



ONTSTAAN VAN EEN NIEUW WERELDBEELD ASTROFOTOGRAFIE 1839 – 1939

Xavier Debeerst
Foto-antiquariaat Anamorfose
Arcturus Sterrenwacht, Izegem



Vergeet de CCD en de Hubble Space Telescope.
Ga terug in de tijd en ontdek een wereld waar alles nieuw is.

**KIJK MET DE VERWONDERING
VAN HET EERSTE LICHT**

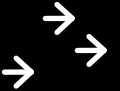


Reis in tijd en ruimte naar een wereld waar “modern” werd uitgevonden.

NEGENTIENDE EEUW

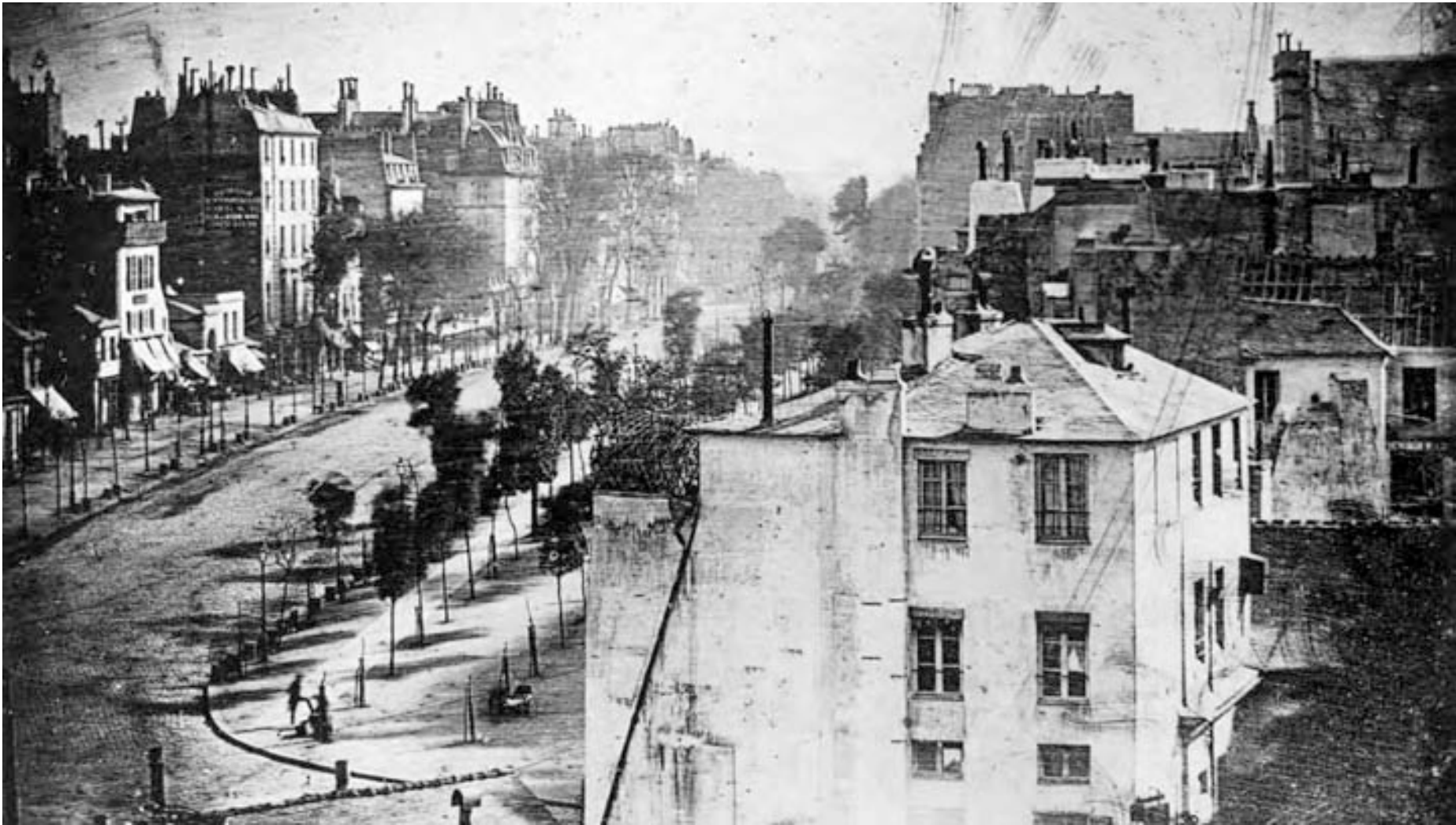
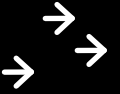
Industriële revolutie

18° en 19° eeuw Industriële revolutie in Europa
James Watt (1736 – 1819)



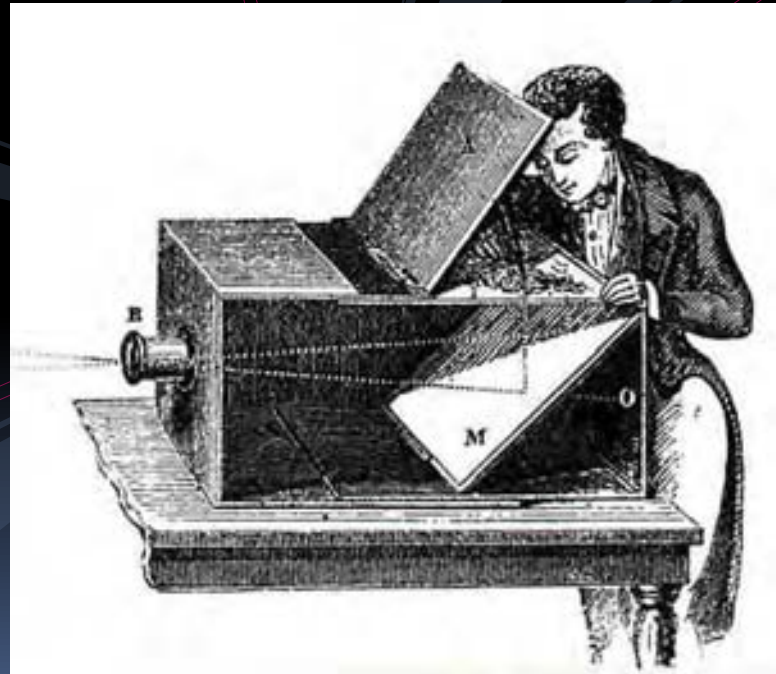
Paris 1839

Metropool en stad van ontwikkelingen
Louis Mendé Daguerre, Paris, 1839



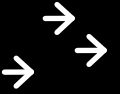
Ontstaan van de fotografie


Eindpunt van een zoektocht sinds de 17^o eeuw



Eerste fotografische experimenten

Thomas Wedgwood +/- 1800





Bij het ontstaan van de fotografie zijn het astronomen die de uitvinders motiveren om verder te gaan.

Astronomen bepalen de koers van de prille fotografie



ASTRONOMEN STAAN AAN DE WIEG VAN DE ONTWIKKELING VAN DE FOTOGRAFIE

French Connection



Nicéphore Niépce
(1765 – 1833)



François Arago
(1786 – 1853)



Louis Mandé Daguerre
(1787 – 1851)



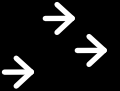
François Arago

- Frans politicus
- Astronoom
- Directeur Observatoire de Paris

- 1839 wereldkundig maken van de ontdekking van de fotografie door Niépce en Daguerre
- Schenkt de fotografie aan de wereld in ruil voor pensioen voor Daguerre en Niépce (zoon)

Bekendmaking met een boodschap


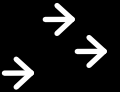
In de Franse Assemblé de bekendmaking van de uitvinding van de fotografie met verschillende wetenschappelijke opdrachten voor de fotografen





Atlas van de maan

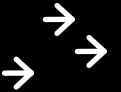
Is er leven op de maan? Heeft de maan een atmosfeer? Oorsprong van de maankraters.



t d'effet physique perceptible. Les
s de plaqué préparées par M. Dague
nchissent au contraire à tel point s
tion de ces mêmes rayons et des op
is qui lui succèdent, qu'il est per
spérer qu'on pourra faire des ca
tographiques de notre satellite. C

Wat is de natuur van de zon?

Wat is de zon? Heeft de zon een vast oppervlak? Het zonnenspectrum

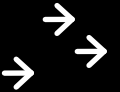


Observation a montré que le spectre solaire est continu, qu'il y existe des solutions de continuité transversales, des raies entièrement continues et des solutions de continuité pareilles à des raies obscures qui paraissent produire les raies spectrales? S'il y en a, correspondent-elles à des raies du spectre lumineux?



De sterren

Sterren tellen (astrometrie). Atlas van de hemel.



couverts par M. Daguerre, marqueront les progrès d'une des sciences qui honorent le plus l'esprit humain. Avec leur secours, le physicien pourra procéder, désormais, par voie d'intensités absolues : il comparera les lumières par leurs effets. S'il y trouve de l'utilité, le même tableau lui donnera des empreintes des rayons éblouissants du soleil, des rayons trois cent mille fois plus faibles de la lune, des rayons des



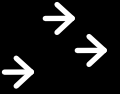
Daguerreotypie

- Direct positief procedé
 - Uniek exemplaar
 - monochroom
 - Koperen drager met zilverlaag
 - Weinig lichtgevoelig -> lange belichtingstijd
 - Zeer scherp
- 



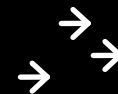
Eerste Daguerreotype van de Maan 1840

John William Draper (1811 – 1862)



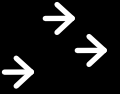
Ambrotypie van de Maan

Goedkopere variante van de Daguerreotypie
Anoniem +/- 1850
Private collection



Zonnespectrum Daguerreotype

John William Draper (1811 – 1862)



English Connection




Henry Fox Talbot
(1800 – 1877)




John Herschel
(1792 – 1871)



Julia Margaret Cameron
(1815 – 1879)

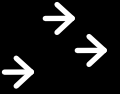


Talbotypie, zoutdruk, Calotypie

- Negatief / positief procedé
 - Reproduceerbaar
 - Op papier
 - monochroom
 - Gevoeliger dan de Daguerreotypie
 - Minder resolutie
- 

Calotypie van de Copernicus krater

Sir John Herschel, 1842



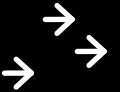
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Wetenschappelijke waarde van een foto



Fotografie versus visueel

Vergelijking van visuele magnitude schatting en fotografische registratie.
Photographie Der Gestirne. Dr. J. Scheiner. 1897
Anamorfose collectie



Stern	Photo- graphische Grösse	Optische Grösse (Pickering)	Differenz	Farbe (Schmidt)
β Lacertae	m 5.0	m 4.5	m — 0.5	orange
ψ Pegasi	5.1	4.6	— 0.5	roth
ι Lacertae	5.7	4.1	— 1.6	roth-orange
δ Androm.	5.0	3.4	— 1.6	tief goldgelb
ω Persei	6.3	4.7	— 1.6	roth
α Arietis	3.9	2.0	— 1.9	goldgelb
σ Persei	6.4	4.4	— 2.0	röthlich
β Androm.	4.4	2.2	— 2.2	roth
λ Androm.	6.2	4.0	— 2.2	goldgelb
η Persei	6.3	3.9	— 2.4	roth

Getekende kaart van Mars

Schiaparelli, 1875
Anamorfose collectie

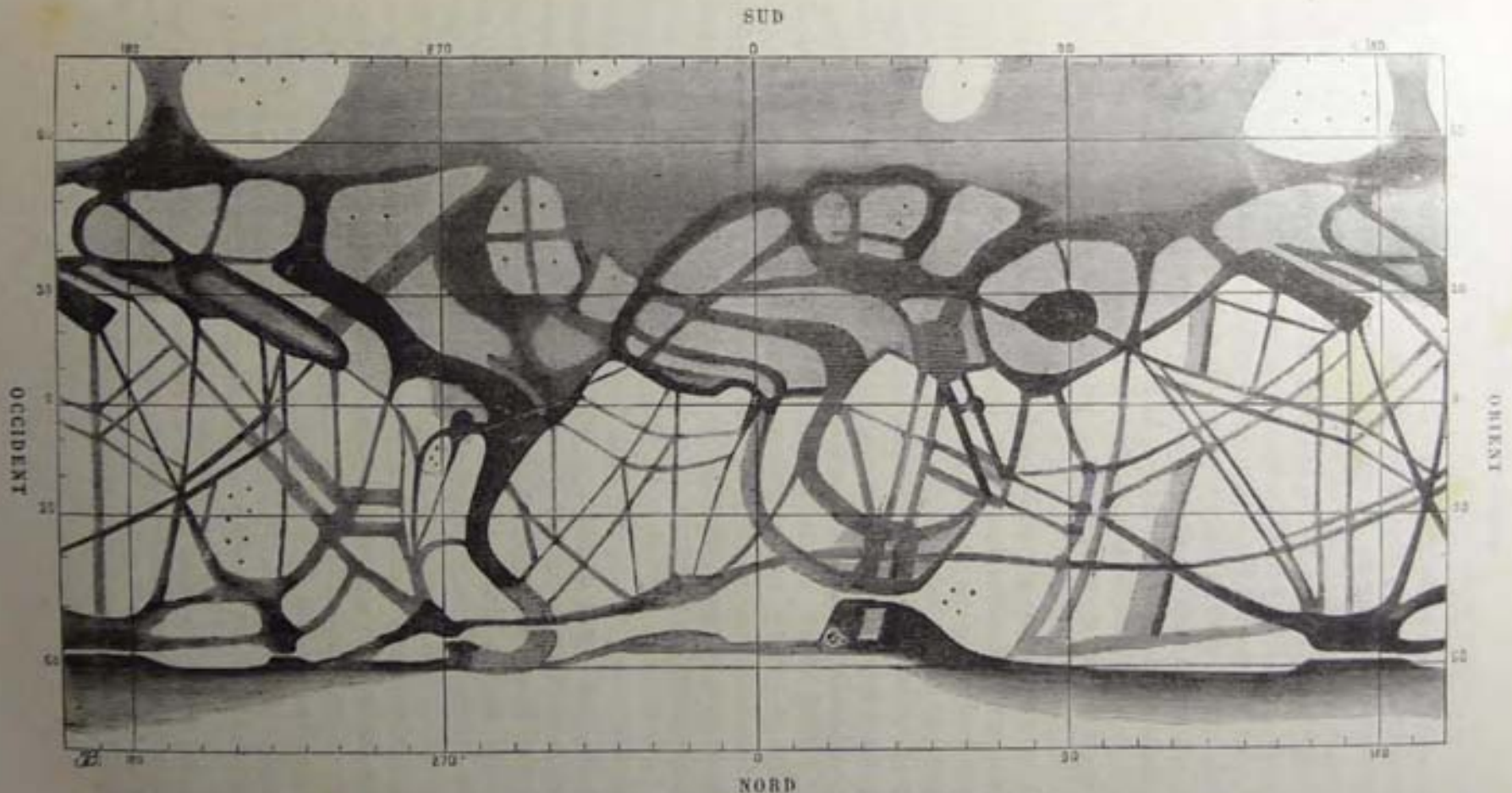
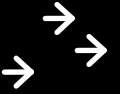


Fig. 30. — Canaux énigmatiques observés sur la planète Mars.
(Dessin de M. SCHIAPARELLI)

(Aux points signalés par de petits cercles oooo, on a vu des taches blanches comme de la neige.)

Tekeningen van de Orionnevel

Amédée Guillemin, *Le Ciel*, 1877
Anamorfose collectie



Fig. 328. Nébuleuse de l'Épée d'Orion,
d'après le dessin d'Huygens. 1656.



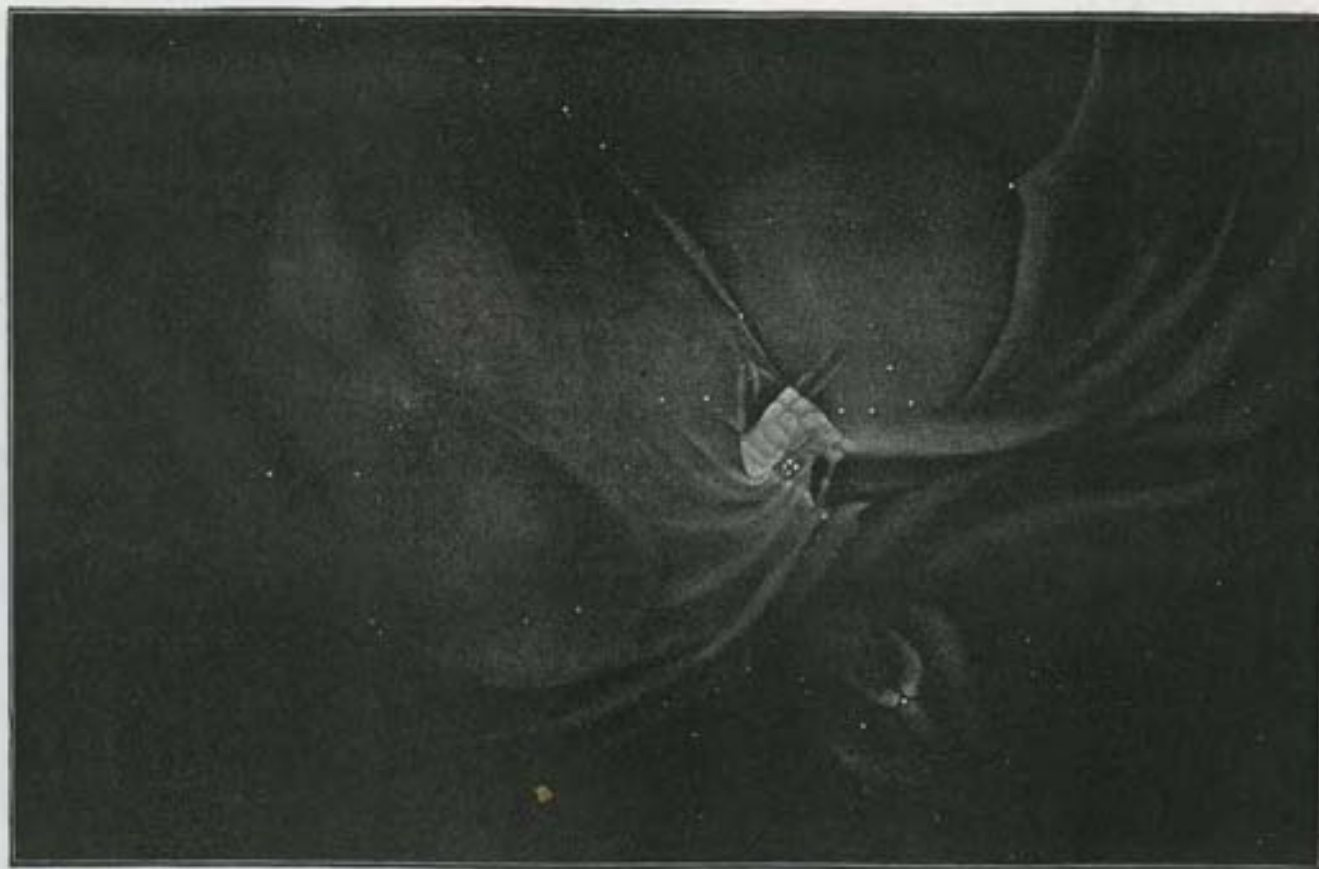
Fig. 329. Nébuleuse d'Orion, d'après
le dessin de Mairan. 1750.

Amédée Guillemin, Le Ciel, 1877
Anamorfose collectie



LE CIEL

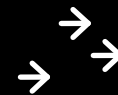
PL. XLVI



LA GRANDE NÉBULEUSE D'ORION

D'après un dessin de G. P. Bond.

