

Migrating Harvard's Astronomical Plate Collection from Paper and Glass to Bits

- 500,000 glass plates covering the entire sky from 1885-1989
- Basis for fundamental discoveries in astronomy, such as using Cepheid variable stars as cosmic yardsticks
- A legacy of long-term commitment to astronomical photography and research
- Astronomy will not have an equivalent time frame from digital observations until 2080.

List what is in the archive (and put it on the web)

Harvard Plate Stacks Plate Series - Mozilla Firefox


http://tdc-www.harvard.edu/plates/plates.html

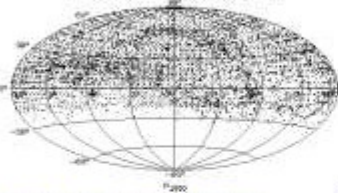
Series	Aperture (in.)	Scale "/mm	Scale "/inch	--dec	at d=0 --ra	N/S	Total	Years	Limit	Q	Logs	Remarks
A	24	60	0.42	2.5	14.8	S	27204	1893-1950	18	4	Scanned logs	primary (Some early plates northern hemisphere)
ADH	30	68	0.48	2.4	9.6	S	7067	1950-1963	18-19	4	Not scanned	Circular plates, north edge at mark
AC	1.5	600	4.23	21.1	67.7	N/S	42749	1898-1957	13-14	3	Scanned logs	primary
AI	1.5	1200	---	---	---	N	44730	1901-1958	---	2	Scanned logs	bright_objects
AM	1.5	600	4.23	21.1	67.7	N/S	28562	1898-1957	13-14	3	Scanned logs	primary
AX	3.0	700	4.93	24.6	79.0	N/S	4833	1922-1954	13-14	3	Scanned logs	primary
AY	2.6	700	4.93	24.6	79.0	N	1974	1923-1927	13-14	3	Scanned logs	primary
B	8	179	1.26	6.3	20.2	S	76874	1885-1954	17	4	Scanned logs	primary
BM	3	390	2.76	13.8	44.2	N	3222	1934-1941	15	3	Scanned logs	primary
BR	8	209	1.46	7.3	23.4	S	4176	1938-1944	17	4	Scanned logs	like MF
C	11	84	0.59	2.4	5.9	N	23270	1886-1947	---	2	Scanned logs	Mostly spectra; limited use
DNB	1.6	580	4.09	20.5	65.4	N	6711	1962-1989	15	5	Scanned logs	**Patrol (>1962)
D9B	1.6	580	4.09	20.5	65.4	S	2895	1962-1989	15	5	Scanned logs	**Patrol (>1962)
FA	1.5	1200	8.46	21.1	67.7	N	13884	1901-1958	---	2	Scanned logs	bright_objects
H	24	60	0.42	0.9	3.6	N	6644	1906-1953	---	3	Scanned logs	Reflector (small field)
I	8	163	1.14	5.7	18.2	N	59246	1889-1946	17	4	Scanned logs	primary
IR	8	162	1.13	5.6	18.0	N	12798	1934-1976	17	4	Scanned logs	--
J	24	98	0.68	2.7	10.8	N	4770	1942-1957	---	3	Scanned logs	Schmidt; square plates, N-S diagonal
MA	12	97	0.68	3.4	10.9	N	11737	1905-1983	17-18	5	Scanned logs	primary
MB	4	193	1.4	6.8	22	N	2722	1914-1932	---	2	Scanned logs	MA piggy-back
MC	16	98	0.68	2.7	13.6	N	40596	1909-1992	17-18	5	Scanned logs	primary
MD	4	193	1.36	6.8	21.7	N	30000	1911-	11	2	Not scanned	MC piggy-back
MF	10	167	1.17	5.8	18.7	S	40897	1915-1955	17	4	Scanned logs	primary (Some early plates N)
E	3	390	2.75	13.8	44.2	S	320	1937-1958	15	3	Scanned logs	Radcliffe College
EB	3	391	2.76	13.8	44.2	S	17030	1928-1963	15	3	Scanned logs	primary
EH	3	391	2.76	13.8	44.2	N	16178	1928-1963	15	3	Scanned logs	primary
RL	4	260	2.05	8.2	32.8	N	5062	1933-1962	---	--	Scanned logs	--
SB	60	26.3	18	.36	45	S	6396	1933-1955	---	--	Scanned logs	4x5 plates, Asteroids (Reflectors)
SH	60	25.0	18	.36	45	N/S	13830	1934-1989	---	--	Scanned logs	4x5 plates, Asteroids (Reflectors)
Superschmidt	12	1200	8.4	27	108	N	30000	1953-1968	---	--	Not scanned	Meteor films (circular, molded)
X	13	42	.29	1.2	5.8	S	19090	1888-1951	---	--	Scanned logs	primary (4x5 and 8x10 plates)

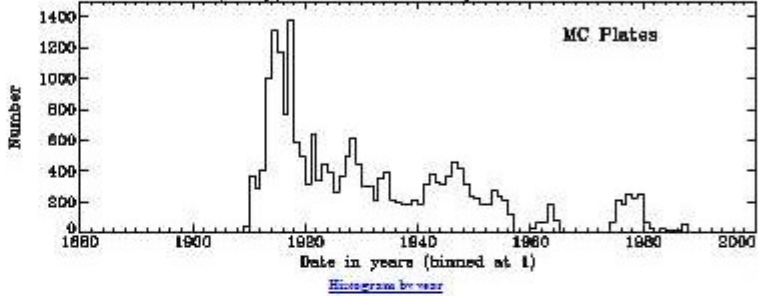
Done

Digitize Top Level Metadata

[Harvard-Smithsonian Center for Astrophysics](#)
[Telescope Data Center](#) [Harvard Plate Collection](#) [Harvard Observatory Plate Stacks](#)
MC Series Characteristics



