

HDRI (High Dynamic Range Imaging) For Preservation of Historical Documents

Oliver Nina

Roger Pack

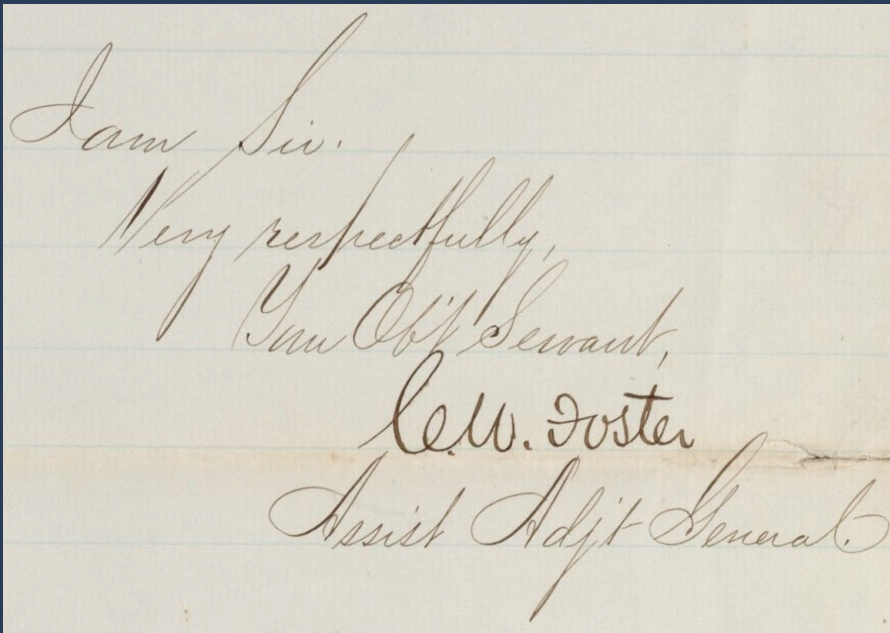


Motivation

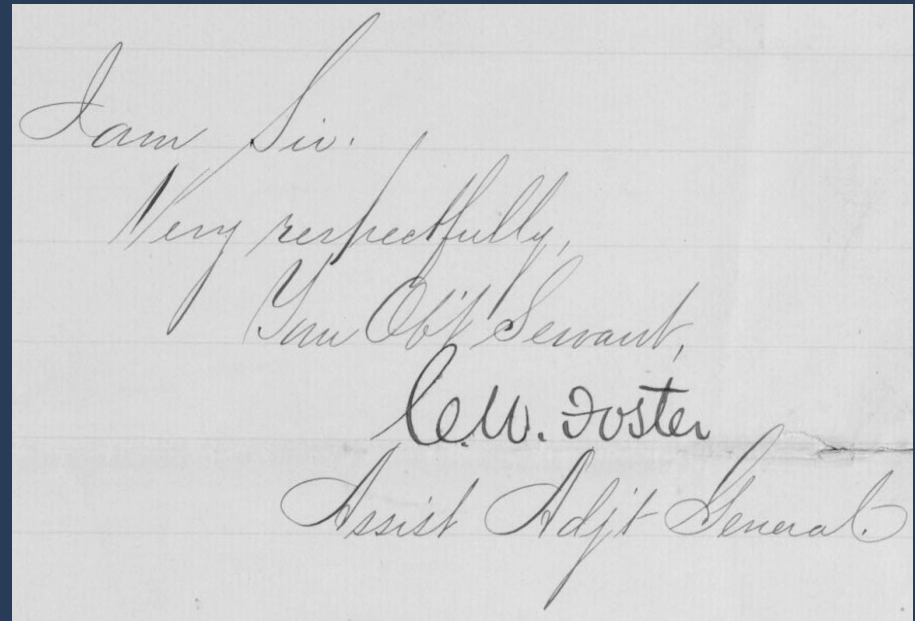
- Great effort of digitally archiving historical documents
- Using Digital Cameras is most affordable and available
- Using Digital Cameras has some limitations :
 - Dimensions (2D)
 - Resolution (Limited)
 - Color Range (Low range)
 - DcamX(LDS church project) preserves documents in grayscale

Motivation

- Grayscale images lose information from the original image (even lower range)



I am Sir.
Very respectfully,
Your Obedt Servant,
C. W. Foster
Asstt Adj't General.

A photograph of a handwritten letter on aged, cream-colored paper. The handwriting is in dark brown ink, using a cursive script. The text is written in five lines, with the first line starting with a capital 'I' and the last line ending with a period. The paper shows some signs of age, including slight discoloration and a small tear near the bottom right.

I am Sir.
Very respectfully,
Your Obedt Servant,
C. W. Foster
Asstt Adj't General.