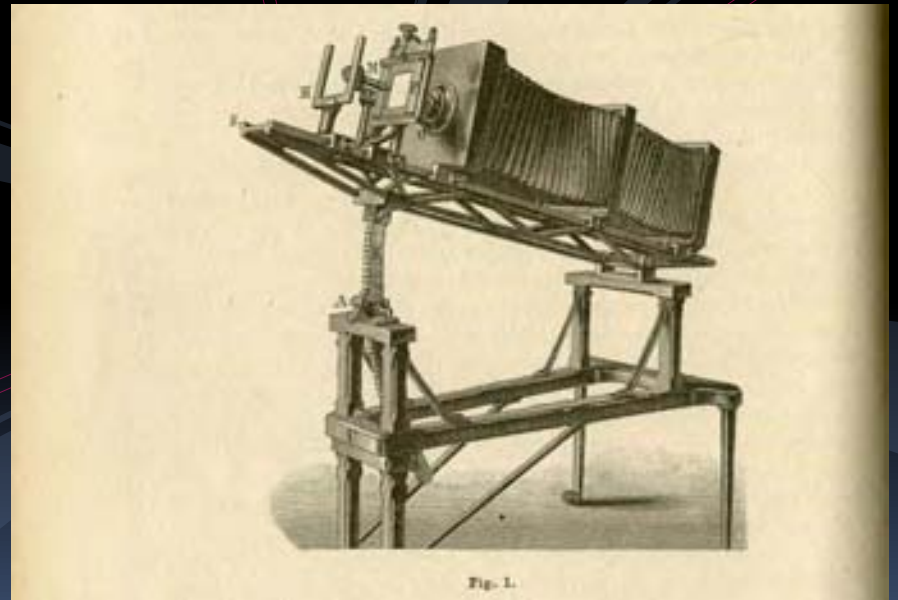
Secchi , Le Soleil, 1875
Anamorfose collectie



Techniek van de Astrofotografie

It was a very different world from the electronic world we now know, where the sensitivity of the modern detector is 100+ times that of the best photographic plates. A lot of black art going on then,..


Peter Boyce





Technische eisen

- Gevoelige emulsies
 - Stabiele emulsies
 - Resolutie
 - Snelle optieken
 - Gecorrigeerde optieken
 - Equatoriale montering
 - Volgmechanisme

 - Geduld
- 

De fotografische emulsies



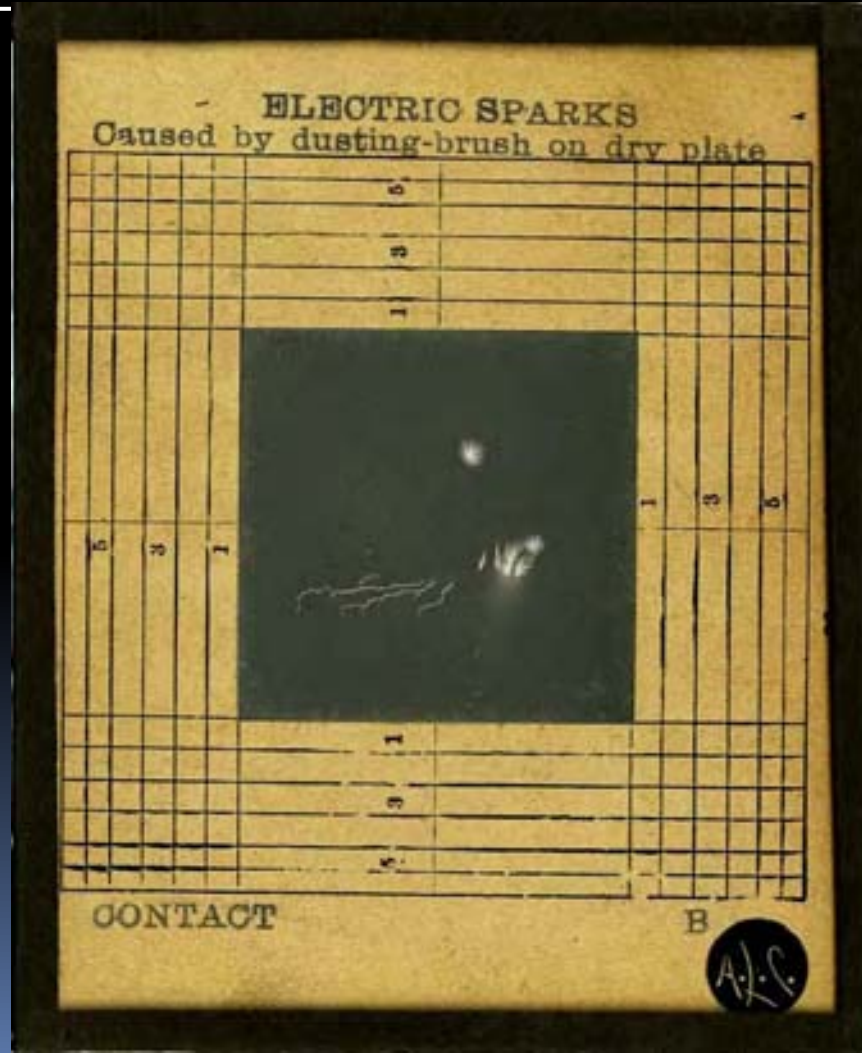
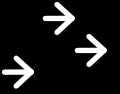


Emulsiedragers

- Metaal
 - Papier
 - Glas
 - Flexibele dragers (Estar Polyester)
- 

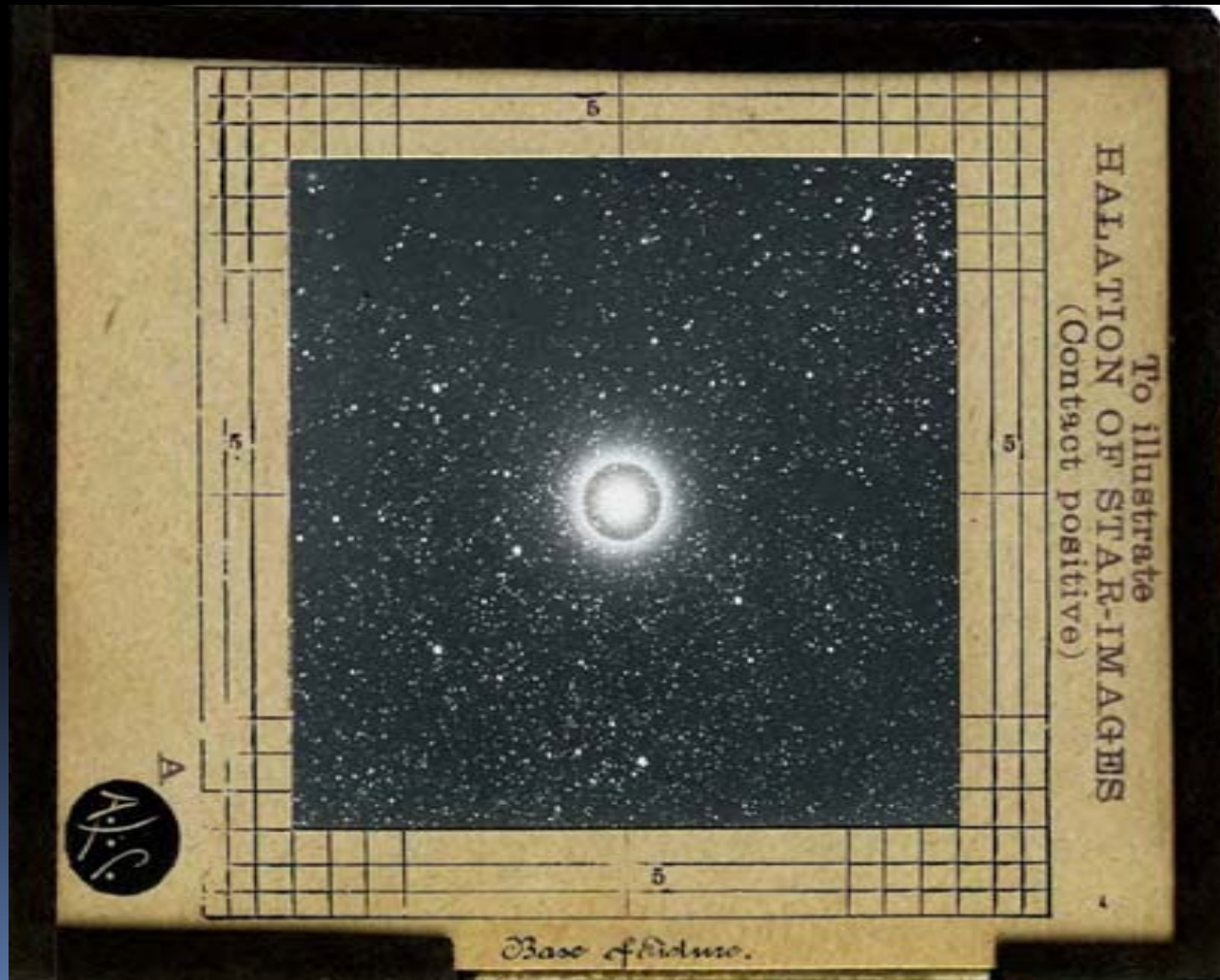
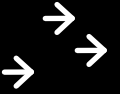
E. E. Barnard, onderzoek van emulsies, 1890

Lantaarnplaat, Lick Observatory, 1890
Anamorfose collectie




E. E. Barnard, onderzoek van emulsies, 1890

Lantaarnplaat, Lick Observatory, 1890
Anamorfose collectie





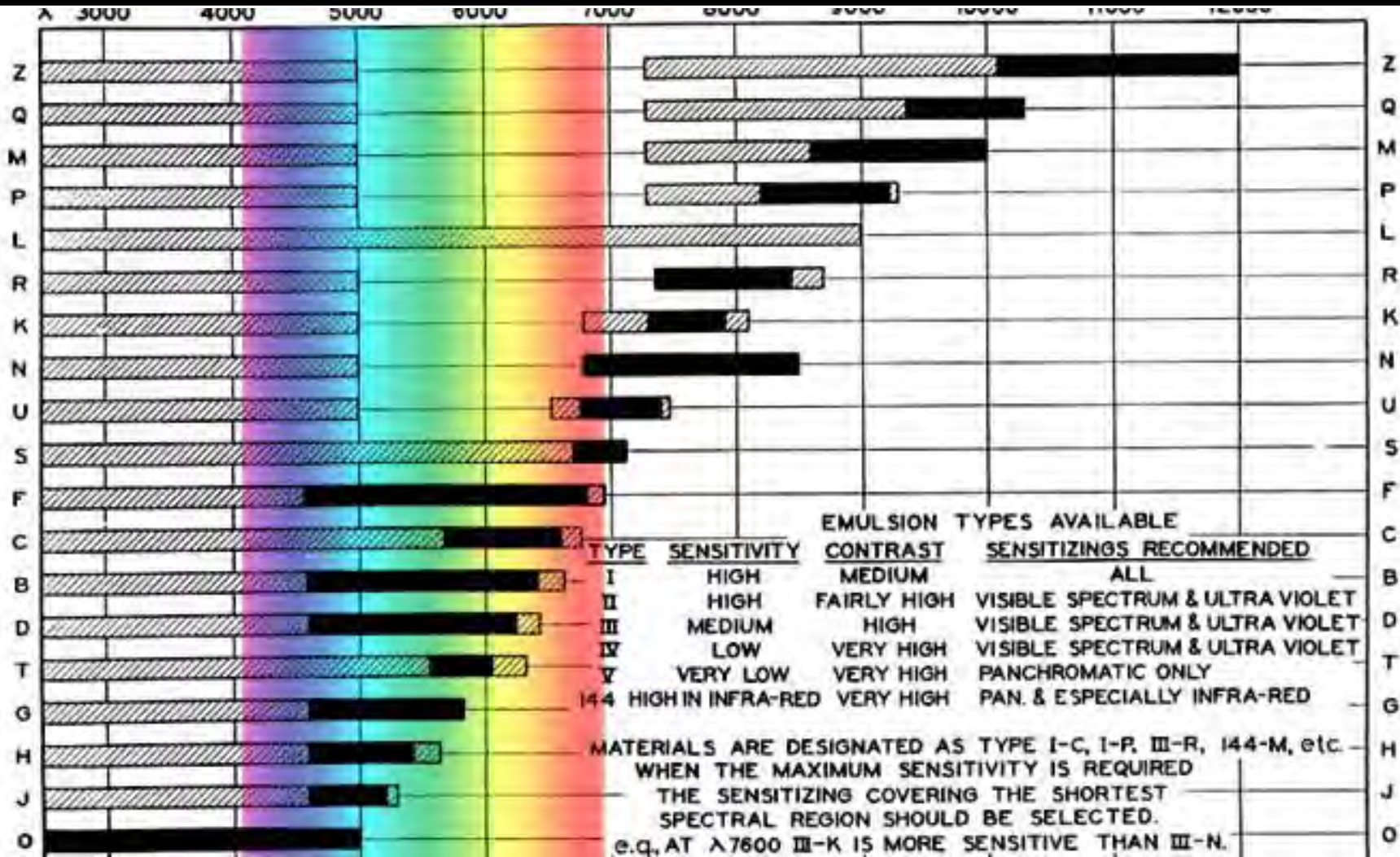
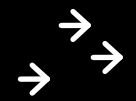
Size matters

- Grootformaat glasplaten
 - Van 9x12cm tot 30"x30"
 - Gemiddeld 13x18cm of 5"x7"
 - Groter beeldveld
 - Minder uitvergroten = hogere resolutie
- 

Spectrum & Gevoeligheid

- Natte Collodium (1851)
- Droge Collodium (1855)
- Albumine (1855)
- Orthochromatische emulsie (1873)
- Zilver bromide (1871)
- Gelatine zilver bromide (1878)
- Isochromatische emulsie (1894)
- Panchromatische emulsie (1906)
- Kodak 103a (1928)

Kodak 103a: de doorbraak



De telescopen



Lange buizen

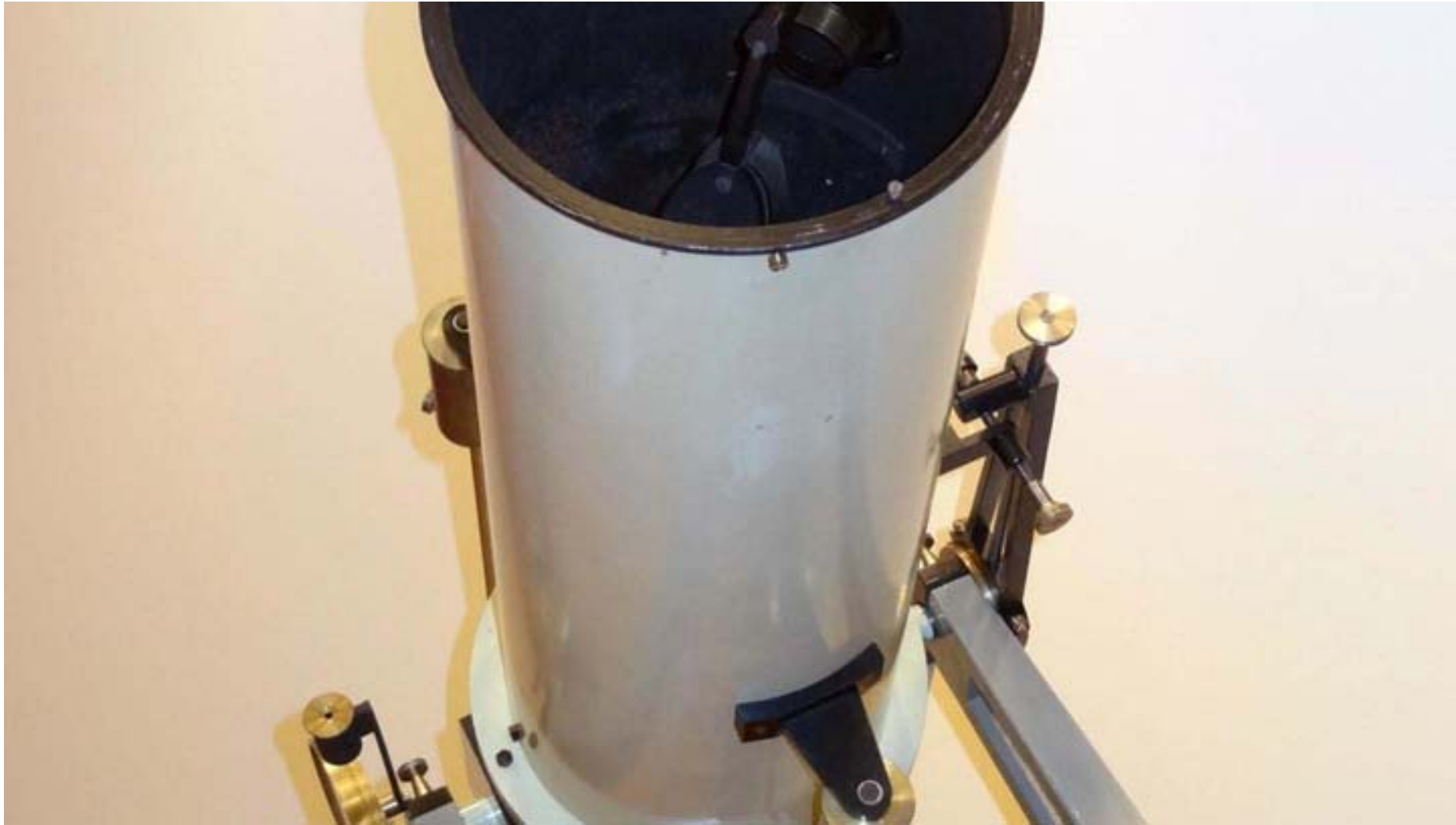
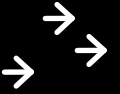
- Grote refractoren (tot 1 meter doormeter)
- Lange brandpunten ($f:15 - 25$)
- Visuele telescopen
- Geen aangepaste optieken
- Verschillende optische fouten
- Achromatische objectieven

Trage opkomst van reflector

- Dominantie van de Amerikaanse refractoren
- Ongeloof in de mogelijkheden van een spiegeltelescoop
- Optische problemen
- Doorbraak vanaf 1856

15cm Manent Newton

Maurice Manent, 15cm Zeiss f:5,5, 1924
Anamorfose collectie



De montering

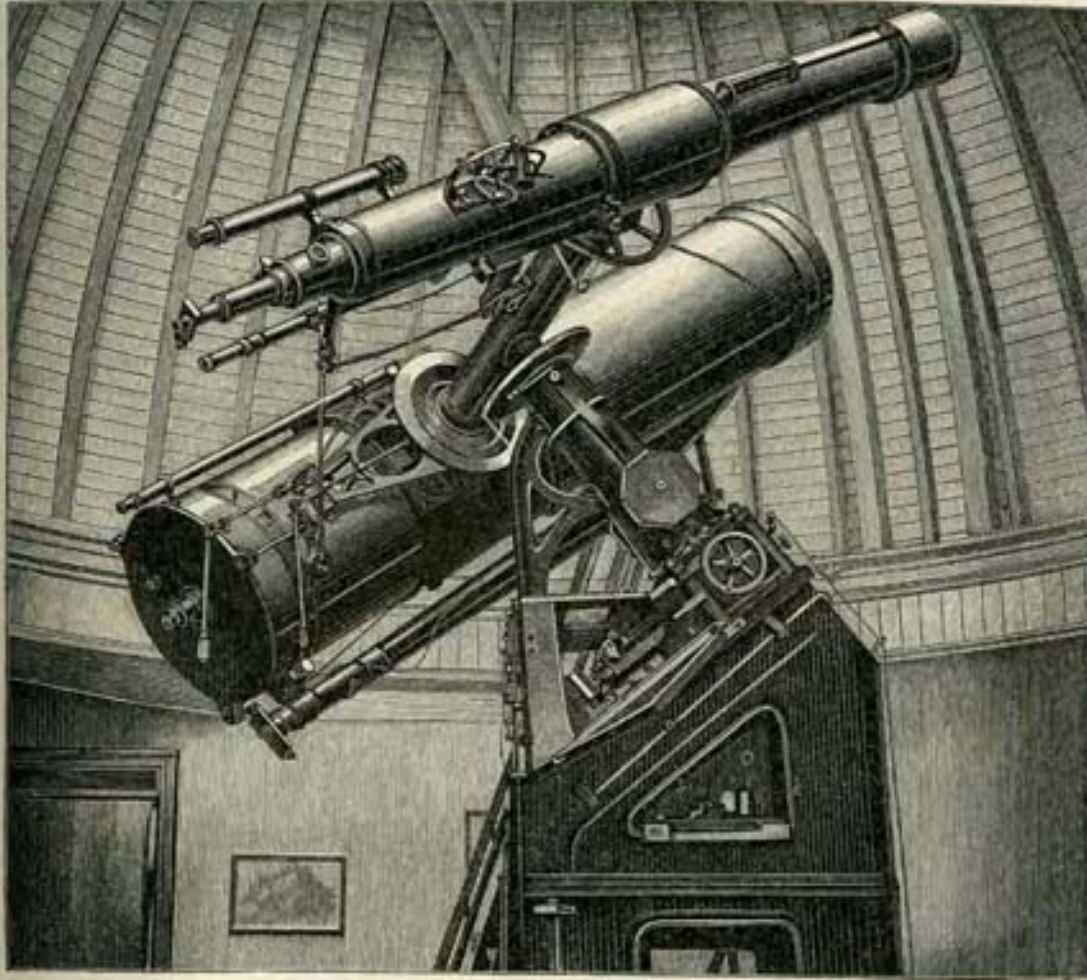



Fig. 24.

