

Lohse's historic plate archive

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Oswald Lohse's astrophotographic plate archive was established at the Astrophysical Observatory Potsdam (AOP) in the period 1879 – 1889. Unfortunately, from 217 plates, listed in the log book, the first 148, taken between 1879 and 1885, cannot be found any longer. On April 14, 1945 a bomb detonated near the dome where the plates had been stored. This apparently caused the loss (Wempe 1974, Dick 1988).

The 67 still existing plates of the archive were taken with the largest instrument of the observatory at that time – the refractor ($D = 0.30$ m, $F = 5.40$ m, scale = $38''/\text{mm}$) and with the second heliographic objective ($D = 0.13$ m, $F = 1.36$ m, scale = $152''/\text{mm}$) (Vogel 1878–1890, Hassenstein 1941). The sizes of the plates are mostly 9×12 cm², which corresponds to fields of 1.2° and 5° , respectively, for each of the two instruments mentioned above. The average limiting magnitude is 13.0(pg). English standard plates produced by Wratten and Wainwright with an average sensitivity and exceptional pure emulsion layer according to Lohse (1889) had been used at the AOP since 1881. Nevertheless, in the log book of the archive Lohse specifically mentions some other emulsions from different manufacturers that were used in the beginning of astrophotography (Gädicke, Schleussner, Beer-naert, etc.). The plates taken after November 1887 are mainly with orthochromatic emulsions sensitive up to 580 nm.

The observations can be divided in two groups: technical experiments and scientific observations. The technical experiments include mainly investigations of photographic processes, tests of new instruments, focus plates, and observation methods. The scientific observations were taken in the framework of the programs investigating the surfaces of the giant planets, stellar clusters (Lohse 1886), nebulous

objects, determinations of the parallaxes, and magnitudes of some bright stars (see Table 1).

Name	Period of observations	No. of plates
Moon	Nov. 1885 - Nov. 1888	3
Jupiter	May 1886 - May 1886	3
Alpha Aql	Sep. 1886 - Nov. 1888	5
Gamma Cas	Oct. 1886 - Oct. 1886	5
Alpha Ori	Feb. 1887 - Mar. 1887	3
Alpha Cas	Oct. 1886 - Oct. 1886	2
Alpha Peg	Dec. 1887 - Dec. 1887	2
Delta Peg	Dec. 1887 - Dec. 1887	2
Gamma Cyg	Dec. 1888 - Dec. 1888	2
Gamma Aql	Oct. 1886 - Oct. 1886	2
Orion Nebula (M 42/43)	Dec. 1888 - Feb. 1889	7
Pleiades (M 45)	Dec. 1885 - Dec. 1888	5
η & χ Persei	Mar. 1885 - Sep. 1886	2
Gen. Cat. 1295 (M 37)	Apr. 1886 - Apr. 1886	2
Gen. Cat. 4230 (M 13)	May 1886 - May 1886	3
Gen. Cat. 4294 (M 92)	Sep. 1886	1
Gen. Cat. 3636 (M 3)	Apr. 1885	1
Gen. Cat. 4437 (M 11)	Oct. 1886	1
Andromeda Neb. (M 31)	Nov. 1885 - Nov. 1888	6

Tab.1 Observations of some objects in Lohse's archive. Names of the objects are given as they appear in Lohse's log book, which he took from Sir John Herschel's *General Catalogue of Nebulae and Clusters of Stars* and from Dreyer's *New New General Catalogue* (Dreyer 1888).

Having in mind that 114 years have passed since the beginning of Lohse's observations, and that the archive survived two world wars, it is in remarkably good condition. There are 5 plates whose emulsions are completely detached from the glass or have begun to detach. Some of the plates have yellow spots with different sizes, up to the complete loss of images. It has been known for long that aging of the plates influences the image silver and results in golden spots and corresponding destruction of the image's information content. The experiments by Budell (1998) with aging simulation show that the plates with emulsions susceptible to yellow spots do not develop any spots when they were fixed and rinsed for an unusually long time. Lohse (1889), having big interest in photography and thinking about the storage of the plates, recommended a rinsing of the plates for several hours in the

shower bath, which obviously contributed to the relatively good state of the archive.

10 of Lohse's plates were chosen for digitalization with the PDS 2020 GM⁺ microdensitometer of Münster University in July 1998. The standard square diaphragm of 10 microns and a step size of 10 microns was used. Table 2 summarizes the scanning parameters and results.

LS. No.	Object	Coordinates (2000.0)		Date	Exp. (min)	m _{Limit} (pg)	Scan (mm)	Scan (MB)
		R.A.	Dec.					
152	Moon	-----	-----	17.11.1885	0.1	-	60/60	72
154	Pleiades	03 ^h 45 ^m 49 ^s	+24° 22' 12''	18.03.1886	12.0	11:	114/92	210
162	M13	16 ^h 41 ^m 41 ^s	+36° 27' 37''	20.05.1886	60.0	12:	117/92	215
168	M31	00 ^h 42 ^m 46 ^s	+41° 16' 18''	28.08.1886	120.0	12.5	111/91	202
171	h&χ Per	02 ^h 20 ^m 00 ^s	+57° 08' 00''	01.09.1886	120.0	13.5	88/111	194
206	Pleiades	03 ^h 47 ^m 24 ^s	+24° 06' 18''	04.12.1888	30.0	12.5	78/85	133
210	γ Cyg	20 ^h 22 ^m 14 ^s	+40° 15' 24''	06.12.1888	30.0	12.5	95/83	158
211	M42	05 ^h 35 ^m 31 ^s	-05° 16' 12''	09.01.1889	60.0	13.5	97/85	165
213	M42	05 ^h 35 ^m 31 ^s	-05° 16' 12''	10.01.1889	60.0	13.5	88/120	211
215	M42	05 ^h 35 ^m 31 ^s	-05° 16' 12''	24.01.1889	30.0	12.0	114/82	187

Tab.2 List of the digitized plates from Lohse's archive.

Lohse's archive is included into the Wide Field Plate Database (WFPDB, Tsvetkov et al. 1997, <http://www.skyarchive.org>) as the oldest systematic one, covering the fields of Orion (M42/43), Pleiades, h & χ Persei, M37, M3, M11, M13, M92, M31, etc., and will be very soon incorporated into the WFPDB, which is on-line accessible at <http://vizier.u-strasbg.fr/cats/VI.htx> - catalogue number VI/90. This historic plate archive shows not only the development of astronomy as a science, but also the progress of the application of photography for astronomical purposes. In this respect the time influence on such old astrophotographic plates certainly also is of interest for newer plate collections. Good conservation of old plates is a very important task as the wide-field plate collections are the most valuable data sources for optical sky surveys that were taken during this century. Examination of plates leads to the definitive conclusion that scanning of the archives is urgently needed in order to save the information contained on the plates and to make it accessible for the astronomical community.

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