EVOLUTION OF THE SLIT-LAMP BIOMICROSCOPE (1820-1960)

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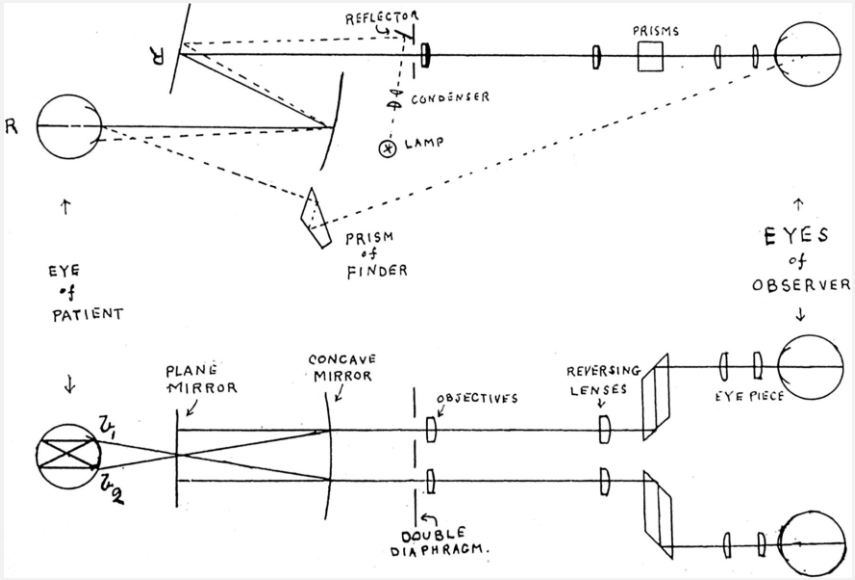
RANZCO Congress, Sydney, 2019

PRE-EMERGENCE OF THE SLIT-LAMP

- Johannes Purkinje (1823)
  - Attempts to develop a type of slit lamp using a hand-held lens to focus strong illumination
- Louis De Wecker (1863)
  - Portable ophthalmomicroscope
  - Combines small monocular microscope
  - Rests against patient face with attached condenser lens



Images: Keeler, Dua (2014) The Eye in History

BINOCULAR OPHTHALMOSCOPE

Felix Giraud-Teulon (Paris, 1861)

- Illumination from gas or oil lamp
- Difficult to use, not popular

John Laurence and Charles Heisch (London, 1862)

- Binocular ophthalmoscope
- Adjustable inter-pupillary distance

Walter Thorner (Emil Busch Company, Rathenow Germany)

- Eliminates reflexes from the cornea

Allvar Gullstrand (Jena, 1910)

- Aimed to employ binocular eye piece to view the fundus in 3-Dimensions
- Table mounted, free of annoying reflexes

SIEGFRIED CZAPSKI (1897)

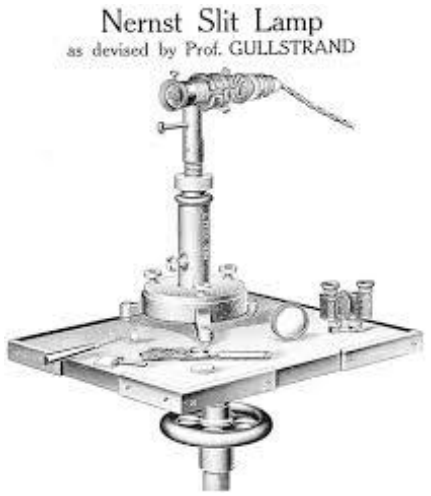
- Siegfried Czapski (1861-1907), of Carl Zeiss (Jena, Germany)
- Table mounted, binocular microscope
- High, interchangeable magnification
- First time allowed the stereoscopic examination of the cornea under magnification
- Illumination (projected obliquely) via a weak, diffuse beam of light

