Virtual Astronomy with the Digitized Harvard Plate Stacks

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- There are 600,000 photographic images in the Harvard Plate Stacks, 385,000 primary
- It will be many years before the plates will all be available online
- But useful information from and about the plate collection can be online sooner than you might think.

600,000 Plates

Telescope Data Center
SMITHSONIAN ASTROPHYSICAL OBSERVATORY

Harvard-Smithsonian Center for Astrophysics

Harvard University Plate Stacks
Plate Characteristics

Collection Summary rev. 31 October 2002 i

Code	Aperture (in.)	Scale "/mm	Scale "/inch	+-dec	at d=0 +-ra	N/S	Total	Years	Limit	Q	Remarks
A	24	60	0.42	2.9	14.3	S	27504	1893-1950	18	5	primary (Some early plates northern hemisphere)
ADH	30	68	0.48	2.4	9.6	S	7067	1950-1963	18-19	4	Circular plates, north edge at mark
AM,AC, etc.	1.5	600	4.23	21.1	67.7	N/S	75000	1898-1957	13-14	3	primary
B	8	179	1.26	6.3	20.2	S	76874	1885-1954	17	4	primary
BR	8	209	1.46			S	4176	1938-1944	17	4	like MF
C	11	84	0.59	2.4	5.9	N	23270	1886-1947	--	2	Mostly spectra; limited use
DNB,DSB	1.6	580	4.09	20.5	65.4	N/S	9000	1962-1989	15	5	**Patrol (>1962)
FA,AI	1.5	1200	----	----	----	N	70000	1901-1958	--	2	bright_objects
H	24	60	0.42	0.9	3.6	N	6644	1906-1953	--	3	Reflector (small field)
I	8	163	1.14	5.7	18.2	N	59246	1889-1946	17	4	primary
IR	8	162	1.13	5.6	18.0	N	12798	1934-1976	17	4	--
J	24	98	0.68	2.7	10.8	N	4770	1942-1957	--	3	Schmidt; square plates, N-S diagonal
MA	12	97	0.68	3.4	10.9	N	11737	1905-1983	17-18	5	primary
MB	4	193	1.4	6.8	22	N	2722	1914-1932	--	2	MA piggy-back
MC	16	98	0.68	2.7	13.6	N	40596	1909-1992	17-18	5	primary
MD	4	193	1.36	6.8	21.7	N	30000	1911-	11	2	MC piggy-back
MF	10	167	1.17	5.8	18.7	S	40897	1915-1955	17	4	primary(Some early plates N)
RH,RB	3	391	2.76	13.8	44.2	N/S	33000	1928-1963	15	3	primary
RL	4	290	2.05	8.2	32.8	N	5062	1933-1962	--	--	--
SH,SB	60	26	.18	.36	.45	N/S	20000	1934-1989	--	--	Asteroids (Reflectors)
Superschmidt	12	1200	8.4	27	108	N	30000	1953-1968	--	--	Meteor films (circular, molded)
X	13	42	.29	1.2	5.8	S	19090	1888-1951	--	--	primary

