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Preface

Dear Friends of Astronomy,

you have in your hands the proceedings from the first workshop about glass plate negatives. This proceedings put together selected lectures in the form of articles from the workshop.

The ASTROPLATE workshop held in Prague, Villa Lanna, in March 2014 represented major event in investigation, archiving, and digitization of astronomical photographic archives including all aspects. This volume represents collection of papers related to presentations and posters presented at the conference.

The photographic emulsion was the only medium for creating and storing images in astronomy for more than 100 years, from the discovery of photography up to the beginning of the era of electronic imaging devices (mostly CCD) in early 1980. And the same was valid for all other areas working with photographs including other sciences, national musea and archives, etc. The astronomers need to save indeed a rich variety of types of images ranging from direct images of stars and other celestial objects to wide field images covering large sky areas, to various types of spectral images, both wide-field with many spectral images, to just single recorded spectrum. I have got the opportunity to visit and work with more than 50 astronomical photographic archives. In last few years, I have found increasing number of damaged or even very damaged plates in these collections, the two main types of damage being the released emulsion layer and various types of yellow spots known as gold disease. We have established a consortium with specialists working in chemistry and photography restoration, in order to exploit the cause of these damages. It became obvious that if we want to save the large scientific cultural and historical heritage included in these archives, we need both national and international collaboration. At the same time, scanning of photographic records started at numerous institutions, with different approaches, technologies, and methods. Again it became evident that wider collaboration is necessary to optimize the digitization procedures in all aspects including metadata treatment. This was the background of the idea to organize an international workshop in Prague, where specialists of all involved disciplines could meet and discuss their results. We were very impressed by the response of the community, and by the high level of the contributions presented at the ASTROPLATE conference. Unfortunately, many of our colleagues were unable to attend this time for various reasons. We plan to organize 2nd ASTROPLATE conference in spring 2016, again in the beautiful Villa Lanna in Prague.

René Hudec

Proceedings are published without language correction.
Contents is on the responsibility of author of the separate articles.

UkrVO: Astroplates and the Joint Digitized Archive

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Abstract

ABSTRACT. The UkrVO (Ukrainian VO) database consists of about 150,000 astronegatives and 50,000 CCD-frames containing the unique astroinformation for formulation of important scientific tasks. This database is compiled from observations conducted in 1898-2011 years at observational sites of 8 Ukrainian observatories with about 50 instruments. The Joint Digital Archive (JDA) of photographic observations has become the UkrVO astroplate’s core. Now the UkrVO Joint Digitized Archive covers about 40,000 astroplates, from which 15,000 are digitized. They were performed with a flatbed scanner EpsonExpression 10000XL with 16-bit gray levels, resolution of 1200-1600 dpi. Digitized images are stored in TIFF and FITS formats. Current version of UkrVO site for JDA and other information is placed on <http://ukr-vo.org>.

Keywords: virtual observatory, UkrVO, database, astroplates

Introduction

The main task of the UkrVO project is the processing and digitizing the all astroplate’s archives of astronomical observations, which were saved at the observatories of Ukraine since 1890s [1-6]. At the initial stage, this task involves the creation and development of the Joint Digital Archive (JDA) of photographic observations. The total number of photographic plates in the UkrVO collection exceeds 300 thousands, including not only the positional but also the spectral and photometric observations. The JDA pilot version includes only positional observations (<http://ukrvo.org/science/index.php?b1&2>). Till the March of 2014, the JDA database contains more than 38 thousands records and more than 6 thousands of the digitized images from glass collections of Main Astronomical Observatory NAS of Ukraine (MAO NASU), Crimean Astrophysical Observatory (CrAO), Nikolaev Astronomical Observatory (RI NAO), and astronomical observatories of the national universities in Kyiv (AO KNU), L’viv (AO LNU), and Odesa (AO ONU). Among them are the following (see, also, Table 1):

- 26 thousand records of astronegatives' metadata and more than 6000 digital images of MAO NASU glass collection (GPA);
- 4 000 records of plates' metadata and more than 1000 digital images (from 4 000 digitized ones) of AO LNU glass collection;

- 8400 records of plates' metadata of SRI MAO glass collection (without images, which are available on the UkrVO web site, the database obtained by the mutual exchange of information between MAO NASU and SRI MAO);
- metadata of 24 partially filled observational archives of AO KNU glass collection with digitized images of more than 1 500 individual plates selected for the solution of current scientific problems;
- 600 records and more than 400 digitized images of selected plates of AO ONU glass collection (out of 120 thousand plates), which are related to the Simeiz collection (CrAO) on the Solar System Small Bodies observations in the 1950s; as well as the JDA of the Crimean AO.