A grayscale version of the same handwritten letter. The text is identical to the original, but the color scheme is in shades of gray. The handwriting and paper texture are preserved, but the color information is lost.

Motivation

- Color images better than grayscale
- However, color images still have low range
- High Dynamic Range Imaging (HDRI) increases color range to better approximate that of the real world
- HDRI techniques haven't been applied for preservation of historical documents yet.
- We demonstrate that HDRI techniques allow better preservation of detail and contrast of document images even in gray scale

About HDR

- HDR combines images under different exposure
- Tone mapping reduces range while preserving contrast
- We used Photomatix software

HDR Example



Results

Guards Machine
Gun Regiment.

No. 1560 Name Adams, D. Sqn. Batty. 1 or Company 1 Date of enlistment 1861

Period not reckoning towards
battalion transfer

Sheet No. 1 Temporary Signature O.C. 1

Place Date of offence Rank Cases of Drunkenness Offence Names of Witnesses Punishment awarded Dated award or of order dispensing with trial By whom awarded Remarks

Army Form B 122.

Guards Machine
Gun Regiment.

No. 1560 Name Adams, D. Sqn. Batty. 1 or Company 1 Date of enlistment 1861

Period not reckoning towards
battalion transfer

Sheet No. 1 Temporary Signature O.C. 1

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No. 1560 Name Adams, D. Sqn. Batty. 1 or Company 1 Date of enlistment 1861

Period not reckoning towards
battalion transfer

Sheet No. 1 Temporary Signature O.C. 1

Place Date of offence Rank Cases of Drunkenness Offence Names of Witnesses Punishment awarded Dated award or of order dispensing with trial By whom awarded Remarks

Army Form B 122.

Results

Original

Guards Machine
Gun Regiment.

No. 1560 Name Adams, D. Sqn., Batty., or Company 1 Corps Date of enlistment 1891

Date of last entry in Company 1891 Sheet No. 1 Temporary Signature O.C. 1 Company, etc. 1

Period not reckoning towards freedom from extra time 1

Place Date of offence Rank Cases of Drunkenness Offence Names of Witnesses Punishment awarded Date of award or of order dispensing with trial By whom awarded Remarks

Army Form B 122

[P.T.O.]

HDR

Guards Machine
Gun Regiment.

No. 1560 Name Adams, D. Sqn., Batty., or Company 1 Corps Date of enlistment 1891

Date of last entry in Company 1891 Sheet No. 1 Temporary Signature O.C. 1 Company, etc. 1

Period not reckoning towards freedom from extra time 1

Place Date of offence Rank Cases of Drunkenness Offence Names of Witnesses Punishment awarded Date of award or of order dispensing with trial By whom awarded Remarks

Army Form B 122

[P.T.O.]

Results

REGIMENTAL CONDUCT SHEET. Army Form B 120.

Number of sheets (in words) Two
 Signature of C.O. or Adjutant R.M. Pigott Lt. Col. Captain,
Commanding 10th Signal Coy. R.E.
 Regiment. 19

Regimental Number and Name 44808. Adams, William Attested Adams 2: 9 10/4. Joined _____

Place.	Date of Offence.	Rank.	Names of Witnesses.	PUNISHMENT awarded.	By whom.	REMARKS.
				<u>No Entries</u>		<u>R.M. Pigott Lt. Col. Captain,</u> <u>Commanding 10th Signal Coy. R.E.</u>

To be carried over.

S.M.E. 1186
G.D. 9.14.

Original

REGIMENTAL CONDUCT SHEET. Army Form B 120.

Number of sheets (in words) Two
 Signature of C.O. or Adjutant R.M. Pigott Lt. Col. Captain,
Commanding 10th Signal Coy. R.E.
 Regiment. 19

Regimental Number and Name 44808. Adams, William Attested Adams 2: 9 10/4. Joined _____

Place.	Date of Offence.	Rank.	Names of Witnesses.	PUNISHMENT awarded.	By whom.	REMARKS.
				<u>No Entries</u>		<u>R.M. Pigott Lt. Col. Captain,</u> <u>Commanding 10th Signal Coy. R.E.</u>

To be carried over.

S.M.E. 1186
G.D. 9.14.

HDR

Results

W. P. Gifford & Sons Ltd., Printers, Old Bailey, E.C. 4.
[112] W2201, T1119 100ms 7/18 127 85

REGIMENTAL CONDUCT SHEET. Army Form B. 120.