Phase 0 (2002): Test scanners

UMAX PowerLook 3000 $5,000

Adequate resolution (1200 dpi), reliable

Under 10 minutes per scan

Phase 0: Test scanners

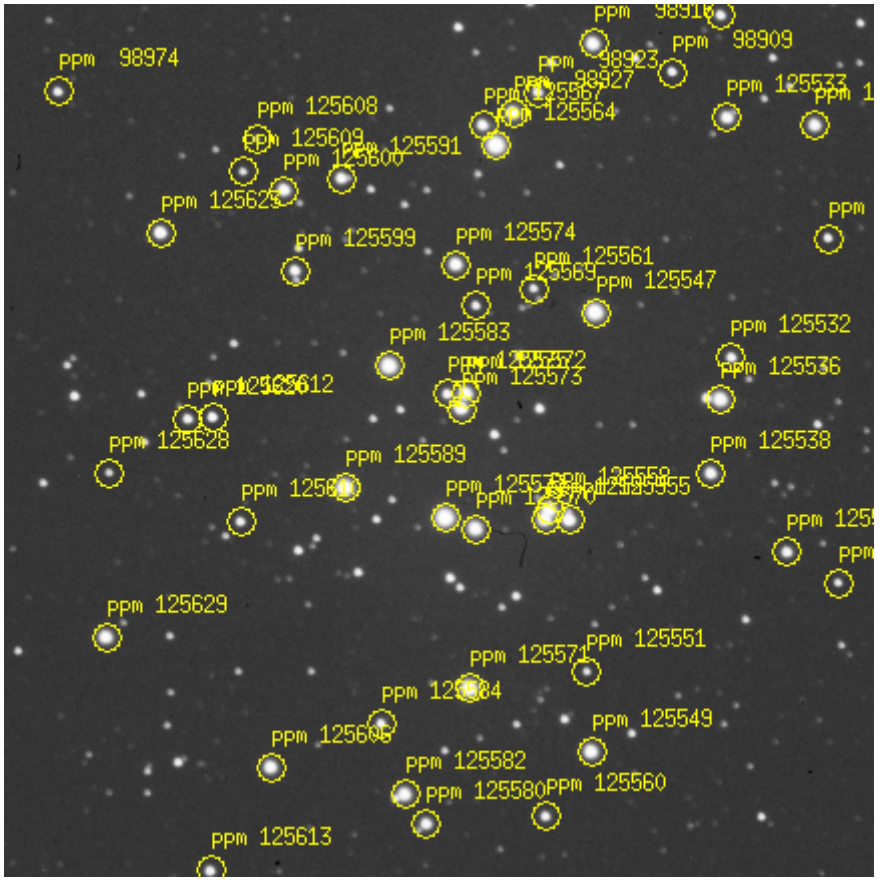
CreoScitex EverSmart $35,000-$50,000

High resolution (4800 dpi), but crashed a lot

20 minutes per scan

Phase 0: What we learned

- Plate astrometry using FITS WCS is good enough for source ID, but higher order terms needed.
- 1200 dpi is enough for most of the sky
- Photometry is possible!



Phase 1: Proof of Concept

- Can science be done with digitized plates?
- Scan 100+ plates and study Cepheid variability