UkrVO Joint Digitized Archive of Astroplates

Now the UkrVO JDA consists of the observational databases of 6 observatories of Ukraine. The number of the digitized archives, astroplates, digitized images etc. are presented in Table 1 (till the end of 2013).

Table 1. Statistical data on the quantitative and qualitative status of the UkrVO Joint Digitized Archive

Observatory	Archives	Number of archives	Number of astroplates in the main database	Number of astroplates in the processing	Total number of astroplates	Number of the digitized astroplates : Preview and full scans
MAO NASU	ABA020, ABA039B, BYU053, BYU100, EAO035, EAO040B, GUA010A, GUA010B, GUA011A, GUA011B, GUA012A, GUA012B, GUA015, GUA040A, GUA040B, GUA040C, GUA040D, GUA040E, GUA070A, GUA070B, GUA070C, MAJ060, QUI021A, QUI021B, TAS040A, TAS040B, TER060	27	26437	36	26473	7554 +2293
RI "Nikolaev AO"	MYK012, PUL012	2	8405	0	8405	-
**SRI "Crimean AO"	CRI012S, CRI017A, CRI017B, CRI040A, CRI040B, CRI040C, CRI100, CRI120, CRI260	D - 2 S - 6	11000 15000	1750 480		2100 730
AO KNU	9909900A, ABA020C, ABA020D, ABA039K, AMR020A, DAR020A, IND013S, KAO000A, KAO000B, KAO000C, KAO000D, KAO000G, KAO000P, KAO010A, KAO010B, KAO012A, KAO013, KAO013S, KAO014A, KAO020A, KAO040K, KAO040Z, KAO048A, KAO060A, KAO070A	25	589	958	1547	~1500*

AO LNU	LAO010	1	4090	37	4127	3073*
AO ONU	CRI012A, CRI012B	2	600	0	600	289 +216
	Total**(without CrAO data)	57	40121	1031	41152	14889

* Digitized images are partially included into the UkrVO JDA

** By the information from the CrAO VO (D – direct images, S – spectral plates) – now in 2014 these archives are in processing to be added to the UkrVO JDA

Table 2. Ukrainian Plate Archives and telescopes, which are presented in the WFP Database [7, 8] till 2013.