Basics	<table border="0" style="width: 100%;"> <tr> <td style="text-align: left;">Plate Size</td> <td style="text-align: left;">Plate Scale</td> <td style="text-align: left;">Telescope</td> <td style="text-align: left;">Focal Length</td> </tr> <tr> <td>8x10, 4x5 98"mm</td> <td>16-inch Merz/Douglas</td> <td>83 inches</td> <td></td> </tr> </table>	Plate Size	Plate Scale	Telescope	Focal Length	8x10, 4x5 98"mm	16-inch Merz/Douglas	83 inches		
Plate Size	Plate Scale	Telescope	Focal Length							
8x10, 4x5 98"mm	16-inch Merz/Douglas	83 inches								
Observatory	<table border="0" style="width: 100%;"> <tr> <td style="text-align: left;">Plate no.</td> <td style="text-align: left;">Location</td> <td style="text-align: left;">Date</td> </tr> <tr> <td>1-26093</td> <td>Cambridge</td> <td>1909-06-22 - 1932-05-28</td> </tr> <tr> <td>26094-40591</td> <td>Oak Ridge</td> <td>1932-09-28 - 1938-12-12</td> </tr> </table> <p style="font-size: small; text-align: center;">(Harvard MC plate stack catalog (online))</p>	Plate no.	Location	Date	1-26093	Cambridge	1909-06-22 - 1932-05-28	26094-40591	Oak Ridge	1932-09-28 - 1938-12-12
Plate no.	Location	Date								
1-26093	Cambridge	1909-06-22 - 1932-05-28								
26094-40591	Oak Ridge	1932-09-28 - 1938-12-12								
Online Searchable catalog	 <p style="font-size: small; text-align: center;">Map of spatial and temporal distribution</p>									
ASCII Catalog	<ul style="list-style-type: none"> • MC Series tab-separated table (number-sorted B1900 Starbase MJD) • MC Series tab-separated table (number-sorted B1900 Starbase ISO date) • MC Series tab-separated table (number-sorted J2000 Starbase ISO date) • MC Series tab-separated table (RA-sorted B1900 Starbase MJD) • MC Series tab-separated table (RA-sorted B1900 Starbase ISO date) • MC Series tab-separated table (RA-sorted J2000 Starbase ISO date) 									
Location in Stack	<table border="0" style="width: 100%;"> <tr> <td style="text-align: left;">Plate Size</td> <td style="text-align: left;">Location</td> <td style="text-align: left;">Numbers</td> </tr> <tr> <td>8x10</td> <td>first floor</td> <td>all</td> </tr> <tr> <td>4x5</td> <td>first floor</td> <td>all</td> </tr> </table>	Plate Size	Location	Numbers	8x10	first floor	all	4x5	first floor	all
Plate Size	Location	Numbers								
8x10	first floor	all								
4x5	first floor	all								
Card Catalog:	complete; there is also an Approach database of the blue plates.									
Record Books:	(49) 1-37502 (Catalog) (2) MC Important Regions (2) MC Long Period Variables (1) MC Photometric Work									
Record Sheets:	26154-40591									
Comments:	<p>This instrument, the most powerful reflector in the northern station up to 1936, was especially valuable for faint objects where the large scale was of benefit. When the plates are used for photometric purposes, it is well to take precautions, since the color coefficient is large and the distance correction is both large and variable from one plate to another.</p> <p>The instrument was refigured after about 3500 plates had been taken; the distance correction was thereby diminished, but the color coefficient was practically unchanged. In general, it is well to avoid plates taken before the refiguring for accurate photometric work. All plates subsequent to 4171 were taken with the curved plate holder, which diminishes the distance correction due to curvature of field.</p>									



[Histogram by year](#)

