

Basic Knowledge of Cultural Properties Photographs

Text & Worksheet

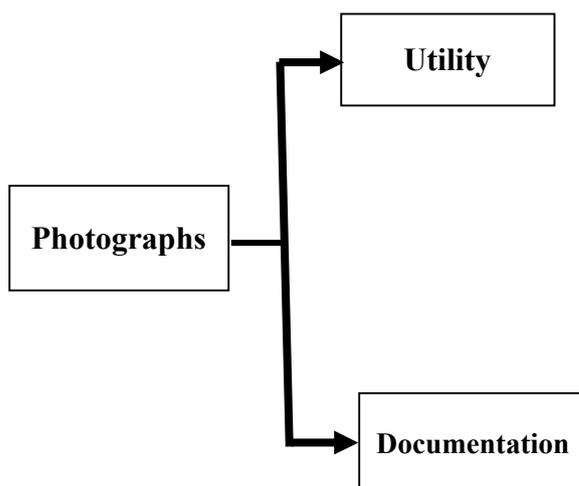
1. Introduction

Photographs are indispensable for study of cultural properties. However, cultural properties photograph taken without proper understanding of the objective and mechanism of photography will not yield an abundance of information. It is important to store the cultural properties photographs that record an exhaustive amount of information for a long time as the materialized cultural properties. How to take and preserve the photographs with a large amount of information and high utility value is explained in this text and worksheet.

2. Role and types of photographs of cultural properties

Photographs of cultural properties include photos used for work and documentary photographs obtained by research and restoration. Documentary photographs have a role to provide detailed and verifiable high-quality photographic image for posterity, therefore, it is necessary to preserve the information on a long-term basis.

Worksheet: Role of photographs



3. Types of cameras

There are several types of cameras in film and digital. The larger the film or digital sensor size, the larger the camera tends to be, and offers better picture quality.

Worksheet: Types of cameras

Film camera/Film size

(1) 35 mm camera

(2) Medium size camera

(3) Large camera

Digital camera/Sensor size

(1) Small format sensor

(2) 35 mm type sensor (full-frame format)

(3) Medium format sensor

4. Characteristics of digital cameras

There are many types of digital cameras according to size and type of image sensor such as CCD, and effective pixel count (hereinafter referred to as "pixel count").

Worksheet: Characteristics of digital cameras

***Pixel count**

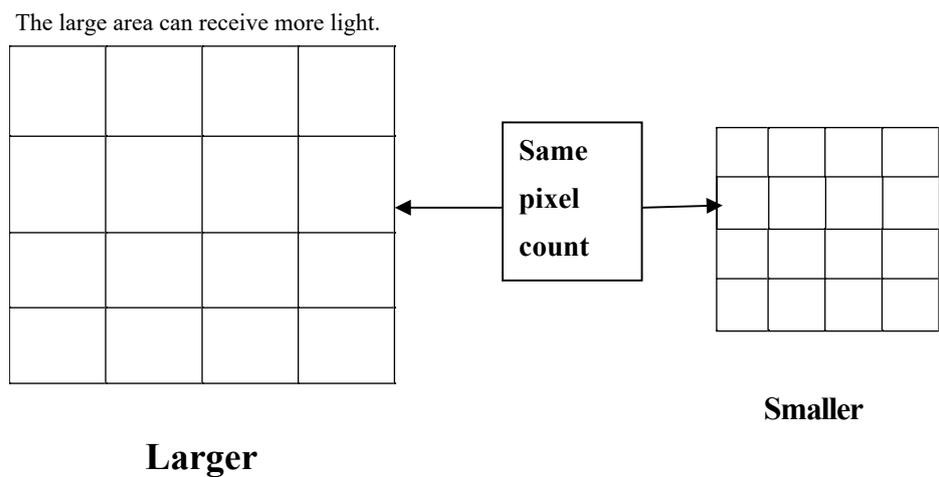
When a picture is enlarged, you can see the color tone is arranged in mosaic like array of squares to express the image.