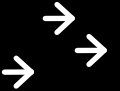


Equatoriale montering

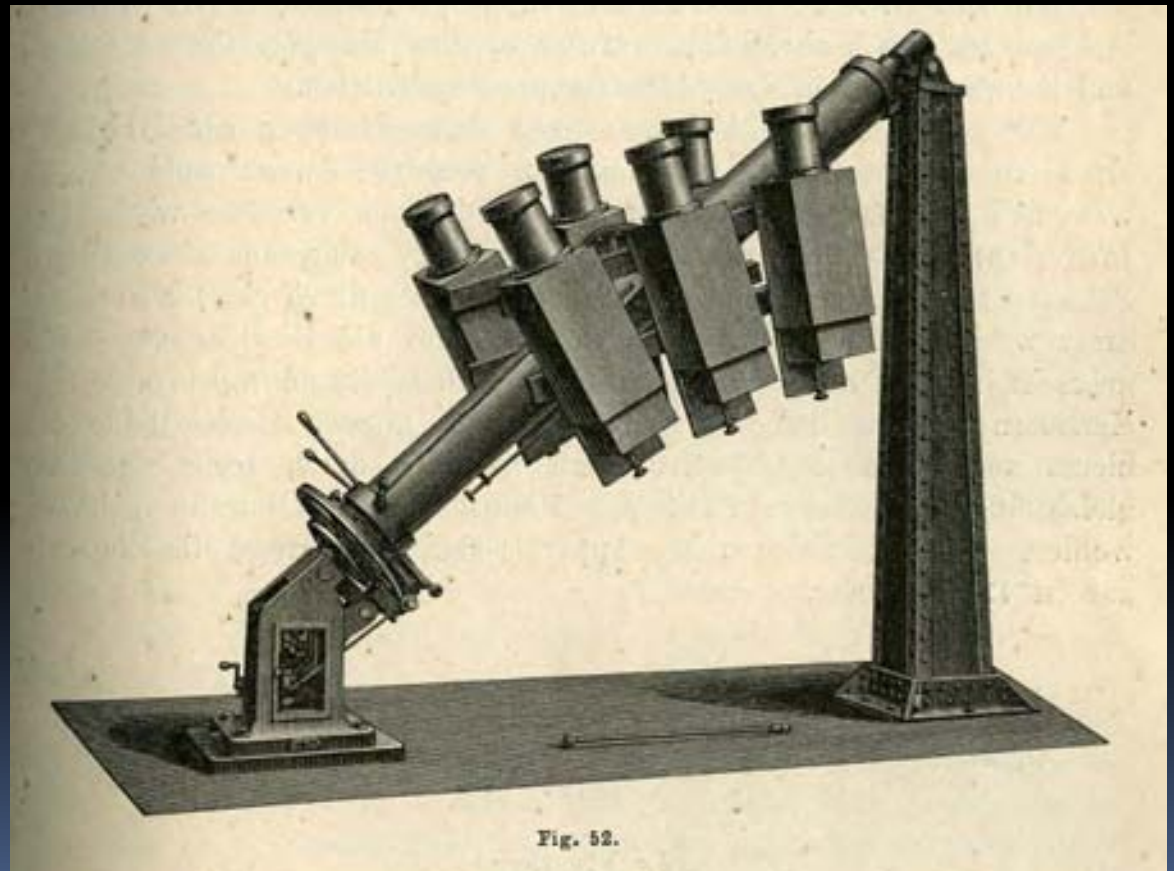
- Nodig voor lange belichting
 - Precisie van de aandrijving (klok of motor)
 - Manueel volgen tot 6 uren
 - Stabiliteit (trillingen en wind)
- 

Joseph von Fraunhofer (1787 - 1826)

Uitvinder van de Duitse Equatoriale montering op punt gezet door Merz
Struve (Dorpat) refractor 1824




De astrograaf



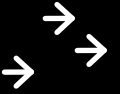


Sneller en flexibel

- Gebaseerd op de portretcamera
 - Sneller
 - Minder optische fouten
 - Gebaseerd op de Petzval optieken
 - Wide field
 - Minder zware montering
- 

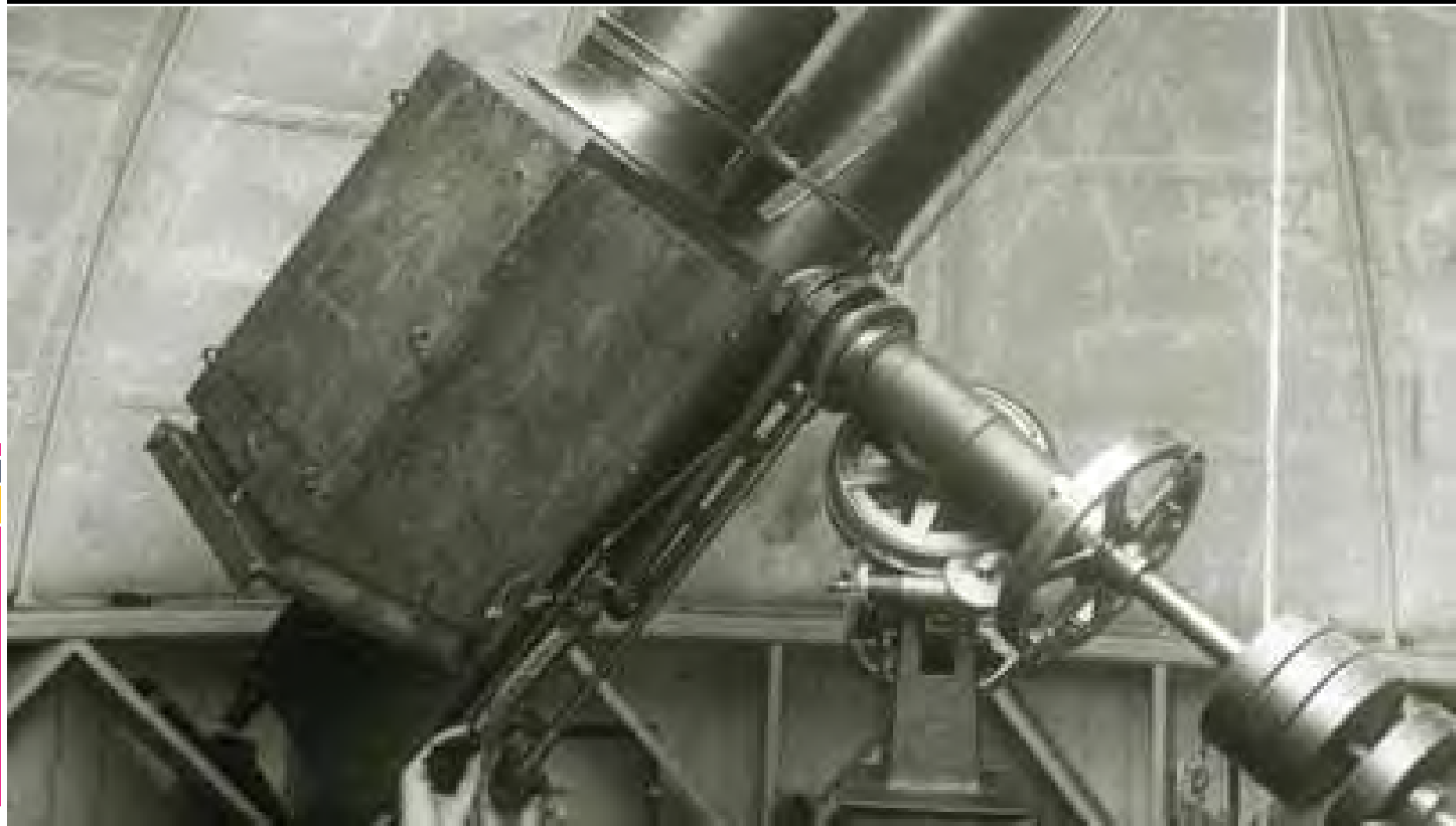
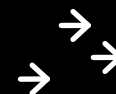
Doppel-Plasmat Meyer

Brandpunt 210mm f:1.4, Meyer & Co. Goerlitz, 1920
Standaardlens voor 13x18cm
Anamorfose collectie



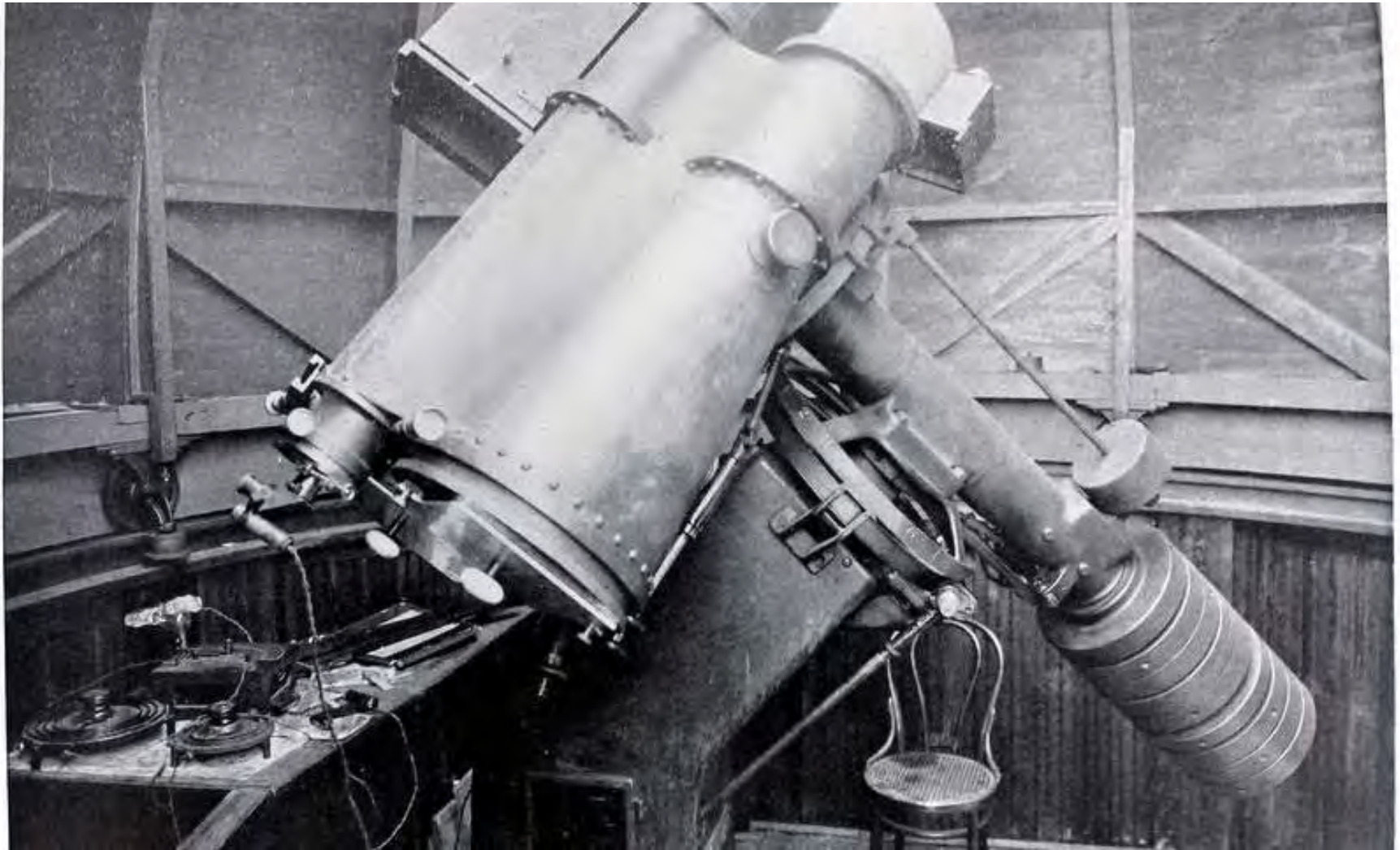
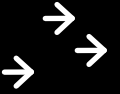
Crocker Astrograph, 1890

Willard portretlens, Lick Observatory, E. E. Barnard



Bruce Astrograph, 1897

Yerkes Observatory, E. E. Barnard



De maan in het vizier

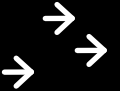
De eerste opdracht van Arago: de maanatlas

Is er leven op de Maan? Heeft de Maan een
atmosfeer? Is er water op de Maan?



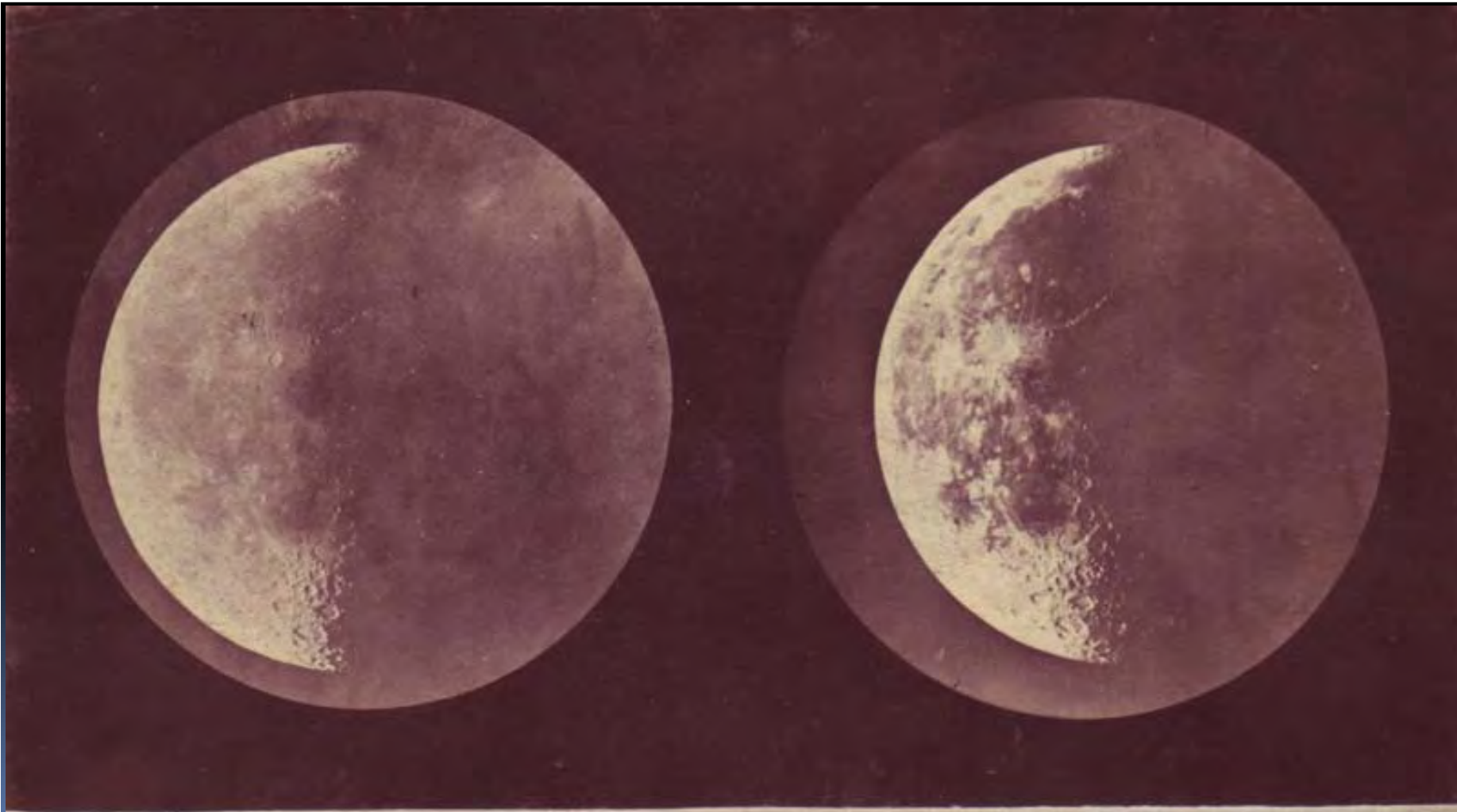
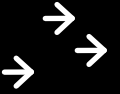
Anoniem, Ambrotype, +/-1850

Goedkoper alternatief voor de Daguerreotypie. Op glas. Gevoeliger. Minder scherp.
Private collection



Warren de la Rue, Maan in Stereo, 1850

Albuminedruk, Warren de la Rue, eerste stereo opname van de Maan, 1850
Private collection