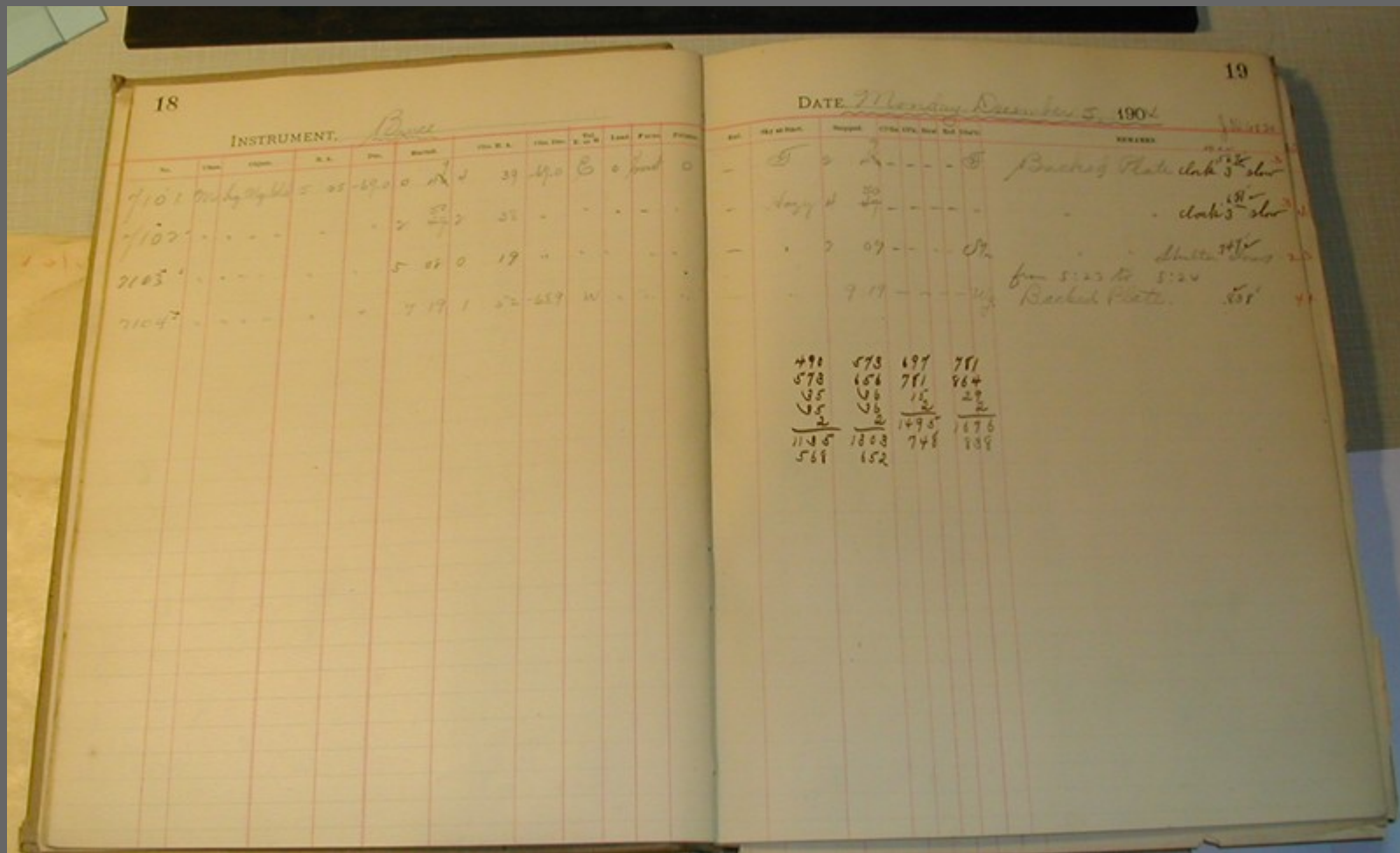
Digitize Plate Metadata

From hand-written cards and logbooks



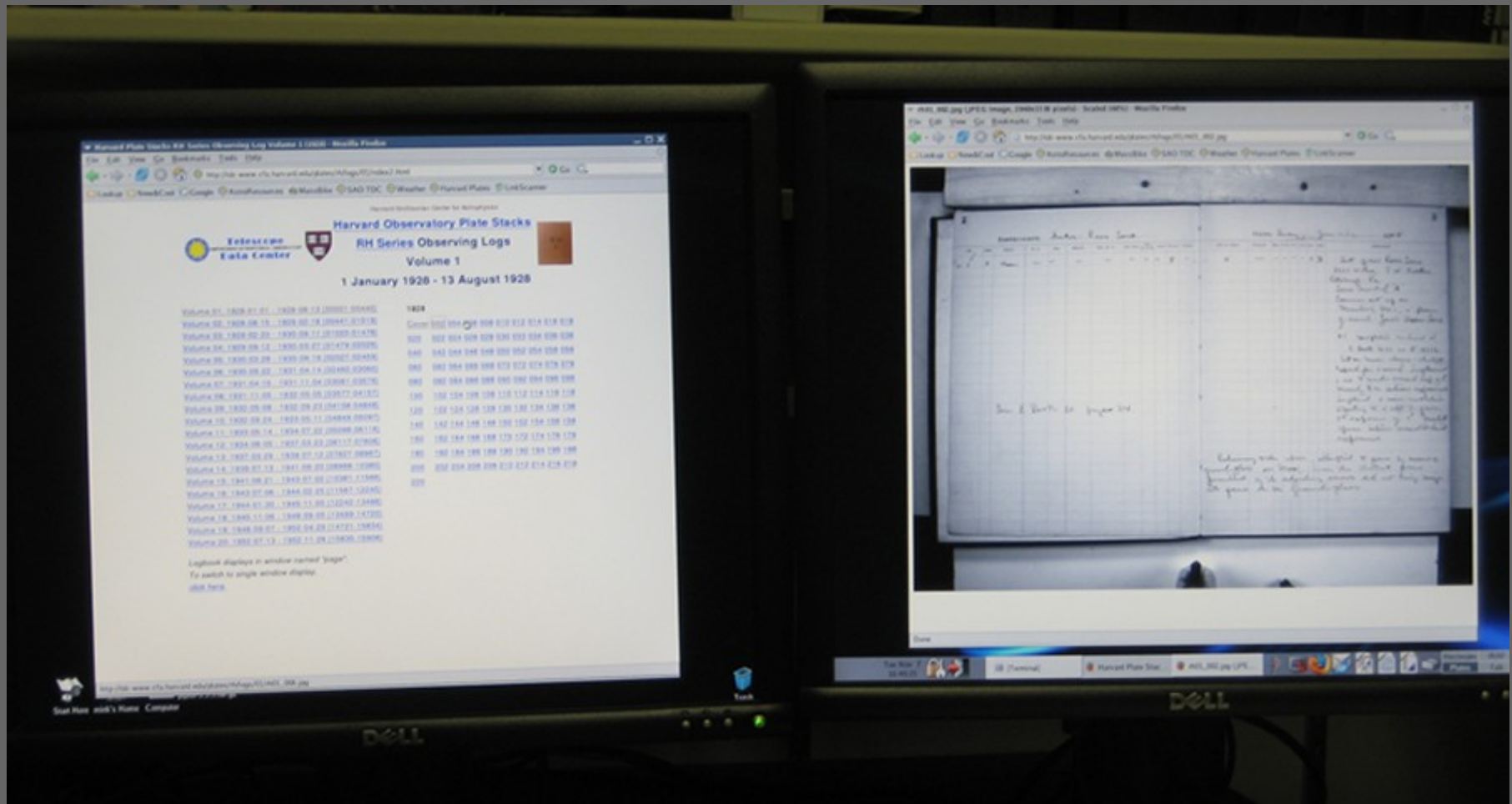
Digitize Plate Metadata

Digitize hand-written cards or logbooks



Digitize Plate Metadata

Serve logbooks on the web

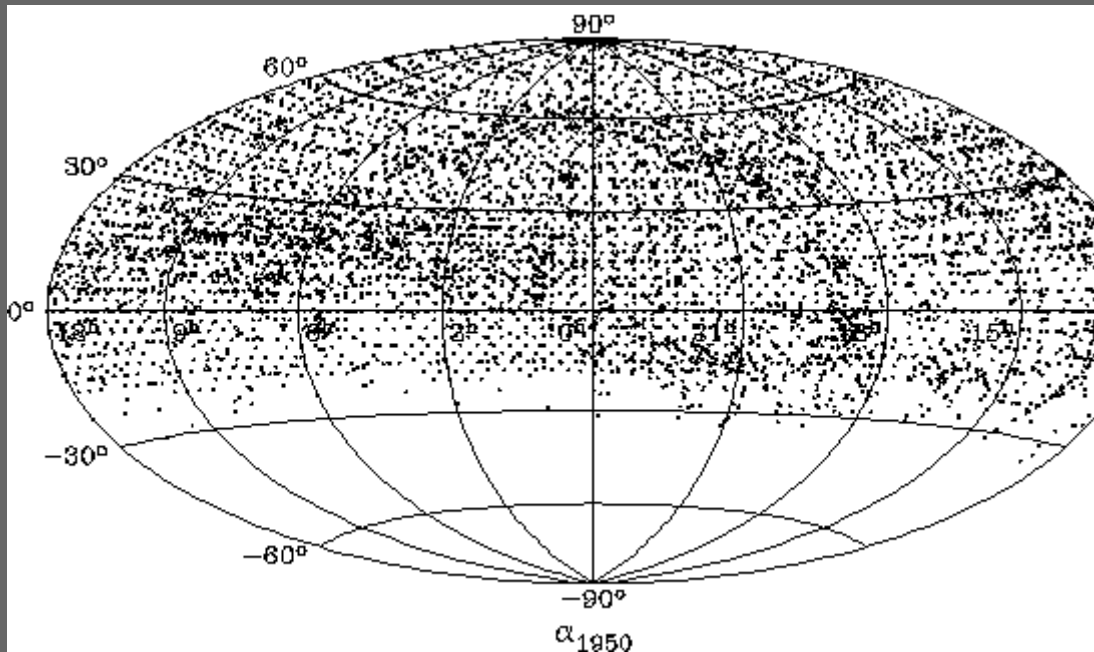


Digitize Metadata

To a computer-readable format

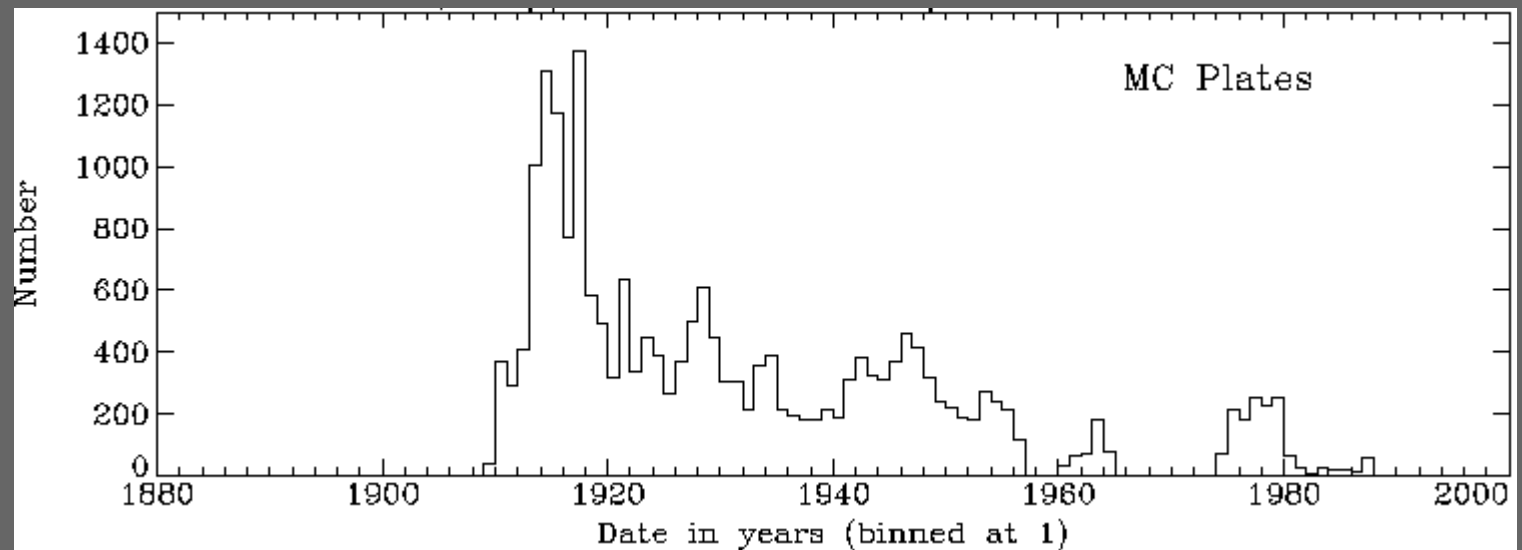
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epoch 1950.0
equinox 1950.0
plate ra dec exp mjd comment
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00057 00:45 +00:00 51 18620.000
00061 03:42 +23:36 30 18621.000
00062 03:41 +23:54 120 18621.000
00063 03:43 +23:54 30 18621.000
00064 05:30 +16:42 60 18621.000 Halleys_Comet
00065 22:21 -21:30 63 18622.000
00066 23:56 -01:42 15 18622.000 Region_of_Mars
00068 01:08 +04:42 30 18625.000 saturn
00069 01:09 +04:30 30 18625.000 saturn
00070 01:09 +04:30 39 18625.000 saturn
00071 01:09 +04:30 10 18625.000 saturn
00073 05:27 +16:42 60 18625.000 Halleys_Comet
00074 05:34 -05:30 60 18625.000 Nebulae_Orion
00075 04:16 +16:36 60 18627.000 wrong_field
00076 01:08 +04:06 01 18628.000 saturn
00078 01:08 +04:24 10 18628.000 saturn
00079 01:09 +04:48 1 18628.000 saturn
00080 01:08 +04:48 33 18628.000 saturn
00082 01:10 +04:42 10 18628.000 saturn
00084 04:09 +16:12 60 18628.000 Halleys_comet
00086 00:34 +29:00 10 18649.000
00087 01:06 +03:54 15 18649.000
00088 01:06 +04:24 12 18649.000
00089 01:04 +04:00 23 18649.000
00095 02:02 +01:00 33 18650.000
00096 03:43 +24:00 82 18650.000
