
REFLECTANCE TRANSFORMATION IMAGING

GLOSSARY

OF PHOTOGRAPHIC AND TECHNICAL TERMS FOR RTI

Document version 1.0



culturalheritageimaging.org

Cultural Heritage Imaging
a nonprofit corporation

RTI Glossary of Photographic and Technical Terms

A

Absolute resolution

Image resolution of a sensor, as expressed in horizontal versus vertical pixels; for example, 1600 x 1200 pixels. This can also be expressed as 2.1 megapixel resolution, meaning that there are more than 2,000,000 pixels on the sensor.

Adobe Camera Raw (ACR)

A tool in which to process RAW image files, especially to convert them to [Digital Negative \(DNG\) format](#). DNG is the archival format recommended by CHI. The tool is included in Photoshop and other products from Adobe Systems Inc.

See [Camera raw file](#).

Albedo

A single number that specifies the reflectivity of a surface, specifically the ratio of incoming to outgoing light. Varies between 0 for a perfectly dark surface patch, to 1.0 for a perfectly reflective, white surface. Albedo can also be expressed as a percentage, for example the Earth's albedo is 30-35%, meaning that 30-35% of incoming solar radiation is reflected back into space, the rest absorbed.

Algorithmic rendering

Computational processing of source image data that results in an image that emphasizes or suppresses certain aspects or features. In the same way that Photoshop filters apply systematic transformations to color data, in algorithmic rendering an algorithm can apply transformations to both color and normal data in an RTI data set, to produce the digital equivalent of technical illustration or photographic manipulation.

Aperture

The [Camera settings](#) for how widely the shutter opens, also called the [F-stop](#). A smaller aperture (higher f-stop number) lets in less light, requiring a longer [Exposure](#) time, and resulting in a wider [Depth of field \(DoF\)](#).

CHI recommends aperture settings between f/5.6 and f/11 to capture high-resolution images.

See also [Diffraction and image resolution](#).

Aspect ratio

The shape, or format, of the image produced by a camera, expressed as width to height. The aspect ratio of a 35mm image is 3:2. Most computer monitors and digital cameras have a 4:3 aspect ratio. Many digital cameras offer the option of switching among aspect ratios of 4:3, 2:3 or 16:9.

Automatic mode

A camera mode in which [Camera settings](#) are adjusted automatically for typical photographic usage. When capturing images for RTI, you should always put the camera in [Manual mode](#) and adjust the settings individually.

B

Band pass filter

A filter that allows a certain band of light, measured in wavelengths, to pass into the camera sensor. For example, a 50nm band pass filter at 830nm allows in a 50nm band of light from 805nm to 855nm. This type of filter is used in multi-spectral imaging.

Blend map

A composite image produced by RTIBuilder when using the highlight method of RTI. The image shows all of the highlights from every image in the RTI image set, composed onto a single sphere. The blend map allows you to see the spread of light achieved for a particular RTI image set.

BRDF (bidirectional reflectance distribution function)

Describes how light is reflected from an opaque surface. A scalar function (that is, a function that returns a single number) of four variables (the inputs to the function). The inputs are two angles that specify the incoming light direction, and two angles that specify the outgoing light direction coming off the surface. RTI and PTM depend only

on the variation in the first two angles; the second two are fixed, determined by the viewing direction.

(First defined in [\[Nicodemus 77\]](#).)

BSSRDF (bidirectional scattering-surface reflectance distribution function)

Characterizes how light interacts with a reflective surface. Unlike the BRDF, it characterizes subsurface scattering by introducing two more sets of independent variables (beyond the four used in BRDF). Subsurface scattering is common in translucent materials such as marble, where light is internally scattered by the material before finally exiting. The two extra pairs of variables correspond to the incoming light location, in addition to the outgoing light location on the surface.

(First defined in [\[Nicodemus 77\]](#).)