Phase 2: Improve access

Move the catalog out of the XIXth century

Phase 2: Improve access

Move the catalog into the 21st century

Telescope
SMITHSONIAN ASTROPHYSICAL OBSERVATORY
Data Center

Harvard Plate Stacks
A Series Search

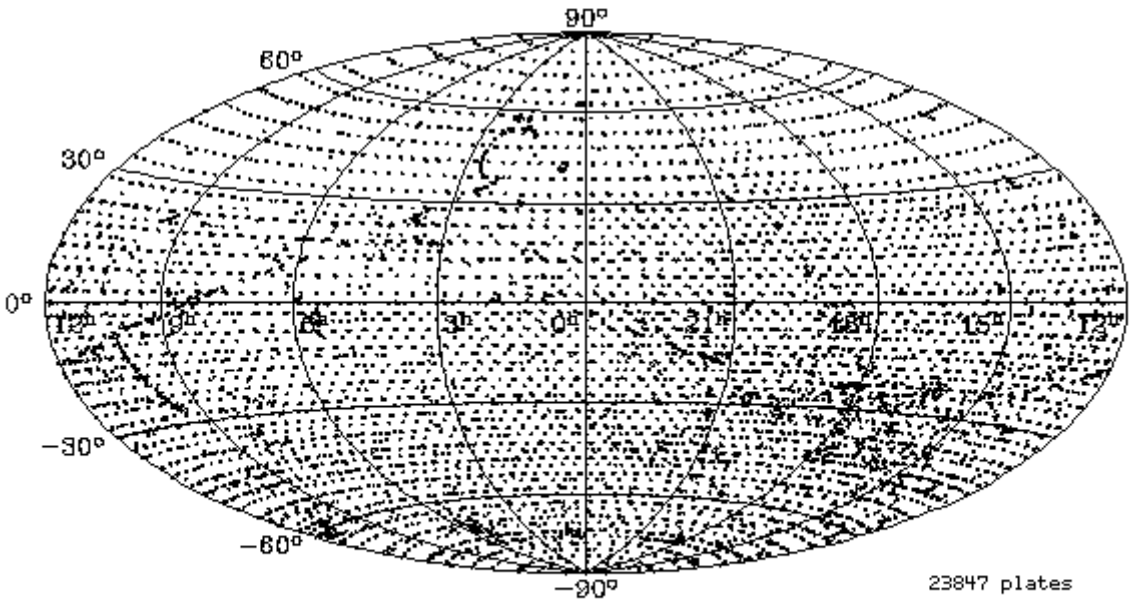
Name | 5-digit Sequence or Object Name

J2000 | Right Ascension (hh:mm:ss.sss) | Declination (dd:mm:ss.sss)

Search | Starting date (year or ISO date) | Ending date (year or ISO date)

Click on map to see plates from 1890's

· Harvard Observatory A plate centers (aplates)



Phase 2: Improve access

Move the catalog into the 21st century

Telescope Data Center
SMITHSONIAN ASTROPHYSICAL OBSERVATORY

Harvard Plate Stacks

A Series Search

Name | **5-digit Sequence or Object Name** m44

J2000 | **Right Ascension (hh:mm:ss.sss)** | **Declination (dd:mm:ss.sss)**

Search | **Starting date (year or ISO date)** 1890.0 | **Ending date (year or ISO date)** 1900.0

Searching for plates containing 08:40:22.198 +19:40:19.43 J2000 from 1890.0 to 1900.0