00099 02:01 +00:00 120 18651.000
00100 03:41 +24:00 20 18651.000
00101 05:00 +15:00 120 18651.000
00103 00:32 +00:00 109 18654.000
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00106 01:00 +15:00 60 18656.000
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00107 10:16 +00:00 1 18656.000 2_fields_w/_9.13_00.0_2exp
--More--(0%)
```

Amalgamate plate metadata



Spatial distribution of HCO MC Plates

Temporal Distribution of HCO MC Plates




Web plate catalog search

MC Series Harvard Plate Stack Search at SAO TDC - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://tdc-www.harvard.edu/cgi-bin/plates/mcsearch

Weather SAO TDC MassPaths MassBike ADS Picasa Google Maps PhotoWorks TV Guide Online Salon Time BlueHost cPanel X

 **Telescope Data Center** SMITHSONIAN ASTROPHYSICAL OBSERVATORY

Harvard Plate Stacks
MC Series Search

[A Series \(about\)](#)
[B Series \(about\)](#)
[MA Series \(about\)](#)
[MC Series \(about\)](#)
[MF Series \(about\)](#)

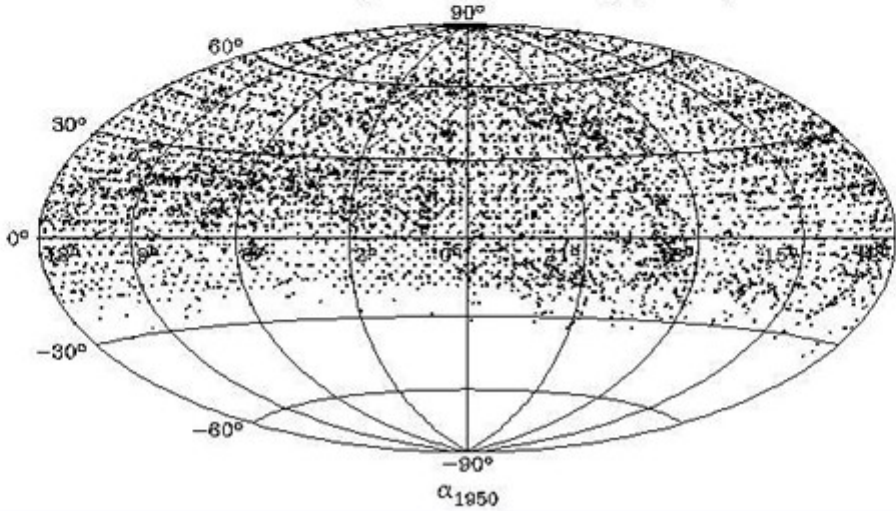
Name 5-digit Sequence X pixels to extract Y pixels to extract

J2000 Right Ascension (hh:mm:ss.sss) Declination (dd:mm:ss.sss) Extracted Image Type

Starting Date (yyyy-mm-dd or frac. year) Ending Date (yyyy-mm-dd or frac. year)

Click on map to see MC plates from 1909-1919

· Harvard MC plate stack catalog (mobra)



Done


Results of plate catalog search

MC Series Harvard Plate Stack Search Results at SAO TDC - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://tdc-www.harvard.edu/cgi-bin/plates/fmcsearch