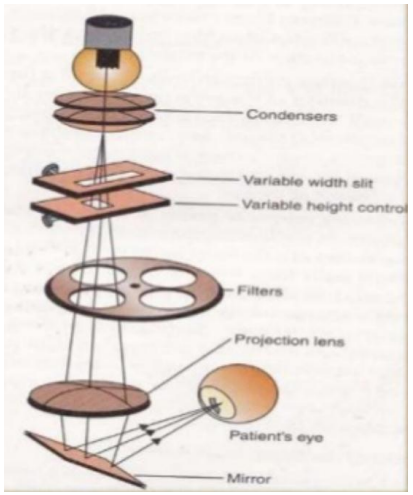
Images: Keeler, R (2008) Essays in Ophthalmic History

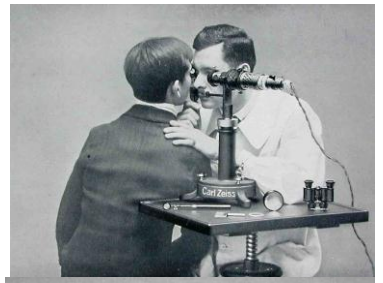
ALLVAR GULLSTRAND (1911)

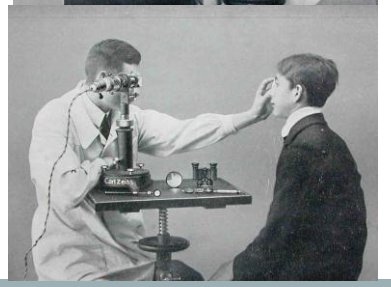
- Allvar Gullstrand (1862-1930)
- Nobel Prize for Medicine and Physiology 1911 (for the optical schematic system of the eye)
- Nerst Slit Lamp (Carl Zeiss) – First instrument to feature slit illumination
  - Nerst glower (Walther Nerst 1897, University of Gottingen)
  - Early form of incandescent lamp, heated ceramic rod
- Glowing light focussed onto a mechanical slit aperture
- Beam projected through a double convex lens

it beam of light when focused on









Images: Zeiss.com, and Richard Keeler (RCOphth Museum)

OTTO HENKER (1915)

Otto Henker (1874-1926)

Combined Czapski's binocular microscope with Gullstrand's slit-lamp

- Leonard Koeppe (1915) - Idea to combine Gullstrand's slit lamp with binocular microscope of Czapski

Resulting in **the first Slit Lamp Microscope**

Devised an arm to support the focusing loupe

Allows "hands free" corneal inspection

Images: Google 2019

NERST SLIT LAMP AFTER KOEPPE

- Microscope mounted on a base and placed on glass table for smooth positioning
- Nerst lamp unit mounted on double arm
- Allowed one to swing the lamp around the microscope from one eye to another
- Condensing lens positioned at end of the arm holding the lamp

