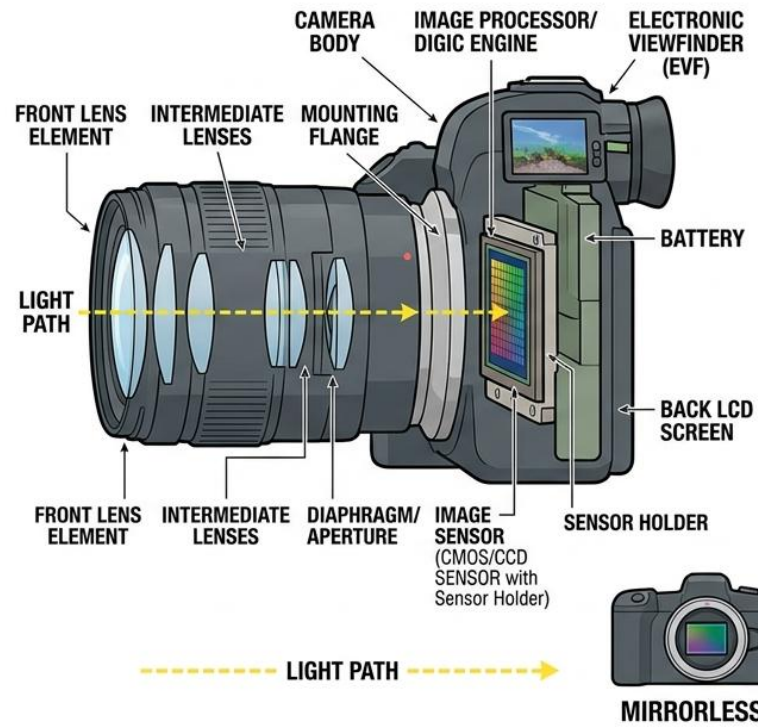
- (1) First view Camera: 1830~1840
- (2) First 35mm Camera: 1913
- (3) First Interchangeable camera: 1930
- (4) First Auto focus: 1977
- (5) First Digital SLR(1.3MP): 1987
- (6) First high resolution(60MP) Camera: 2015
- (7) First body Stabilizer: 2004
- (8) First Mirrorless Eye Focus: 2013