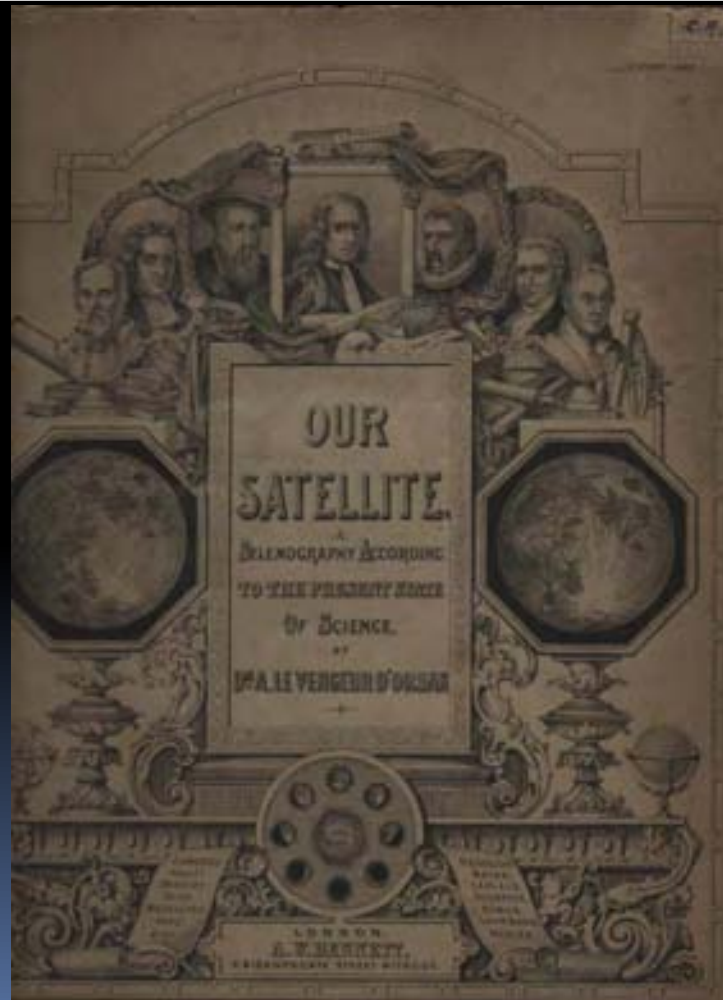
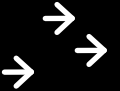


A. Le Vengeur-D'Orsan, 1862

Albuminedruk, 1862

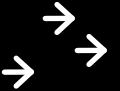
Foto's gemaakt door Rutherford. Eerste geval van plagiaat in de geschiedenis van de fotografie

Private collection



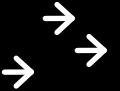
A. Le Vengeur-D'Orsan, 1862

Albuminedruk, 1862
Foto's gemaakt door Rutherford.
Private collection



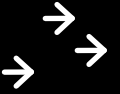
Lewis Morris Rutherford, 1865

Woodburytype, 1884
Anamorfose Collectie



Lewis Morris Rutherford, 1865

Albumine druk, +/- 1870
Anamorfose Collectie

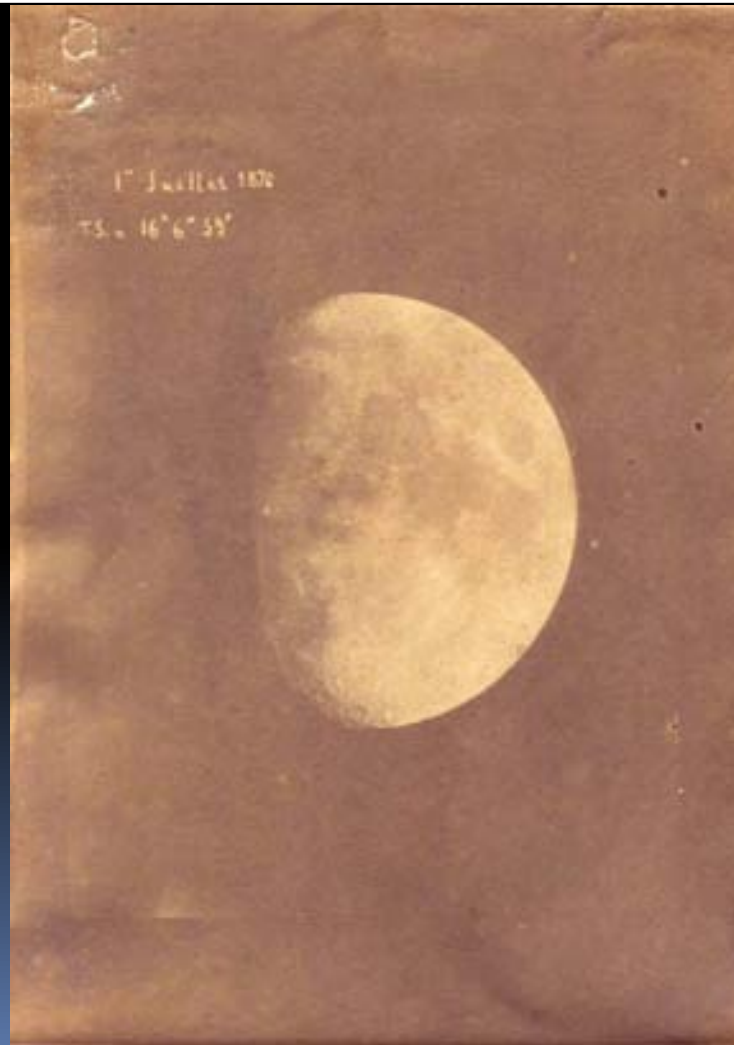
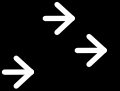


Les Frères Henry, 1876

Paris 1876

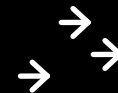
Verwijzing naar Sécretan en Lerebours

Anamorfose collectie



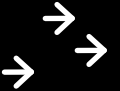
Anoniem, Maansverduistering, +/-1880

Albuminedruk, voor 1880
Anamorfose Collectie



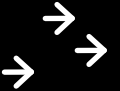
James Nasmyth, 1885

Woodburrytypes uit "*The Moon: considered as a Planet, a World an a Satelite, 1885*"
Anamorfose Collectie



James Nasmyth, 1885

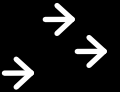
Lantaarnplaat, "*The Moon: considered as a Planet, a World an a Satelite, 1885*"
Anamorfose Collectie



7935 Theophilus, Cyrillus,
Catharina

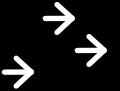
E. E. Barnard, Lunar peak, 1891

Lantaarnplaat, Lick Observatory, Peak in center of Copernicus Enlarged 100 diameters to show grain in plate., 28/07/1891
Anamorfose Collectie



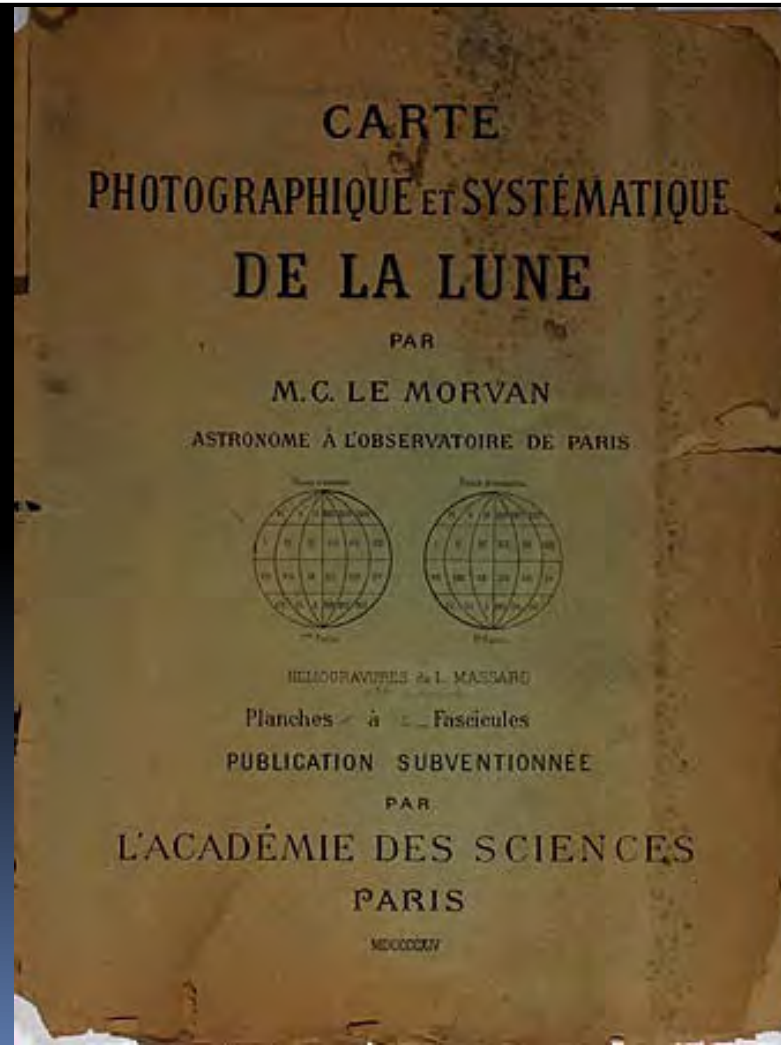
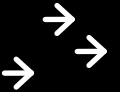
Ladislaus Weinek, 1894

Albumine druk, 1894
Anamorfose Collectie



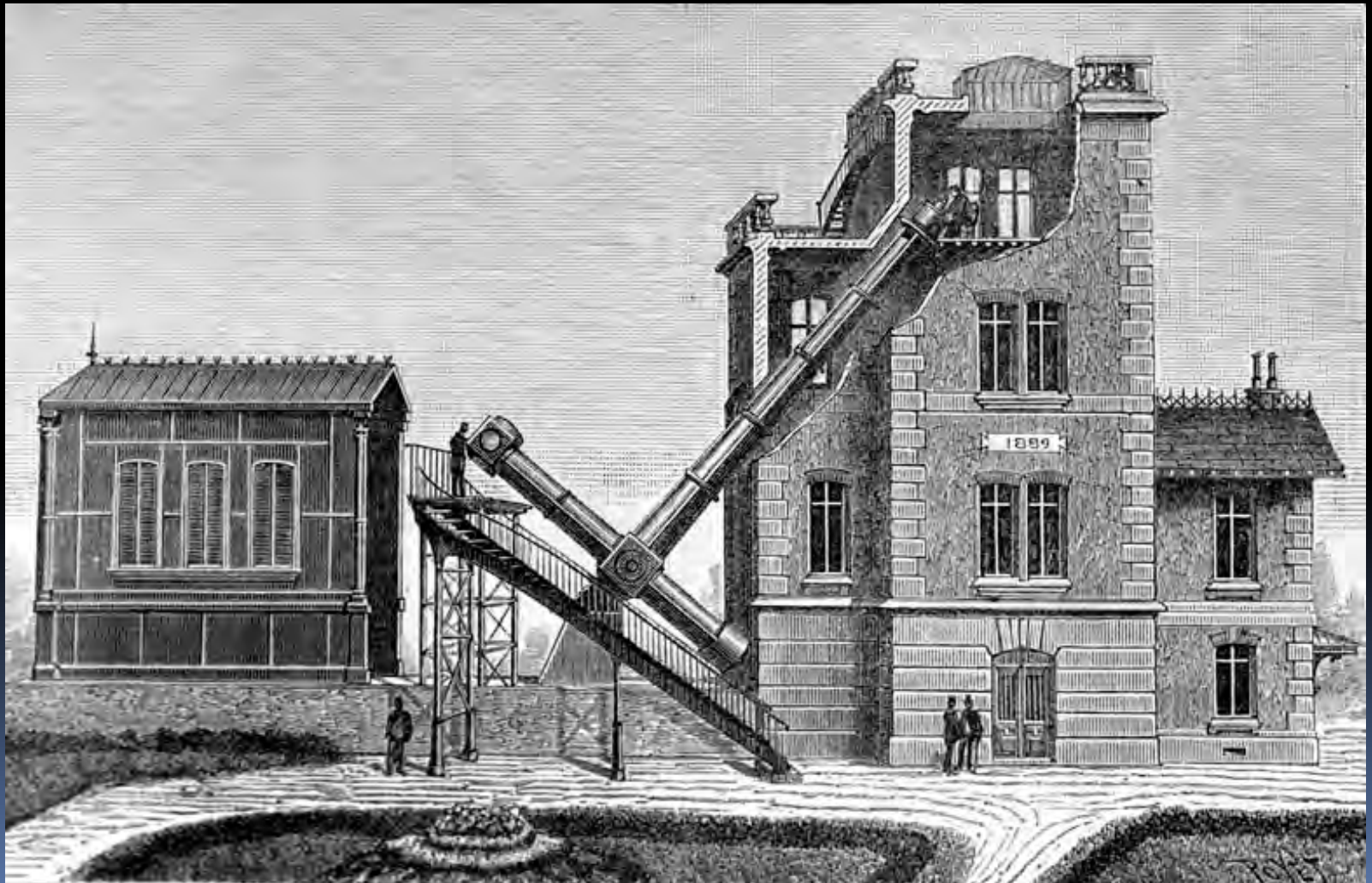
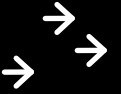
Loewy & Puiseux, +/-1900

Carte Photographique et Systematique de la Lune. Observatoire de Paris, 1900
Eerste volledige maanatlas
Private collection



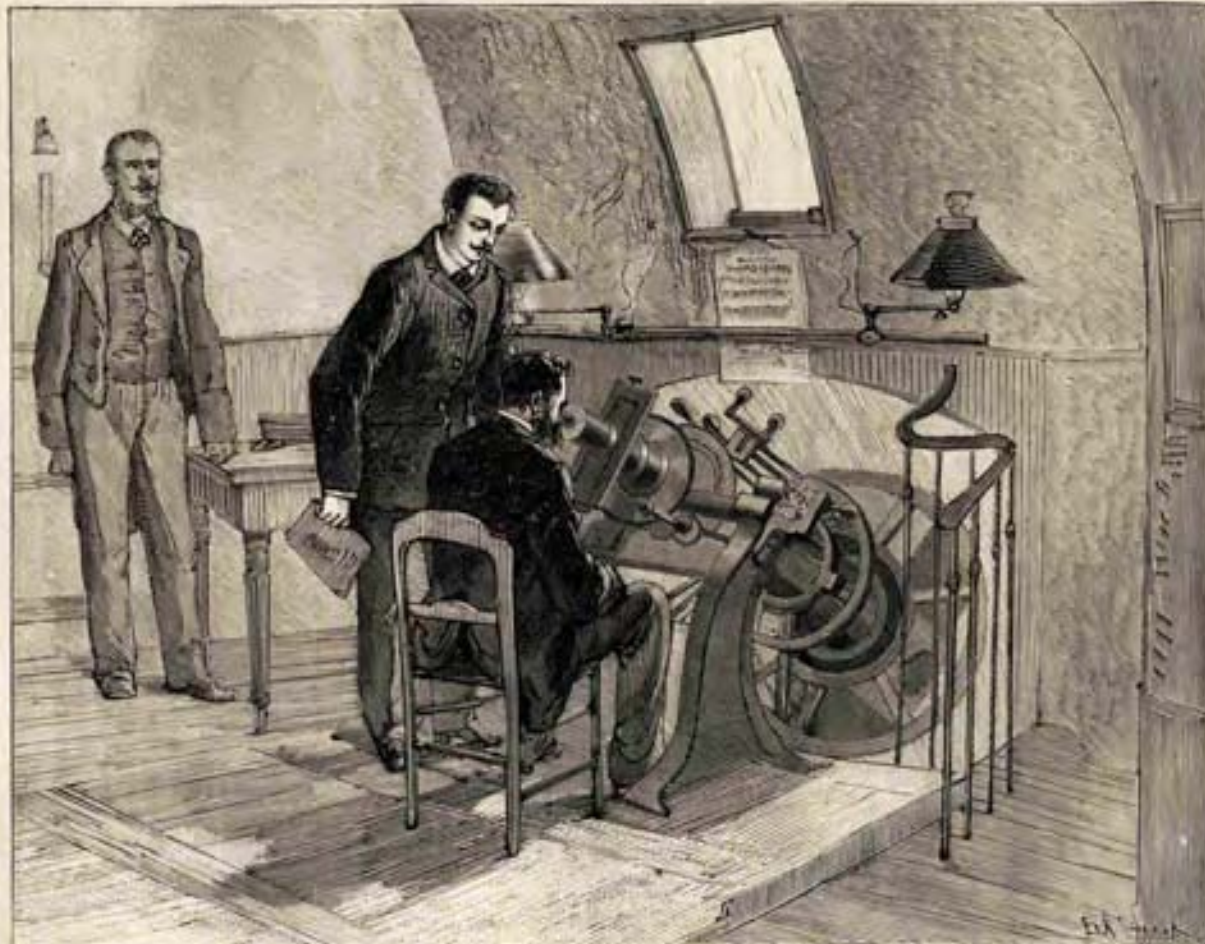
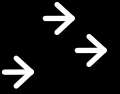
Le Grand Equatorial Coudé, Paris

Observatoire de Paris, Litho, 1900



Werken met de Coudé Refractor, Paris, 1900

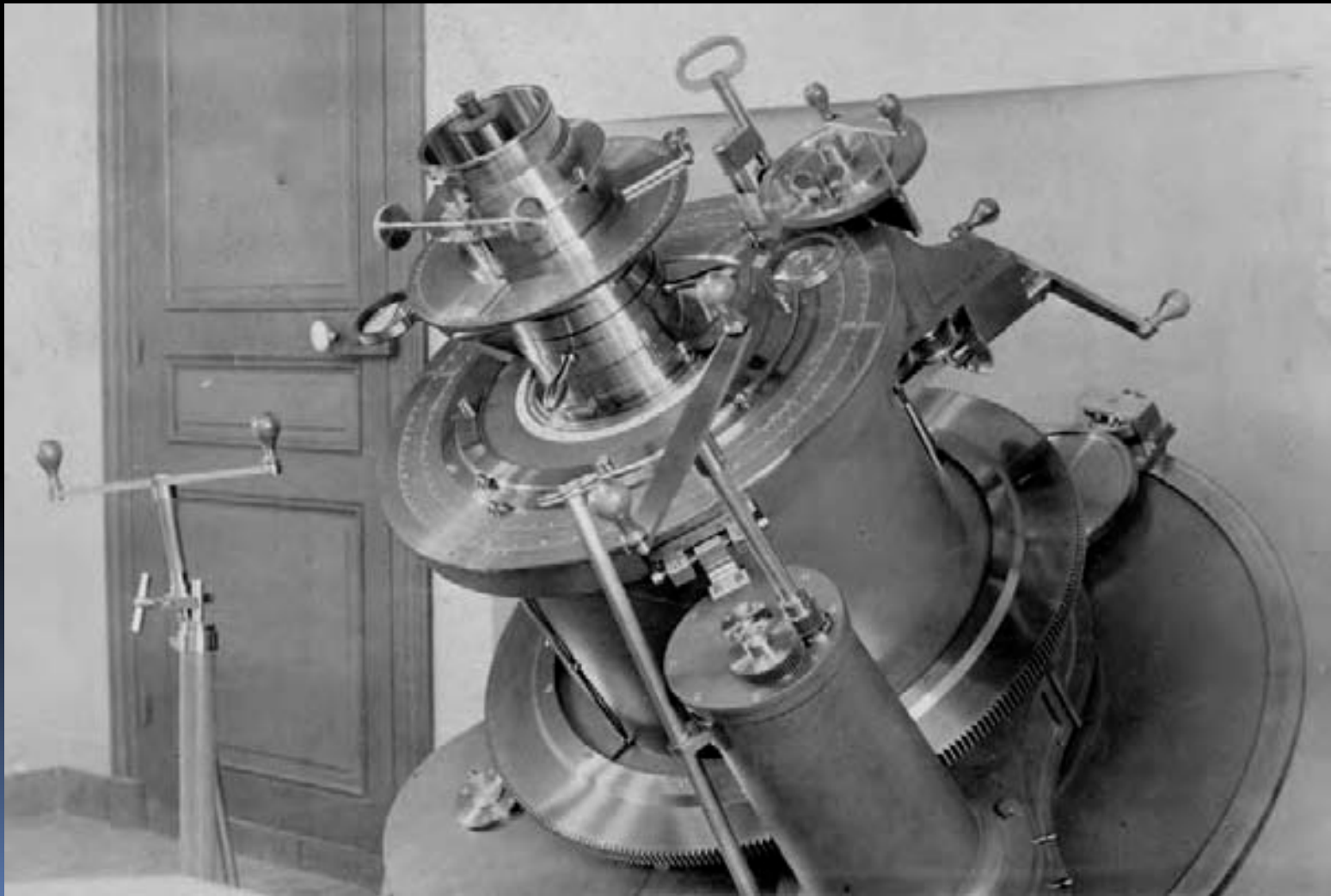
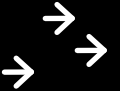
Observatoire de Paris, Litho, 1900



L'ÉQUATORIAL COUDÉ DE L'OBSERVATOIRE DE PARIS. — Aspect intérieur (p. 145, col. 1).