Number of sheets (in words) 1
Signature of C.O. or Adjutant *[Signature]*
Regiment of *Army Pay Corps*
Regimental Number and Name *21209 Adams 46* Attested *10 3* 19 *15* Joined *10 3* 19 *15*

Place	Date of Offence	Rank	OFFENCE	Names of Witnesses	PUNISHMENT awarded	Date of award, or of order expiring with trial	By whom	Date of Commencement	Date of Expiration	REMARKS
			<i>Certified that there is no record of the</i>							
			<i>Above mentioned soldier having incurred any</i>							
			<i>Regimental censure during his service.</i>							
			<i>5.11.16</i>							

To be carried over

Original

W. P. Gifford & Sons Ltd., Printers, Old Bailey, E.C. 4.
[112] W2201, T1119 100ms 7/18 127 85

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Regimental Number and Name *21209 Adams 46* Attested *10 3* 19 *15* Joined *10 3* 19 *15*

Place	Date of Offence	Rank	OFFENCE	Names of Witnesses	PUNISHMENT awarded	Date of award, or of order expiring with trial	By whom	Date of Commencement	Date of Expiration	REMARKS
			<i>Certified that there is no record of the</i>							
			<i>Above mentioned soldier having incurred any</i>							
			<i>Regimental censure during his service.</i>							
			<i>5.11.16</i>							

To be carried over

HDR

Results

W. P. Gilchrist & Sons Ltd., Printers, Old Bailey, E.C.4.
[115] W2201, 7/11/20 2000m 7/12 127 85

REGIMENTAL CONDUCT SHEET. Army Form B. 120.

Number of sheets (in words) 1
Signature of C.O. or Assistant [Signature]
Regiment of Army Regt Co
Regimental Number and Name 21209 Adams G L Attested 10 3 19 15 Joined 10 3 19 15

Place	Date of Offence	Rank	OFFENCE	Names of Witnesses	PUNISHMENT awarded	Date of award or of order dispensing with trial	By whom	Date of Commencement	Date of Expiration	REMARKS
			Certified that there is no record of the above mentioned soldier having incurred any punishment during his service.							
			<u>[Signature]</u>							

To be carried over

Original

W. P. Gilchrist & Sons Ltd., Printers, Old Bailey, E.C.4.
[115] W2201, 7/11/20 2000m 7/12 127 85

REGIMENTAL CONDUCT SHEET. Army Form B. 120.

Number of sheets (in words) 1
Signature of C.O. or Assistant [Signature]
Regiment of Army Regt Co
Regimental Number and Name 21209 Adams G L Attested 10 3 19 15 Joined 10 3 19 15

Place	Date of Offence	Rank	OFFENCE	Names of Witnesses	PUNISHMENT awarded	Date of award or of order dispensing with trial	By whom	Date of Commencement	Date of Expiration	REMARKS
			Certified that there is no record of the above mentioned soldier having incurred any punishment during his service.							
			<u>[Signature]</u>							

To be carried over

HDR

Results (Oliver)

Description of *Mr Benjamin Oliver on E*

Apparent Age *34* years — months.
(To be determined according to the instructions given in the Regulations for Army Medical Services.)

Height *5* feet *6 1/2* inches.

Weight *180* lbs.

Chest measurement { Girth when fully expanded *40* inches.
Range of expansion *2* inches.

Complexion *Fresh*

Eyes *Hazel*

Hair *Dark brown*

Religious denomination
Church of England *yes*
Presbyterian
Wesleyan
Baptist or Congregationalist
Other Protestants
(Denomination to be stated.)
Roman Catholic
Jews

Distinctive marks, and marks peculiarities or previous diseases
(Should the Medical Officer be of opinion before, he will, unless the man service, attach a slip to that effect approving Officer.)

STATEMENT of the SERVICES of No. *172* Name *B. Oliver*

Corps	Promotions, Reductions, Transfers to other Corps, Re-engagements, &c., &c., &c.	Rank	Period of Service in each Rank	
			From	To
<i>R.M.D. 179.</i>	<i>Enrolled</i>	<i>Ple</i>	<i>1.4.89</i>	
	<i>Promoted</i>	<i>Cpl</i>		<i>17/5/90</i>
	<i>"</i>	<i>Sgt</i>	<i>28/5/90</i>	<i>22/3/91</i>
	<i>Re-enrolled</i>	<i>"</i>	<i>23/3/91</i>	<i>27/4/91</i>
	<i>Malaya</i>	<i>"</i>	<i>27/4/91</i>	

Traditional

Description of *Mr Benjamin Oliver on E*

Apparent Age *34* years — months.
(To be determined according to the instructions given in the Regulations for Army Medical Services.)

Height *5* feet *6 1/2* inches.

Weight *180* lbs.

Chest measurement { Girth when fully expanded *40* inches.
Range of expansion *2* inches.

Complexion *Fresh*

Eyes *Hazel*

Hair *Dark brown*

Religious denomination
Church of England *yes*
Presbyterian
Wesleyan
Baptist or Congregationalist
Other Protestants
(Denomination to be stated.)
Roman Catholic
Jews

Distinctive marks, and marks peculiarities or previous diseases
(Should the Medical Officer be of opinion before, he will, unless the man service, attach a slip to that effect approving Officer.)