BTF (bidirectional texture function)

Characterizes the spatial variation of reflectance for material that is not uniform, by adding two independent variables to the BRDF, for a scalar function of 6 variables. Can also be considered to have another independent variable, the wavelength of light used in the measurement.

(First defined in [\[Dana 97\]](#).)

C

Camera raw file

A proprietary RAW format produced as an output option in digital cameras. It contains all the pixel information captured by the camera's sensors without compression or processing applied.

RAW files should be used to capture the most information, and to have total control over the processing. However, because they are proprietary, RAW files should not be used for archiving, and the image data should be converted to an archive format such as [Digital Negative \(DNG\) format](#).

See also [Adobe Camera Raw \(ACR\)](#).

Camera positioning for RTI

When using the [Highlight method](#) for [Image capture for RTI](#), the camera should always be positioned so that it is perpendicular to the subject. The positioning technique depends on whether the subject is horizontal (set on a table for example), or vertical (on a wall, or set upright).

For a vertical subject, positioning is straightforward, with the camera on a tripod facing the subject.

For a horizontal subject, you can mount a ball head upside down on the bottom of a tripod's central column, and rotate it so that the lens faces straight down. This creates the fewest shadows, and makes positioning easier. Camera stands and copy stands work well for horizontal subjects.

Camera settings

Basic camera settings are the lens [Aperture](#) and [Exposure](#) time, which together determine the [Depth of field \(DoF\)](#). Other important settings that affect image quality include [White balance](#) and [ISO](#) sensitivity.

When capturing images for RTI, you should always put the camera in [Manual mode](#) and adjust the settings individually.

Capture client

Software that aids in [Image capture for RTI](#), usually in reference to the operation of a [Light array](#).

CIDOC

See [ICOM-CIDOC](#).

Color card

See [Gray card](#).

Color temperature

A linear scale for measuring the color of ambient light with warm (yellow) light measured in lower numbers and cool (blue) light measured in higher numbers. *See also* [White balance](#).

Measured in terms of *degrees Kelvin*, daylight (midday) is approximately 5600-degrees Kelvin, a candle is approximately 800 degrees, an incandescent lamp is approximately 2800 degrees, a photoflood lamp is 3200 to 3400 degrees, and a midday blue sky is approximately 6,000-degrees Kelvin. (Named for engineer and physicist Lord Kelvin [William Thomson], who conceived of the thermodynamic temperature scale in 1848.)

Compression

A method of reducing the size of a digital image file in order to free up the storage capacity of memory cards and hard drives. Compression technologies are distinguished from each other by whether they remove detail and color from the

image. Lossless technologies compress image data without removing detail, while "lossy" technologies compress images by removing some detail.

Computational photography

The computational extraction of relevant information from a sequence of digital photographs. Extracted information is integrated into new digital representations to yield rich data not found in the original, individual photographs.

RTI is one of many forms of computational photography.

For an in-depth discussion, see
<http://culturalheritageimaging.org/Technologies/>.

Conceptual Reference Model (CRM)

[ICOM-CIDOC](#) has defined this model, which provides a formal and extensible [Semantic ontology](#) for cultural heritage information. It is currently an ISO International Standard (ISO 21127).

Where the model is supported, a searchable graphic diagram can present relationships in the data. For example, a search for a particular painting would not only find the painting but also commentaries about the painting, information about the artist, the owners of the painting, and other related information.

Continuous light

Lighting for [Image capture for RTI](#) can be continuous, as opposed to flash or strobe lighting. Continuous lights can be aimed quickly and accurately at the center of the subject, permit longer exposures if more light is required, and do not need to be synchronized to the camera shutter.

Continuous light is easy to work with if you are indoors and have appropriate power. It doesn't work well in location settings where you might not have a generator and can run out of batteries.

Cut-off filter

A filter that excludes light at a specified wavelength and allows all wavelengths either above or below that wavelength to pass through the filter. For example, a 900nm cut-off filter allows all wavelengths above 900nm to pass through it, but blocks wavelengths below 900 nm.