Weather SAO TDC MassPaths MassBike ADS Picasa Google Maps PhotoWorks TV Guide Online Salon Time BlueHost cPanel X


Telescope Data Center

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J2000 Right Ascension (hh:mm:ss.sss) Declination (dd:mm:ss.sss) Extracted Image Type

Starting Date (yyyy-mm-dd or frac. year) Ending Date (yyyy-mm-dd or frac. year)

Searching for plates containing m44 = 08:40:22.198 +19:40:19.43 J2000 from NED

Plate	RA2000	Dec2000	Exp	Epoch	Arcsec	Comment	
00242	08:26:52.591	+19:49:21.39	20.00	1910-04-01	2010.22	Fraesepe_2exps	scanned plate (WCS)
00250	08:26:52.657	+19:49:24.80	28.00	1910-04-05	2845.61	Fraesepe_2exps	scanned plate (WCS)
00255	08:26:52.591	+19:49:21.39	31.00	1910-04-10	2010.22	Fraesepe_2exps	scanned plate (WCS)
00247	08:26:52.591	+19:49:21.39	31.00	1910-04-20	2010.22	2exp_at_0.25_+22.5	scanned plate (WCS)
00276	08:26:55.199	+22:19:21.32	5.00	1910-04-27	9981.95	Fraesepe	
00277	08:26:55.199	+22:19:21.32	5.00	1910-04-27	9981.95	Fraesepe	
00280	08:26:52.657	+19:49:24.80	5.00	1910-04-28	2845.61	Fraesepe	scanned plate (WCS)
00896	08:26:52.899	+20:07:21.28	10.00	1911-01-24	2372.09	Fraesepe	scanned plate (WCS)
02923	08:22:52.009	+19:00:45.11	10.00	1913-03-08	6799.61	V110_MD	scanned plate (WCS)
02979	08:25:52.967	+20:07:24.79	10.00	1913-03-13	4124.50	V11V_MD	scanned plate (WCS)
04829	08:42:52.184	+19:49:11.19	10.00	1914-02-25	2182.25	Fraesp_GC1681_S_Ca	scanned plate (WCS)
04998	08:26:52.591	+19:49:21.39	20.00	1914-02-13	2010.22	Fraesepe	