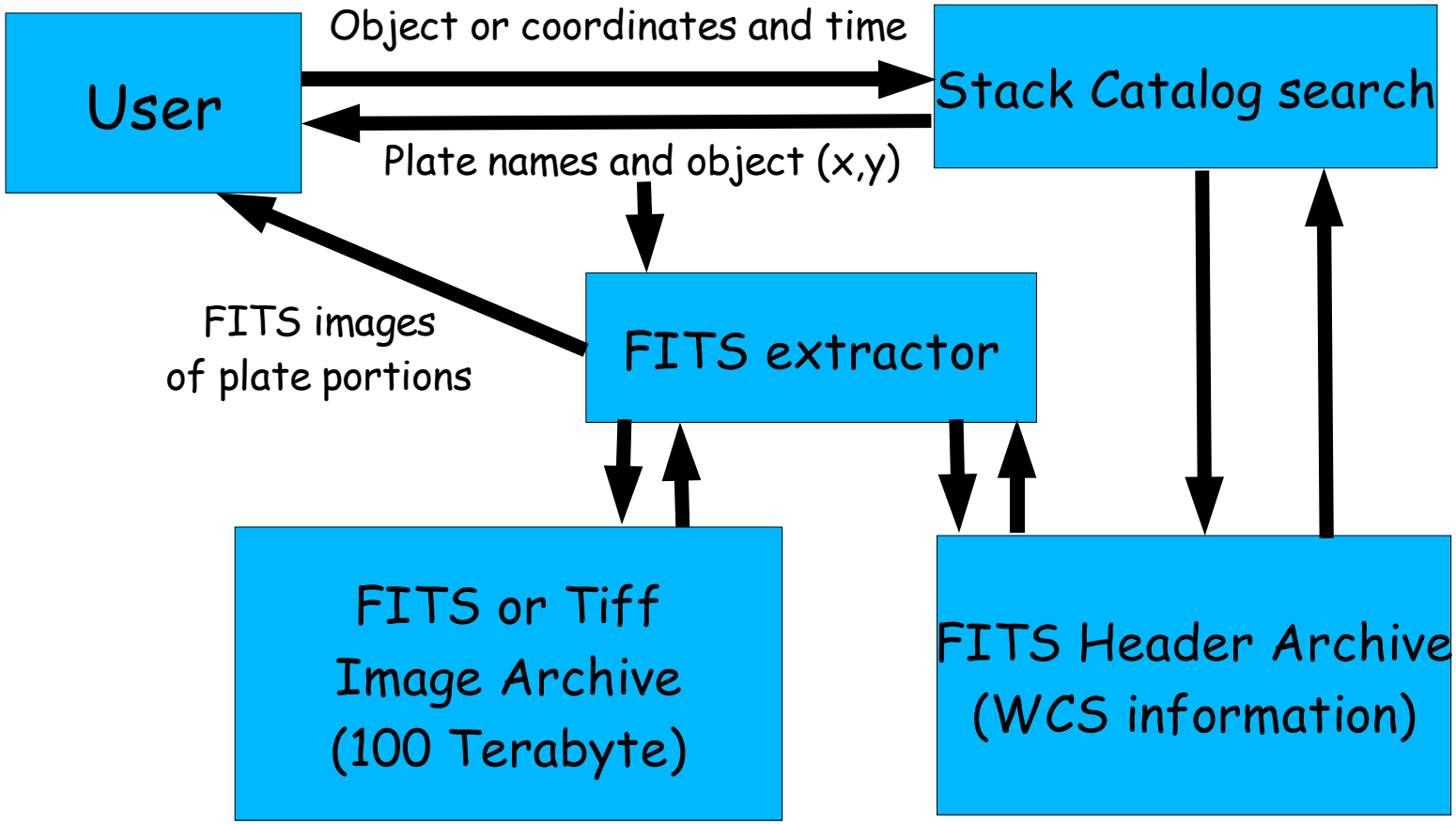
Plate	RA2000	Dec2000	Exp	Epoch	Arcsec
0045	08:34:52.827	+19:55:38.21	18.00	1893-11-26	4738.41
0147	08:33:53.101	+20:07:41.64	59.00	1894-01-02	5728.35
0194	08:33:53.101	+20:07:41.64	16.00	1894-01-26	5728.35
0196	08:33:52.997	+20:01:41.64	60.00	1894-01-31	5638.83
0207	08:32:53.272	+20:13:45.08	15.00	1894-02-02	6639.87
0244	08:32:53.272	+20:13:45.08	10.00	1894-02-17	6639.87
0263	08:33:52.789	+19:49:41.65	14.00	1894-02-25	5526.18
0265	08:49:53.978	+22:06:48.14	21.00	1894-02-25	11892.47
0326	08:52:49.101	+17:18:38.58	13.00	1894-03-08	13606.37
0537	08:32:50.291	+17:19:45.16	10.00	1894-04-18	10604.32
0549	08:35:53.070	+20:13:34.78	60.00	1894-04-26	4287.29
1252	08:47:54.341	+22:18:54.64	20.00	1894-12-24	11429.00
1280	08:31:53.338	+20:13:48.54	68.00	1895-01-30	7450.71
1285	08:35:53.070	+20:13:34.78	60.00	1895-02-15	4287.29