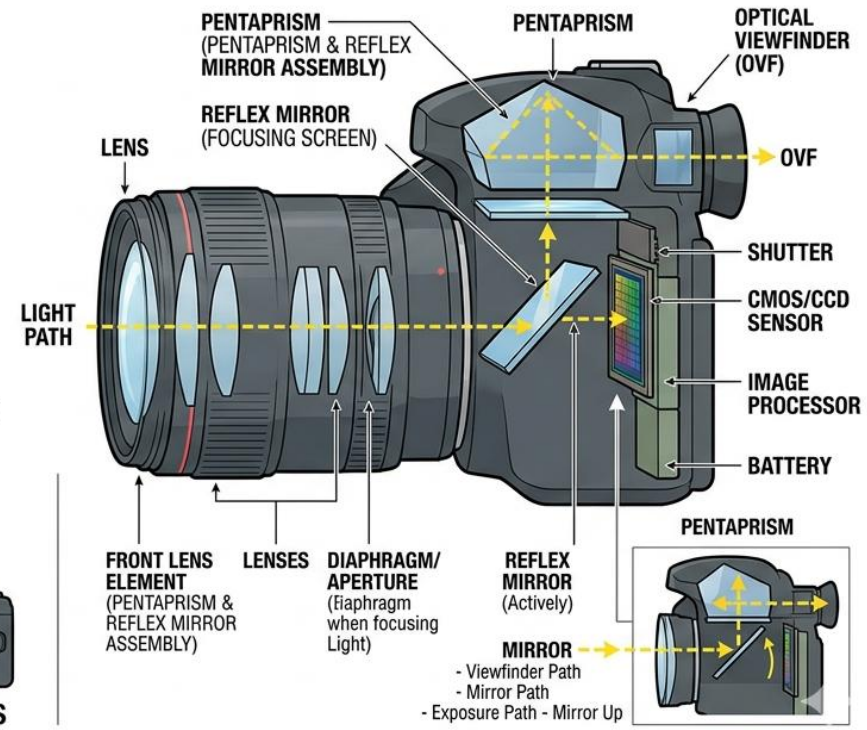
# Digital Camera



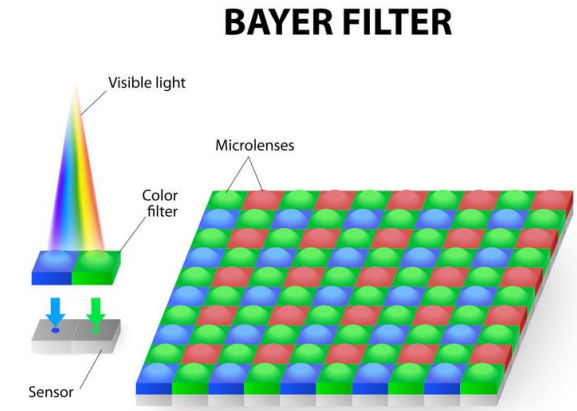
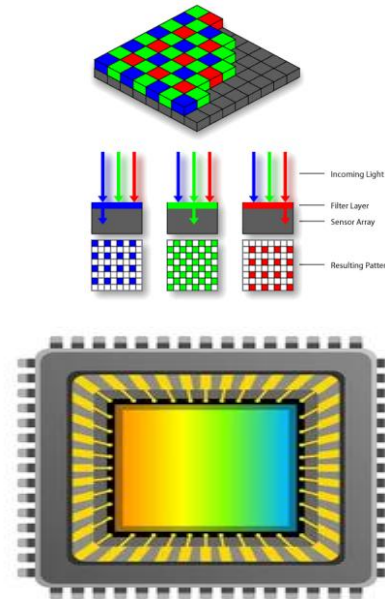
**MIRRORLESS DIGITAL CAMERA**  
(CROSS-SECTION)



**DIGITAL SLR (DSLR) CAMERA**  
(CROSS-SECTION)



# 카메라 원리

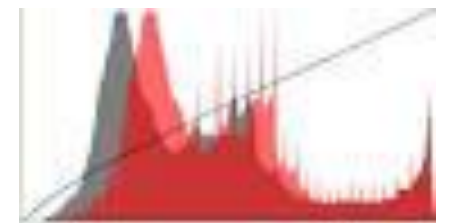
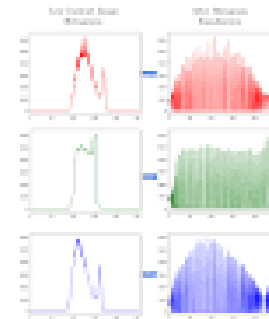


- 바늘구멍 사진기
- 렌즈와 필름 발견
- Solar panel같은 카메라 센서의 역할(Pixel)
- Red, Blue, Green 빛의 삼원색
- Analog 신호를 Digital signal 로 변경
- 이미지생성과 압축파일의 장점

1	00000001
2	00000010
3	00000011
4	00000100
5	00000101
6	00000110
7	00000111
8	00001000
...	
...	
255	11111110
256	11111111

# Camera Specification

- Interchangeable lens (SLR)
- Sensor Size, Resolution, Dynamic range
- Image stabilization
- Mirrorless
- Flash sync speed
- Monitor display configuration
- Light room capability
- Histogram





# Basic Camera Operation

(1) ISO (ASA/DIN) setup

어두운 실내, 실내, 흐린 실외, 밝은 실외

(1) Exposure mode set (M, A, S, P)