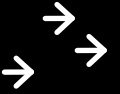
Oculaire en focuser van de Coudé

Observatoire de Paris



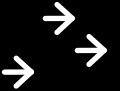
Carte Photographique et Systematique de la Lune

Loewy, Puiseux & Le Morvan, 1896
Private collection



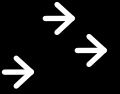
Carte Photographique et Systematique de la Lune

Loewy, Puiseux & Le Morvan, 1898
Private collection



Carte Photographique et Systematique de la Lune

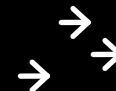
Loewy, Puiseux & Le Morvan, 1897
Anamorfose Collectie





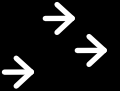
Anoniem, Maansverduistering

Printing-Out-Paper, 1913, UK
Anamorfose Collectie



Photographic Lunar Atlas, 1960

Gerard P. Kuiper
Private collection



PHOTOGRAPHIC LUNAR ATLAS

based on photographs taken at the
Mount Wilson, Lick, Pic du Midi, McDonald and Yerkes Observatories

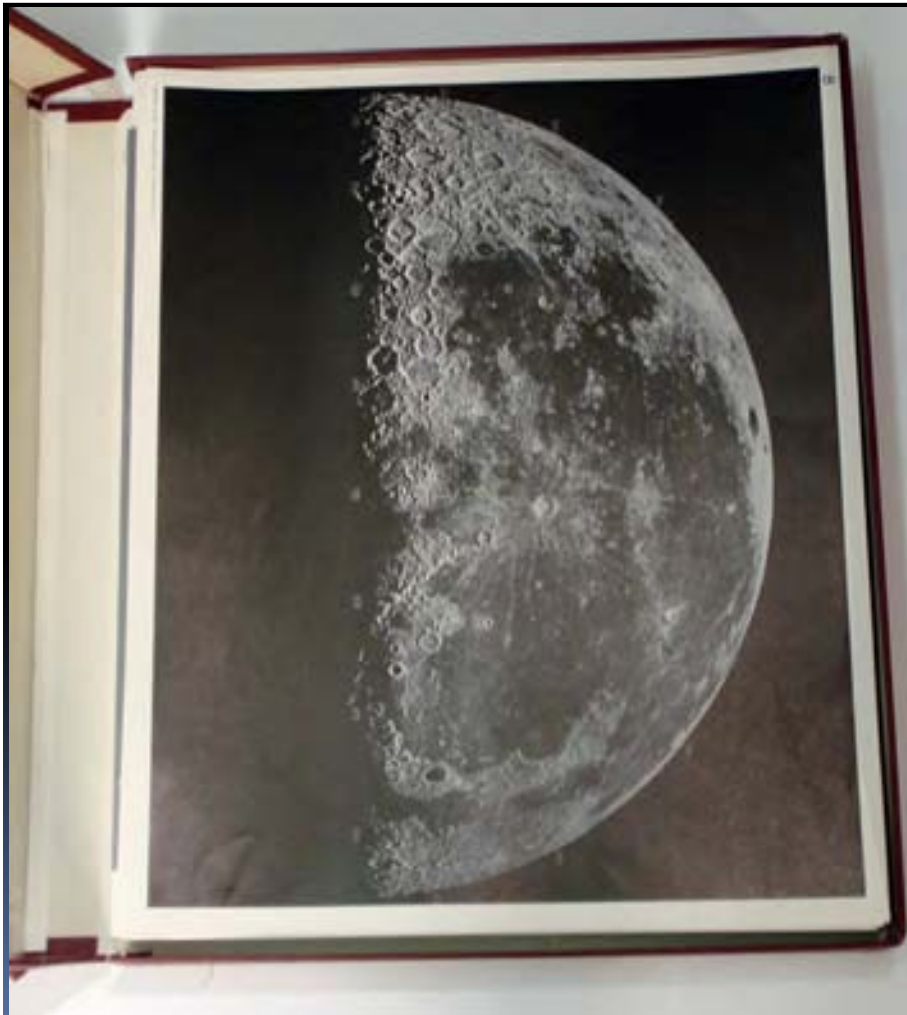
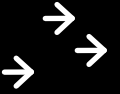
EDITED BY GERARD P. KUIPER



THE UNIVERSITY OF CHICAGO PRESS

Photographic Lunar Atlas, 1960

Gerard P. Kuiper
Private collection



Antwoorden

- De eerste gedetailleerde maanfoto's waren een shock
- Geen leven, geen water, geen atmosfeer, ...
- De atlas van Puisseux en Loewy werd zelfs door de NASA gebruikt

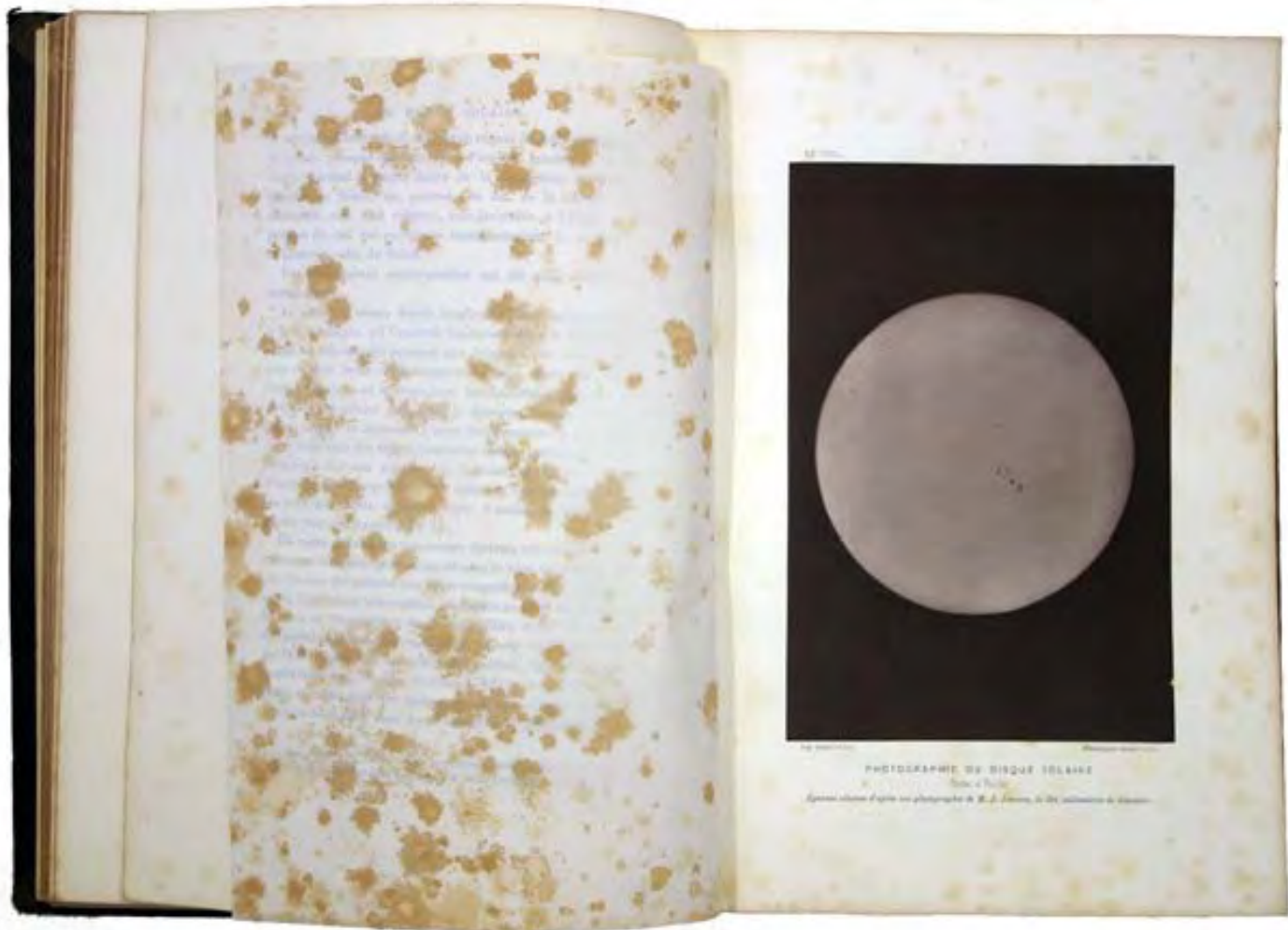
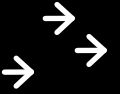


Jules Janssens, 1877

Amedée Guillemin, Le Ciel, 1877

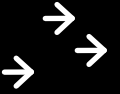
Jules Janssens, Albuminedruk, 74, Observatoire de Meudon

Anamorfose Collectie



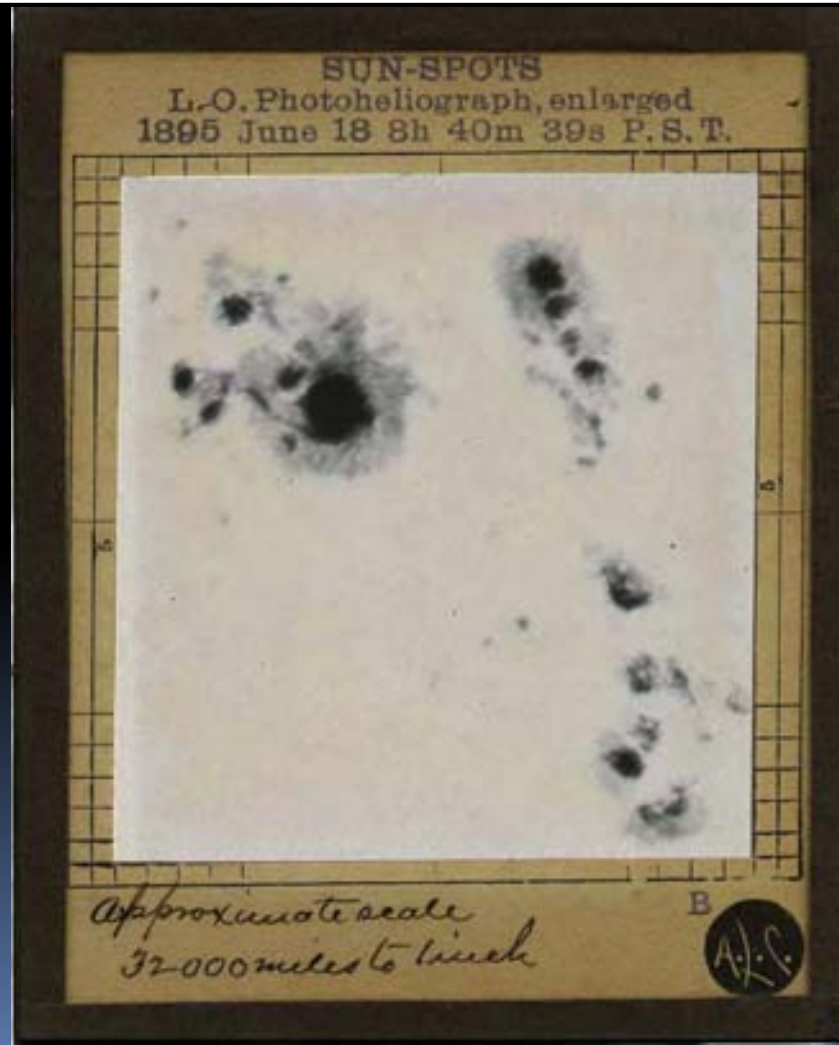
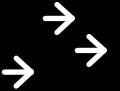
Jules Janssens, Etudes de la surface Solaire, 1893

Jules Janssens, Albuminedruk, 1893, Observatoire de Meudon
Anamorfose Collectie



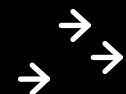
E. E. Barnard, Zonnevlekken, 1895

Lantaarnplaat, Lick Observatory, 18/06/1895



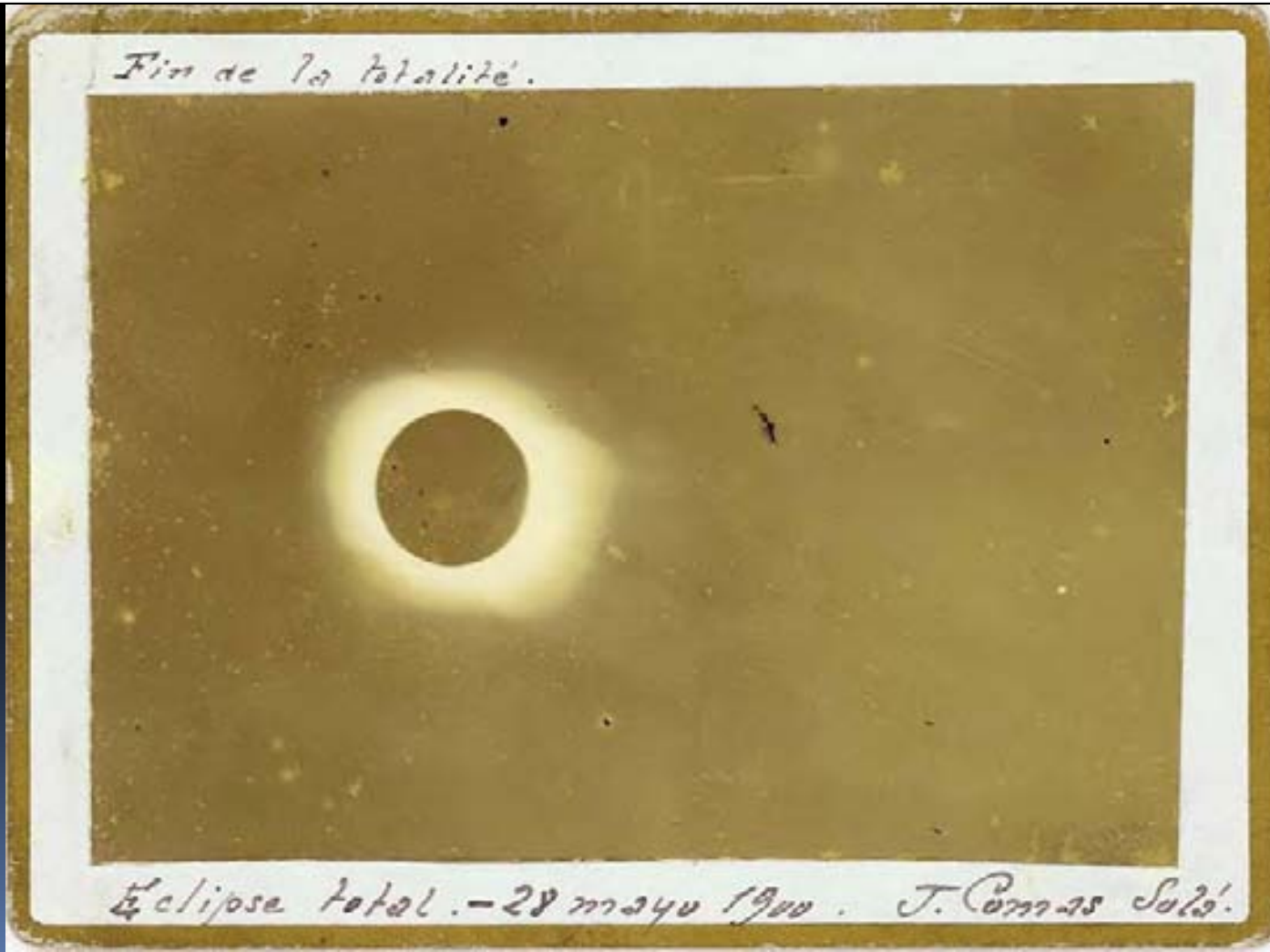
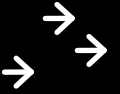
E. E. Barnard, Zonsverduistering, 1889

Zilverbromide, Lick Observatory, Reports on the Observations of the total eclipse of the sun, 1889
Anamorfose Collectie



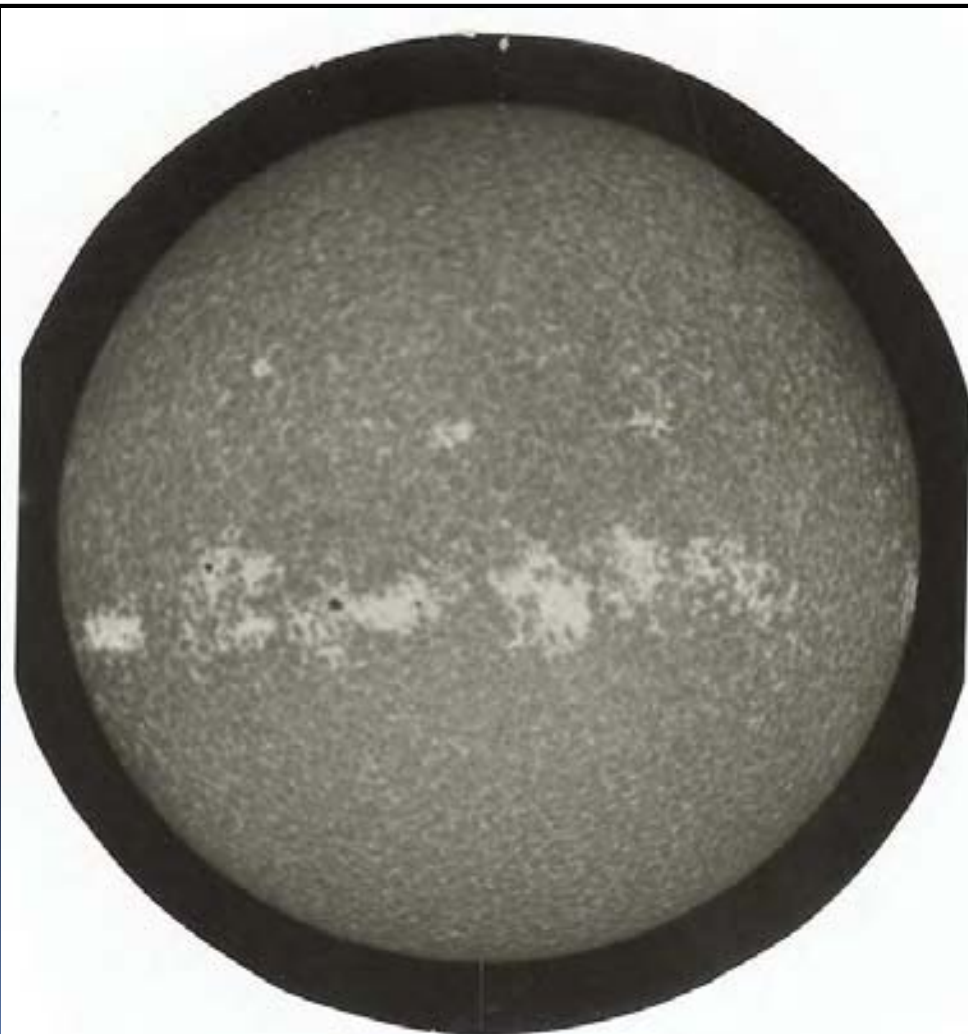
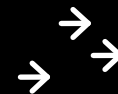
J. Comas Sola, 1900, zonsverduistering