05077	08:26:52.591	+19:49:21.39	1.00	1914-02-20	2010.22	Scale_of_magns_Fra	scanned plate (WCS)
05161	08:26:52.657	+19:49:24.80	10.00	1914-02-25	2845.61	Fraesepe_S_Cancr1	scanned plate (WCS)
05176	08:26:52.657	+19:49:24.80	11.00	1914-04-01	2845.61	Fraesp_S_Cancr1_GC	scanned plate (WCS)
08121	08:25:52.846	+20:00:24.79	10.00	1915-03-09	2990.03	Fraesepe	scanned plate (WCS)
08175	08:25:52.846	+20:00:24.79	10.00	1915-03-12	2990.03	Fraesepe	scanned plate (WCS)
11995	08:27:52.124	+18:50:02.51	1.00	1916-12-28	11041.72	Neptune mult	

Done

Next: Digital access to image data

Move the plates out of the 20th century

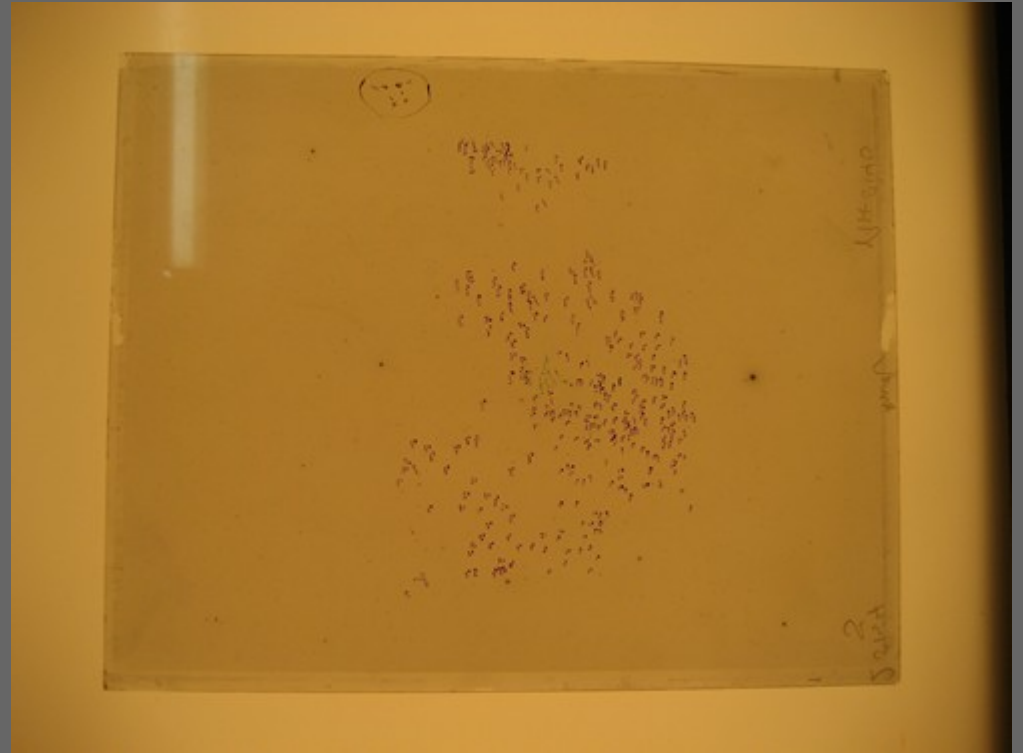


Pre-scanning procedures



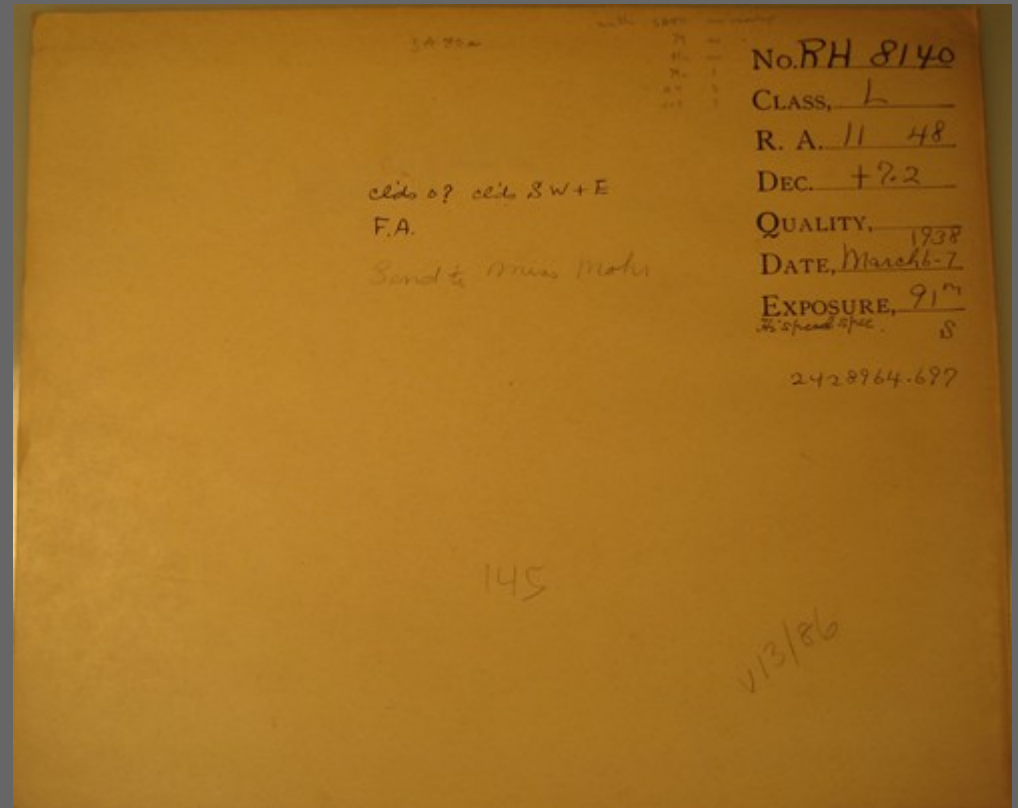
Record plate-specific metadata

Pre-scanning procedures



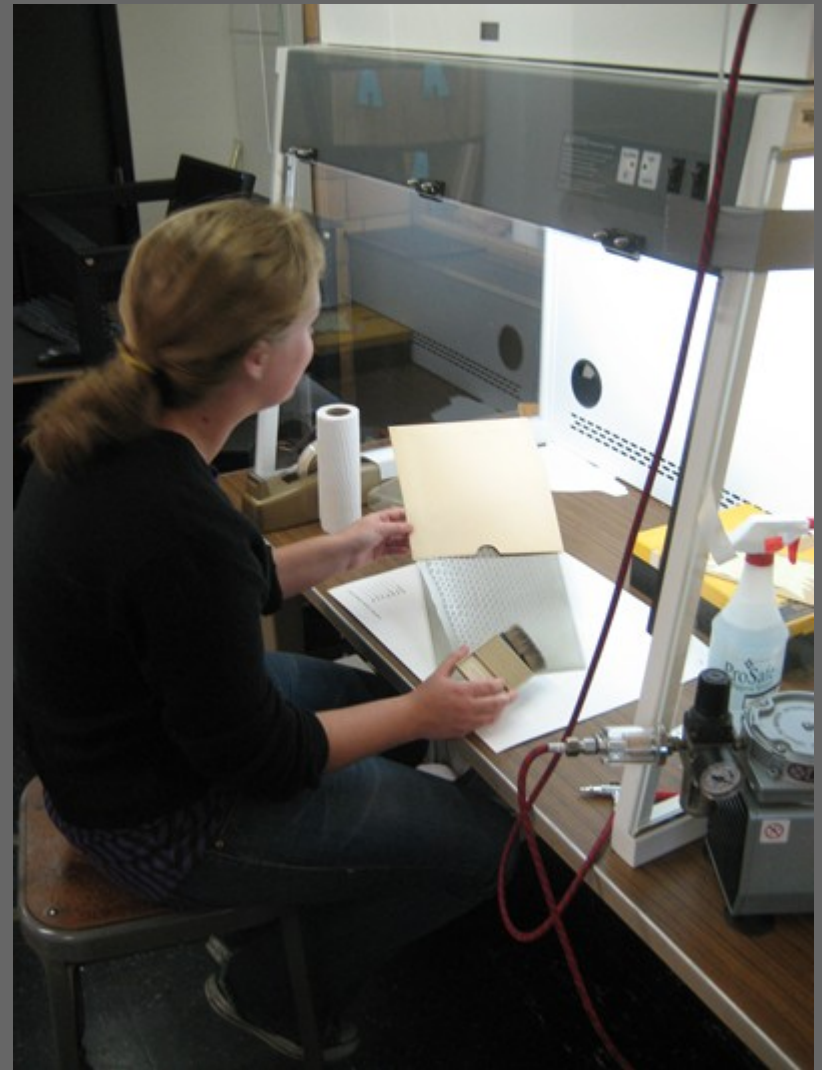
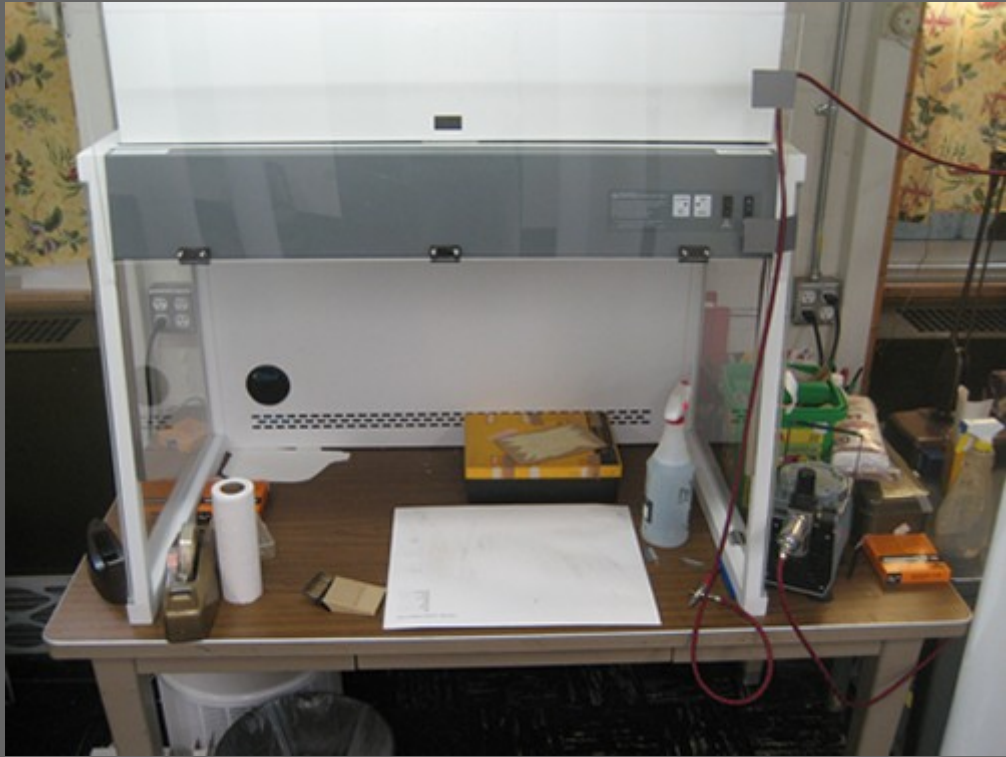
Record image of plate with markings

Pre-scanning procedures



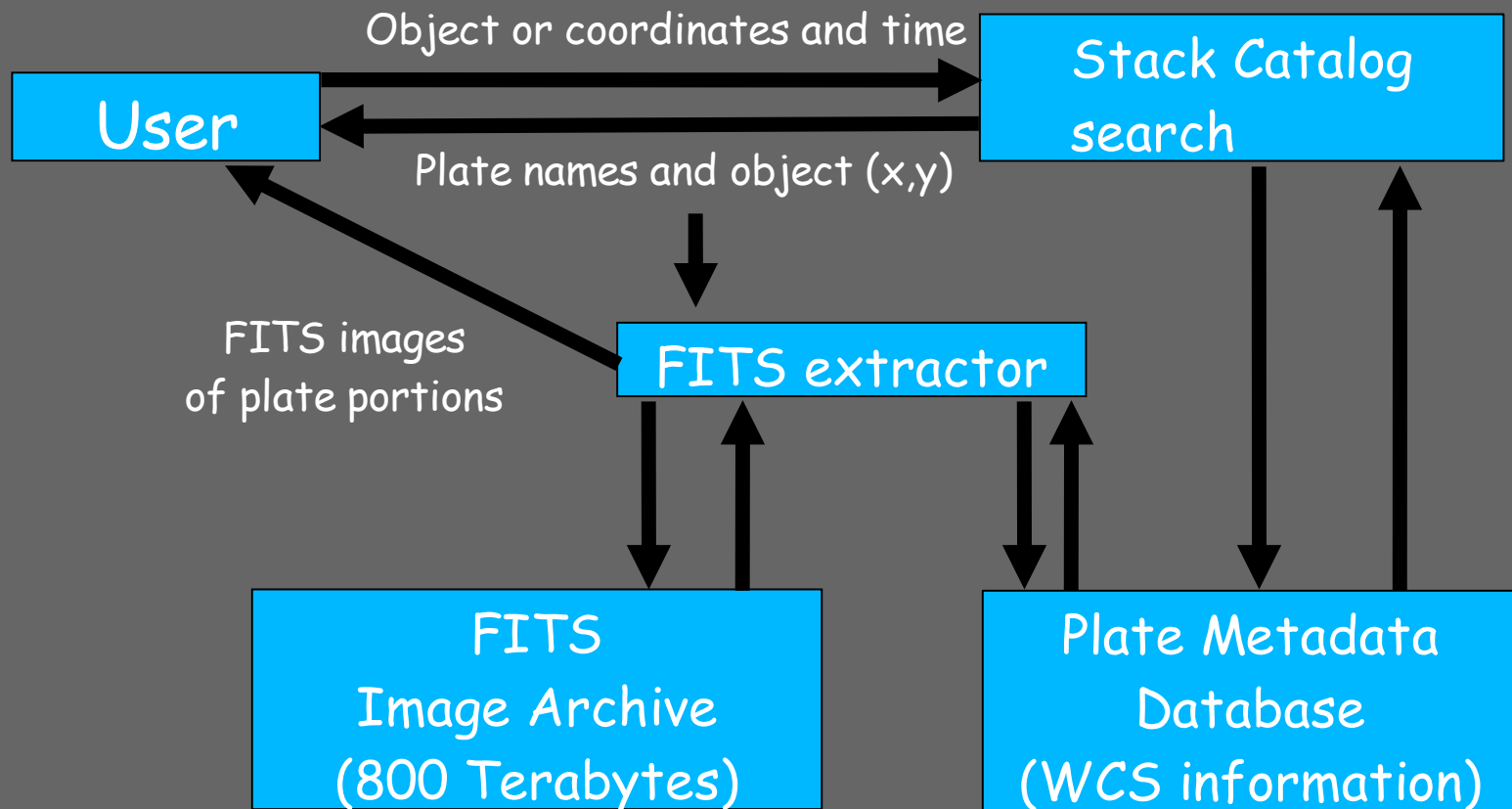
Record image of plate jacket

Pre-scanning procedures



Clean markings off plate for scientific use

Access to digital images



Web access to digital images

MC Series Harvard Plate Stack Search Results at SAO TDC - Mozilla Firefox

http://tdc-www.harvard.edu/cgi-bin/plates/mcsearch

Telescope Data Center
SMITHSONIAN ASTROPHYSICAL OBSERVATORY

Harvard Plate Stacks

MC Series Search

[A Series \(about\)](#)
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[MA Series \(about\)](#)
[MC Series \(about\)](#)
[MF Series \(about\)](#)