(2) Aperture, Shutter speed set

(4) Composition

(5) Steady camera hold

(6) Focus

(7) Shutter release at right timing

(8) Manipulate images by Photoshop or Lightroom



# Lens Angle by focal length

Rule:  $\text{Angle} = 2 \times \text{ArcTan}(18/\text{focal})$

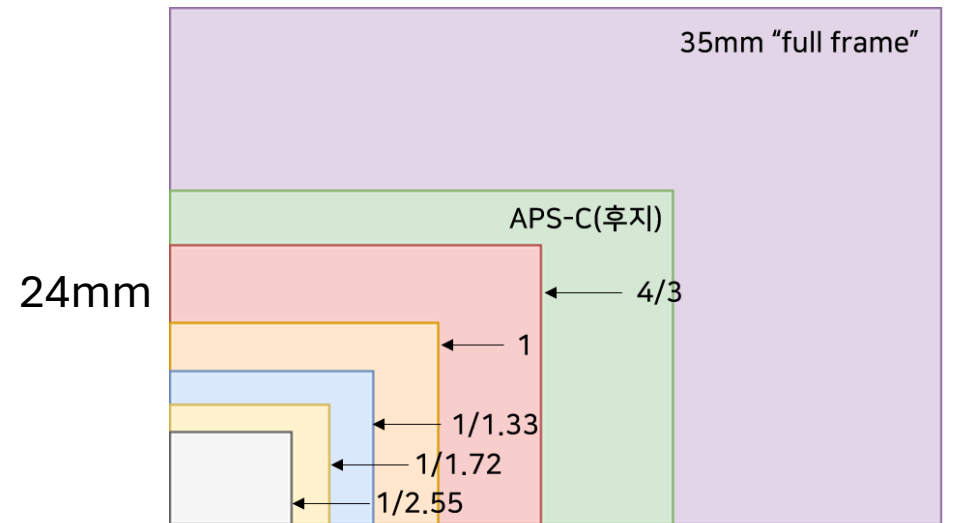
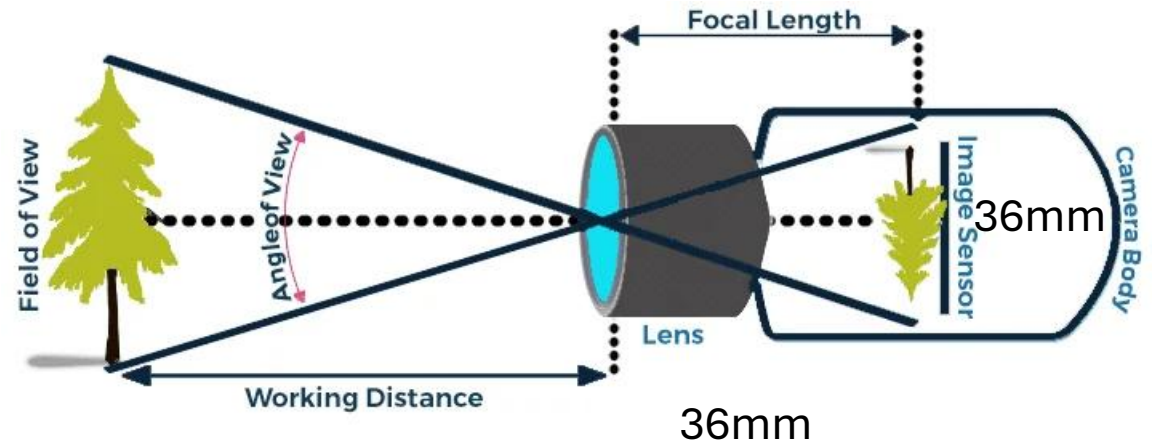
Wide angle lens: 12mm ~ 35mm

Standard lens: 50mm

Telephoto lens: 70 ~ 300mm

Zoom lens: 12 ~ 24, 24 ~ 70, 70 ~ 200

APS-C lens 1.5x factor



# Understanding of F-Stop

Rule: Exposure f-Stop: ISO(50, 100, 200, 400, 800, 1600...)

Shutter speed (1,  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ,  $\frac{1}{16}$ ,  $\frac{1}{30}$ ,  $\frac{1}{60}$ ,  $\frac{1}{125}$ ,  $\frac{1}{250}$ ,  $\frac{1}{500}$ ,  $\frac{1}{1000}$ ....)

Aperture (Lens area: 1,  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ,  $\frac{1}{16}$ ,  $\frac{1}{30}$ ,  $\frac{1}{60}$ ,  $\frac{1}{125}$ ,  $\frac{1}{250}$ ,  $\frac{1}{500}$ ....)

(Lens radius: 1,  $\frac{1}{1.4}$ ,  $\frac{1}{2}$ ,  $\frac{1}{2.8}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5.6}$ ,  $\frac{1}{8}$ ,  $\frac{1}{11}$ ,  $\frac{1}{16}$ ,  $\frac{1}{22}$ ,  $\frac{1}{32}$ ....)