D

Depth of field (DoF)

The distance between the nearest and farthest objects in a subject that appear acceptably sharp in an image. A large DoF is often called deep focus, and a small DoF is often called shallow focus.

A deep focus, produced with a small [Aperture](#) and long [Exposure](#) time, is typically desirable for [Image capture for RTI](#).

Diffraction and image resolution

As you change to a smaller [Aperture](#), you lose sharpness, as a function of the diffraction of light through the lens. While an aperture of f-22 gives you more depth of field, you lose sharpness and the ability to resolve definition (that is, line pairs per millimeter). For this reason, stopping down to gain depth of field must be weighed against image clarity.

Diffuse gain

An enhancement technique that helps to see surface detail due to shape. Keeps the surface normal for each pixel at the value estimated mathematically from the input images, but allows the user to arbitrarily control the second derivative (curvature) of the reflectance function interactively. This transformation makes the surface more sensitive to variations in lighting direction.

(Presented in [\[Malzbender 2001\]](#).)

Diffuse reflectance

Any reflectance of light off a surface that appreciably scatters light in many directions is considered diffuse. An ideal diffuse reflector is called Lambertian, and emits light in all directions uniformly, regardless of the incoming light direction. An example of an approximately diffuse surface is that of paper. This is opposed to a specular reflectance, which returns a highlight in a specific direction, producing a specular highlight. Many materials have both a diffuse and specular component.

See also [Specular reflectance](#).

Digital lab notebook

[Metadata](#) associated with a digital representation (such as an [RTI file](#)) that records the provenance and complete processing history of the data.

This serves the same function as a scientist's lab notebook written before the digital age, allowing scholars to assess the reliability of data and confidently rely on it for their own research purposes.

For an in-depth discussion, see
http://culturalheritageimaging.org/Technologies/Digital_Lab_Notebook.

Directory structure for RTI

The [RTIBuilder](#) software requires a specific folder structure and file-naming convention for the image files it uses to create an [RTI file](#).

In order to process the image sequence resulting from your [Image capture for RTI](#), create a project folder. Convert the original [Camera raw files](#) to [Digital Negative \(DNG\) format](#), and store the DNG files in a subfolder named `original-capture/`. Export JPEG versions of those images, and store them in a subfolder named `jpeg-exports/`.

Dome

See [Light array](#).

Digital Negative (DNG) format

DNG is an open, lossless, raw image format, created by Adobe, based on the [TIFF \(Tagged Image File Format\)](#) standard. Use of this format preserves initial image state, and provides [XMP \(Extensible Metadata Platform\)](#) records of all transformations, beginning with development from a [Camera raw file](#).

The recommended workflow for producing RTI from captured images is to use Adobe Digital Negative Converter to convert [Camera raw files](#) to the standardized DNG format, and make copies in the [JPEG format](#).

Dynamic range

The range of brightness and tonality reproduced in a digital (or traditional) photographic image. Wider dynamic range means more tonal values (and thus detail) between the darkest shadows and the brightest highlights.

E

Empirical provenance

The processing history of image-based data from original capture through final product. A term

developed by Carla Schroer and Mark Mudge of Cultural Heritage Imaging to address the authenticity concerns of researchers using image-based data. See [Digital lab notebook](#).

EOS Utility

The camera-control application for Canon cameras, which you can use during an [Image capture for RTI](#) session to adjust [Camera settings](#) and remotely fire the camera from the computer and set an initial image storage location.

EXIF (Exchangeable Image File)

Common [Metadata](#) format for information relevant to digital images, such as camera, lens, exposure information, date/time, and so on. Typically, the camera automatically collects the data and embeds it in the image file.

Exposure

The total amount of light allowed to fall on the image sensor when taking a digital photograph. This is controlled by the [Camera settings](#).

