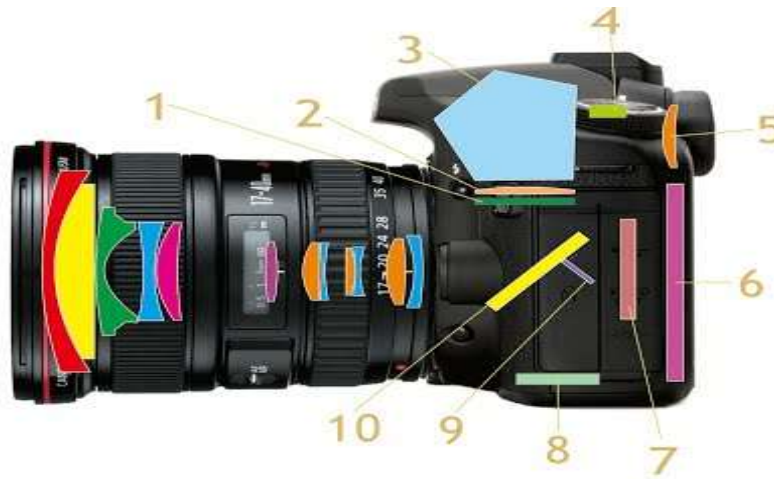


Topic 41

Digital Imaging Device



Key components in DSLR cameras

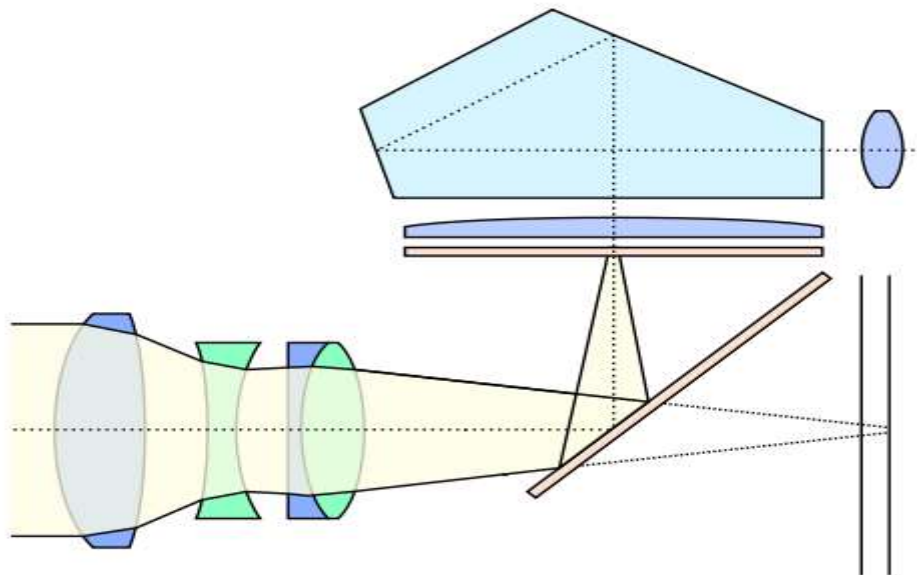
In the above figure, we can see that there are several key components in a DSLR camera, which are listed as follows with their respective functions:

1. Matte focusing screen: A screen on which the light passes through the lens will project.
2. Condensing lens: A lens that is used to concentrate the incoming light.
3. Pentaprism: To produce a correctly oriented and right side up image and project it to the viewfinder eyepiece.
4. AF sensor: It's full name is autofocus sensor, which is used to accomplish correct auto focus.
5. Viewfinder eyepiece: To allow us to see what will be recorded on the image sensor.
6. LCD screen: It's full name is liquid crystal display, which is used to display the

photos stored in its memory card, settings and also what will be recorded on the image sensor in the live view mode.

7. Image sensor: A device that contains a large number of pixels for converting an optical image into electrical signals. The commonly used types are charge-coupled device (CCD) and Complementary Metal-oxide-semiconductor (CMOS).
8. AE sensor: Its full name is auto exposure sensor, which is used to provide exposure information and adjust the exposure settings after calculations under different situations.
9. Sub mirror: To reflect the light passes through the semi-transparent area on the main mirror to the autofocus (AF) sensor.
10. Main mirror: To reflect incoming light into the viewfinder compartment. It must be in an angle of exactly 45 degrees. There is a small semi-transparent area on it to facilitate auto focus.

Having an overall idea about the internal structure of a DSLR camera and the functions of different components, I will use the following figure to illustrate its working principle.



The basic working principle of a DSLR camera

In the above figure, we can see that light from the outside world first passes through the lens. After this, the light is projected on the matte focus screen through reflection by the main mirror. The condensing lens and the pentaprism then project the image formed on the matte focus screen to the viewfinder eyepiece by internal reflection. This explains why we can see the image that will be taken by the camera through the viewfinder.

When we need to take a photo using autofocus, we can first press the shutter button half-way down to trigger the process. During this process, the light is directed to the AF sensor by the sub-mirror. The AF sensor then performs a series of calculations to achieve correct focus. After focusing, the main mirror will flip up (towards the matte focus plane). As a result, the light coming from the lens can reach the image sensor. A digital image is formed after the light has been converted to electronic signals by the image sensor.

Mirror less Interchangeable Lens Cameras (MILCs)



Mirrorless interchangeable lens camera



The internal structure of a MILC

From the above figure, we can see that there are some common components with DSLR cameras mentioned in the previous part, for instance image sensor and LCD screen.

However, unlike a typical DSLR, there are no mirrors, and therefore no optical viewfinder, in a MILC, as what it called. Also, MILCs use contrast-detect autofocus, which is achieved by measuring the contrast within the field of the image sensor, instead of phase-detect autofocus, which is achieved by dividing the incoming light into pairs of images and comparing them, that is being used in conventional DSLR cameras. In addition, auto exposure of MILCs is dealt with by the image sensor in real time, rather than being done by a dedicated AE sensor in conventional DSLR cameras. Furthermore, most MILCs do not have a viewfinder, but only the LCD display. This can be a great disadvantage under strong sunlight since it is very difficult to see what the LCD display shows due to reflection of sunlight.