STATEMENT of the SERVICES of No. *172* Name *B. Oliver*

Corps	Promotions, Reductions, Transfers to other Corps, Re-engagements, &c., &c., &c.	Rank	Period of Service in each Rank	
			From	To
<i>R.M.D. 179.</i>	<i>Enrolled</i>	<i>Ple</i>	<i>1.4.89</i>	
	<i>Promoted</i>	<i>Cpl</i>		<i>17/5/90</i>
	<i>"</i>	<i>Sgt</i>	<i>28/5/90</i>	<i>22/3/91</i>
	<i>Re-enrolled</i>	<i>"</i>	<i>23/3/91</i>	<i>27/4/91</i>
	<i>Malaya</i>	<i>"</i>	<i>27/4/91</i>	

HDR

Results

Description of John Henry Nelson **on Enlistment**

Apparent Age 34 years — months.

(To be determined according to the instructions given in the Regulations for Army Medical Services.)

Height 5 feet 6 1/2 inches.

Weight 180 lbs.

Chest measurement { Girth when fully expanded 40 inches.
Range of expansion 2 inches.

Complexion Fresh

Eyes Hazel

Hair Dark brown

Religious denomination { Church of England yes
Presbyterian —
Wesleyan —
Baptist or Congregationalist —
Other Protestants —
(Denomination to be stated.)
Roman Catholic —
Jews —

Distinctive marks, and marks peculiarities or previous diseases (Should the Medical Officer be of opinion before, he will, unless the man in service, attach a slip to that effect approving Officer.)

STATEMENT of the SERVICES of No. 177 **Name** John Henry Nelson

Corps	Promotions, Reductions, Transfers to other Corps, Re-engagements, &c., &c., &c.	Rank	Period of Service in each Rank	
			From	To
<u>P.M.D. 179.</u>	<u>Enrolled</u>	<u>Ple</u>	<u>1.4.84</u>	<u>17/5/84</u>
	<u>Promoted</u>	<u>Cpl.</u>	<u>18/5/84</u>	<u>27/3/85</u>
	<u>"</u>	<u>"</u>	<u>23/3/85</u>	<u>"</u>
	<u>Attached</u>	<u>"</u>	<u>"</u>	<u>"</u>
	<u>Discharged</u>	<u>"</u>	<u>"</u>	<u>"</u>

Traditional

Description of John Henry Nelson **on Enlistment**

Apparent Age 34 years — months.

(To be determined according to the instructions given in the Regulations for Army Medical Services.)

Height 5 feet 6 1/2 inches.

Weight 180 lbs.

Chest measurement { Girth when fully expanded 40 inches.
Range of expansion 2 inches.

Complexion Fresh

Eyes Hazel

Hair Dark brown

Religious denomination { Church of England yes
Presbyterian —
Wesleyan —
Baptist or Congregationalist —
Other Protestants —
(Denomination to be stated.)
Roman Catholic —
Jews —

Distinctive marks, and marks peculiarities or previous diseases (Should the Medical Officer be of opinion before, he will, unless the man in service, attach a slip to that effect approving Officer.)

STATEMENT of the SERVICES of No. 177 **Name** John Henry Nelson

Corps	Promotions, Reductions, Transfers to other Corps, Re-engagements, &c., &c., &c.	Rank	Period of Service in each Rank	
			From	To
<u>P.M.D. 179.</u>	<u>Enrolled</u>	<u>Ple</u>	<u>1.4.84</u>	<u>17/5/84</u>
	<u>Promoted</u>	<u>Cpl.</u>	<u>18/5/84</u>	<u>27/3/85</u>
	<u>"</u>	<u>"</u>	<u>23/3/85</u>	<u>"</u>
	<u>Attached</u>	<u>"</u>	<u>"</u>	<u>"</u>
	<u>Discharged</u>	<u>"</u>	<u>"</u>	<u>"</u>

HDR

Conclusion

- Digital Cameras are affordable and common for preservation
- However, traditional digital photography has lower color range
- High Dynamic Range Imaging (HDRI) increases color range to better approximate that of the real world
- HDRI techniques allow better preservation of detail and contrast of document images even when converted grayscale

Future Work

- Investigate how to implement it with Dcam (Grayscale)
- Investigate compression of HDR radiation map.
- Improve tone mapping technique

Questions?

Special Thanks

Craig Johnson for his help and feedback.
Chong Ahn for lending his Nikon camera.

Credits

Debevec et al. *SIGGRAPH* 97.
Photomatix software

Images

H-DIBCO dataset – Slide 3