Albuminedruk, 1900
Private collection



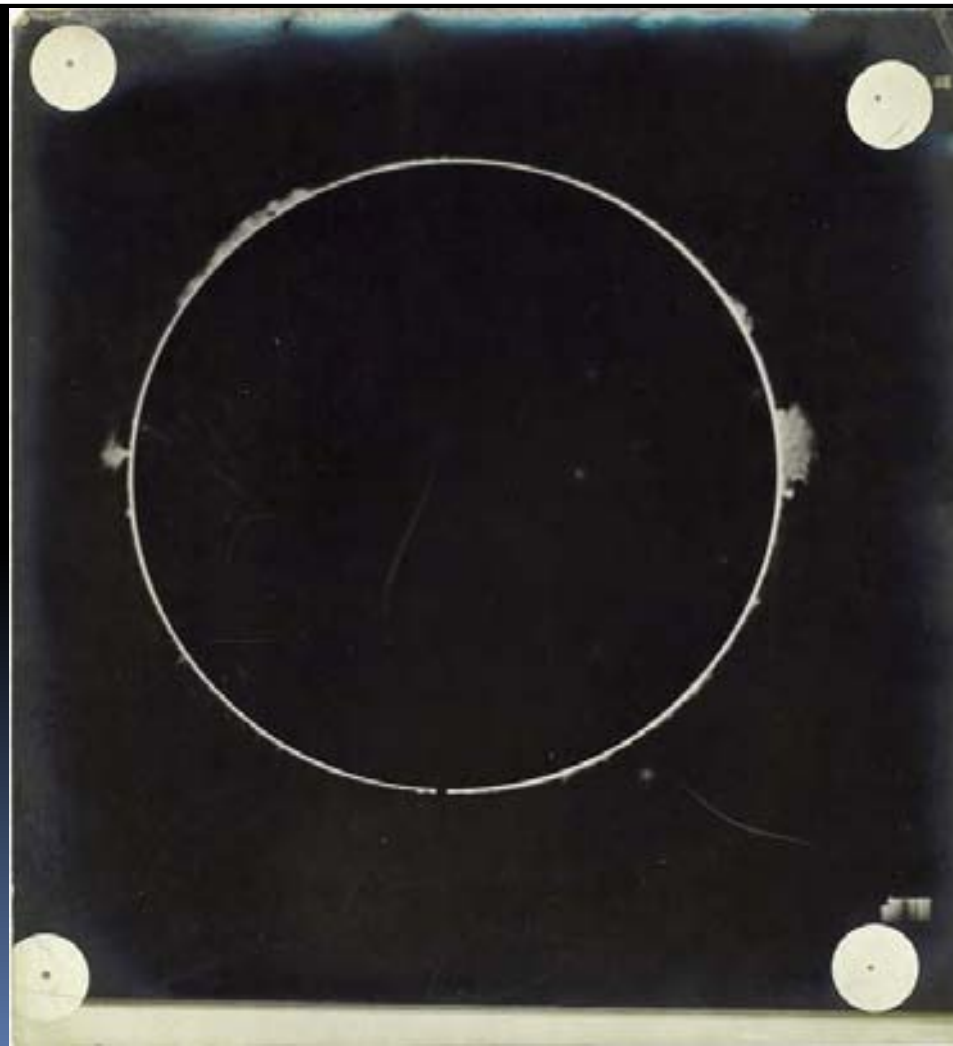
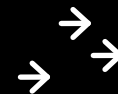
Anoniem, zon in H-Alfa, 1907

Zilverbromide druk, 1907
Private collection



Anoniem, Protuberansen, 1907

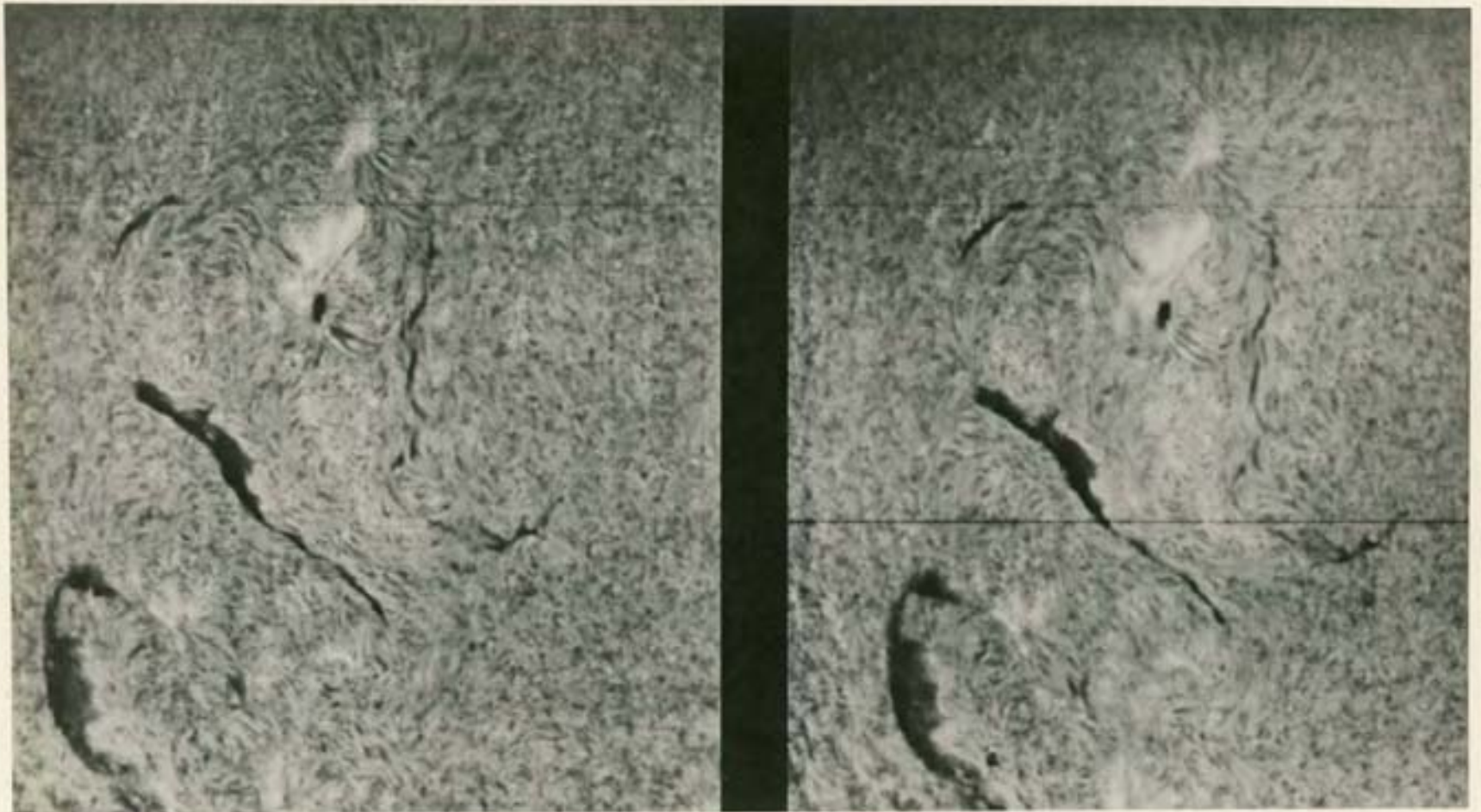
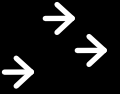
Zilverbromide druk, 1907
Private collection



Mount Wilson, zon in H-alfa, 1917

Zilverbromide, Mount Wilson Observatory, 08/02/1917

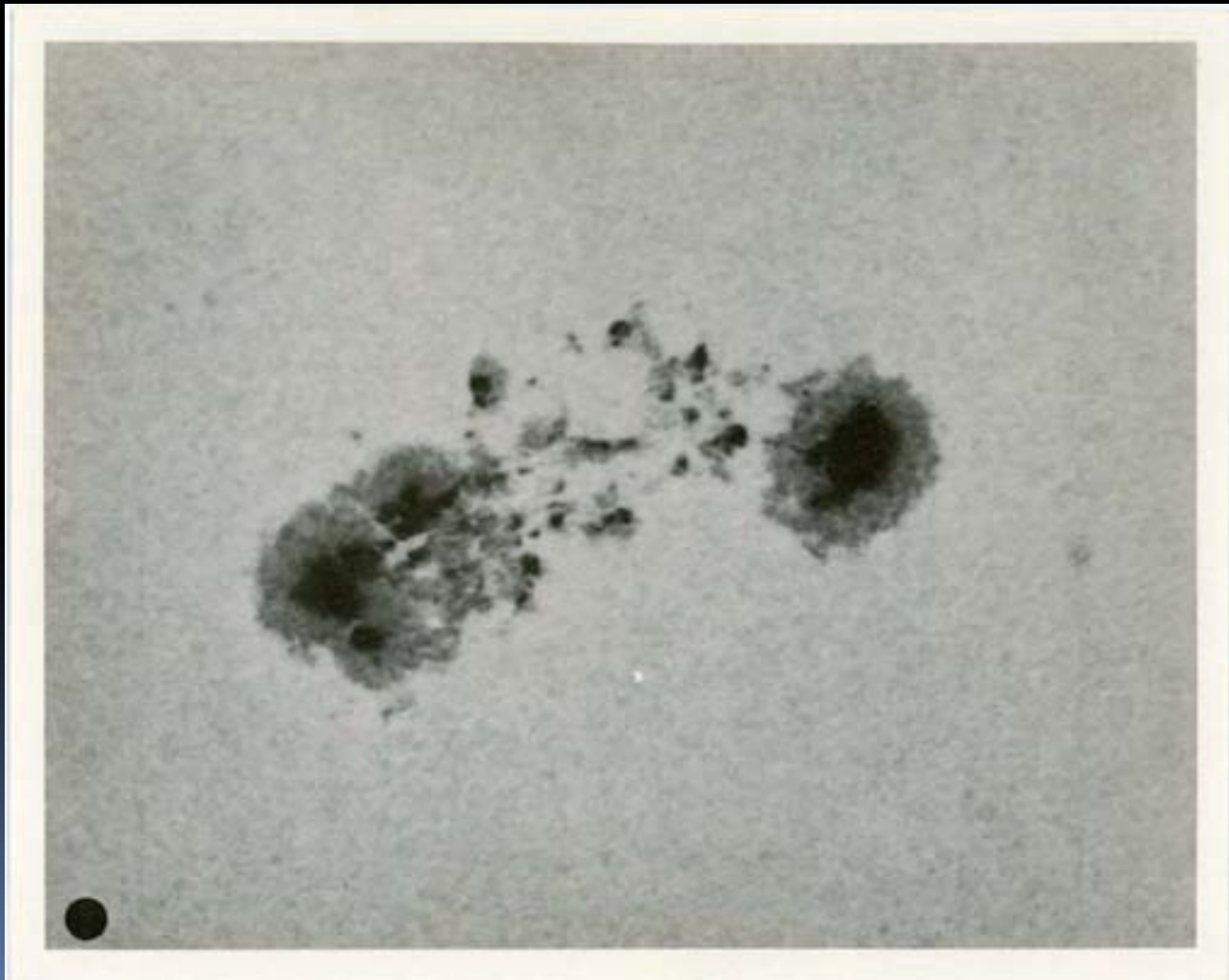
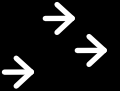
Anamorfose collectie



Mount Wilson, Zonnevlekken, 1917

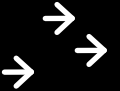
Zilverbromide, Mount Wilson Observatory, 08/02/1917

Anamorfose collectie



Anoniem, zonsverduistering, 1921

Zilverbromide, 08/04/1921
Anamorfose Collectie



Eclipse of Sun.

Apr. 8. 1921.

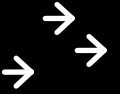
9.45 a.m.

greatest phase.

—
Taken from
Smoking Room
window through
3 thicknesses of
black film.

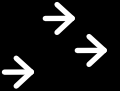
Simjian, Yale University Solar Eclipse, 1925

Zilverbromide, Luther Georges Simjian, Yale University Solar Eclipse, 1925
Anamorfose collectie



Mount Wilson, evolutie van protuberansen, 1929

Zilver bromide, Mount Wilson Observatory, 18/06/1929
Anamorfose collectie



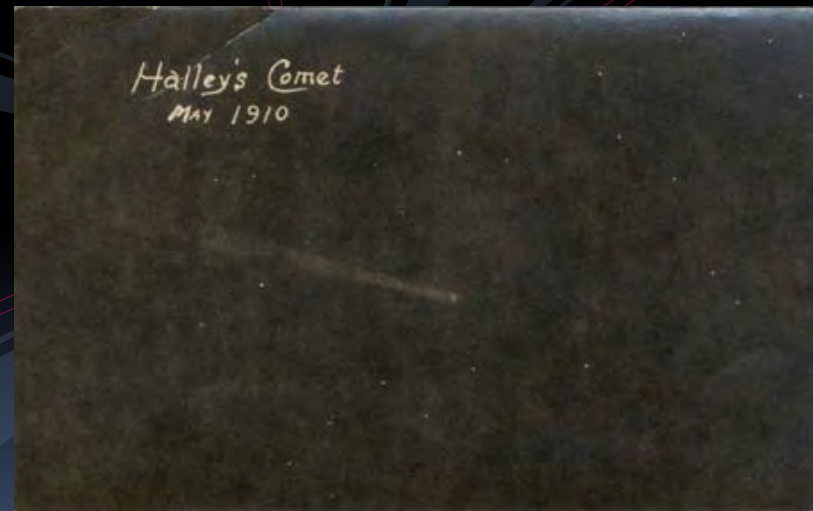
Antwoorden

- De Zon is maar een gewone ster!
- Gasvormig, niet vast
- Atmosfeer
- Ontdekking van Helium door Janssen.
(zie de Simpsons)



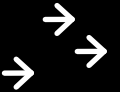
Kometen en Planeten

Kan fotografie helpen om kometen te ontdekken?
De ware aard van de planeten? Kaarten van de planeten?



Jules Janssen, Komeet, 1882

Albuminedruk, Maurice Loewy, Annuaire pour l'An 1882
Anamorfose Collectie



776

d'incalculablement prolongée devrait être conduite dans des conditions de haute précision, malgré le mouvement diurne du ciel, compliqué du mouvement propre très rapide de la comète.

Mais, fort heureusement pour l'Astronomie, il s'est produit tout récemment une très importante découverte en Photographie : celle des plaques sèches au gélatino-bromure d'argent. Ces plaques unissent aux avantages des plaques sèches ceux d'une sensibilité qui peut devenir extraordinaire avec des soins spéciaux de préparation.

L'emploi de ces plaques permettra déjà de réduire cette durée de l'action lumineuse, qu'il eût fallu prolonger pendant un temps si démesurément long avec le collodion humide, à quelques couples d'heures.

C'était encore trop, en raison du mouvement si rapide de la comète, surtout si l'on voulait obtenir une image précise, pouvant se prêter à des mesures et propre à mettre en évidence de délicats détails de structure.

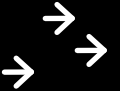
Pour résoudre la difficulté, nous avons pensé à utiliser, en cette circonstance, un télescope de construction toute spéciale, semblable à celui qui, en 1871, nous permit de découvrir la véritable nature de cette couronne des éclipses totales qui a été reconnue constituée par une enveloppe gazeuse très rare et très étendue autour du Soleil.

Cet instrument, dont le miroir à 0^m,50 et seulement 1^m,60 de foyer, donne aux images une



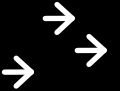
E. E. Barnard, Komet Holmes, 1892

Publication of the Lick Observatory, 1913
Anamorfose Collection



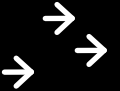
E. E. Barnard, Komeet Swift, 1892

Publication of the Lick Observatory, 1913
Anamorfose collectie



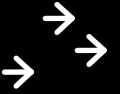
Max Wolf, Ontdekking van Asteroïde, 1910

Zilverbromide, Dr. Max Wolf, 1910
Private collection

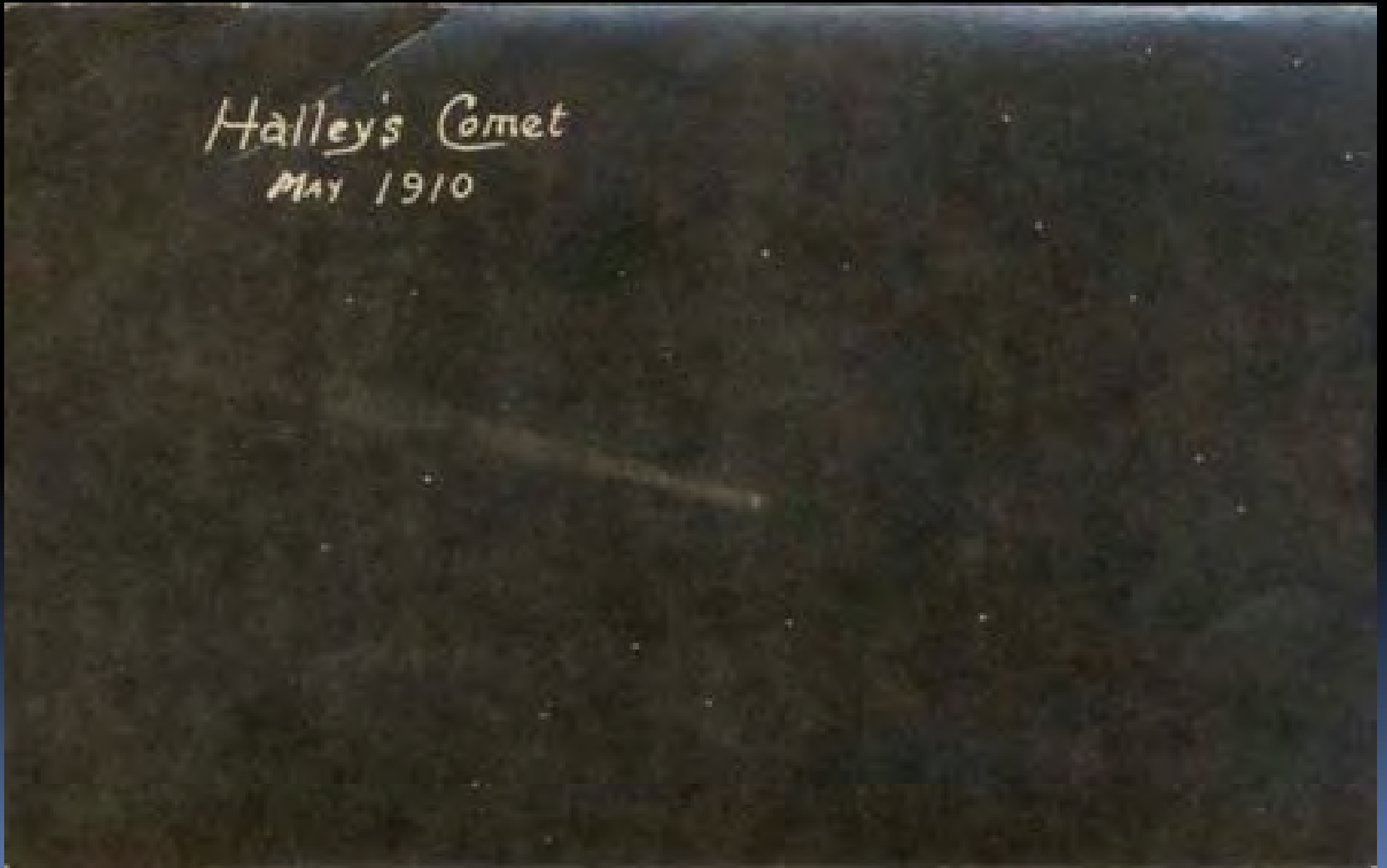


Anoniem, Halleys komeet

Zilverbromide, Anoniem, 1910
Private collection

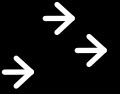


Halley's Comet
MAY 1910



Lick Observatory, Pluto, 1934

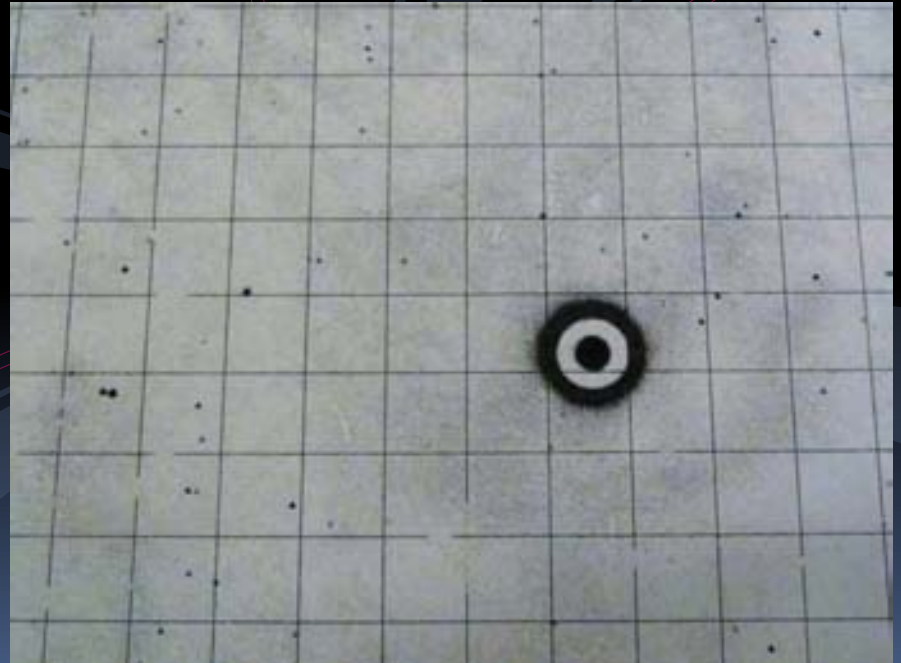
Zilverbromide, Lick Observatory, Daily motion of Pluto, 1934 (1970)
Anamorfose Collectie



Sterren tellen

Derde opdracht van Arago:

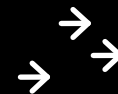
Exacte positie van de sterren? Hoeveel sterren zijn er? Wat is de samenstelling van de sterren?