Phase 3: Improve access to images

Move the plates out of the 20th century

Phase 3: Improve access to images

Move the plates into the 21st century



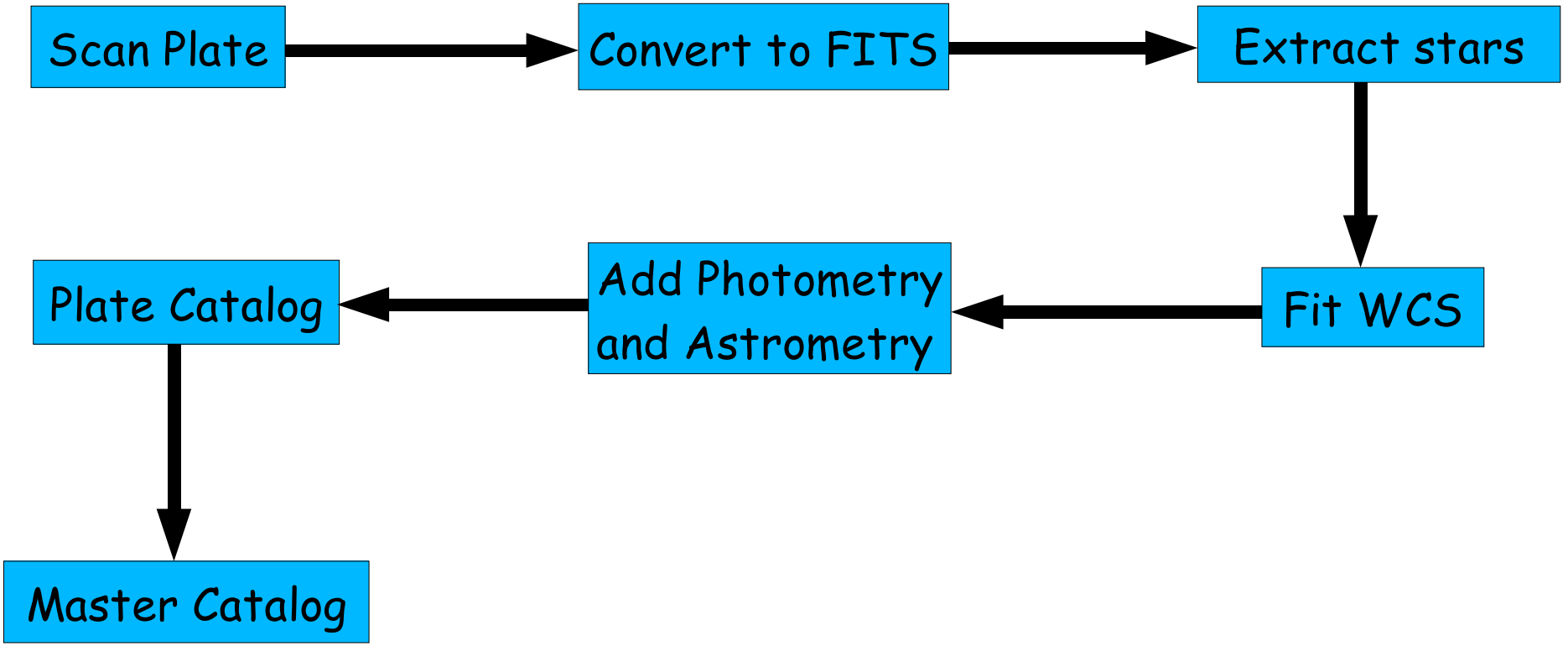
Phase 3: Improve access more

Move the plates into the 21st century

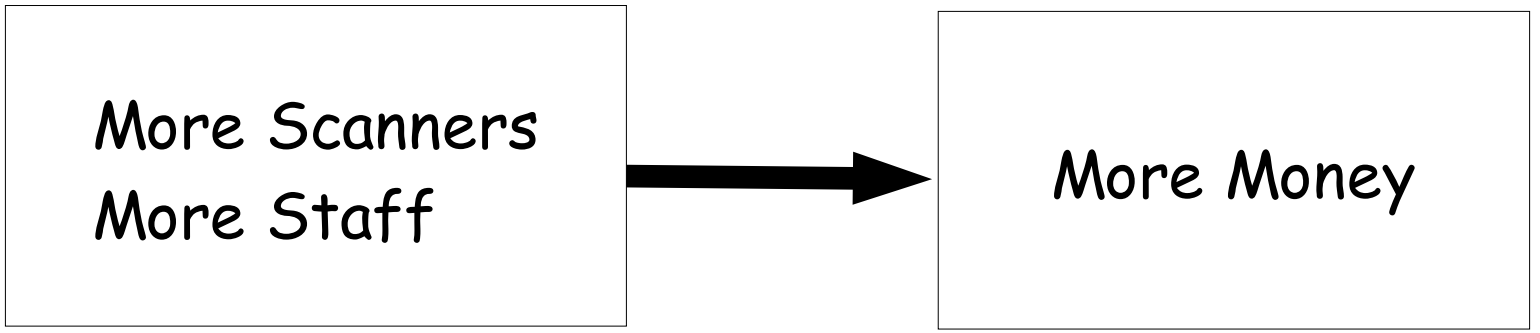
MC catalog search screenshot
(when catalog is debugged)

Phase 4: Make science easier

Provide plate catalogs with photometry and astrometry during pipeline processing



What's Next?



Harvard Digital Libraries Initiative
National Virtual Observatory


Happy Halloween