# Understanding of F-Stop







	Aperture	Shutter	ISO	
밝다 ↑	1.4	1/4	25600	거칠다 ↑
	2	1/8	12800	
	2.8	1/15	6400	
	4	1/30	3200	
	5.6	1/60	1600	
	8	1/125	800	
	11	1/250	400	
어둡다 ↓	16	1/500	200	부드럽다 ↓
	22	1/1000	100	
	32	1/2000	50	

# 색깔에 따른 compensation

Incident vs Reflected light

색깔별 반사량 순서 (높은 순):

흰색 > 노란색 > 빨간색 > 파란색 > 보라색 > 검은색.

-  흰색 (White)      •  노란색 (Yellow)
-  빨간색 (Red)      •  파란색 (Blue)
-  보라색 (Purple)      •  검은색 (Black)

# HDR, Exposure bracketing

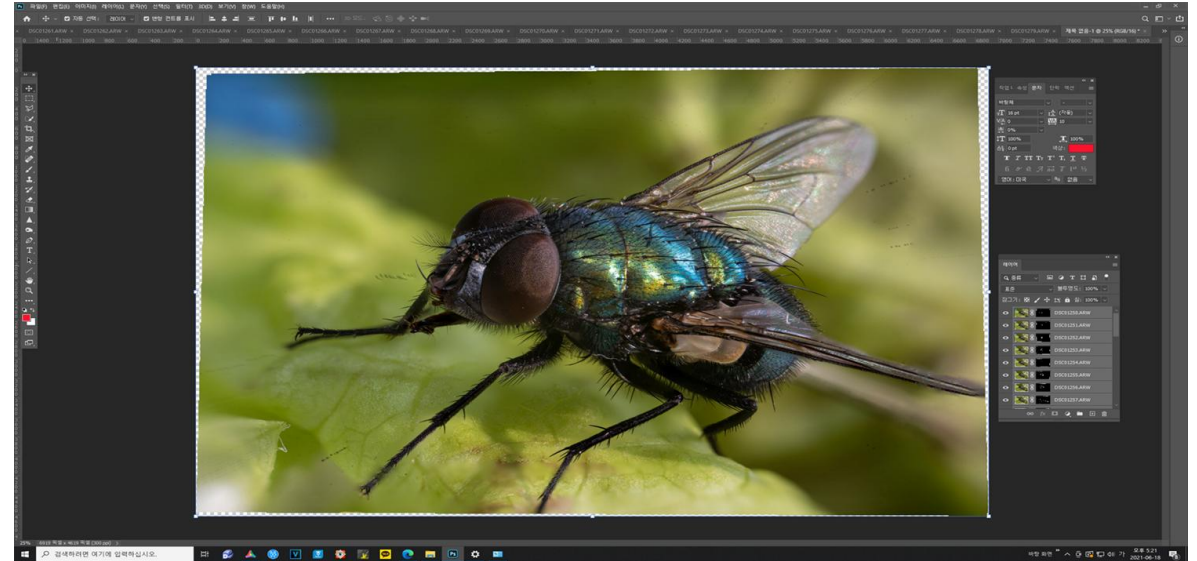


-3, -2, -1, 0, +1, +2, +3 F-Stop 으로  
사진을 7장 이상 찍는다.

Photoshop 으로 7장을 합성한다.

Photoshop / File / Automate / Merge to  
HDR pro

# Focus Stacking



- Open multiple images
- Copy each image create multiple layers
- Edit > Auto align layers
- Edit > Auto Blend Layer > Stack images