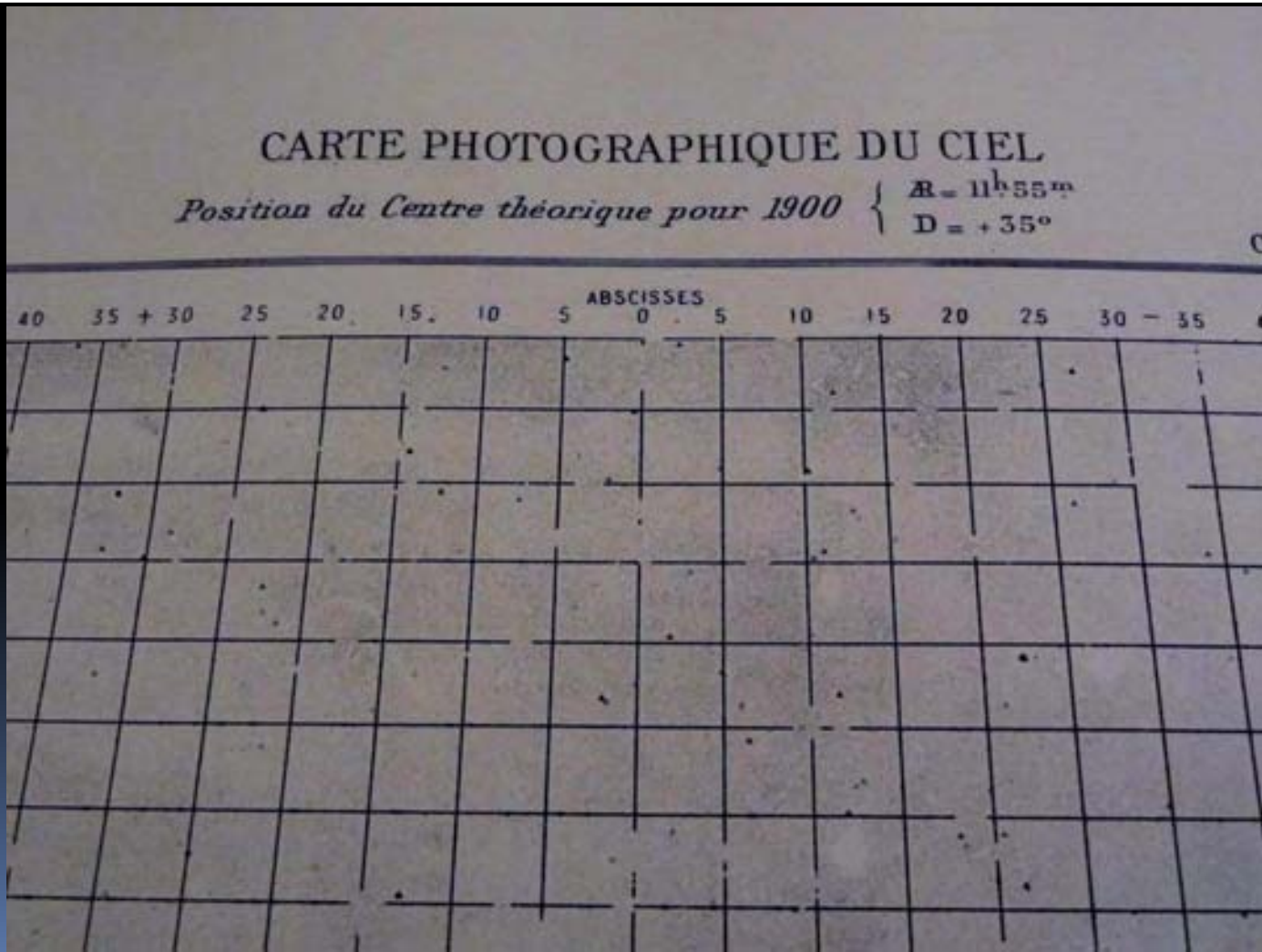
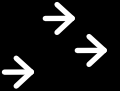
Henry Frères, Melkweg, 1886

Albuminedruk, Paul & Prosper Henry, 1886
Private collection



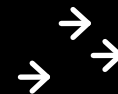
Carte Photographique du Ciel, 1887 - 1970

Fotogravure, Admiral Mouchez et al. 20 sterrenwachten wereldwijd, Koninklijke
Sterrenwacht België
Anamorfose Collectie



Carte Photographique du Ciel, telescopen

30cm dubbele refractors ontworpen door de Frères Henry



Carte Photographique du Ciel, astrometrie

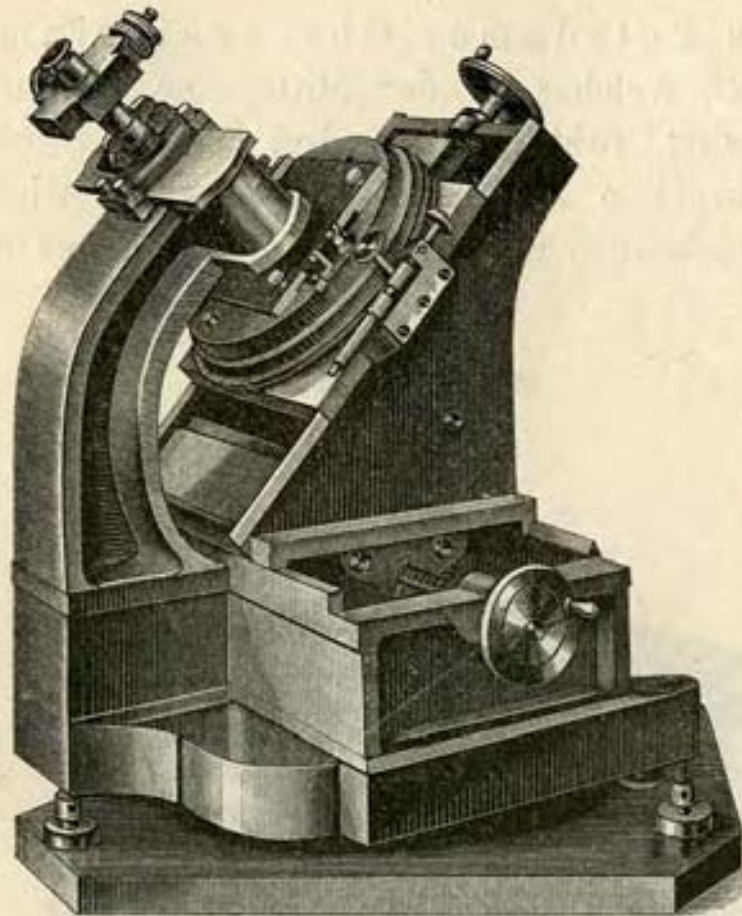
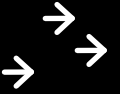
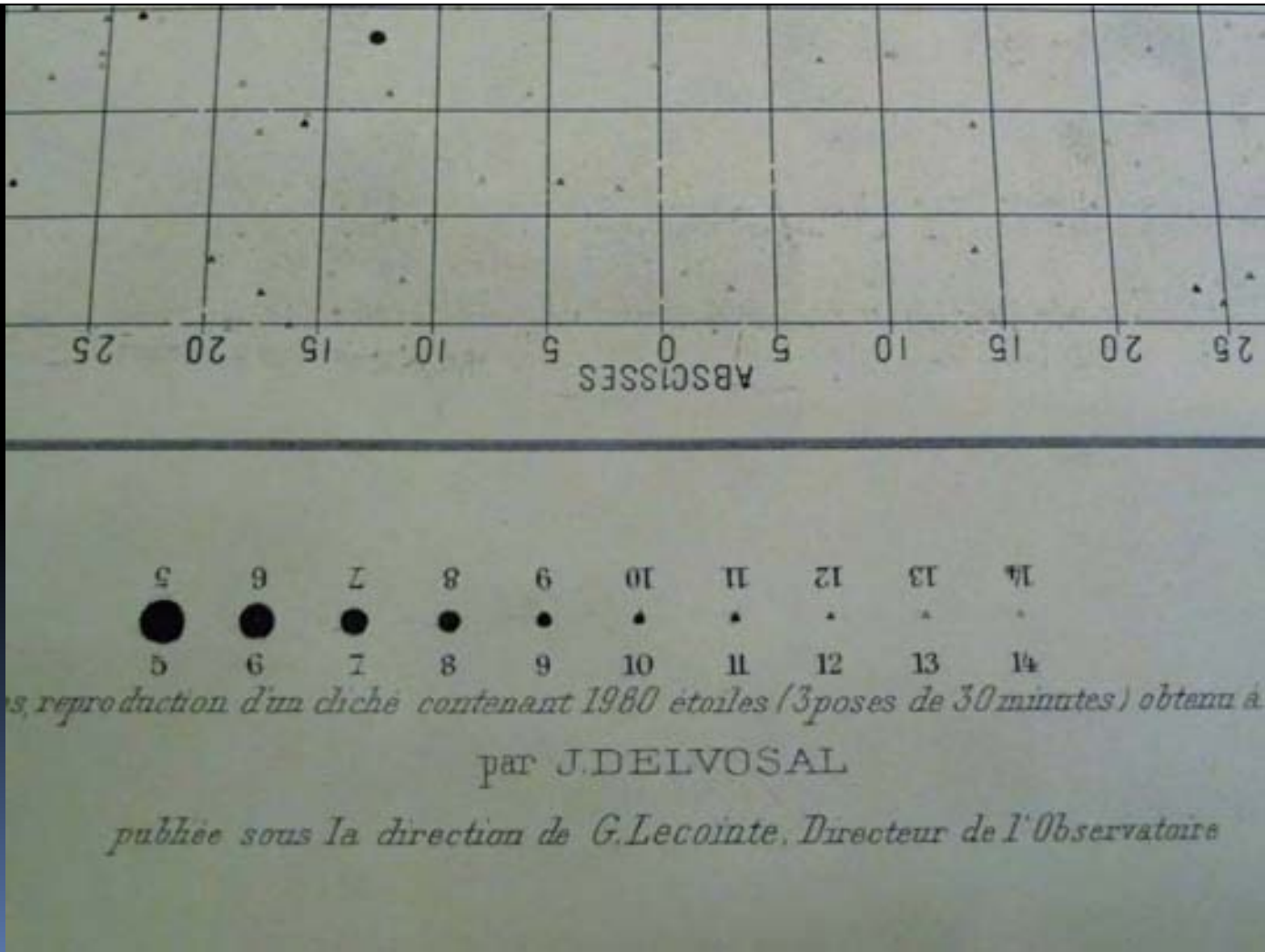
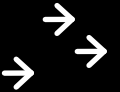


Fig. 36.

Gitterstrich genau kreuze bleibt. Da chung der beiden C der Senkrechthei ganz unmerkliche andererseits nur Mes die kurzen Distanze vorkommen, so sind Gitterstriche paralle Bewegungsrichtungen Nunmehr wird das so justirt, dass eines paare parallel zur St steht. Wenn man reflectirt, die Hun Bogensecunde exact sind damit auch o Mikrometerbewegun Das Einstellen auf

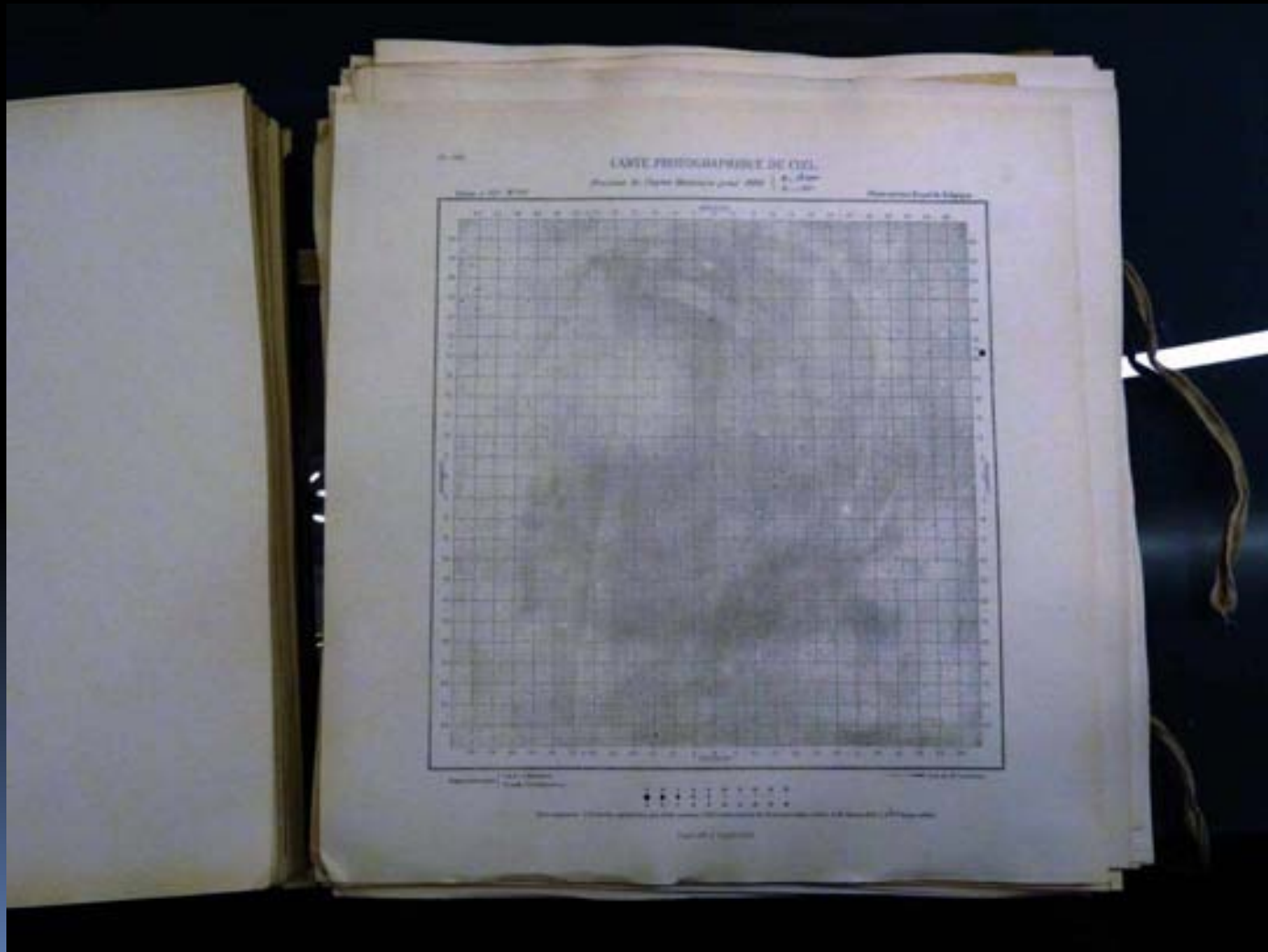
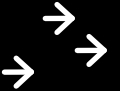
Carte Photographique du Ciel, 1887 - 1970

Fotogravure, Admiral Mouchez et al. 20 sterrenwachten wereldwijd, Koninklijke Sterrenwacht België
Anamorfose Collectie



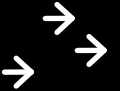
Carte Photographique du Ciel, 1887 - 1970

Fotogravure, Admiral Mouchez et al. 20 sterrenwachten wereldwijd, Koninklijke
Sterrenwacht België
Anamorfose Collectie



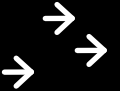
Carte Photographique du Ciel, 1887 - 1970

Fotogravure, Admiral Mouchez et al. 20 sterrenwachten wereldwijd, Koninklijke
Sterrenwacht België
Anamorfose Collectie



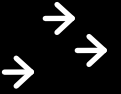
Isaac Roberts, Andromedanevel, 1888

Heliogravure, A selection of Photographs of stars, star-clusters and nebulae, 1889
Private collection



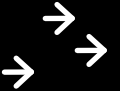
Isaac Roberts, M74, 1893

Zilverbromide, 1893 (1920)
Anamorfose Collectie



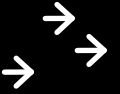
W. E. Wilson, M27, 1894

Albuminedruk, William Edward Wilson (attr.), Dumbbell Nebula or M27 (Negative print), +/-
1894
Anamorfose Collectie