Over-exposed and under-exposed images do not reliably record the color and detail of the subject, and should not be used to build an [RTI file](#). Use the [Histogram](#) to make sure your settings are correct, and to find and exclude over- or under-exposed images from the capture sequence.

F

File format

The way an image is saved to a digital camera's memory or to a computer. The most common file formats for digital cameras are JPEG, TIFF and RAW (DNG or other proprietary file formats).

Fitting algorithm

The mathematical process of finding a low-complexity function that best represents a set of measured values. Typically the order of the function being fit (6 for PTMs), needs to be less than or equal to the number of measured values, or it is referred to as *under-constrained* and cannot be solved without introducing additional assumptions.

Current fitting algorithms for [RTIBuilder](#) include the [Polynomial Texture Map \(PTM\)](#) algorithm (`ptmfitter`), and the [Hemispherical Harmonics \(HSH\)](#) algorithm (`hshfitter`).

Fluorescence imaging

See [Ultraviolet-induced visible fluorescence photography](#).

F-stop

See [Aperture](#).

G**Gray card**

A middle gray reference, used to ensure the correct [White balance](#) in your image sequence.

H**Highlight map**

See [Blend map](#).

Highlight method

An image-capture technique for [Reflectance Transformation Image \(RTI\)](#), in which you include an image of at least two [Reflective spheres](#) in each shot. The reflection of the light source on the spheres enables the processing software to calculate the lighting angle for that image. This light source information is used during the generation of an RTI or [Algorithmic rendering](#) image.

The highlight method allows you great flexibility in subject size and location.

For an in-depth discussion, see the [RTI Guide to Highlight Image Capture](#).

Histogram

A visual representation of the exposure values of a digital image, typically a graph that shows the image's shadows, midtones and highlights as vertical peaks and valleys along a horizontal plane. Shadows are represented on the left side, highlights on the right side, and midtones in the central portion of the graph.

Hemispherical Harmonics (HSH)

A model of distribution across a hemisphere of directions (as opposed to spherical harmonics, which model a distribution across an entire sphere of possible directions). This is a natural representation in the study of reflectance off an opaque surface, which only occurs in a hemisphere.

Horizontal capture setup

See [Camera positioning for RTI](#).

I**ICOM-CIDOC**

The International Council of Museums Committee on Documentation, which focuses on the documentation requirements and standards of museums, archives, and similar organizations.

Image capture for RTI

The process of creating the initial set of digital images from which to create an [RTI file](#). You must take a sequence of images of the subject with a specific set of lighting angles. You can use the [Highlight method](#) or a [Light array](#) to produce the image sequence.

Infrared (IR)

The region of the electromagnetic spectrum with wavelengths longer than visible light. Invisible infrared light band begins following the wavelengths seen as red, around 700 nanometers, and runs to wavelengths of 1 mm, perceptible as heat.

Infrared reflected photography

A technique that records how infrared radiation is absorbed, reflected or transmitted by the image subject.

See also [Multi-spectral imaging](#).

ISO

A camera setting that controls light sensitivity. A higher ISO speed allows the camera to render an image using less light, but with reduced quality. For RTI photographic capture, a low ISO setting is recommended.

See also [Camera settings](#).

J**Java**

The computer language in which the [RTIBuilder](#) program is written.

JPEG format

A "lossy" compression format, capable of reducing digital image files to about 5% of their normal size. JPEG stands for Joint Photographic Experts Group.

Decompression of JPEG files can cause pixelization ("blockiness" or "jaggies") in certain digital images. The greater the compression levels, the more pixelization occurs. A greater [Absolute resolution](#) (pixel count) in the original image reduces the chance of pixelization.

L

Light array

An apparatus (typically dome-shaped) that has a set of lights at fixed positions. Control software flashes each light in a fixed sequence in order to produce the image sequence needed to produce an [RTI file](#).

