



## Hans Goldmann (1899–1991)

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Hans Goldmann was born in Komotau (Bohemia) on November 21, 1899 into a Jewish family. He obeyed his father's wish and studied medicine at the German University in Prag instead of his favorite study theme, astronomy. At the age of 25, he started his ophthalmology career as a resident in the eye clinic of Berne Switzerland. In 1927, he became a senior physician (“Oberarzt”), and in 1930, he received his ophthalmic habilitation (“Privatdozent”). In 1935, he succeeded his teacher August Siegrist (1865–1947) as the head of department. He became the youngest head of an eye clinic in Switzerland and was probably the only head of a clinic who undertook research, spending up to 4 months of the year in a retreat in the south of Switzerland. In 1936, he gained the Swiss citizenship and remained in Switzerland during the Second World War. During his career at the eye clinic in Berne, he was the dean of the medical faculty from 1945–1947 and the rector of the university of Berne in 1964 and 1965. He retired in 1968 after a long period in the position as head of the department of Ophthalmology in Berne (1935–1968). During last years of his life, he suffered from a blinding macular degeneration, which made him visually impaired. He died in 1991 in Berne, leaving his wife, Erna Renfer, to whom he had been married for 56 years.

Goldmann published more than 200 peer-reviewed papers in the fields of ophthalmology, especially in glaucoma, physiology, optics, and development of optical instruments. In collaboration with the firm Haag-Streit in Switzerland, he developed techniques for measuring the intraocular pressure and the visual field, which are still the gold standard worldwide.

Goldmann's constant development of new instruments and diagnostic devices helped him in his work on biomicroscopy and stereobiomicroscopy of the posterior parts of the eye [1, 2]. He developed different contact glasses for the stereoscopic examination of the chamber angle and of the fundus that became important diagnostic tools for the classification of different diseases of the vitreous and the retina. The first contact glass was presented during an ophthalmological meeting in Cairo in 1937.

Goldmann also published an interesting article on strabology, discussing different approaches to the sensorimotor system of the visual organ and describing the pathophysiology of strabismus [3].

In 1945, Goldmann created the basis for an exact quantitative perimetry by testing different settings, defined by a standardized background illumination [4]. His research led to the development of a self-registering spherical projection perimeter [5]. Goldmann's kinetic perimetry was the key for the standardization of the visual field examinations and neuroophthalmological examinations, but did not allow precise diagnosis of central loss of visual field sensitivity. Therefore, in 1950, Heinrich Harms developed a static examination to determine differences in light sensitivity in given points of the visual field. Goldmann continued to develop this technique. Goldmann's scholar, Franz Fankhauser integrated the computer science and developed a visual field device called “Octopus”, which is still used worldwide. However, the determination of the visual field with kinetic perimetry still remains an important examination for neurological and neuro-ophthalmological questions.

Goldmann described the perimetry as the best tool to assess the function of the periphery of the retina in contrast to the visual acuity which gives insights to the central part of the retina [6].

The main topic of Goldmann's research, however, was pathophysiology, diagnostic tools and treatment of glaucoma as a neuropathy of the optic nerve. Goldmann, besides being involved in the development of an often used gonioscopy lens, started at the same time to work on the hypothesis that a connection between the canal of Schlemm and the

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episcleral veins must exist and made this visible by marking the passage of liquid. He published his discovery of the aqueous veins in 1945, thinking he was the first who saw these veins. However, Karl Wolfgang Ascher published the same findings in 1942, but because of the difficulties in communication between Europe and the United States during the Second World War, Goldmann was unaware of the results of Ascher's studies.

Goldmann continued to publish studies on the aqueous humor passage and its role in glaucoma [7, 8]. His skills in mathematics and physics were the base for research of the intraocular pressure. In the 1950s, Goldmann developed the Goldmann Applanation Tonometer (GAT) that is still the gold standard in the diagnostic of glaucoma worldwide [9]. During many decades, the interaction between intraocular pressure and the decay of visual function was a main theme in Goldmann's publications [10].

Although Goldmann was trained as an ophthalmologist his contributions to perimetry, namely, the design and introduction of kinetic perimetry, has enabled neuro-ophthalmologists and neurologists to plot and monitor visual field defects in central nervous system disorders.

### Fotography: separate JPEG Fotography

Hans Goldmann as a young professor (with permission of the Foto Archiv Haag-Streit AG, Köniz, Switzerland).



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