***Gradation**

Gradation means a gradient from the bright (color) to the dark (color). Wide (detailed) gradation enables smooth reproduction of change in brightness and color

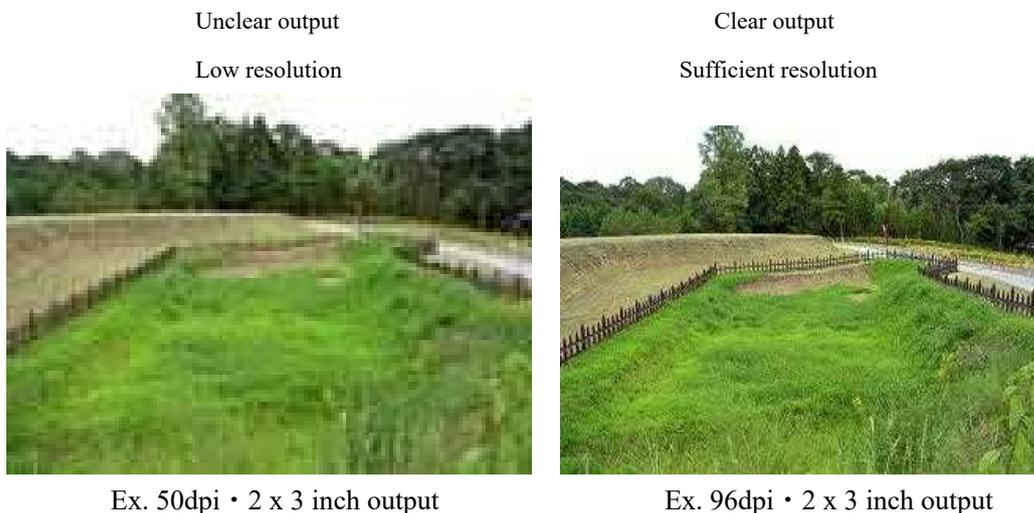
***Difference in sensor size**

Image sensors come in various sizes. The larger per pixel area can receive more light information, resulting in rich gradation. It can also gain the image with high sensitivity and less noise.



***Resolution (dpi)**

Resolution indicates density of pixels per unit area for output (dots per inch). The number of pixels required depends on output method and size



5. Digital photograph image saving format

Images photographed with a digital camera are first recorded as RAW image files. After that, general types of image data format such as JPEG or TIFF RAW is generated (developed). This development processing is performed within the camera according to its setting or processed with PC upon the RAW data output.

***RAW**

Generally, RAW data cannot present a photographic image without development processing. Such processing of RAW data by a computer with appropriate software makes various adjustment available.

