

**Presentation of the
Bordeaux astrophotographic
old plates archive (1893 - 1996)**

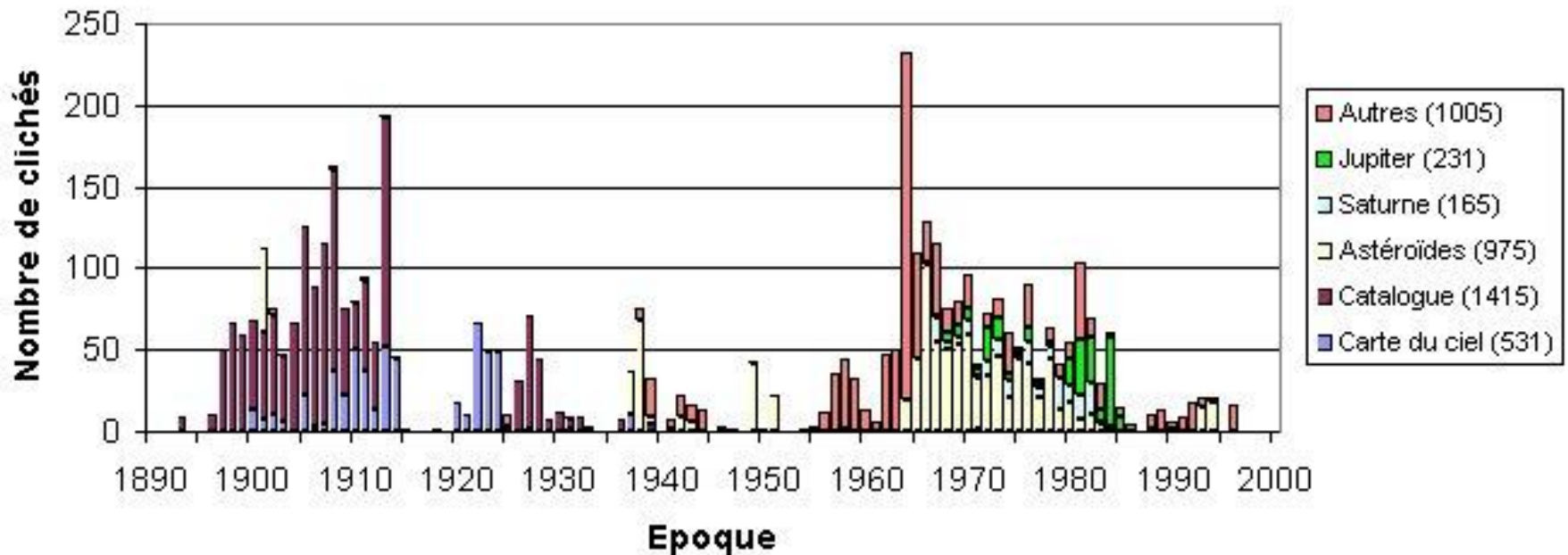
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Histogram of the number of archived plates with the observation epoch

The astrophotographic old plates archive of the Bordeaux Observatory has collected about 5000 plates taken from 1893 to 1996.

The distribution of the archived plates with the observation epoch is displayed below.

Répartition des clichés dans le temps



The plates were taken by 2 different instruments:

1. The « Carte du ciel » astrograph ($d = 33\text{cm}$; $f = 3.43\text{m}$; $s = 60''/\text{mm}$), built by the Henry brothers, was the most used instrument for astrophotography .
2. The 38 cm equatorial refractor ($d = 38\text{cm}$; $f = 6.82\text{m}$; $s = 30''/\text{mm}$), initially used with a micrometer, was later equipped with a photographic chamber in the 1960 .

The measurements were made with a Zeiss comparator equipped with 2 Heidenhain rules with an accuracy of about $0.1\mu\text{m}$.