Name 5-digit Sequence or Object Name X pixels to extract Y pixels to extract

J2000 Right Ascension (hh:mm:ss.sss) Declination (dd:mm:ss.sss) Extracted Image Type

Starting Date (yyyy-mm-dd or frac. year) Ending Date (yyyy-mm-dd or frac. year)

Searching for plates containing m44 = 08:40:22.198 +19:40:19.43 J2000 from NED

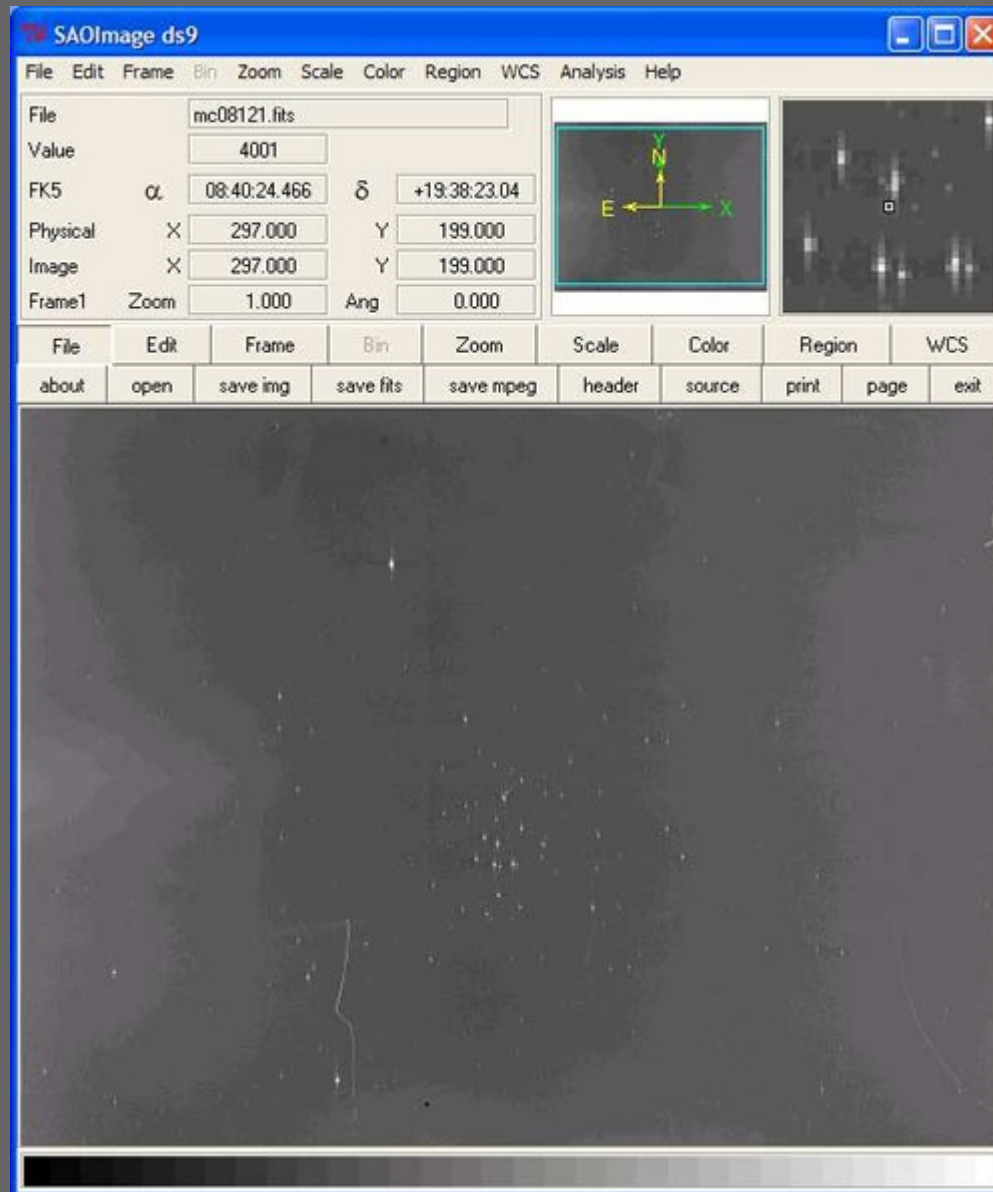
Plate	RA2000	Dec2000	Exp	Epoch	Avsec	Comment	
00242	08:26:52.591	+19:49:21.39	30.00	1910-04-01	3010.22	Fraesepe_2exps	scanned plate (WCS)
00250	08:26:52.657	+19:49:24.80	28.00	1910-04-05	3845.61	Fraesepe_2exps	scanned plate (WCS)
00255	08:26:52.591	+19:49:21.39	31.00	1910-04-10	3010.22	Fraesepe_2exps	scanned plate (WCS)
00247	08:26:52.591	+19:49:21.39	31.00	1910-04-20	3010.22	2exp_av_0.25_+22.5	scanned plate (WCS)
00276	08:26:55.199	+22:19:21.32	5.00	1910-04-27	9981.95	Fraesepe	
00277	08:26:55.199	+22:19:21.32	5.00	1910-04-27	9981.95	Fraesepe	
00280	08:26:52.657	+19:49:24.80	5.00	1910-04-28	3845.61	Fraesepe	scanned plate (WCS)
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02923	08:22:52.009	+19:00:45.11	10.00	1913-03-08	6799.61	V110_MD	scanned plate (WCS)
02979	08:26:52.967	+20:07:24.79	10.00	1913-03-13	4124.50	111V_MD	scanned plate (WCS)
04829	08:42:52.184	+19:49:11.19	10.00	1914-02-25	2182.25	Fraesp_GC1681_S_Ca	scanned plate (WCS)
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05161	08:26:52.657	+19:49:24.80	10.00	1914-03-25	3845.61	Fraesepe_S_Cancr1	scanned plate (WCS)
05176	08:26:52.657	+19:49:24.80	11.00	1914-04-01	3845.61	Fraesp_S_Cancr1_GC	scanned plate (WCS)
