Gullstrand, Einstein, and the Nobel Prize

James G. Ravin, MD

Only one individual who practiced ophthalmology for a significant period has ever received a Nobel Prize. This was Allvar Gullstrand, MD (1862-1930) (Figure 1), a Swede who was awarded the Nobel Prize in physiology or medicine in 1911. Although Gullstrand is often said to be the only Nobel laureate who was an ophthalmologist, this is incorrect. Fritz Pregl, MD (1869-1930), an Austrian ophthalmologist who deserted the eye for analytical chemistry, received the Nobel Prize in chemistry in 1923. Walter Hess, MD (1881-1973), a Swiss ophthalmologist and physiologist, was awarded the Nobel Prize in physiology or medicine in 1949 for his work on autonomic control by the hypothalamus.

The king of Sweden, Gustav V, awarded Gullstrand the prize on behalf of the conferring organization, the Royal Swedish Academy of Sciences “for his works concerning the dioptrics of the eye.” Gullstrand was recognized for making the most significant contribution to our understanding of the eye as a refractive organ following the pioneering work of Hermann von Helmholtz, MD, the German physician and physiologist who invented the ophthalmoscope in 1850.

Today, Gullstrand is best known as the inventor of the slitlamp. When his slitlamp was combined with a microscope made by members of Zeiss Optical Works, Jena, Germany, it became the basis of the instrument that is still used in every ophthalmologist’s office today. Before the development of this exceptionally useful device, examination of the anterior segment of the eye could be done with a corneal microscope. However, the lighting systems available were far inferior to Gullstrand’s slitlamp. At best, they used a dim electric lamp that focused light poorly. Gullstrand first demonstrated his slitlamp in 1911, the same year he received the Nobel Prize for his contributions to optics. It incorporated 2 important advances, far more intense light and sharp focus of the beam.

Ophthalmologists who use this valuable instrument so routinely today may be surprised to learn that it was not immediately incorporated into clinical practice. Earlier ophthalmologists, in general, believed that existing systems of illumination were sufficient. A long series of descriptions by many investigators, especially Alfred Vogt’s atlases, helped popularize use of this instrument.

Gullstrand was the Swedish representative to the International Congress of Ophthalmology held in Washington, DC, in 1922. The president of the congress, George de Schweinitz, MD, stated that the most important scientific contribution at the meeting was Gullstrand’s demonstration of an improved form of his invention. De Schweinitz added jokingly, medicine now has a “gentleman with the lamp,” a male counterpart to nursing’s Florence Nightingale, the lady with the lamp.

Gullstrand made another important contribution to ophthalmology, a reflexless ophthalmoscope. Ophthalmoscopy can be made difficult by the glare of reflexes formed from the cornea and other layers of the eye, which act like mirrors, reflecting light back at the examiner. Bright sources of illumination and small pupils are contributory factors. The solution to this problem is either to separate the sys-
tems of illumination and observation or to use polarized light. Gullstrand used the first of these 2 options.3

Other ophthalmologists have been nominated, but not selected, for the Nobel Prize in physiology or medicine. Hjalmar Schiotz, MD, was considered for his tonometer, as was Karl Koller, MD, for his discovery of topical anesthesia in the eye. Jules Gonin, MD, nearly received the award for his innovations in retinal detachment surgery. He was recommended by the Nobel committee in 1934, but died before the Royal Swedish Academy of Sciences made its decision.4 The Nobel Prize has been awarded to other scientists whose work concerns the function of the eye. In 1967, Ragnar Granit, MD, Haldan Hartline, MD, and George Wald, MD, were the designers for their contributions to our understanding of the chemistry and physiology of vision. In 1981, David Hubel, MD, and Torsten Weisel, MD, were the recipients for their work on information processing in the visual system.

The 5 original Nobel Prizes were first given in 1901 in the fields of physics, chemistry, physiology or medicine, peace, and literature. The Nobel Prize in economics was added in 1969. The prize has often been a matter of national pride. The Swedish people were pleased when Gullstrand was named a recipient, for until that time no citizen of the conferring country had ever won in 2 of the 5 categories: physics and physiology or medicine.

Gullstrand is the only individual who both received and also declined a Nobel Prize. (Rarely has a Nobel Prize been declined. Russian author Boris L. Pasternak declined the Nobel Prize for literature in 1958, French writer Jean-Paul Sartre declined the Nobel Prize for literature in 1964, and Le Duc Tho, of North Vietnam, declined the Nobel Prize for peace in 1973.) In 1910 and in 1911, Gullstrand was nominated for the Nobel Prize in physics. In 1911, the Nobel Committee for Physics, of which he was a member, suggested that he receive the prize. At the same time, the Nobel Committee for Physiology or Medicine was considering him for their prize; Gullstrand declined the Nobel Prize in physics in favor of the Nobel Prize in physiology or medicine.5(pp73-74) The Nobel statutes require committee deliberations to be kept confidential. So what transpired during the committee meetings in 1911 has never been made public. We do not know if Gullstrand excused himself during the discussions.