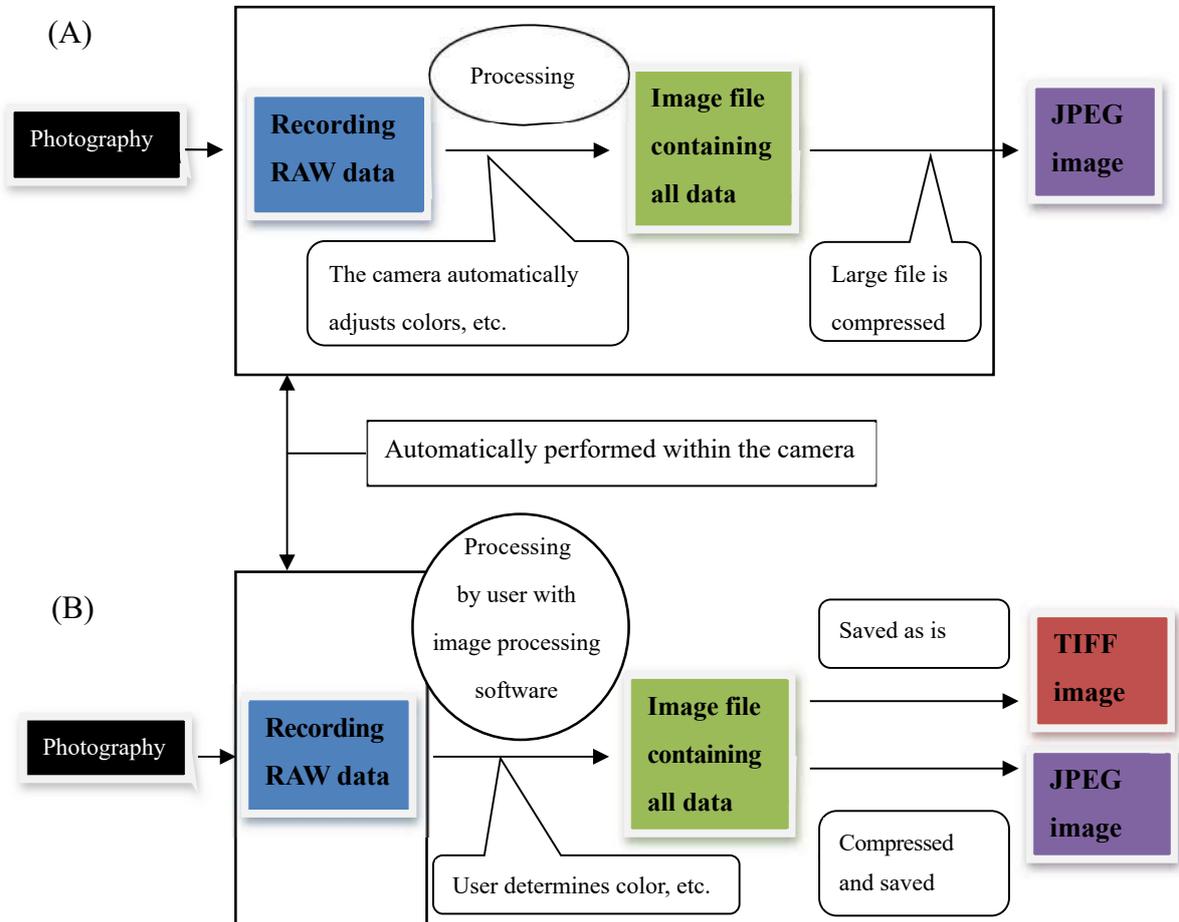
***JPEG**

Image data obtained by compressing a developed photograph to a degree not to bring about problems in quality. The degree of compression can be selected, and the compression rate affects the image quality.

***TIFF**

TIFF allows development processed photographic image data to be saved without compression. It simply consists of a mapped array of bits of optical data; therefore, TIFF is a stable format with a high potential for being reproduced in the future.

- Development processing within the camera (A)
- Development processing of RAW data by PC (B)



Worksheet: Creation (Development) of image

Processing of RAW format with PC

*“How to Photograph Cultural Properties: Procedures from Raw Image Photography to Image Processing”

Output of image processed within the camera

*“Camera Settings for Cultural Properties Photography: Without Using a PC”

6. Mechanism by which a photograph is taken

Up to this point, we have talked primarily about cameras. Now we will talk about the mechanism by which photographs are taken to produce the desired results.

Worksheet: Photographs and exposure

The purpose of taking a photograph is to record the subject exactly as it is. The light that is reflected from the subject and enters the camera through the lens must be properly adjusted. This is called "exposure."

***Function of aperture**

“Aperture” is a function attached to the lens to adjust the amount of light by changing the size of a hole through which the light can pass.

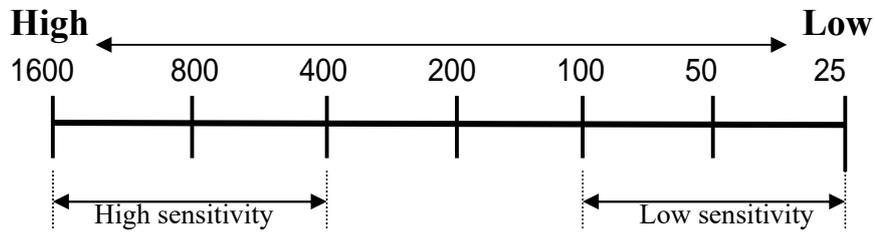
***Function of shutter speed**

“Shutter speed” is a function attached to the camera to control the length of time the film or image sensor is exposed to the light.