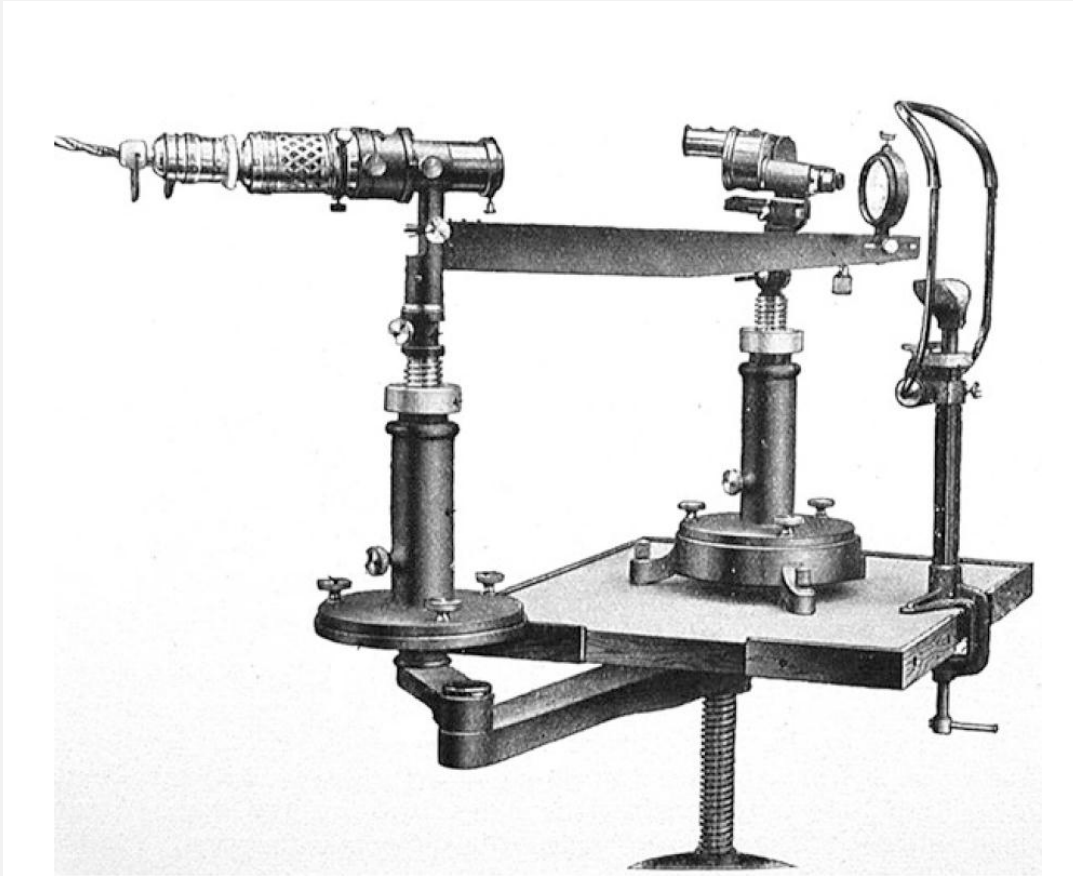


Image: Richard Keeler (2017)

REFLEX-FREE FUNDUS EXAMINATION – GULLSTRAND LARGE OPHTHALMOSCOPE

- Challenge was to eliminate/ reduce reflexes when examining the fundus
- Walter Thorner (1874-1948)
- Allvar Gullstrand
- Principle – path illuminating the fundus should not overlap the visual path
- Small, narrow, short slit of illumination 1.5mm at an angle in margin of patient's pupil
- Fundus observed monocular or binocularly through central 2.4mm of dilated pupil

Image: Richard Keeler, RCOphth museum collection, (2017)

LARGE SIMPLIFIED OPHTHALMOSCOPE (1919)