From 1911 to 1929, Gullstrand was a member of the Nobel Committee for Physics, and served as its chairman from 1923 to 1929. During the academic year 1925-1926, he was president of the Royal Swedish Academy of Sciences, the body that awards the Nobel Prizes in chemistry and physics (as well as economics since 1969).

Albert Einstein, PhD (Figure 2), (1879-1955) was nominated for the Nobel Prize in physics many times and was awarded this prize while Gullstrand was a member of the Nobel Committee for Physics. Gullstrand was a strong personality and a powerful force on the committee. He wrote 2 harsh opinions against giving the prize to Einstein, in 1921 and 1922. Einstein did receive the Nobel Prize in physics in 1921, which was not awarded until 1922.

To understand what took place requires an understanding of how the selection process works. The Royal Swedish Academy of Sciences selects the awardees in physics, chemistry, and economics. Nominations are made only by invitation. The invitees include all previous recipients of a prize and members of the academy. The nominations are reviewed by a committee of 5 individuals, with a separate committee for each prize. Each committee then submits its report to a section within the academy for its approval. The final decision is made by a vote of the full academy. The process in medicine or physiology is similar, except that the Karolinska Institute, not the academy, is involved.

From 1910 to 1922, Einstein was nominated every year except 2, 1911 and 1915.5(p68) He had published several important papers in the first decade of the new century, and was widely recognized for the importance of his contributions. However, Einstein was a theoretical physicist, and by the terms of Alfred Nobel’s will, the prize was to go for works of proved, not theoretical, value to humanity. Nobel, who had died in 1896, left a will that stated the proceeds “shall be annually distributed in the form of prizes to those who, during the preceding year, shall have conferred the greatest benefit on mankind.”6 The nominations for Einstein were strong. Max Karl Ernst Ludwig Planck, PhD, the 1918 recipient in physics, said Einstein had taken the first step beyond Isaac Newton. Niels Henrik David Bohr, PhD, the eventual 1922 winner, described Einstein’s work as “advances of decisive significance for the development of research in physics.”5(pp72-73)

A major part of the problem was that Einstein’s ideas were not
easy to understand. Relativity theory, his most important contribution, remains a difficult concept. According to Einstein’s general theory of relativity, gravity is not a force as Newton had described, but is a curved field in the continuum of space and time, created by the presence of mass. Studies done by others, in attempts to verify his statements, had given conflicting results. In an attempt to resolve the problem in 1921, the Nobel Committee for Physics asked 2 of its members to prepare accounts of Einstein’s contributions. Gullstrand was asked to report on relativity, and Svante Arrhenius, the recipient of the 1903 award in chemistry, was asked to report on the photoelectric effect, by which light energy striking some solids may release electrons.

Gullstrand’s report was highly critical of Einstein’s work, and his report was also flawed. Gullstrand erred in stating the effects of general relativity “which are measurable by physical means are, however, so small that, in general they lie below the limits of experimental error.”5(p74) He also misinterpreted critical experiments by others. Arrhenius’ report on the photoelectric effect was also negative. In the aftermath of these 2 reports, the decision on the Nobel Prize in physics for 1921 was delayed for a year. The following year Einstein was again proposed, and Gullstrand was asked to provide an updated report on relativity. Another committee member was asked to reevaluate the photoelectric effect. Gullstrand was again negative concerning relativity. However, this time the report on the photoelectric effect was laudatory. The committee resolved the dilemma by proposing Einstein for the 1921 prize, and the academy voted favorably. The prize was finally awarded for the photoelectric effect, not for relativity.

This aspect of Einstein’s work was worthy of the prize, and has been eclipsed by his better known relativity theory. Gullstrand's contributions to ophthalmology have also stood the test of time.

Accepted for publication December 4, 1998.

Reprints: James G. Ravin, MD, 3000 Regency Ct, Toledo, OH 43623 (e-mail: jamesravin@aol.com).

REFERENCES


Be sure to visit the Archives of Ophthalmology’s World Wide Web site (http://www.ama-assn.org/ophth) and try your hand at our new Clinical Challenge interactive quiz. We invite visitors to make a diagnosis based on selected information from a case report or other feature scheduled to be published in the following month’s print edition of the ARCHIVES. The first visitor to e-mail our Web editors with the first correct answer wins an Archives of Ophthalmology CD-ROM and will be recognized in the print journal and on our Web site. A full discussion of the case featured in the quiz can be found in the following month’s print edition of the journal.

ARCHIVES Web Quiz Winner for March 1999:
Our congratulations to the winner of our Clinical Challenge, Stuart Andrew Sullins, OD, Etiwah, Tenn.

©1999 American Medical Association. All rights reserved.