Highlights of the Heidelberg Königstuhl Astronomical Plate Archives

Joachim Krautter[1], Markus Demleitner[2], Gabriella Langer[1], Holger Mandel[1], Florian Rothmaier[2], Nikita Roytman[1], Stefanie Schwemmer[1], Lukasz Siegwald[1], Otmar Stahl[1]

1 Zentrum für Astronomie Heidelberg (ZAH), Landessternwarte Heidelberg-Königstuhl
2 Zentrum für Astronomie Heidelberg (ZAH), Astronomisches Rechen-Institut, Heidelberg

Introduction

In 2005, we started a scan project for digitizing the photographic plate archives of the Landessternwarte Heidelberg (ZAH) and the Max Planck Institute for Astronomy (MPIA) with funding provided by the Klaus Tschira Foundation, Heidelberg.
During the last eight years roughly 25000 historic plates from various telescopes from the late 19th century to our days have been digitized and published via the German Astronomical Virtual Observatory (GAVO) data center as Heidelberg Digitized Astronomical Plates (HDAP). The project will be finished end of May 2014.

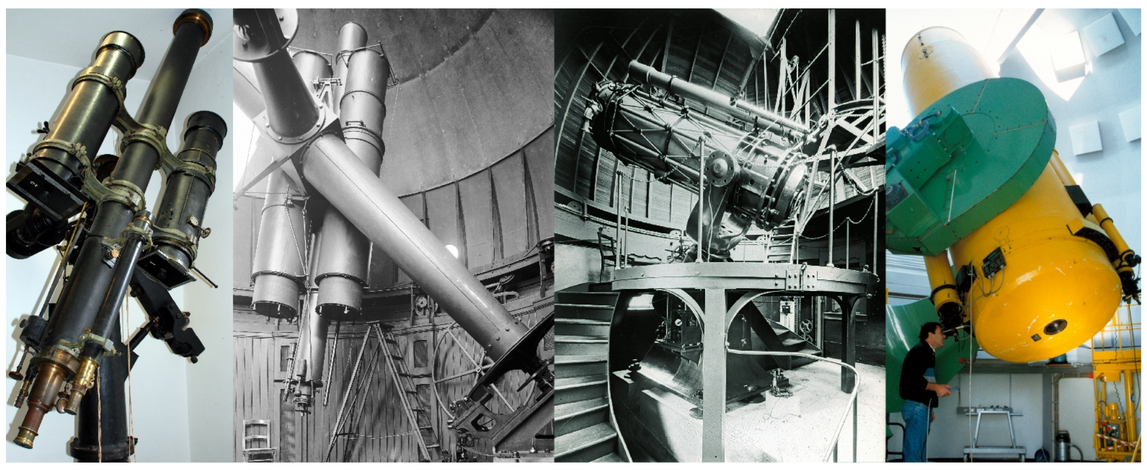

Fig.1: *The four most relevant telescopes for our archives: Wolf's Double Astrograph (1887) ~ 8000 plates; Bruce Telescope (1900) ~ 10000 plates; Waltz Reflector (1906) ~ 5000 plates; Calar Alto Schmidt Telescope (1975) ~ 350 plates*

The Telescopes

Name	Eff. Focal Length /mm	Aperture Ratio	Plate Size /cm²	Latitude	Longitude	Altitude / m
Wolf's double astrograph (15 cm) at Märzgasse	900	f/6	13x18 or 9x12	49.610 N	8.694 E	110
Wolf's double astrograph (15 cm) on Königstuhl	900	f/6	13x18 or 9x12	49.399 N	8.721 E	560
Königstuhl Bruce telescope (40 cm)	2000	f/5	24x30 or 30x30	49.399 N	8.721 E	560
72 cm Waltz reflector	2815	f/3.9	13x18 or 9x12	49.399 N	8.721 E	560
Calar Alto Schmidt telescope	2400	f/3	24x24	37.224 N	2.538 W	2168
1.23 m in Cassegrain focus with corrector	9857	f/8	24x24	37.224 N	2.546 W	2138
2.2 m in Cassegrain focus with corrector	17037	f/7.744	20x25 or 24x24	37.224 N	2.546 W	2138
3.5 m in primary focus with 3-lens corrector	13761	f/3.93	20x25	37.224 N	2.546 W	2138
3.5 m in primary focus with 2-lens corrector	12195	f/3.48	12.5x20	37.224 N	2.546 W	2138
2.2 m MPG ESO/La Silla			20x25	29.257 S	70.735 W	2335