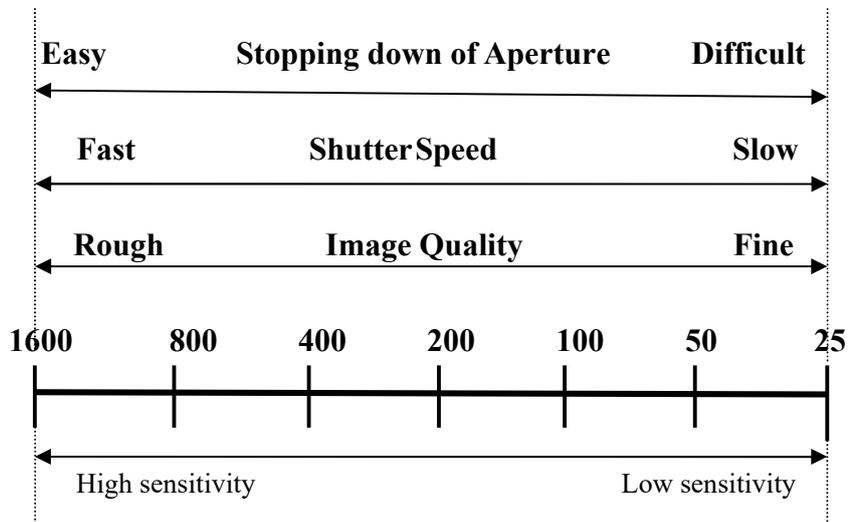
***ISO sensitivity**

The film or image sensor has a set capacity to sense the light, which is “sensitivity.” It is necessary to combine aperture and shutter speed properly to let the required amount of light according to ISO into the film or sensor.

ISO sensitivity



Correlation of ISO sensitivity and setting of aperture, etc.

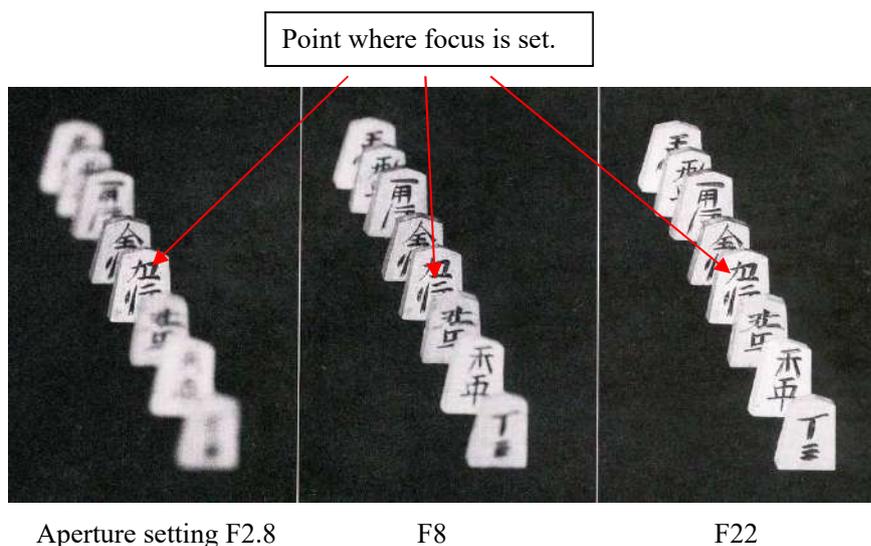


***Relation of “aperture” and “shutter speed”**

Understand the combination of aperture and shutter speed.

