Digital Preservation Fundamentals: Text and Image Formats

Text

- Digital text encodings have their roots in telegraph codes *(really)*
- ASCII (American Standard Code for Information Interchange) dates from 1968
  - 7-bit code
  - 32 control characters
  - 94 printable characters

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USASCII code chart

	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b4 b3 b2 b1	0	1	2	3	4	5	6	7
0 0 0 0	0	NUL	DLE	SP	0	@	P	`	p
0 0 0 1	1	SOH	DC1	!	1	A	Q	a	q
0 0 1 0	2	STX	DC2	"	2	B	R	b	r
0 0 1 1	3	ETX	DC3	#	3	C	S	c	s
0 1 0 0	4	EOT	DC4	$	4	D	T	d	t
0 1 0 1	5	ENQ	NAK	%	5	E	U	e	u
0 1 1 0	6	ACK	SYN	&	6	F	V	f	v
0 1 1 1	7	BEL	ETB	'	7	G	W	g	w
1 0 0 0	8	BS	CAN	(	8	H	X	h	x
1 0 0 1	9	HT	EM	)	9	I	Y	i	y
1 0 1 0	10	LF	SUB	*	:	J	Z	j	z
1 0 1 1	11	VT	ESC	+	;	K	[	k	{
1 1 0 0	12	FF	FS	,	<	L	\	l	|
1 1 0 1	13	CR	GS	-	=	M	]	m	}
1 1 1 0	14	SO	RS	.	>	N	^	n	~
1 1 1 1	15	SI	US	/	?	O	_	o	DEL

Text: UTF-8

- Unicode is an unlimited way of encoding characters
- The **Unicode Transmission Format - 8 bit** (UTF-8) is the most common way to encounter Unicode
  - UTF-8 transmits using 1 to 4 "octets," 8-bit bytes
  - First 128 of these are US-ASCII, and then there are lots of other things

Text: UTF-8

- Easy to identify
  - Given an unknown text string, a simple search pattern identifies UTF-8 over 99.5% of the time
- Default, native encoding for XML
- Multi-language support

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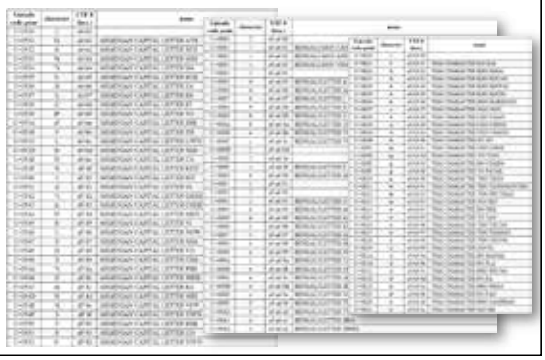
(some of) The UTF-8 Character Set



Images and Text

- That unicode character set that just scrolled by was, of course, an image.
- Computers don't read; they encode and decode
- So, digitized books are page images plus text transcriptions plus the metadata that holds all of that together.

Next: Images

TEXT Q&A

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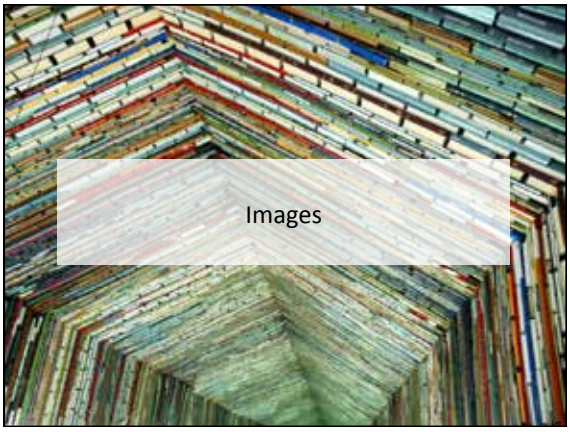

TIFF

- Developed by Aldus in 1986, and passed to Adobe.
- Version 6.0 published in 1992 and has no IP restrictions
- TIFF may include compressed parts; **be diligent about using uncompressed TIFF.**
  – LZW (lossless) compression debatable.

JPEG 2000

- Developed in 2000, released as ISO standard with a no-cost license for its core components
- Wavelet-based, so can hold several levels of compression within one file
- Shortage of authoring tools

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Digital Negative

- Developed by Adobe to provide a non-proprietary format for RAW camera data
- May be valuable as a digital preservation format for the specific use-case of **born-digital photography**

The Other Image Formats and...

- JPEG (not JPEG2000)
- RAW (Camera sensor data)
- PNG (Portable network graphics)
- PSD (Photoshop document)

... Their Problems

- Compression or size limits (JPEG, PNG)
- Intellectual property / manufacturers proprietary standards (PSD, RAW)

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And then there's PDF

- Lots of PDF types, with varying levels of preservability. Currently in version 1.7.
- PDF is (simplistically) a metadata wrapper for text and graphic content.
  - PDF **can** contain almost any media – raster and vector graphics, forms, audio, video, and more
- PDF 1.4 has an off-shoot called PDF/A that is used for archiving

What to put into an image

- Resolution
  - 300 dpi bare minimum, 600 dpi standard, 1200+ for special circumstances
- Bit-Depth (color)
  - 8-bit (256 grays) or 24-bit (256 Reds, 256 Greens, and 256 Blues for 16 million combinations)

Resolution

- Scanners
  - Limited by the number of sensors in the scanner's array (top to bottom) and the motion of its motor (left to right)
- Cameras
  - Limited by physical size (H" x W") and sensor density (pixels per inch) of the imaging chip

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Color

- Color needs to be calibrated
- The eye, the image sensor, and the image rendering device all have different color sensitivity
- None of these are a perfect match for the source spectra
  - And those vary depending on the type of illumination
- Best practice is to calibrate all devices and **not** edit color on the initial capture
- Create derivatives for each use-case: web delivery (RGB), high-res. display (RGB), print (CMYK), etc.