Table 1: *Complete list of telescopes with contribution to our plate archives.*

The Scanner

The plates are digitized with a Nexscan F4100 professional scanner of Heidelberg Druckmaschinen AG. The device has a scanning window larger than A3 format (see Fig. 2), an optical resolution of 5080 dpi, a dynamic range of 16Bit/pixel and a maximum resolvable density of D = 4. In a compromise between the requirements needed for a good scan and the amount of data per digitized plate, it was decided to scan with a reduced resolution of 2540 dpi. This resolution correlates with a pixel size of 10 µm x 10 µm, taking into account the sampling theorem for 20 µm x 25 µm photographic grains. Scanning a plate of 24 cm x 30 cm takes about 50 min.
The files are stored in FITS format including a header with all necessary information about observation date, exposure time, object, observer, etc. This information was taken from the original observations journals.
In addition, the observation journals were digitized in a separate campaign by the University Library of Heidelberg to provide the users of the HDAP with all the information that was not included in the FITS header (like weather conditions and private remarks by the observers).
The project was funded by the Klaus Tschira Foundation, Heidelberg, grant number 00.071.2005.

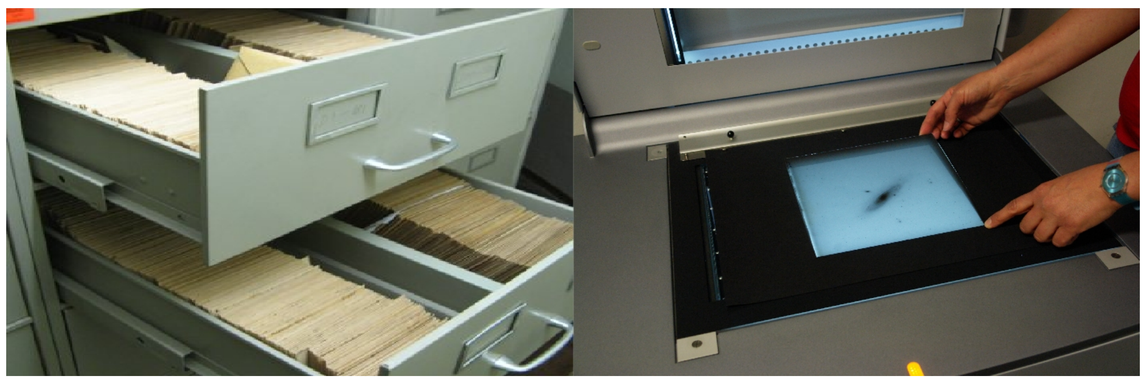

Fig. 2: *left: Some plates from Wolf's Double Astrograph archive. right: Scanner "Nexscan F4100" with masked 8x10 inch Schmidt plate.*