**The « Carte du ciel » 33cm astrograph of Bordeaux Observatory
f = 3,43m; scale = 60"/mm**



The 38cm refractor of Bordeaux Observatory
 $f = 6,82\text{m}$; scale = $30''/\text{mm}$



The ZEISS measuring machine

The measurements were made with a Zeiss comparator equipped with 2 Heidenhain rules with an accuracy of about $0.1\mu\text{m}$



The three main series of archived plates

The three main series of the archived plates of Bordeaux Observatory are:

1. « Catalogue de la Carte du ciel » research program

1415 plates taken from 1893 to 1938 with the dedicated astrograph of 33cm in the Bordeaux zone between 11 and 18° of declination

There are 3 aligned exposures on each plate taken with 3 different exposure times of 1.5, 3 and 6 mn

Magnitude < 13

These plates had been measured for the « Carte du ciel » program

2. « Carte du ciel » research program

531 plates taken from 1900 to 1937 with the same instrument in the same declination zone

There are 3 exposures placed in a triangle on each plate all taken with the same exposure time of 20mn

Magnitude < 15

These plates had not been measured for the « Carte du ciel » program.

They have been scanned at Cambridge in the 1990 for the « Meridien 2000 » program developed at the Bordeaux Observatory.

The measured coordinates x and y are available on request

3. Other series

Solar system objects: asteroids (975 plates), planets (571 plates), comets (131 plates)

Other objects: nebulae (178 plates), open clusters (54 plates)

A detailed information of the different series of observations including their numbers and periods are given in Table 4.

Table 4. Distribution of the about 5000 archived astrophotographic plates of the Bordeaux Observatory

Program	Number of plates	Period of observation
Carte du ciel:		
Catalogue 1st serie	1217	1893 - 1925
Carte du ciel	531	1900 - 1937
Catalogue 2 nd serie	198	1924 - 1938
Solar system objects:		
Venus	10	1967 – 1969
Mars	38	1967
Jupiter	231	1966 – 1987
Saturn	165	1966 – 1991
Uranus	74	1966 – 1982
Neptune	43	1966 – 1980
Pluto	10	1967 – 1992
Ceres	54	1964 – 1981
Pallas	87	1964 – 1979
Vesta	85	1949 – 1978
Eros	75	1900 – 1982
Other asteroids	975	1900 -1994
Comets	131	1907 – 1996
Other objects:		
Nebulae	178	1962 -1965
Pleiads	46	1901 – 1971
Persée	8	1980 – 1982

Plate 3: Jupiter and the 4 Galilean satellites taken with a mask
(IIaO)