Don't trust your eyes

CHROMATIC ADAPTATION

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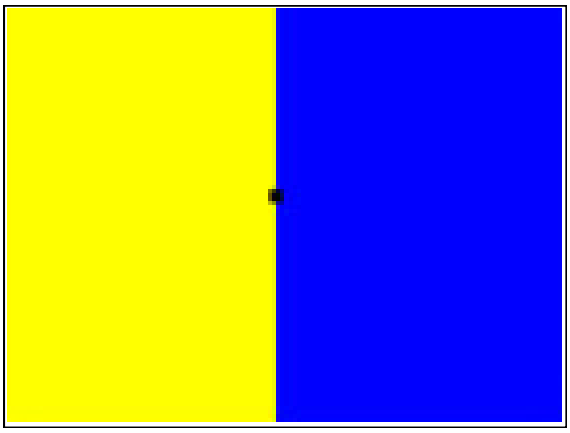

Seeing and Recording and Transmission

- The eye processes light in two ways
  - Hue and saturation (color shade and depth; cones)
  - Luminance (brightness, like "black & white"; rods).
- Computers and digital imaging devices process light as three color channels: red, green, and blue
  - A fixed amount of data is assigned to each color
  - "24-bit" color has 8 bits worth of R, G, and B (256 levels each; 16.7 million combinations)
- Colors are returned as RGB (digital) or CMYK (print)

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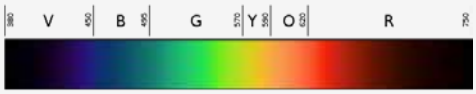
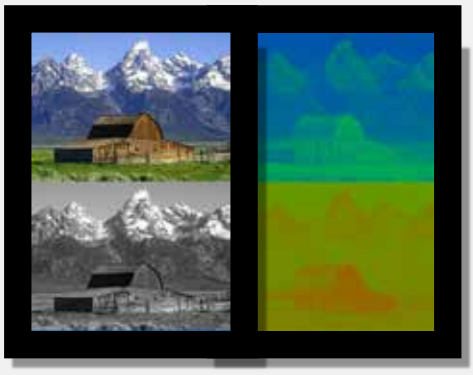
Multi-spectral imaging

- Light is radiation. Our visible spectrum ranges from 390 to 750 nanometers.
  - Immediately below (longer freq.) is infrared, which we encounter as heat, above is ultraviolet
- Under different types of radiation, media reflect, refract, fluoresce in different ways.
  - Infrared, Ultraviolet, X-radiation, Polarization, and more can produce different imaging effects
  - More image capture in more spectra means more complete digital representation
- But mostly, we just need the visible spectrum.





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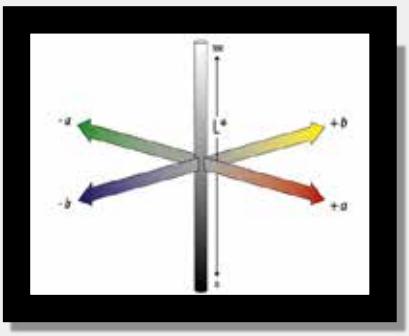

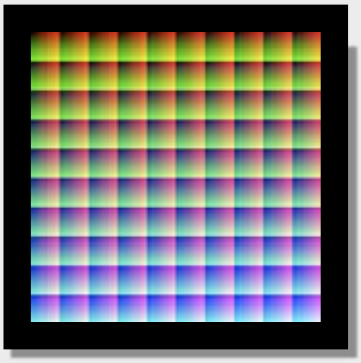

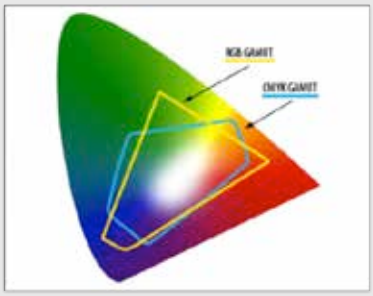

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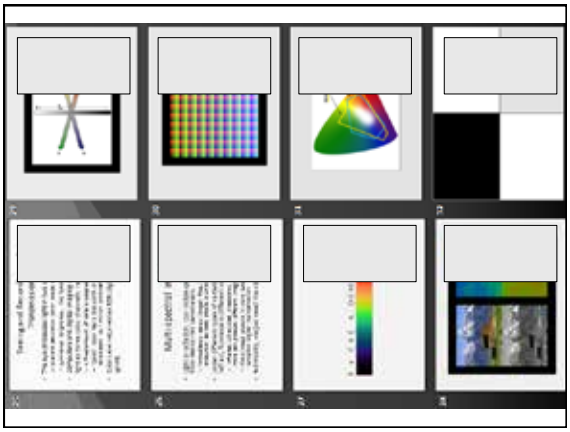
Starting Background Color

Note how much your eye adjusted, and how quickly.

Ending Background Color



http://www.jacobnadal.com/247

IMAGE Q&A

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