WFPDB Identifier	Archive Location	Observatory	Telescope		Focal Length (m)	Scale ("/m)	Field Size, (deg)	Years of Operation	Direct Plates
			Type	Aperture /mirror (m)					
ABA020	Kyiv	Abastumani, Kanobili	Ast	2x 0,20	1,00	206	13,7	1990-1990	30
ABA039	Kyiv	Abastumani, Kanobili	Sch	0,39/0,44	0,62	330	8,2	1987-1987	20
BYU053	Kyiv	Byurakan Obs.	Sch	0,53/0,53	1,83	113	5,0	1985-1985	28
BYU102	Kyiv	Byurakan Obs.	Sch	1,02/1,31	2,13	97	4,0	1983-1983	15
CRI012	Odessa	Crimean Obs. Simeiz	Ast	2x 0,12	0,25	352	35,0	1909-1953	6900
CRI017A	Crimea	Crimean Obs.Simeiz	Cam	0,17	0,75	276	13,0	1948-1965	516
CRI017B	Crimea	Crimean, Nauchny	Cam	0,17	0,75	276	13,0	1951-1953	49
CRI040A	Crimea	Crimean Obs. Simeiz	Ast	0,40	1,60	129	10,0	1947-1948	59
CRI040B	Crimea	Crimean, Nauchny	Ast	2x 0,40	1,60	129	10,0	1951-1965	215
CRI040C	Crimea	Crimean, Nauchny	Ast	2x 0,40	1,60	129	10,0	1963-1998	9781
EAO040B	Kyiv	Engelhardt, Zelench,	Ast	0,40	2,00	103	8,9	1982-1993	142
GUA010A	Kyiv	Main Astron. Obs.	Ast	0,10	0,50	412	20,0	1957-1961	438
GUA010B	Kyiv	Main Astron. Obs.	Ast	0,10	0,50	412	20,0	1957-1961	277
GUA011A	Kyiv	Main Astron. Obs.	Ast	0,11	1,20	172	8,0	1955-1957	35
GUA011B	Kyiv	Main Astron. Obs.	Ast	0,11	1,20	172	8,0	1955-1957	55
GUA012A	Kyiv	Main Astron. Obs.	Ast	2x 0,12	0,70	295	20,0	1949-1990	2041
GUA012B	Kyiv	Main Astron. Obs.	Ast	2x 0,12	0,70	295	20,0	1949-1978	2143
GUA015	Kyiv	Main Astron. Obs.	Ast	0,15	1,70	121	6,0	1955-1961	162
GUA040A	Kyiv	Main Astron. Obs.	Ast	2x 0,40	5,50	38	2,5	1949-1986	8485
GUA040B	Kyiv	Main Astron. Obs.	Ast	2x 0,40	5,50	38	2,5	1949-1986	649
GUA040C	Kyiv	Main Astron. Obs.	Ast	2x 0,40	2,00	103	8,5	1976-1998	4276
GUA040D	Kyiv	Main Astron. Obs.	Ast	2x 0,40	2,00	103	8,5	1976-1997	1834
GUA040E	Kyiv	Main Astron. Obs.	Ast	2x 0,40	2,00	103	6,5	1981-2005	3657
GUA070	Kyiv	Main Astron. Obs.	Rfl	/0,70	3,15	66	1,0	1960-1973	566
KYI020	Kyiv	Kyiv University Obs.	Ast	0,20	4,30			1898-2004	2401
LAO010	L'viv	L'viv University Obs.	Ast	0,10	0,50	412	19,0	1939-1976	8339
MYK012	Mykolayiv	Nikolaev Obs.	Ast	0,12	2,04	101	5,0	1961-1999	8400
ODE006A	Odessa	Odessa Obs.	Ast	0,06	0,12		30,0	1945-1957	2000
ODE006B	Odessa	Odessa Obs.	Ast	0,06	0,12		30,0	1945-1957	2000
ODE007	Odessa	Odessa Obs.	Ast	0,07	0,30		30,0	1945-1957	2000
ODE010A	Odessa	Odessa Obs.	Ast	0,10	0,50		22,0	1945-1957	2000
ODE010B	Odessa	Odessa Obs.	Ast	0,10	0,50		22,0	1945-1957	2000
ODE010C	Odessa	Odessa Obs.	Cam	0,10	0,25	288	35,0	1957-1990	7100
ODE010D	Odessa	Odessa Obs.	Cam	0,10	0,25	288	34,0	1957-1990	7100
ODE010E	Odessa	Odessa Obs.	Cam	0,10	0,25	288	25,0	1957-1990	7100
ODE010F	Odessa	Odessa Obs.	Cam	0,10	0,25	288	12,0	1957-1990	7100
ODE010G	Odessa	Odessa Obs.	Cam	0,10	0,25	288	12,0	1957-1990	7100
ODE010H	Odessa	Odessa Obs.	Cam	0,10	0,25	288	22,0	1957-1990	7100
ODE010I	Odessa	Odessa Obs.	Cam	0,10	0,25	288	18,0	1957-1990	7100
ODE015	Odessa	Odessa Obs.	Ast	0,15	1,00	204	12,0	1945-1957	2000

ODE020	Odessa	Odessa Obs.	Sch	0,20/0,40		474	6,0	1969-1980	2000
PUL012	Mykolayiv	Pulkovo Obs.	Ast	0,12	2,04	101	5,0	1929-1931	196
QUI021A	Kyiv	Quito Astron. Obs.	Cam	0,21	0,74	281	15,6	1986-1986	100
QUI021B	Kyiv	Quito Comet Station	Cam	0,21	0,74	281	15,6	1986-1986	50
TAS040A	Kyiv	Tashkent Obs. Kitab	Ast	2x 0,40	3,00	69	5,5	1981-1989	96
TAS040B	Kyiv	Tashkent Obs. Kitab.	Ast	2x 0,40	3,00	69	5,5	1981-1989	5

A preliminary processing of the digitized images of all the observational archives was done with LINUX/MIDAS/ROMAFOT: registration of objects till 16m, determination of pixel coordinates, instrumental photometric evaluation [3, 4]. The final digitized scans are kept on a server for their following including to the UkrVO JDA (Fig. 1). We give in the Table 2 those statistical data about 125,000 astroplates (Ukrainian Plate Archives), which were included in the Wide-Field Plate Database [7, 8]. One can see a significant difference (see Table 1), which is connected, from our point of view, with a gap in the monitoring during the last years among the observatories on the current status of the digitized astroplates. For example, now the UkrVO JDA give access to the 50,000 digitized astroplates of a good quality.

Instead of the final remarks we would like to point IAU's Commissions attention that the ASTROPLATES project needs the additional financial and scientific support and could be organized, for example, in frame of the HORIZON-2020 program as the cooperation of the European astronomical observatories, which hold this unique astroinformation resource. Due to such support, it seems, such a project will have a success to be finalized till 2020.