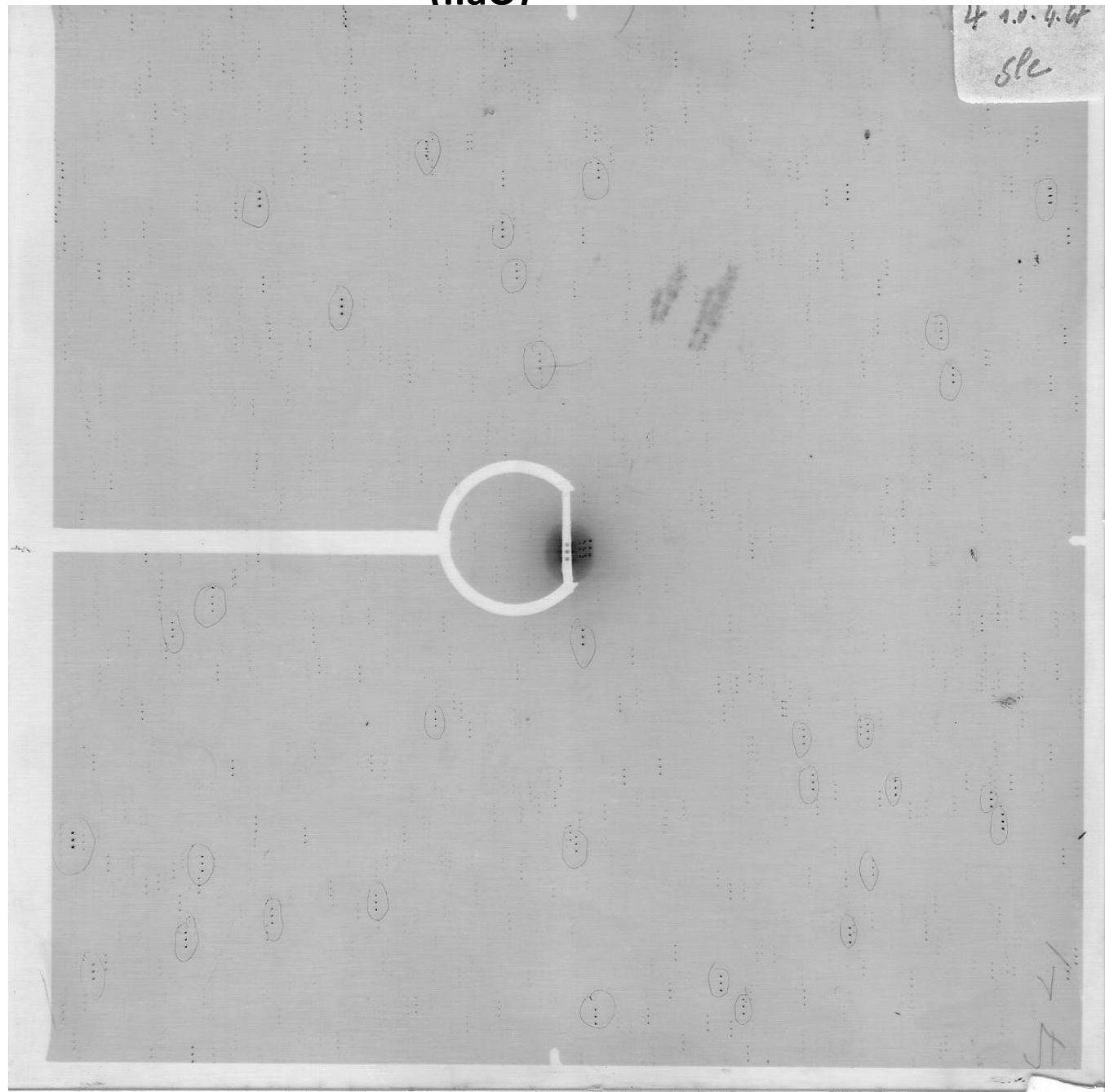


Plate 6: Jupiter and the 4 Galilean satellites taken with a neutral filter (IIaO)