- Based on Gullstrand's earlier models
- Reflex-free ophthalmoscope

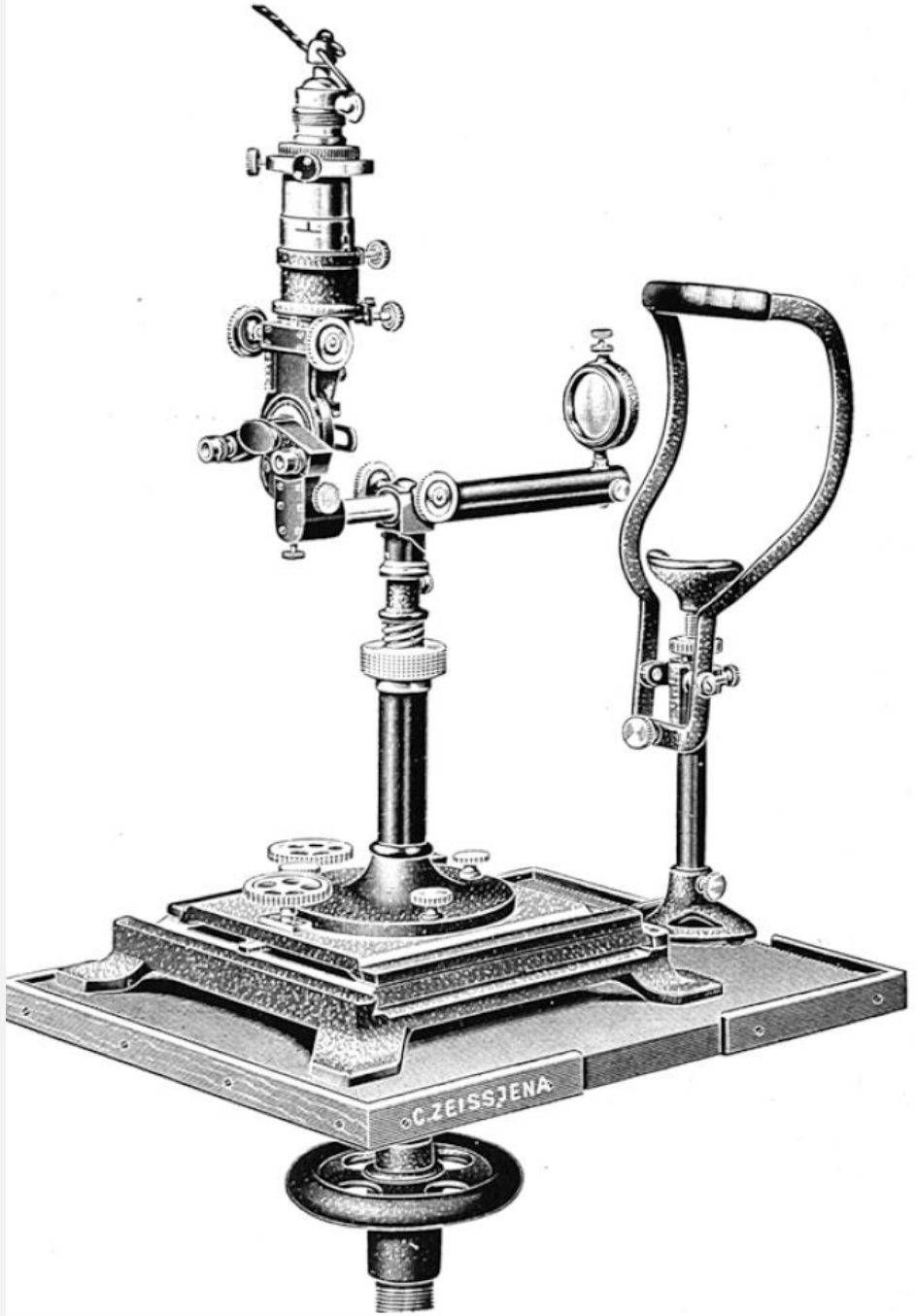
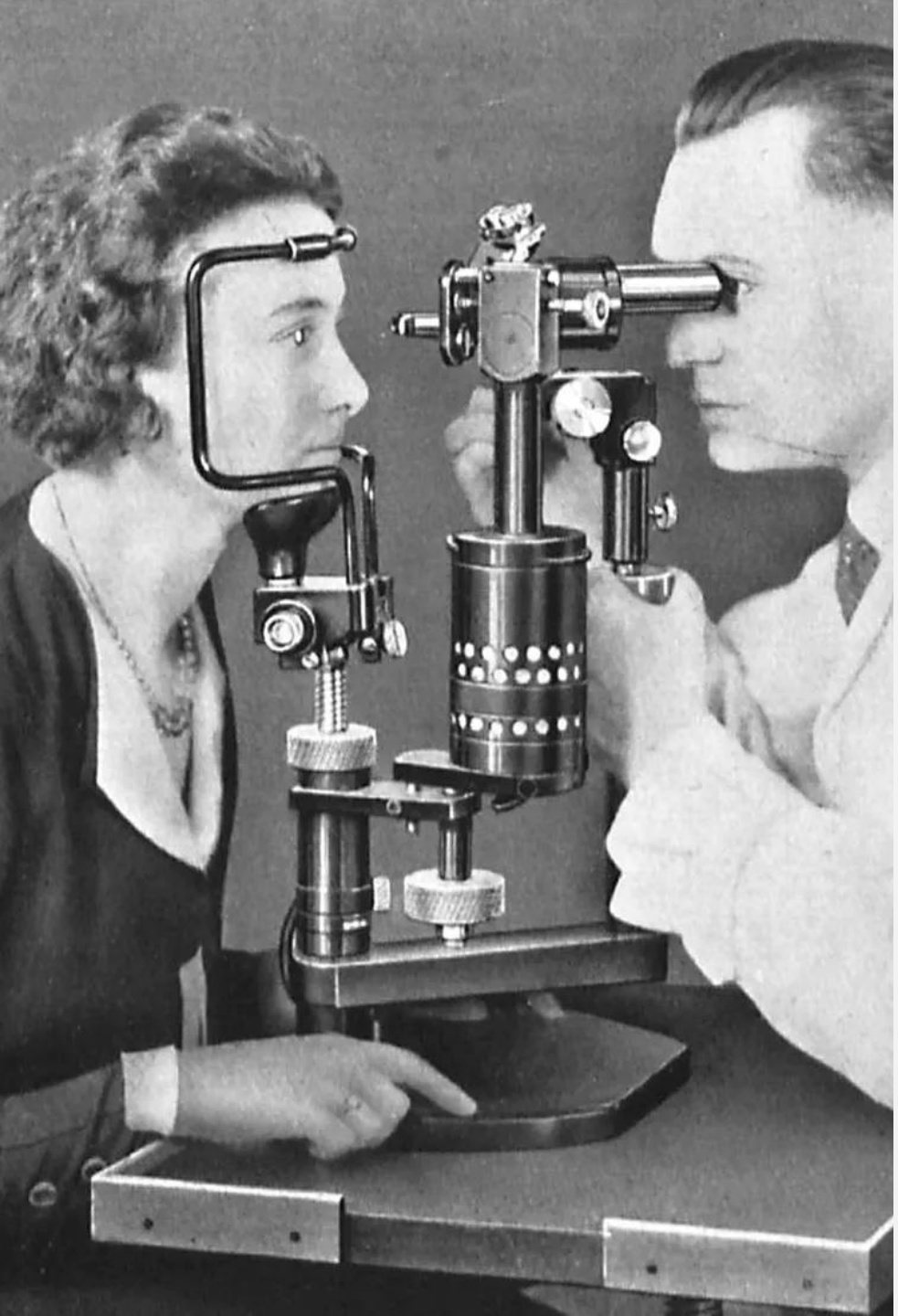