***Focus range = depth of field and depth of focus**

Aperture has another important role. By changing the aperture, “the area in focus” can be adjusted. Aperture setting makes focus range larger or smaller. This focus range is referred to as "depth of field."



The photograph taken with F22 appears in sharp image compared to the one with F2.8. However, too small aperture causes deterioration in resolution.

***Correct exposure and exposure compensation**

Most cultural properties photography is of still subject, so the aperture value should be set based on the depth of field, then necessary amount of light according to the sensitivity is adjusted by shutter speed. Required light level is measured by exposure meter or built-in automatic exposure function of the camera in some case. When necessary, “exposure compensation” is adopted to adjust intentionally brighten or darken the exposure by increasing or decreasing the amount of light. In this way, “correct exposure” is achieved. For digital cameras, histogram serves as a standard to determine the correct exposure. (*Attachment: “Understanding a Histogram”)

7. Light orientation = Lighting

Lighting is one of the most important points when photographing cultural properties. Light orientation -- the angle at which light strikes the subject -- is an element that has a decisive effect on the quality of the photographs. Lights have specific roles such as "main light" to affect expression and atmosphere and "sub light" to adjust the brightness in shade. In addition, "top light" to adjust brightness of the background and "key light" to express details of the subject are sometimes used.

There are various types of lighting equipment different in heat quantity or color.

Worksheet: Orientation of light

***Main light irradiation direction and effect to three-dimensional subject**

***Forward light (light from the front)**

***Oblique light (light from the oblique direction)**

***Side light (light from the lateral side)**

***Top light (light from directly above)**

***Back light**

***Photographing pottery shards and stone tools from above**

To avoid the shadow of the subject from appearing in the background thereby making the outline unclear, the subject is placed on a sheet of transparent glass raised from the background.

***Photographing planar subjects such as ancient texts**

The entire subject should be uniformly illuminated. One or two light sources are set each on the left and right side of the copy stand at an angle of 45 degrees.

8. Composition

Photography is the act of forcing the subject to fit in a limited frame. The appearance of the photograph varies according to the way it is fit into the frame, in other words, the composition.

*Rule of thirds

This is a type of composition in which an image is divided into thirds, both horizontally and vertically, to arrange the subjects.

*Composition with the subject in center:

Composition with the subject positioned in the center of the picture. Overhead shot, etc.

*Camera angle

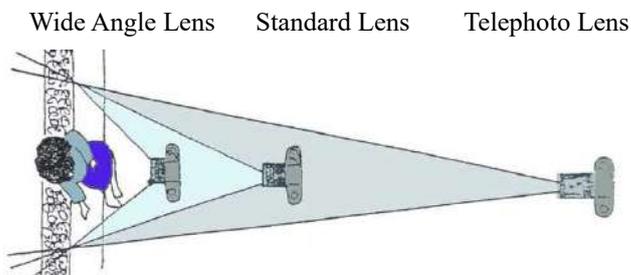
The impression varies according to whether the subject is photographed from a high or low angle, or from a frontal angle.

9. Lens

Lenses are classified by millimeter units. This is referred to as "focal length." If the focal length is small, it can photograph a wide angle (wide angle lens), and if it is large, it can zoom in on a limited range (telephoto lens).

For the subjects such as museum materials, standard or telephoto lens is used aiming at natural image. Wide angle lens is used to cover wider area such as outdoor photography.

In general, wide angle lens has more distortion, while telephoto lens has less.