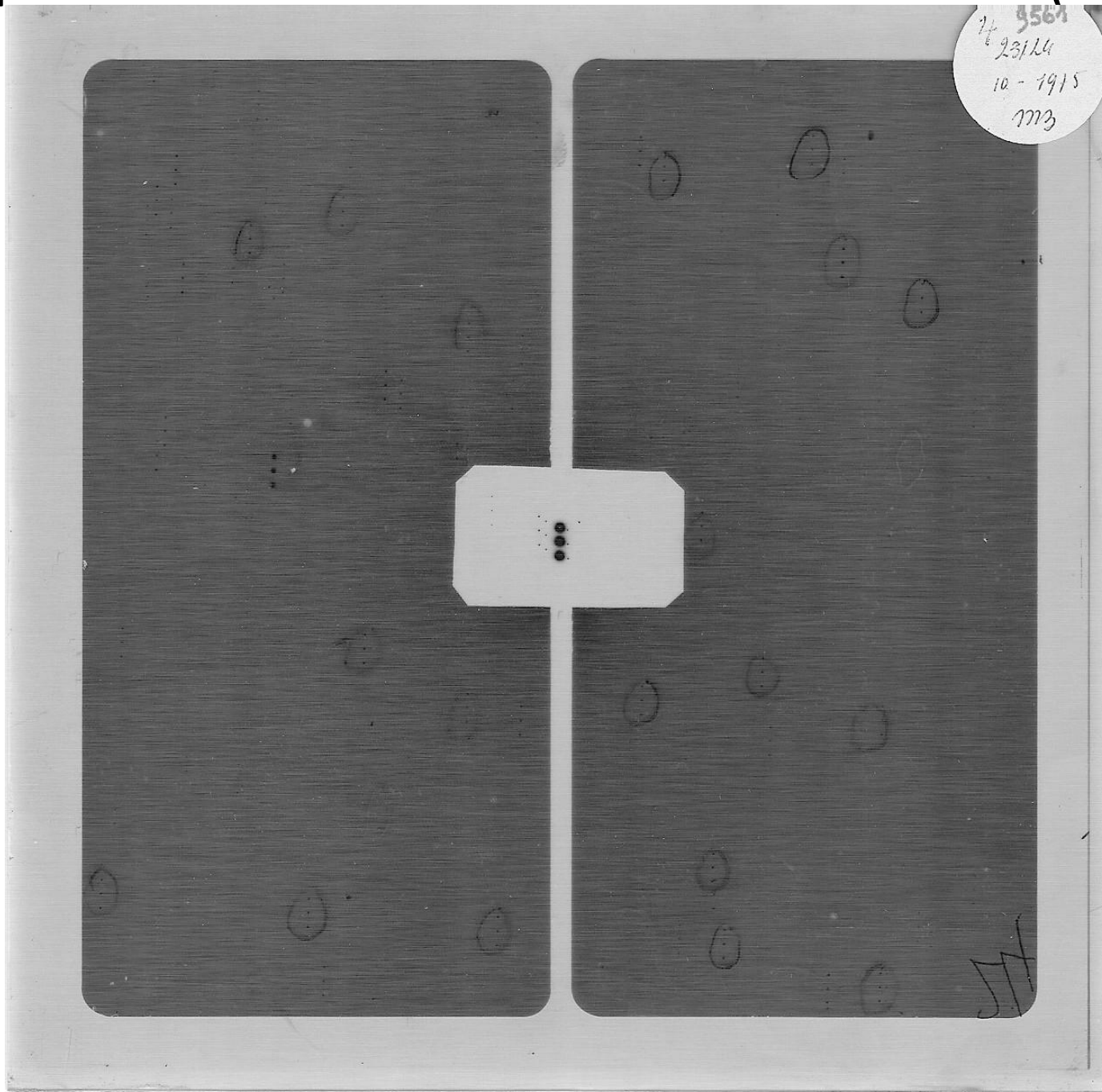


Plate 10: Saturn taken with the 38 cm refractor (scale = 30"/mm)
(103 aG)