Image: Richard Keeler (20

BIRTH OF THE HAAG-STREIT SLIT LAMP

- Alfred Streit
  - In effort to improve the ophthalmometer, designs the arc light focal lamp (1918)
  - Brighter, bluish colour, increases light yield
- Wilhelm Haag
  - 1929, writes to Hans Goldmann (Bern University)
  - Produces first model for the ophthalmology congress (1933)



GOLDMANN AND COMBERG

- **Joystick controlled mechanism**
  - Hans Goldmann (1899-1991)
  - Joystick controlled mechanism
  - Coupling the focusing of the illumination system and corneal microscope
- **Vertically mounted illumination system, swivel axis**
  - Comberg (1933)

Image: Zeiss.com

HANS LITTMANN (1950)

- Hans Littmann (1908-1991), physicist
- Combines Goldmann and Comberg systems
- Rotatory magnification changer (Galilean telescope)
- Swing the illumination system around (useful for contact lens examinations)
- Fully manouvreable joy-stick
- Mobile stand on wheels

HAAG-STREIT SLIT LAMP 360 MODEL(1933)

- Simple construction
- Single lever on the side of the slit lamp
- Allows instrument to move horizontally in all directions with one hand
- Other hand free to use vertical adjustment screw

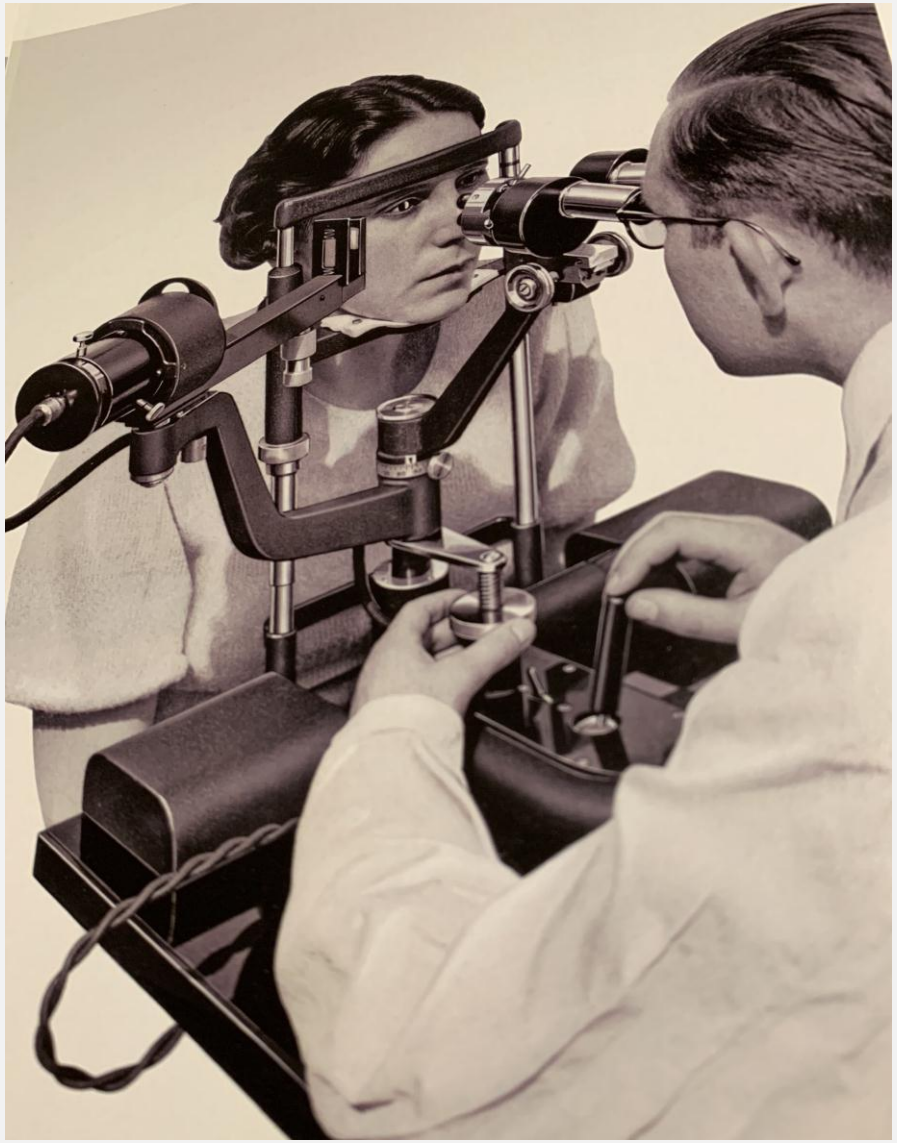


Image: Haag-Streit (2008) 150 Years of Haag-Streit

HAAG STREIT SLIT LAMP 900 (1959)