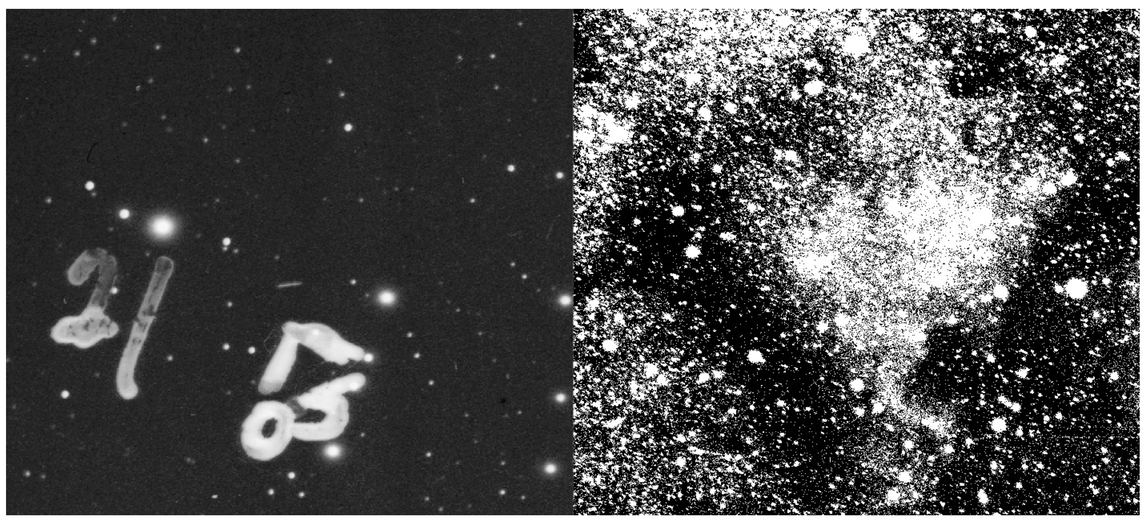

Fig. 3: *left: 30 arcsec x 30 arcsec cut-out of Bruce plate B2229a taken on January 27, 1909 with trail of minor planet (325) Heidelberga; exposure time: 210 min; right: NGC 7000 (North America Nebula) taken with Wolf's Double Astrograph in 3 suceeding nights (September 11-13, 1891); exposure time: 11h 7min*

Fig. 4: *M42 (Orion Nebula) taken on November 11, 1906 with the 72 cm Waltz Reflector at Landessternwarte; exposure time: 30 min*

Fig. 5: *20 minutes exposure of comet 1/P Halley taken on March 16, 1986 with the Calar Alto Schmidt telescope*

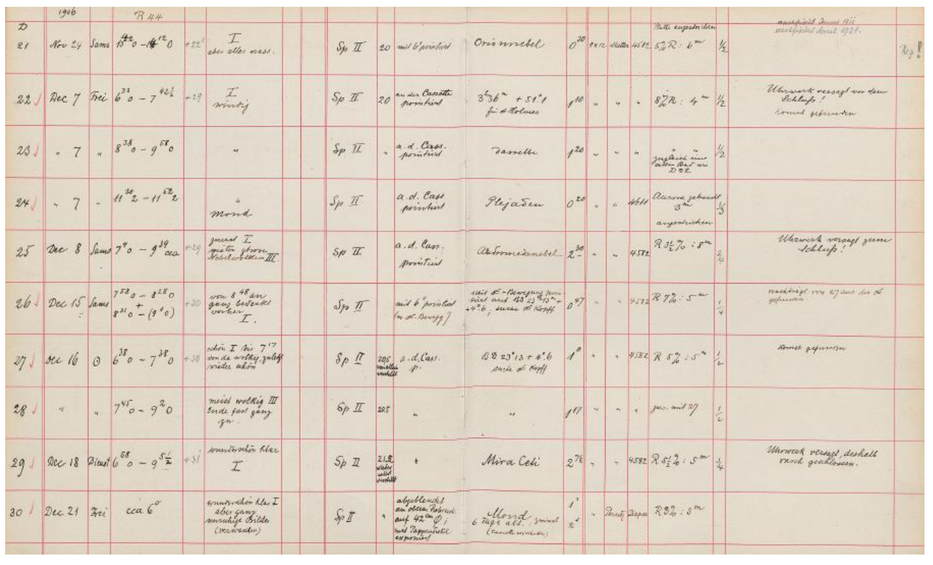

Fig. 6: *Scanned page of the first Waltz observation journal. The first entry on the page corresponds to the image shown in Fig. 4. The scans can be found at: http://www.ub.uni-heidelberg.de/helios/digi/landessternwarte.html*