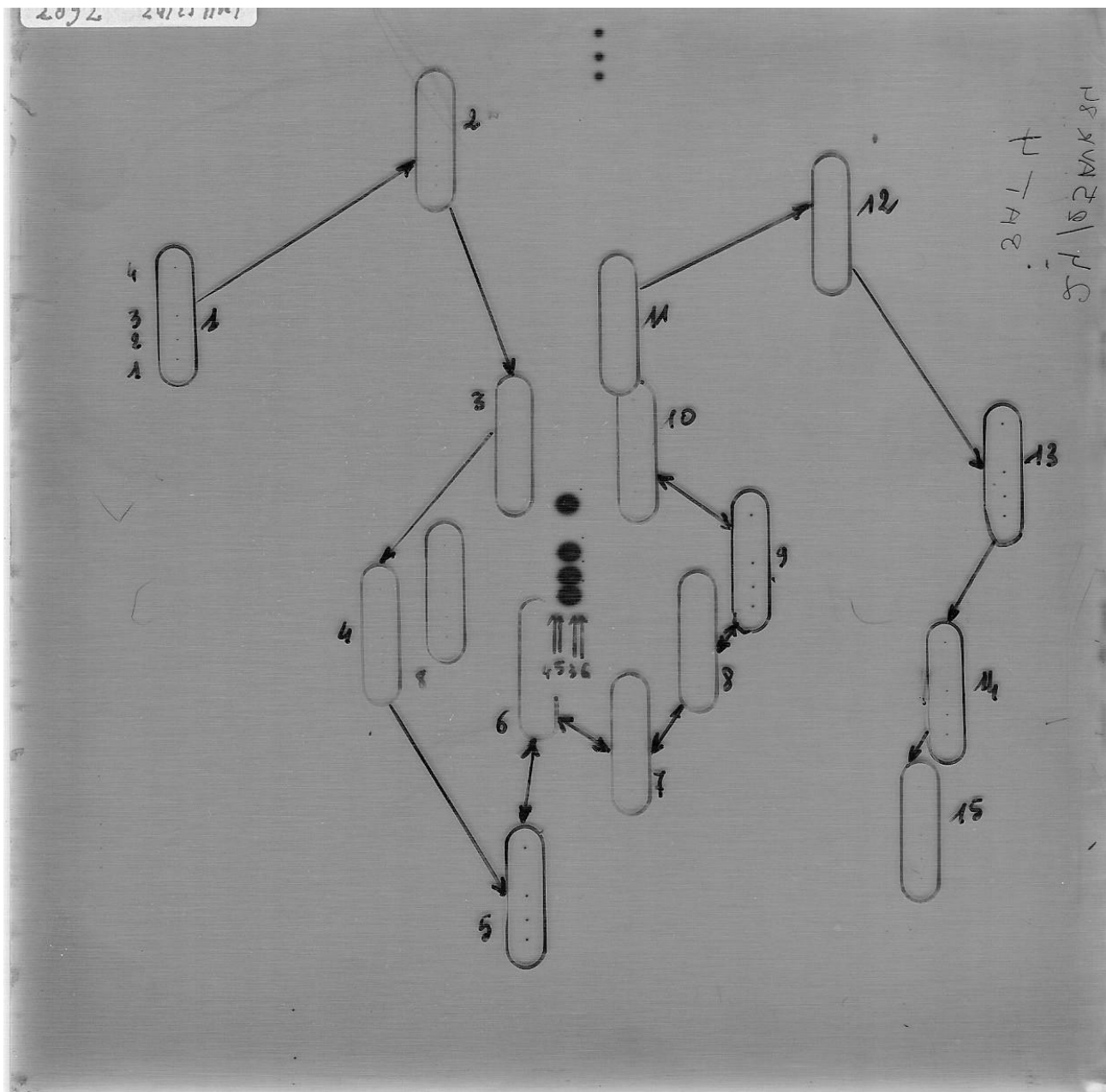
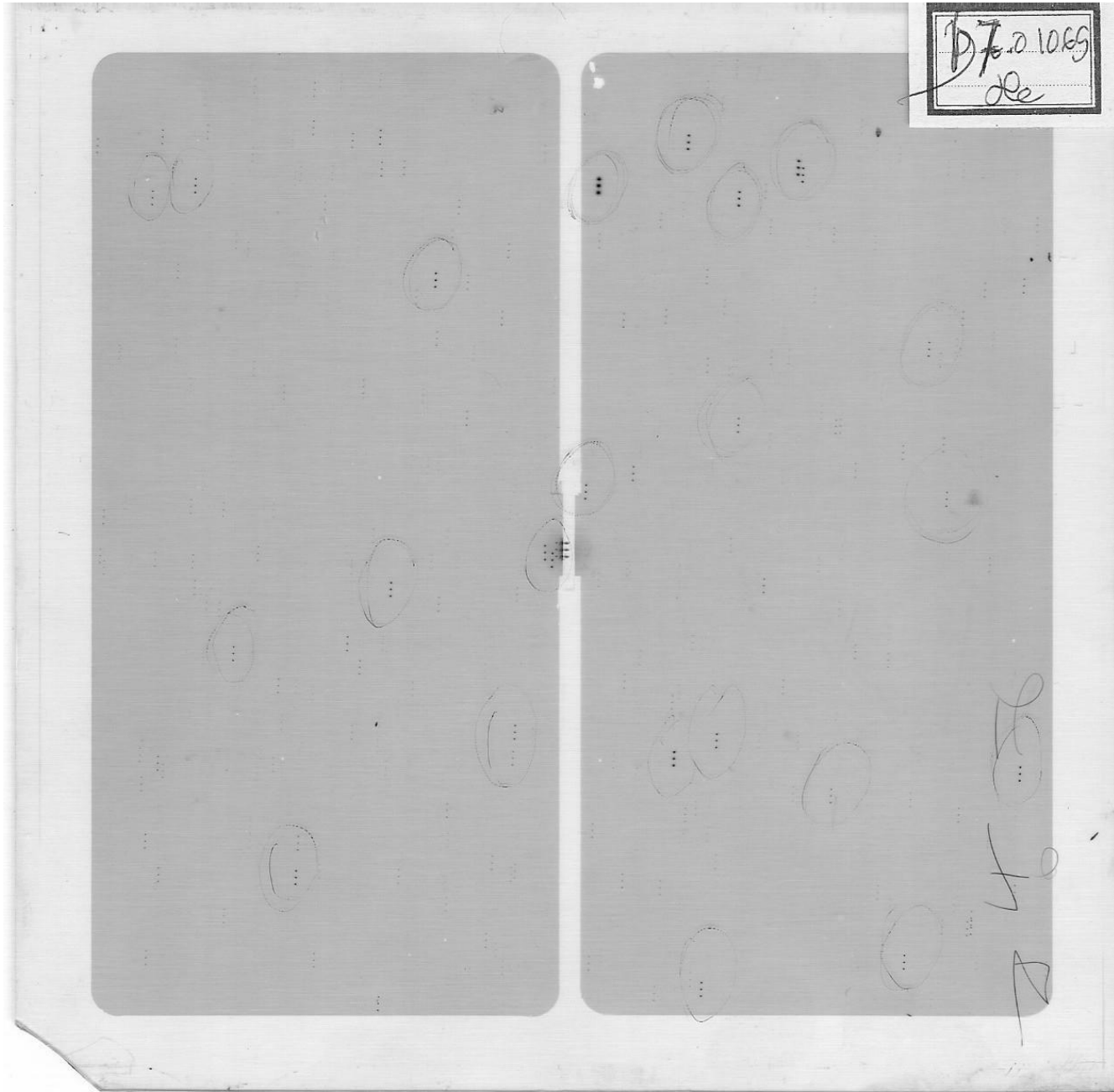