- **Prof Goldmann and Dr Theodor Schmidt - Vertical adjustment of illumination** (inclined to 15 degrees), completely pivotable in front of the microscope
- Lamp placed uppermost portion
- Allows slit to be made narrow, sharp
- No cooling device needed to protect lamp house from over-heating
- Direction of slit can rotate horizontal
- Important accessories –

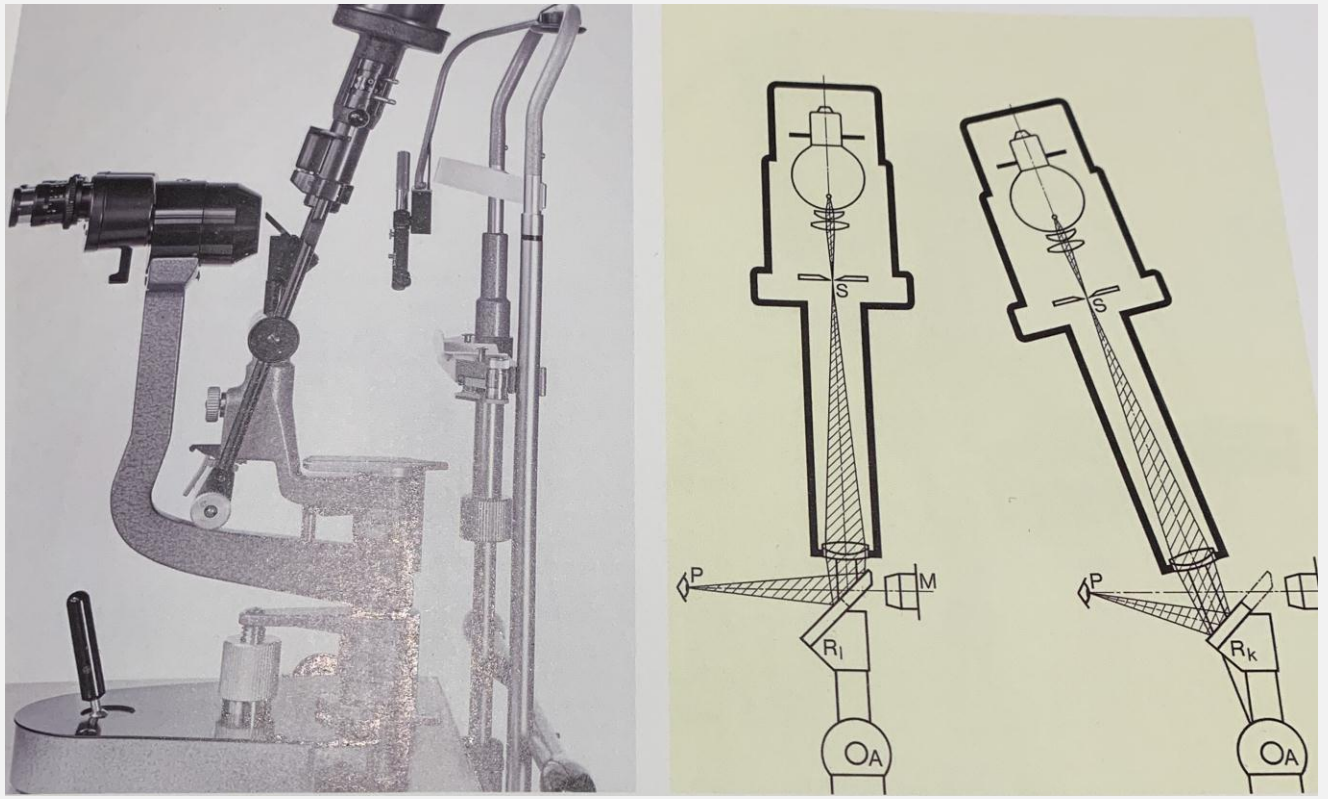


Image: Haag-Streit (2008) 150 Years of Haag-Streit

ACKNOWLEDGEMENTS

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