Because each light is at a known position, the software can use a [Light map](#) to associate each image with the lighting angle used for it.

Light Direction Extrapolation

An enhancement technique that allows lighting to be more grazing than is physically realizable. Once the reflectance functions are modeled based on the input images, we can use lighting direction component values outside the range of (-1 to +1) that are physically unrealizable, producing an extrapolation of the captured reflectance function.

(Presented in [\[Malzbender 2001\]](#).)

Light map

A computer file that maps the angle of a light in a [Light array](#) to the image taken with that light.

Log file

When you use [RTIBuilder](#) to create an [RTI file](#), the software records its processing steps and writes them to a log file named `<project>.xml` in the top-level project folder.

M

Manual mode

A camera mode in which you adjust all [Camera settings](#) individually. Many digital cameras default to an [Automatic mode](#), which you should never use for [Image capture for RTI](#).

Metadata

Information tags that are attached to some form of digital data, which describe that data. Used for a

[Digital lab notebook](#) to establish the [Empirical provenance](#) of RTI data.

Common metadata formats for image data include [EXIF \(Exchangeable Image File\)](#), [TIFF \(Tagged Image File Format\)](#), and [XMP \(Extensible Metadata Platform\)](#).

See also [Digital lab notebook](#).

Movers

Image sequences in RTI or [Algorithmic rendering](#) where some event during image capture has resulted in misaligned images. A new alignment tool called "Imalign" is under construction, which will realign such images.

Multi-spectral imaging

Sampling in various bands of the electromagnetic spectrum including [Ultraviolet \(UV\)](#), visible, and [Infrared \(IR\)](#). The technique requires a camera sensor that can detect the desired wavelengths, and a light source that emits light in that part of the spectrum.

N

Normal

See [Surface normal](#).

P

Phong lighting model

One of the first lighting models used in computer graphics, builds up the brightness of any rendered object as a sum of weighted diffuse and specular reflectances coming from the surface being rendered.

Photogrammetry

The practice of deriving measurements and texture mapped 3D geometry from two or more photographs. In the last five years, the ease of use and power of photogrammetry and related processes have increased dramatically.

For an in-depth discussion, see
<http://culturalheritageimaging.org/Technologies/>

Polynomial Texture Map (PTM)

The first type of RTI imaging, invented by Tom Malzbender at HP Labs in 2001; see details at <http://www.hpl.hp.com/research/ptm/>.

A PTM [Fitting algorithm](#) is available for producing an [RTI file](#).

Prime lens

A fixed focal length lens. These are generally preferred for RTI imaging, as they typically have less distortion than a [Zoom lens](#).

R

Raking illumination

The use of light position at a low angle in relation to the plane of an object, to create shadows that emphasize elevations or depressions which deviate from that same normal plane. This lighting technique helps to record the topography and texture of an object.

Raw file

See [Camera raw file](#).

Reflective sphere

Two or more shiny black spheres included in the source images to allow RTI software to detect the reflection highlights from the light source in each image, and use that data to calculate the exact angle of the light. At least two spheres are required for [Algorithmic rendering](#).

This is the basic technology for the [Highlight method](#) of image capture that allows you to produce RTI images without a fixed [Light array](#).

Reflectance field

Equivalent to the [BSSRDF \(bidirectional scattering-surface reflectance distribution function\)](#), an 8-dimensional quantity that maps incoming lighting direction and position to reflected lighting direction and location, taking into account subsurface scattering.

(Introduced in [\[Debevec 2000\]](#).)

Reflectance function

The amount of light reflected from a given surface point, as a function of the two angles of lighting direction from a directional light source. It is the measurement represented in an RTI or

PTM for each surface point. Viewpoint is assumed to be fixed for acquiring the reflectance function.

(Introduced in [\[Debevec 2000\]](#).)

Reflectance Transformation Image (RTI)

A computational photographic method that captures a subject's surface shape and color and enables the interactive re-lighting of the subject from any direction.