Plate 7: Saturn taken with a mask (IIaO)



Proposal for a new reduction of 22 selected old plates made at the Bordeaux Observatory

We present a selection of 22 old plates chosen for their quality and for the observed objects, with a preference to solar system objects, among the 5000 plates available in the plates archive of the Bordeaux Observatory.

A. 20 plates of solar system objects made in the period 1966 - 1984 :

All these selected plates were taken by Guy Soulié with the 33 cm « Carte du ciel » astrograph ($f = 3.43\text{m}$; scale = $60''/\text{mm}$), except 2 plates of Saturn taken by Gérard Dourneau with the 38 cm refractor ($f = 6,82\text{m}$; scale = $30''/\text{mm}$).

Most of the plates of Jupiter and Saturn made with the 33cm astrograph were taken with a neutral filter to reduce the halo around the planet.

No filter was used for plates of Saturn taken with the 38cm refractor.

The number of selected plates for each planet is given on Table 1.

Table 1. Number of selected plates for each planetary system

Object	Number of plates
Mars	1
Jupiter	5 (including 2 plates common with Uranus)
Saturn	5
Uranus	5 (including 2 plates common with Jupiter)
Neptune	4
Pluto	2
Total	20

Table 2. List of the 20 selected old plates of solar system objects taken at the Bordeaux observatory from 1966 to 1984 proposed for a new reduction

(1/3)