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References

- [1] Pakuliak, L., Kazantseva, L., Virun, N., Andruk, V.: 2012, IAUS, 285, 389.
- [2] Vavilova, I. B., Pakuliak, L. K., Protsyuk, Yu. I. et al: 2012, Baltic Astronomy, 21, 356-365.
- [3] Vavilova, I. B., Pakuliak, L. K. et al.: 2012, Kinematics and Physics of Celestial Bodies, 28, 85-102.
- [4] Vavilova, I. B., Pakuliak, L. K., Protsyuk, Yu. I. et al.: 2011, Kosmichna Nauka i Tekhnologiya, 17, 74-91.
- [5] Vavilova, I. B., Pakuliak, L. K., Protsyuk, Yu. I.: 2010, Kosmichna Nauka i Tekhnologiya, 16, 62-70.
- [6] Pakuliak, L., Golovnya, V. et al: Odessa Astronomical Publications, 2013, vol. 26/2, p.236.
- [7] Tsvetkov, M.K.: 1992, IAU Working Group on Wide-field Imaging Newsletter No. 2, p. 51.
- [8] Tsvetkov, M.K.: <http://www.wfpdb.org/catalogue.html>

DATABASE of JOINT PLATE ARCHIVE (DBGPA V2)

SEARCH PLATES: FIELD (OVERLAP) OBJECTS BY EX. OR NUMBER(S) OBJECTS SPECIALS QPS

RUSS | SPAN | CHINE | японский/русский | астрофото |

Images	map	Archive ID	RA	DEC	Date	Expos.	Dimensions	Instrum.	Object	Place of Storage
		MYK012 83028	7 35 48	+24 17 0	75114	5	10x20	Z2A	Amarnia	Available in Physika
		KA0070A16504	7 36 0	8 11 0	75026	0.3	13x13	A27B	433 Eros	upon request
		MYK012 83064	7 35 38	+22 2 0	660212	5	20x20	Z2A	Leetio	Available in Physika
		KA0070A16503	7 37 0	8 39 0	750211	0.5	13x13	A27B	433 Eros	upon request
		GUA040C001587	7 37 47	+11 4 35	750303	3	24x24	OLA	433 Eros	sh.362 box118
		GUA040D001588	7 37 43	+11 5 35	750303	4	24x24	OLA	433 Eros	sh.362 box119
		MYK012 83087	7 37 48	+21 22 0	761226	2	20x20	Z2A	Veitso	Available in Physika
		GUA040B001584	7 37 53	+25 44 37	500329	6.4	24x24	OLA	192 Haanika	sh.361 box75
		GUA040C001570	7 37 6	+8 34 16	791226	3	30x30	OVA	(3) Jura	sh.10 box71
		GUA040D001586	7 37 6	+8 34 16	791226	3	30x30	OVA	(3) Jura	sh.10 box72
		KA0070A16504	7 36 0	8 13 0	750219	0.5	13x13	A27B	433 Eros	upon request
		MYK012 83062	18 7 6	-2 48 9	600519	5	24x24	Z2A	Hebe	Available in Physika
		CR012A010825	18 8 0	-7 0 0	520020	45	13x18	ZDA0		upon request
		CR012B010826	18 8 0	-7 0 0	520020	45	13x18	ZDA0		upon request
		MYK012 83036	18 8 12	-10 8 9	600706	5	24x24	Z2A	Herzonia	Available in Physika
		MYK012 83053	18 9 24	-4 49 4	600624	5	24x24	Z2A	Juno	Available in Physika
		LA0010 003482	19 0 0	-15 8 9	560705	38	13x19	Zais05/10	45 Eugenia	Available in the AO
		LA0010 00339	19 0 0	-15 30 0	560707	38	13x18	Zais05/10	5 Juno	Available in the AO
		LA0010 00381	19 0 0	-15 30 0	560705	38	13x18	Zais05/10	5 Juno	Available in the AO
		MYK012 83079	19 0 0	+20 0 0	600709	8	9x24	Z2A	Pallas	Available in Physika
		LA0010 00387	19 0 0	-15 8 9						Available in Physika
		LA0010 00389	19 0 0	-15 8 9						Available in Physika
		LA0010 00377	19 0 0	-15 8 9						Available in Physika
		LA0010 00366	19 0 0	-14 8 3						Available in Physika
		LA0010 003482	19 0 0	-15 8 9						Available in Physika

🔍	GUA040C001587B	7 37 6
🔍	GUA040D001588	7 37 6
🔍	KA0070A16504	7 36 0
🔍	MYK012 006362	18 7 6
🔍	CR012A010825	18 8 0
🔍	CR012B010826	18 8 0
🔍	MYK012 006398	18 8 12
🔍	MYK012 006153	18 9 24
🔍	LA0010 003482	19 0 0

Fig 1: Access to the UkrVO Joint Digitized Archive of astroplates (<http://ukr-vo.org>).