RTI also permits the mathematical enhancement of the subject's surface shape and color attributes. The enhancement functions of RTI reveal surface information that is not disclosed under direct empirical examination of the physical object.

For an in-depth discussion, see

<http://culturalheritageimaging.org/Technologies/>.

Rendering modes

Mathematical transformations (also called *signal processing filters*) that allow [RTIViewer](#) to show enhanced versions of an RTI that disclose and emphasize certain features, often difficult or impossible to see under direct empirical examination.

RGBN

An acronym for the representation of the three color quantities (Red, Green, Blue) along with the surface normal (typically a unit length vector representing the surface orientation) for each pixel.

RTIBuilder

An interface to a set of tools that process a source image set to produce an RTI file. It is written in the [Java](#) programming language.

The program uses a user-selected [Fitting algorithm](#) to transform the source data into either PTM or RTI format.

RTIViewer

A software package that allows you to load and examine images created with reflectance transformation techniques.

RTIViewer offers interactive rendering of images, allowing you to change the view and alter the apparent direction of lighting. In addition, it offers a number of enhancement modes, which apply

mathematical transformations to the image data to enhance or emphasize particular features of the target object.

See also [Viewer modes](#).

RTI file

A computer file with the extension `.rti` or `.ptm`, produced using [Reflectance Transformation Image \(RTI\)](#) technology.

You can create RTI files using the [RTIBuilder](#) program, and view them using the [RTIViewer](#) program.

S

Semantic ontology

A framework that organizes events in the world, including human knowledge, into a structure that preserves knowledge of the relationships between individual pieces of data.

An example of semantic ontology is the [Conceptual Reference Model \(CRM\)](#).

Sharpening

A method of adjusting the contrast levels between adjacent pixels to give the appearance of a sharper image. Un-sharp mask is the most common sharpening filter for this purpose. Do not apply sharpening to images intended for processing to RTI.

Shutter speed

The length of time the shutter remains open when the shutter release is activated, most commonly expressed in fractions or multiples of a second.

See also [Camera settings](#).

Specular enhancement

An image enhancement technique that yields improved perception of surface shape by photographically acquiring the reflectance functions of a surface, extracting per-pixel surface normals from these reflectance functions, and then rendering the resultant surface with added specular highlights computed from the surface normals using a [Phong lighting model](#).

(Presented in [\[Malzbender 2001\]](#).)

Specular reflectance

The mirror-like reflection of light, or “shiny highlight.” The direction of reflectance is equivalent to the direction of incidence relative to the surface normal at the point of reflectance.

See also [Diffuse reflectance](#).

Spheres

See [Reflective sphere](#).

String length

When using the [Highlight method](#) for [Image capture for RTI](#), the distance of the light source from the subject should remain nearly constant; this is best achieved by using a string of a specific length to place the light for each image in the set.

The recommended distance from the light to the subject is three times the diameter of the subject. When necessary, this can be reduced to a minimum of twice the diameter. Reducing the ratio below 2:1 results in a proportional reduction of the area on the subject where RTI data can be collected. Ratios greater than 3:1 are fine and offer a slight improvement of normal accuracy.

Surface normal

The mathematical term for the directional vector that is perpendicular to the surface of an object at a specific point. [Reflectance Transformation Image \(RTI\)](#) software calculates the surface normal at each point of an object, using information derived from the lighting angles at each pixel in each of a series of images.

Normal information, in the form of surface shape, is included along with color information for each pixel in the resulting RTI image. This enables viewer software to show the surface shape of the subject in great detail.

Sync cable

A cable that connects the light source to the camera so that the flash occurs when the shutter is open. The cable can connect the light directly to the camera, or can connect the light to a wireless trigger device; see [Wireless light control](#).