Telephoto Lens

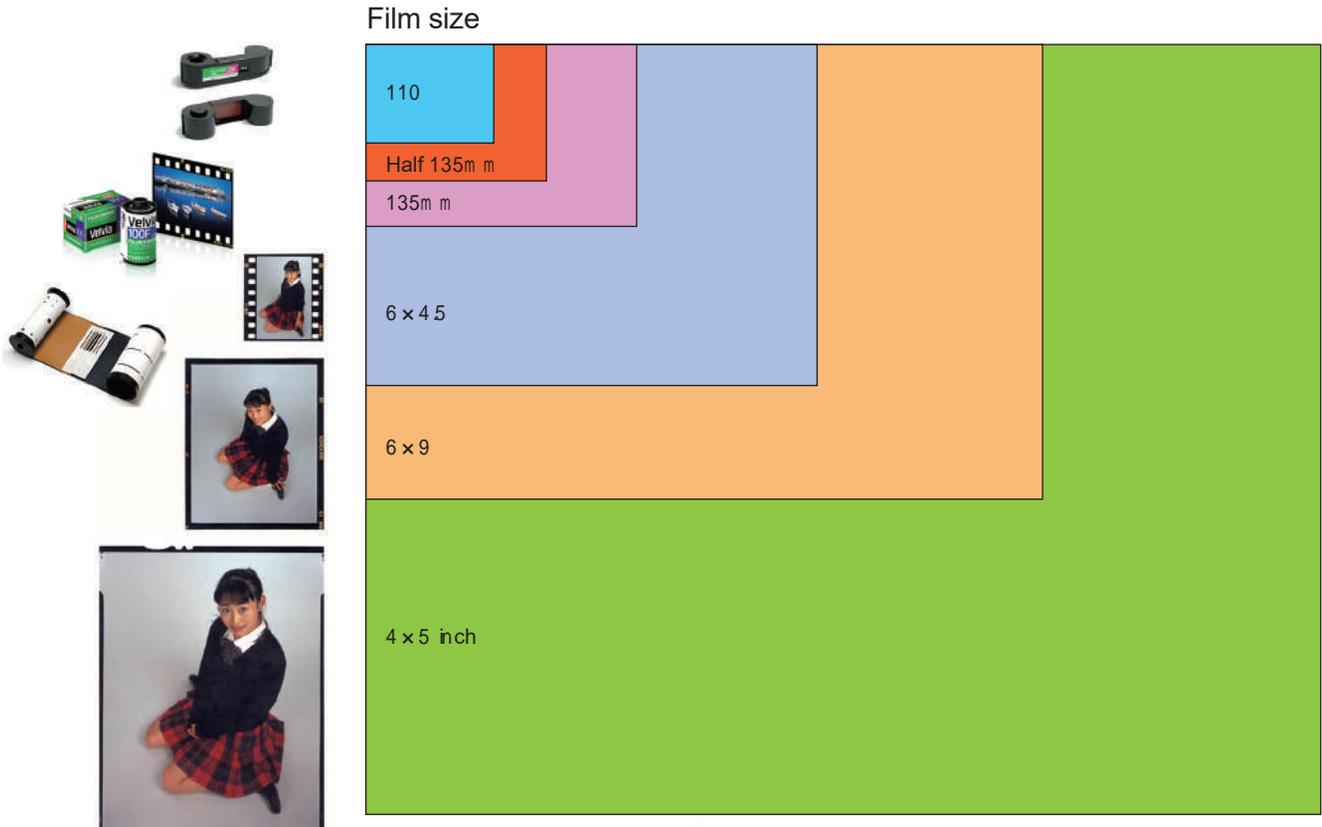


Standard Lens



Wide Angle Lens

Film Size and Sensor Size (actual size)



1/3 size Smart phone etc.



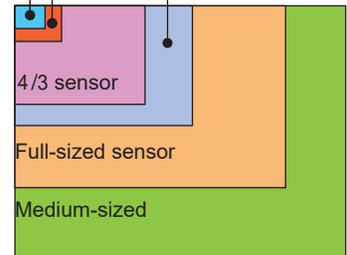
1/2.3 size Many types of compact digital cameras



4/3 size Many types of mirrorless cameras (Four Thirds system)



1/3 sensor
1/2.3 sensor
APS-C sensor



Sensor size

APS-C • Full-sized Single-lens reflex camera etc.



Full-sized sensor
(Canon EOS 6D)



APS-C sensor
(Canon EOS Kiss X7)

Medium-sized Digitalback, mirrorless, Single-lens reflex cameras