Plate number (local number)	Date Day/Month/Year	Object	Number of exposures	Exposure time	Observation time UT	Instrument-scale	References
1 (3920)	20/01/1974	Mars	3	8mn 8mn 8mn	19h 44m 55s 19h 57m 53s 20h 10m 51s	EQP - 60 "/mm	Soulié, G. et al. 1978, A&AS, 33, 257
2	13/03/1967	Jupiter	2	15mn 15mn	22h 23m 08s 23h 04m 02s	EQP - 60 "/mm	Soulié, G. et al. 1968, J. obs., 51, 315
3	31/08/1967	Jupiter	3	6mn 6mn 6mn	20h 15m 03s 20h 40m 59s 20h 56m 56s	EQP - 60 "/mm	Soulié, G. et al. 1968, J. obs., 51, 315
4	7/03/1969	Jupiter + Uranus	3	10mn 10mn 10mn	22h 15m 18s 22h 30m 16s 22h 45m 13s	EQP - 60 "/mm	Soulié, G. et al. 1972, A&AS, 6, 311
5	8/03/1969	Jupiter + Uranus	3	4mn 4mn 4mn	22h 10m 22s 22h 19m 21s 22h 28m 20s	EQP - 60 "/mm	Soulié, G. et al. 1972, A&AS, 6, 311
6 (9521)	23/10/1975	Jupiter	3	3mn 3mn 3mn	20h 52m 01s 21h 04m 59s 21h 17m 57s	EQP - 60 "/mm	Soulié, G. et al. 1981, A&AS, 43, 147
7	6/10/1969	Saturn	3	10mn 10mn 10mn	21h 28m 40s 21h 44m 37s 21h 59m 34s	EQP - 60 "/mm	Soulié, G. et al. 1972, A&AS, 6, 311
8 (1921)	17/10/1969	Saturn	3	10mn 10mn 10mn	20h 46m 24s 21h 01m 22s 21h 16m 19s	EQP - 60 "/mm	Soulié, G. et al. 1972, A&AS, 6, 311
9 (1957)	26/10/1976	Saturn	3	5mn 5mn 5mn	22h 01m 04s 22h 16m 02s 22h 30m 59s	EQP - 60 "/mm	Soulié, G. et al. 1981, A&AS, 43, 147

Table 2. List of the 20 selected old plates of solar system objects taken at the Bordeaux observatory from 1966 to 1984 proposed for a new reduction

(2/3)

Plate number (local number)	Date Day/Month/Year	Object	Number of exposures	Exposure time	Observation time UT	Instrument-scale	References
10 (2092)	24/04/1984	Saturn	4	1mn	23h 03m 29s	GEQ - 30''/mm	Dourneau, G. et al. 1989, AJ, 98, 2
				1mn	23h 05m 00s		
				1mn	23h 06m 30s		
				1mn	23h 08m 00s		
11 (2093)	24/04/1984	Saturn	4	1mn	23h 17m 30s	GEQ - 30''/mm	Dourneau, G. et al. 1989, AJ, 98, 2
				1mn	23h 19m 00s		
				1mn	23h 20m 30s		
				1mn	23h 21m 59s		
12	19/04/1968	Uranus	3	4mn	22h 16m 46s	EQP - 60''/mm	Soulié, G. et al. 1972, A&AS, 6, 311
				4mn	20h 30m 45s		
				4mn	20h 44m 42s		
13 (4236)	9/03/1970	Uranus	3	6mn	22h 06m 24s	EQP - 60''/mm	Soulié, G. et al. 1975, A&AS, 22, 49
				6mn	22h 22m 21s		
				6mn	22h 38m 18s		
14 (4254)	16/04/1974	Uranus	3	6mn	22h 03m 28s	EQP - 60''/mm	Soulié, G. et al. 1978, A&AS, 33, 257
				6mn	22h 19m 25s		
				6mn	22h 35m 23s		
15	19/05/1966	Neptune	3	6mn	22h 07m 38s	EQP - 60''/mm	Soulié, G. et al. 1968, J. obs., 51, 315
				4mn	22h 13m 36s		
				3mn	22h 18m 06s		
16	20/05/1966	Neptune	3	6mn	22h 35m 36s	EQP - 60''/mm	Soulié, G. et al. 1968, J. obs., 51, 315
				4mn	22h 41m 34s		
				2mn	22h 45m 34s		
17	21/05/1974	Neptune	3	6mn	22h 53m 25s	EQP - 60''/mm	Soulié, G. et al. 1978, A&AS, 33, 257
				6mn	23h 04m 22s		
				6mn	23h 15m 20s		
18 (2831)	13/06/1974	Neptune	3	6mn	22h 27m 43s	EQP - 60''/mm	Soulié, G. et al. 1978, A&AS, 33, 257
				6mn	22h 43m 41s		
				6mn	22h 59m 38s		