08121	08:26:52.846	+20:00:24.79	10.00	1915-03-09	3990.03	Fraesepe	scanned plate (WCS)
08175	08:26:52.846	+20:00:24.79	10.00	1915-03-12	3990.03	Fraesepe	scanned plate (WCS)
11995	08:27:52.124	+18:50:02.51	1.00	1916-12-28	11041.72	Neptune mult	

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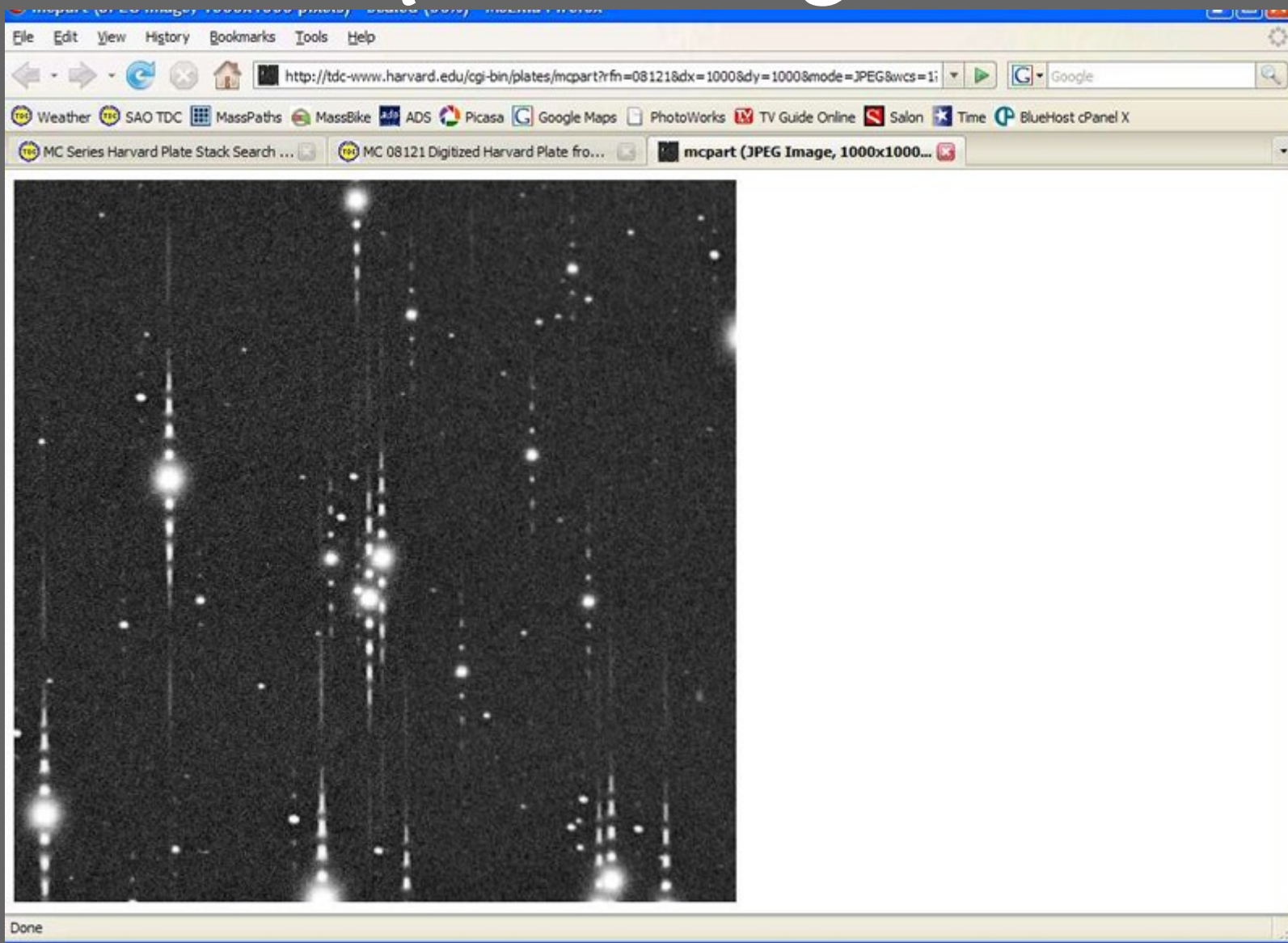
Web access to digital images

The screenshot shows a web browser window displaying a digitized astronomical plate. The browser's address bar shows the URL: <http://tdc-www.harvard.edu/cgi-bin/plates/mcplate?rfn=08121&dx=1000&dy=1000&mode=JPEG&wvcs=1>. The browser's toolbar includes various icons for navigation and search. The page content features the logo of the Telescope Data Center, which is part of the Smithsonian Astrophysical Observatory. The logo includes a sun icon and the text "Telescope Data Center" and "SMITHSONIAN ASTROPHYSICAL OBSERVATORY". Below the logo, there is a link: "Click here for 1.02nd order FITS image with WCS" and another link: "Click on image for 1000 x 1000 JPEG image". The main content of the page is a large, dark, rectangular image of an astronomical plate, showing numerous stars and some faint markings. The plate is labeled "MC08121" in the top right corner. The browser's status bar at the bottom shows the URL: <http://tdc-www.harvard.edu/cgi-bin/plates/mcpart?rfn=08121&dx=1000&dy=1000&mode=JPEG&wvcs=1?259,81>.

Display FITS image in ds9 browser



Display full-resolution piece of plate image



Display full-resolution piece of plate image