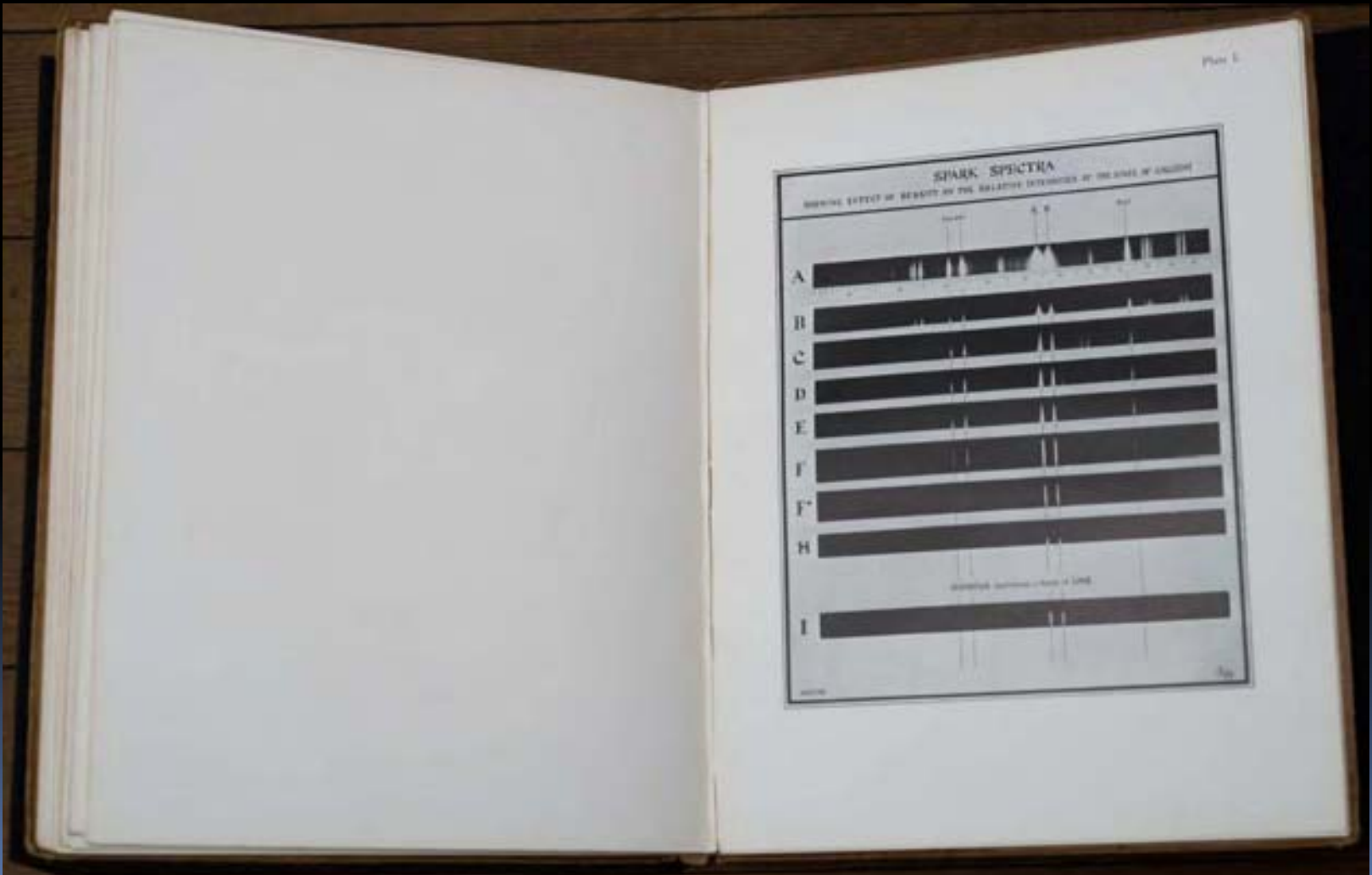
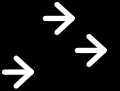
Charles Pickering, Omega Centaury, 1896

Zilverbromide, Harvard College Observaory, Bruce Telescope, 1896
Anamorfose Collectie



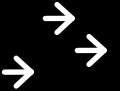
William Huggins, sterspectra, 1899

Sir William Huggins, An atlas of representative stellar spectra from 4870 to 3300 : together with a discussion of the evolutional order of the stars, and the interpretation of their spectra / preceded by a short history of the observatory and its work, 1899 Anamorfose Collectie



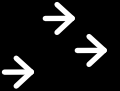
Mount Wilson, M33, 1910

Zilverbromide, Mount Wilson Observatory, M33, Triangulum Spiral Nebula, 05/08/1910
Anamorfose collectie



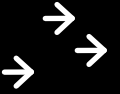
Amateur-astronomer, M31, 1914

Zilverbromide, Anoniem, Great Nebula in Andromeda, M31, enlarged 6 1/4 times
Private collection



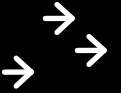
Mount Wilson, M22, 1918

Zilverbromide, Mount Wilson Observatory, Star Cluster M22 Sagittarii, Exposure 3 1/2 hours,
6/8/1918
Anamorfose Collectie



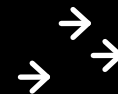
Mount Wilson, M17, 1919

Zilverbromide, Mount Wilson Observatory, Irregular Nebula M 17 Sagittarii (Omega),
28/07/1919
Anamorfose Collectie



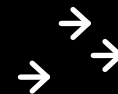
Dr. Wolf, Stereofoto's, 1920

Zilverbromide, Dr. Max Wolf, Stereoskopbilder vom Sternhimmel, 1920
Anamorfose Collectie



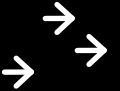
Dr. Wolf, Stereofoto's, 1920

Zilverbromide, Dr. Max Wolf, Stereoskopbilder vom Sternhimmel, 1920
Anamorfose Collectie



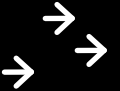
Mount Wilson, M20, 1921

Zilverbromide, Mount Wilson Observatory, Irregular Nebula M 20 Sagittarii (Trifid), 1921
Anamorfose Collectie



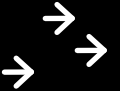
Mount Wilson, Sagittarius, 1922

Zilverbromide, Mount Wilson Observatory, Star Clouds in Sagittarius, 21/07/1922
Anamorfose collectie



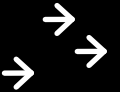
Mount Wilson, M31, 1925

Mount Wilson Observatory, M31, NGC224, Andromeda, South preceding region,
24/08/1925
Anamorfose collectie



E.E. Barnard, zijn Melkweg, 1927

Zilverbromide, Yerkes Observatory, A photographic atlas of selected regions of the Milky Way, 1927
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A PHOTOGRAPHIC ATLAS OF SELECTED REGIONS OF THE MILKY WAY

By
EDWARD EMERSON BARNARD

*Professor of Practical Astronomy in the University of Chicago and Astronomer
at the Yerkes Observatory 1892-1923*

EDITED BY
EDWIN B. FROST, *Director*, and MARY H. CALVERT, *Assistant*,
of the Yerkes Observatory of the University of Chicago

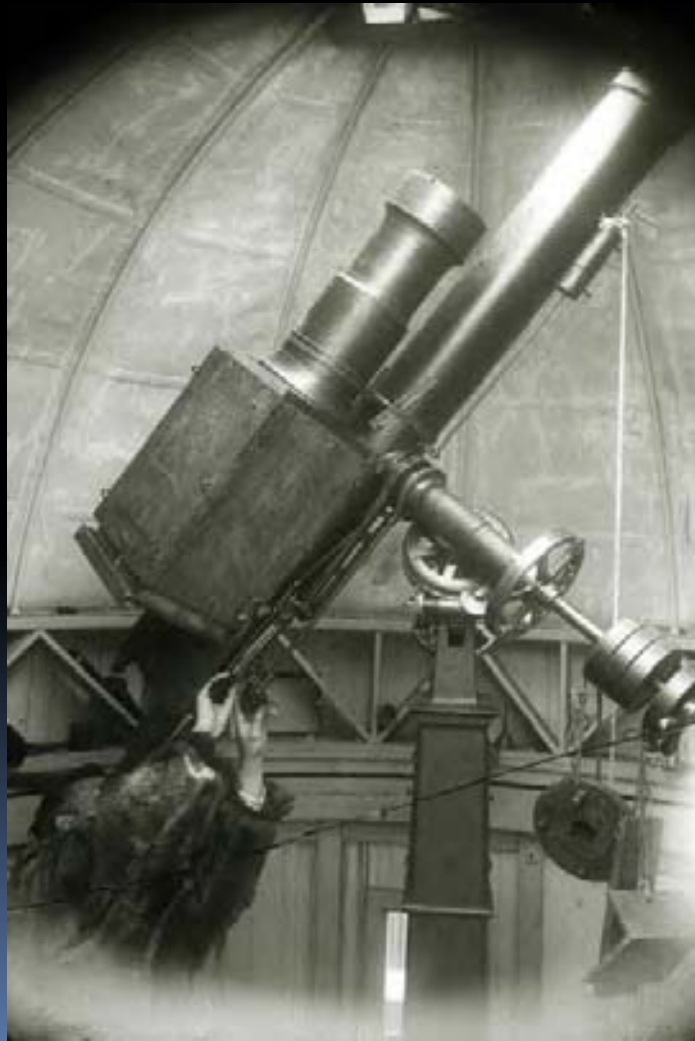
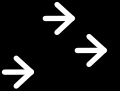
PART I
PHOTOGRAPHS AND DESCRIPTIONS



Published by
CARNEGIE INSTITUTION OF WASHINGTON
1927

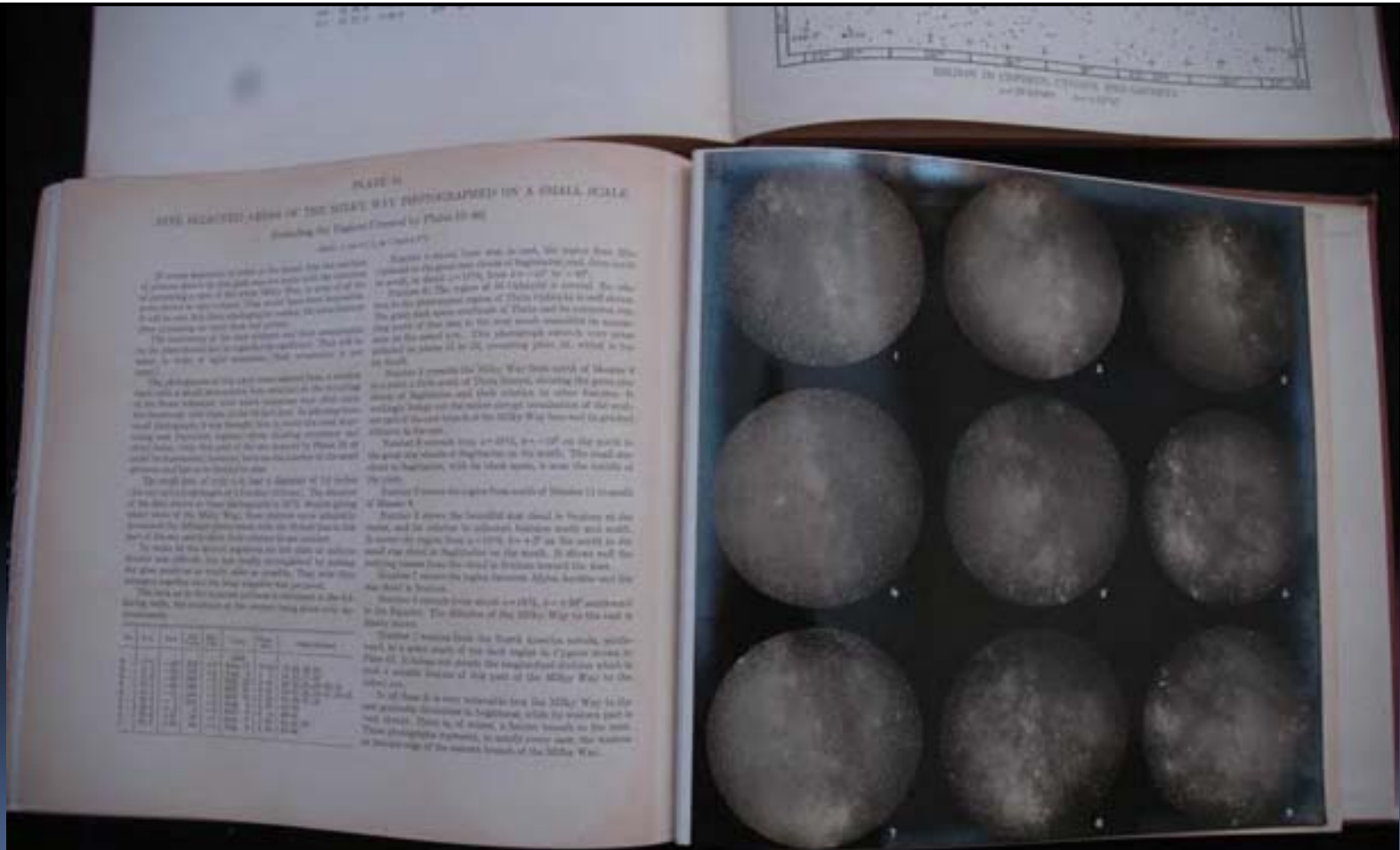
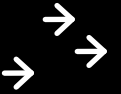
E.E. Barnard, Meester van de astrofotografie

Fotograaf en amateur – astronoom. Later Professor Astronomie. (1857 – 1923). Werkte aan het Lick en Yerkes Observatory. Ontdekker kometen, vijfde maan van Jupiter, etc. Barnards donkere nevels. Eerste volgwaardige astrofotograaf.



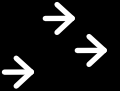
E.E. Barnard, zijn Melkweg, 1927

Zilverbromide, Yerkes Observatory, A photographic atlas of selected regions of the Milky Way, 1927
Anamorfose Collectie



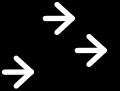
E.E. Barnard, zijn Melkweg, 1927

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Anamorfose Collectie



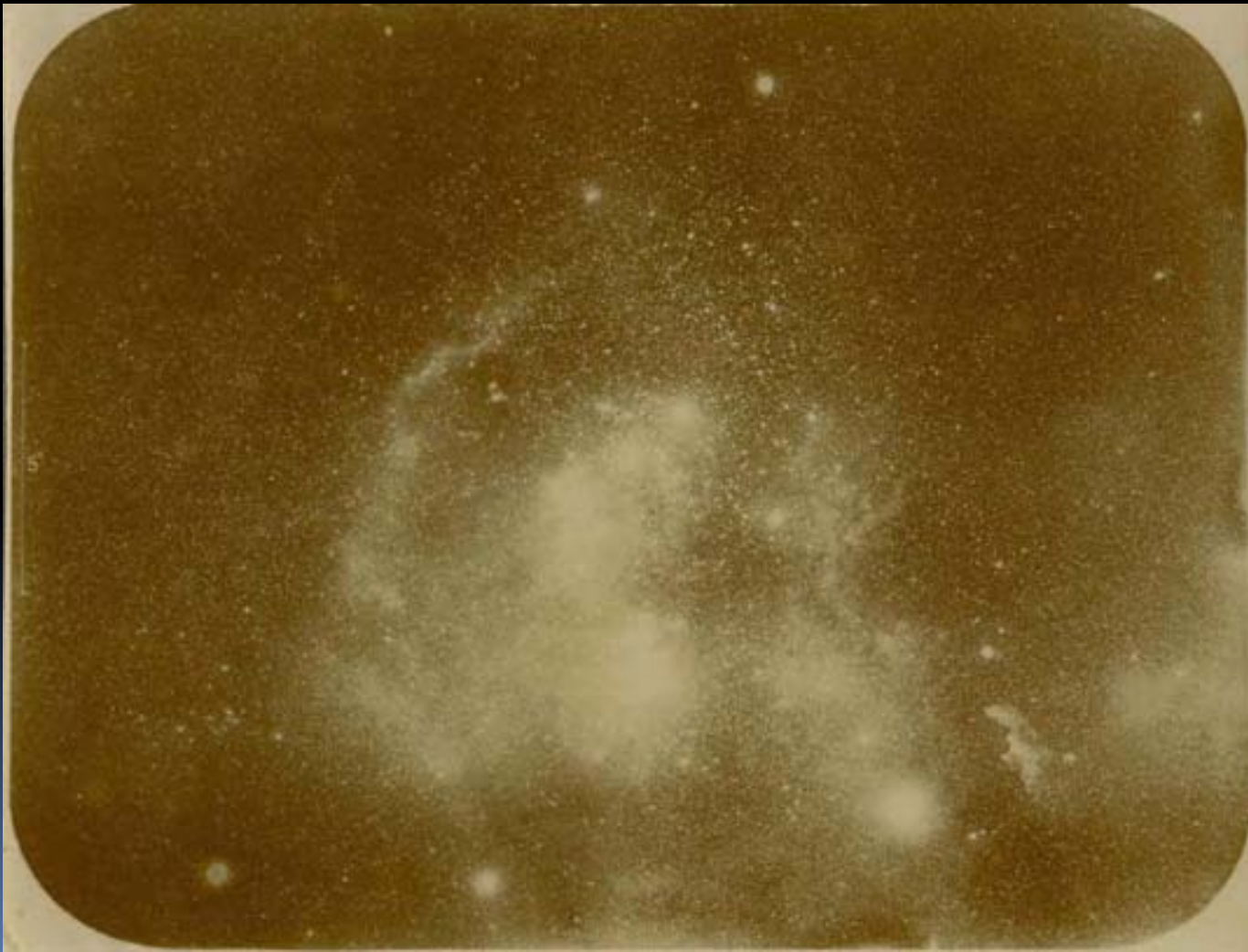
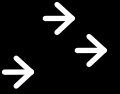
E.E. Barnard, zijn Melkweg, 1927

Zilverbromide, Yerkes Observatory, A photographic atlas of selected regions of the Milky Way, 1927
Anamorfose Collectie



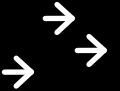
Frank Ross, Orion, 1927

Zilverbromide, Yerkes Observatory, Bruce Astrograph, Nebulosities in Orion, 06/01/1927
Anamorfose Collectie



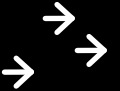
Yerkes Observatory, Stier en Perseus, 1928

Zilverbromide, Yerkes Observatory, Nebulosities in Taurus and Perseus, 21/01/1928
Anamorfose Collectie



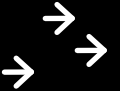
M.J. Newton, M42, +/- 1930

Zilverbromide, M.J. Newton, 1930
Anamorfose Collectie



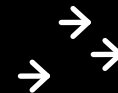
Frank Ross, M8, 1931

Zilverbromide, Mount Wilson, Messier 8 in Sagittarius, 11/07/1931
Anamorfose Collectie



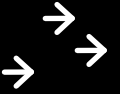
J.R. Eyerman, Sterrensporen, 1950

Zilverbromide, J.R. Eyerman, Startrails, 1950
Private collection



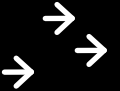
Palomar Sky Survey, 1950

Zilverbromide, Readers Digest, Mount Palomar, Sky Survey, 1950
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Hubble & Sandage, de ouderdom van de kosmos, 1953

Edwin Hubble (foto) en Allan Sandage (notities en berekeningen). Foto gebruikt voor het bepalen van Hubble constante.
Anamorfose Collectie



Antwoorden

- Sterren zijn gasbollen als de Zon
- Sterren hebben een eigen beweging
- Bepaalde nevels zijn melkwegstelsels buiten onze Melkweg
- Ouderdom van ons heelal hebben Hubble en Sandage kunnen bepalen op basis van astrofoto's
- Astrofoto's hebben een grote wetenschappelijke waarde
- Astrofotografie heeft het wereldbeeld van de mensheid mede bepaald.



**VERGEET NIET OMHOOG TE
KIJKEN!**

Doe het licht uit 😊



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- Professor David Block
- Dr. Stefan Hughes
- Leden van de Antique Telescope Society
- Archive of Modern Conflict



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