Table 2. List of the 20 selected old plates of solar system objects taken at the Bordeaux observatory from 1966 to 1984 proposed for a new reduction

(3/3)

Plate number (local number)	Date Day/Month/Year	Object	Number of exposures	Exposure time	Observation time UT	Instrument-scale	References
19	3/03/1967	Pluto	3	20mn 20mn 20mn	01h 42m 29s 02h 22m 22s 03h 02m 16s	EQP - 60''/mm	Soulié, G. et al. 1968, J. obs., 51, 315
20	18/04/1969	Pluto	3	20mn 20mn 20mn	21h 14m 53s 23h 49m 47s 23h 24m 42s	EQP - 60''/mm	Soulié, G. et al. 1972, A&AS, 6, 311

« EQP » is the EQuatorial Photographique « Carte du ciel » 33cm astrograph

« GEQ » is the Grand EQuatorial 38 cm refractor

B. 2 plates of Jupiter made in March 1969 are common with Uranus as the 2 planets were located in the same field at this time.

All the selected plates had been initially measured and reduced . The derived observed positions of planets and satellites were published. This will allow a possible future comparison with the positions derived from a possible new reduction.

A detailed information about the 20 selected plates, including the references of the published observed positions, is mentioned in Table 2.

C. 2 plates of the french « Carte du ciel » program of the Bordeaux zone between 11° and 18° of declination taken in 1907 and 1911 :

1 plate of the « Catalogue de la Carte du ciel » with 3 exposures on a line of 1.5, 3 and 6 mn exposure time and taken in 1907

1 plate of the « Carte du ciel » with 3 exposures on a triangle of 20 mn exposure time each and taken in 1911

The 2 selected plates have been chosen in the Milky Way region so as to present a great number of stars in their fields.

The plates were taken with the 33 cm « Carte du ciel » astrograph (f = 3.43m; scale = 60"/mm),

All the plates of the « Catalogue de la carte du ciel » had been initially measured and reduced during the « Carte du ciel » program.

In the opposite, the plates of the « Carte du ciel » had not been initially reduced. They were scanned at Cambridge later in the 1990 for the « Meridien 2000 program » developped at the Bordeaux Observatory

A detailed information about the 2 selected plates is given in Table 3.

Table 3. List of the 2 selected old plates of the « Carte du ciel » program taken at the Bordeaux observatory in 1907 and 1911 proposed for a new reduction

Plate number (local number)	Date Day/Month/Year	Research program	Number of exposures	Exposure time	Field center coordinates	
					Right ascension	Declination
21(1192)	3/08/1907	Catalogue de la Carte du ciel	3 (in line)	1.5mn 3mn 6mn	19h 46m 21s	+12° 07' 24"
22 (148)	26/08/1911	Carte du ciel	3 (in triangle)	20mn 20mn 20mn	19h 38m 21s	+12° 06' 52"

CONCLUSION

We have presented a selection of 22 old plates which could be chosen for a future new reduction as test of the interest of our plates to be re-reduced.

All the 20 selected plates of solar system objects have been initially reduced and published.

So, a comparison of the old positions with those derived from a new reduction would be possible for each plate.

This should allow us to determine the possible level of improvement of the new reduction results.

For the 2 plates of the « Carte du ciel » program, a comparison with the old positions will not be so easy.

For the « Carte du ciel » plates, the results of the reduction of each individual plate is no more available.

Moreover, the plates of the « Catalogue de la carte du ciel » had not been initially reduced.

They were only scanned at Cambridge in the 1990 for the Meridien 2000 program of Bordeaux observatory.

The measured x y are available on request for a possible comparison of the old and new measurements.

We hope that a new reduction of our selected plates will be made in the future and will show a significant improvement of the observed new positions in comparison to the old ones.

In such a case, the Bordeaux Observatory will be ready to lend all its archived plates - which are about 5000, including more than 500 for planets and satellites - to be rereduced as a continuation of the NAROO program.