# ND filter

## Fixed ND filter

**특징:** 빛 감소율이 고정되어 있어 화질 저하가 적고 색 왜곡이 거의 없습니다.

**종류:** ND2(1스톱), ND4(2스톱), ND8(3스톱), ND16(4스톱), ND64(6스톱), ND1000(10스톱) 등.

## Variable ND filter

**특징:** 두 장의 편광 필터를 겹쳐 회전하며 광량을 조절, 1개의 필터로 다양한 농도 표현 가능.

**장점:** 편리함, 영상 촬영 시 연속적인 빛 조절.

**단점:** 고배율에서 화질 저하 및 X자 형태의 검은색 라인이 생길 수 있음.



# 별사진

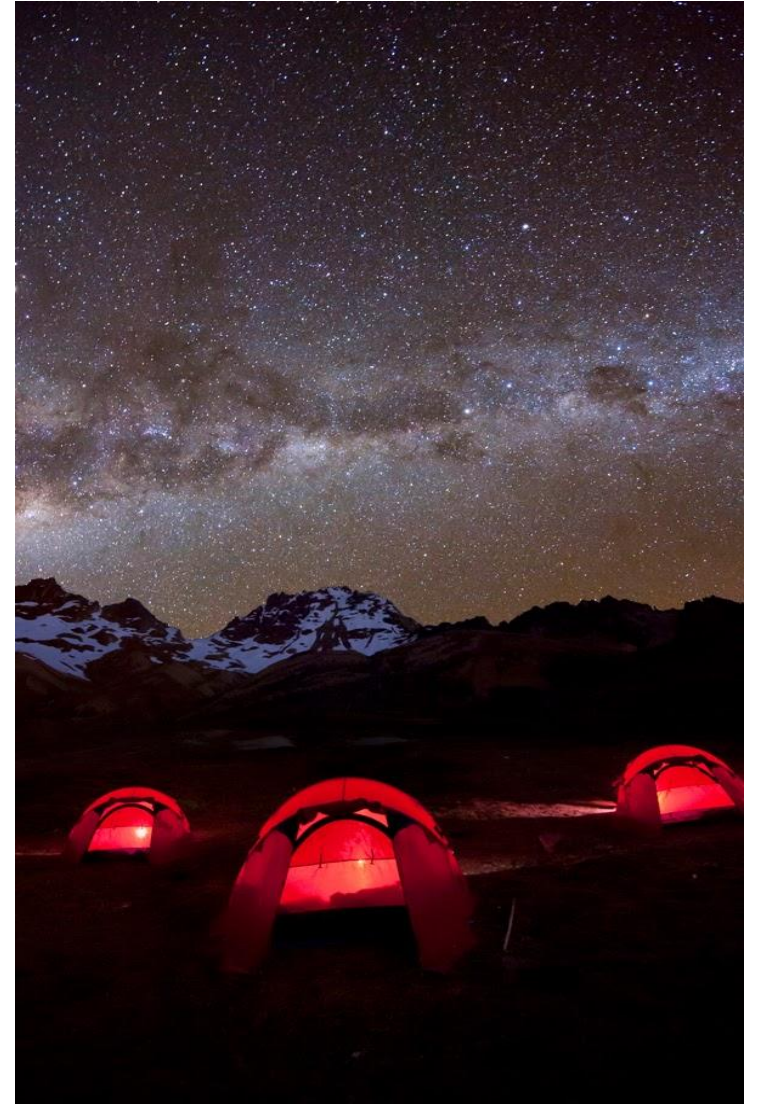
북반부에서는 여름밤 11시쯤 찍는다.  
구름이 없구 바람이 앓불면서 달이  
없을때 촬영

Tripod 와 Shutter Release를 쓴다.

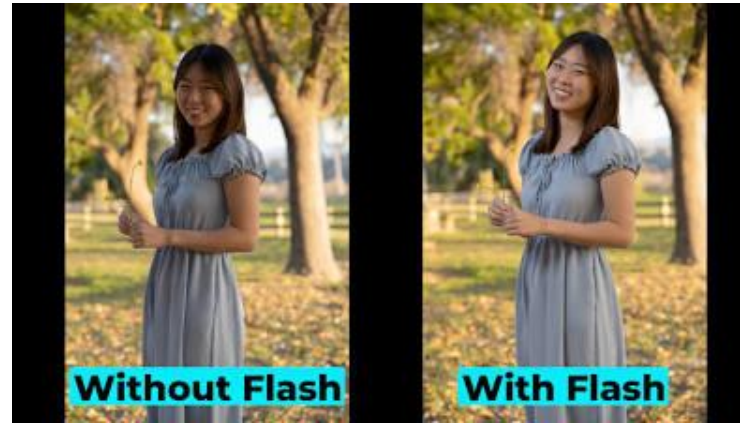
렌즈는 단촛점 12mm, 18mm, 20mm  
포커스와 노출은 Manual