T**TIFF (Tagged Image File Format)**

A format (identified by the `.tif` file extension) for flexible bitmap image files. Supported by virtually all paint, image editing, and page-layout applications, and produced by virtually all desktop scanners. The format supports CMYK, RGB, LAB, grayscale files with alpha channels, and bitmap files without alpha channels. TIFF also supports LZW compression, a lossless compression format.

Transmitted illumination

A lighting technique in which the imaging subject is lit from the side opposite from the viewing position, so that light goes through the object to reach the viewer/camera. This technique helps to record areas of loss or thin material that allows translucence.

U**Ultraviolet (UV)**

The region of the electromagnetic spectrum with wavelengths shorter than visible light and larger than X-rays. The invisible ultraviolet light band ends at the color violet, the shortest wavelength of the visible light band.

Ultraviolet-induced visible fluorescence photography

A technique that uses [Ultraviolet \(UV\)](#) radiation to induce the emission of visible fluorescence in materials that can then be observed and photographed without exposing them to potentially damaging wavelengths. In the fluorescence process, ultraviolet energy is temporarily absorbed by a material and then re-emitted as low-energy radiation in the visible light region.

Ultraviolet reflected photography

A technique that records how [Ultraviolet \(UV\)](#) radiation is absorbed, reflected or transmitted by the image subject.

See also [Multi-spectral imaging](#).

V**Viewer modes**

See [Rendering modes](#).

Visible light photography

The use of normal or reflected illumination to provide a photographic record of the appearance of an object as seen under standard viewing conditions.

W**White balance**

The camera's ability to correct color cast or tint under different lighting conditions including daylight, indoor, fluorescent lighting and electronic flash. Also known as "WB".

For RTI photo sets, it is recommended that you shoot a [Gray card](#) or [Color card](#) to correct the white balance during post processing, rather than using the built-in WB tools.

See also [Color temperature](#).

Wireless light control

A wireless transmitter/receiver can be used to receive signals from the camera so that the flash is triggered when the shutter opens. This minimizes the number of cables in use during an [Image capture for RTI](#) session.

Examples are the Speedlite Transmitter ST-E2, a camera-mounted infrared controller for Canon's flashes, and the PocketWizard, which is attached to a light by a [Sync cable](#).

X**XML (Extensible Markup Language)**

A text-based markup language that can be used for tagging information, making it easier for a computer to scan and to automate various processes. In the RTI workflow, RTIBuilder uses XML format for the log file it produces.

XMP (Extensible Metadata Platform)

A specific [XML \(Extensible Markup Language\)](#) schema used to store [Metadata](#) in image files. A unique advantage of XMP is that it allows creation of custom metadata, as well as supporting certain standards such as IPTC and [EXIF \(Exchangeable Image File\)](#).

Z**Zeroed out settings**

A recommended custom preset for [Adobe Camera Raw \(ACR\)](#), which allows you to make your own adjustments to white balance and exposure (if needed) in your captured source images, before using them to create an [RTI file](#).

A zeroed-out preset ensures that your data is not being processed, interpreted, or stylized to fit consumer tastes. To create it, edit any image in ACR, set all possible options to 0, save the current settings as a named preset, then make that preset your default.

Zoom lens

A lens whose focal length can be continuously adjusted through a fixed range of focal lengths. *See also* [Prime lens](#).

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Acknowledgments: The production of this glossary was a collaborative effort involving the staff of Cultural Heritage Imaging, with Tom Malzbender, and Yosi R-Pozeilov, with additional help and suggestions from a variety of sources. Thanks to Judy Bogart of [Expert Support Inc.](#) for compiling, formatting, editing, and generally making this a readable cross-linked document.

Version 1.0 of this document was made possible by a grant from the Institute of Museum and Library Services (IMLS) 21st Century Museum Professionals (21MP) Grant Program (grant number MP-00-10-0031-10) The contents are solely the responsibility of the authors and do not necessarily represent the official position or policies of the Institute of Museum and Library Services.