Shutter Speed는 30초를 넘기지  
않는다. (최대노출=500/렌즈 촛점거리)

ISO는 400~1600 정도



# 후라쉬 사용법



텅스텐 플라쉬 벌브(1950), 전자식 플라쉬(1970)

Manual flash, Automatic Flash, TTL Flash

Flash 노출 -3 fstop: 날씨가 아주 흐릴때

Flash 노출 -2 fstop: 날씨가 맑고 배경이 밝을때

Flash 노출 1 fstop: 창문앞

Flash 노출 0 fstop: 배경이 굉장히 밝을때

# Multiple Flashes



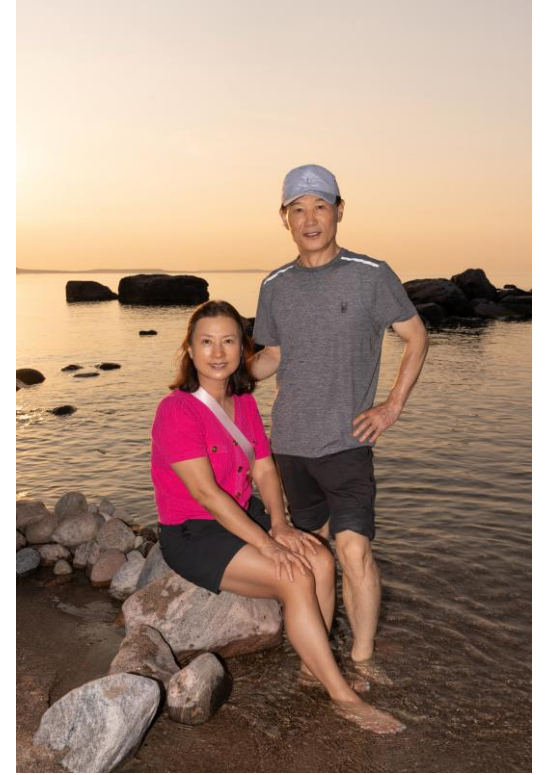
Godox Flash wireless system

Godox Trigger

Godox Flash

TTL or Manual flash used

# SKY replacement



Photoshop을 이용하여 하늘을 바꾼다.  
Edit / Sky replacement

# Face Portrait

Photoshop 필터를  
이용해 빛반사를  
제거한다.

필터를 이용해  
점들을 없앤다.  
필터를 이용해  
주름을 없앤다



# Lightroom

Lightroom Catalog - Adobe Photoshop Lightroom Classic - Library

File Edit Library Photo Metadata View Window Help

The screenshot displays the Adobe Lightroom Classic interface in the Library grid view. The main workspace shows a large photo of an elderly woman with short grey hair, wearing a black vest over a pink and white striped shirt. The interface is divided into several panels:

- Left Panel:** Contains the 'Navigator' (FIT, 100%, 12.5%), 'Catalog' (All Photographs: 5078, All Synced Photographs: 0, Quick Collection: 8, Previous Import: 51, Photos That Failed to Export: 1), and 'Folders' (Windows-SSD (C:) 330 / 953 GB, 2024: 1560, 2025: 3383, with sub-folders for dates from 2025-01-01 to 2025-01-06). 'Import...' and 'Export...' buttons are at the bottom.
- Top Right:** Navigation tabs for 'Library', 'Develop', 'Map', and 'Book'. The 'Library' tab is active.
- Right Panel:** Features a 'Histogram' with a color-coded graph and camera metadata: ISO 1000, 135 mm, f / 2.8, 1/60 sec. Below the histogram are buttons for 'Original Photo', 'Early Access', 'Assisted Culling', 'Culling Scores', 'Quick Develop', 'Keywording', 'Keyword List', and 'Metadata'. 'Sync' and 'Sync Settings' buttons are at the bottom.
- Bottom:** A filmstrip showing 17 photo thumbnails. The first two are selected. The status bar indicates '51 photos / 51 selected / AR503653.ARW'. A 'Filter: Filters Off' dropdown is on the right.

# Photoshop

