The Nobel Prize in Physiology or Medicine 1911

Presentation Speech

Presentation Speech by Professor the Count K.A.H. Mörner, Rector of the Royal Caroline Institute, on December 10, 1911

Your Majesty, Your Royal Highnesses, Ladies and Gentlemen.

As you know, the Nobel Prize in Physiology or Medicine for the current year has been awarded to Allvar Gullstrand, Professor at the University of Uppsala, for his works concerning the dioptrics of the eye.

Research into optical systems and the images obtained through them goes back to the very distant past. One can name many illustrious physicists and mathematicians who have studied this problem and have tried to formulate a solution. The belief was widespread at one time - and is perhaps still held in some quarters - that the theoretical study of these matters had been completed and that nothing remained to be added to it. This belief can be partially explained by the fact that the technique for the establishment of these optical systems had made very important advances, particularly in the past few decades. It emerges, however, that the theory of optical image formation was in several respects incomplete and in some others erroneous.

In man-made optical instruments the refracting media consist of homogeneous substances and usually a regular, predetermined shape is given to the refracting surfaces. To explain the images thus obtained has in itself been far from easy. If we now consider the eye we are faced with an optical system of particularly complex structure and with conditions of refraction of equal intricacy. This is due primarily to the lens in the eye, because its refractive power varies considerably from layer to layer, and also because, in order to see at different distances, it changes its shape and refractive capacity.

For the theory of normal and abnormal conditions of the eye it is naturally of paramount importance to elucidate the problems of light refraction and visual image formation in the eye, since the physical operation of the eye as an optical instrument is a necessary condition for its operation as a sense organ. The clarity of the images produced on the retina is a factor which determines the power of vision.

Therefore the study of optical image formation in the eye is an important branch of physiological optics, as well as of ophthalmology, and has occupied many famous scientists. It is fitting to mention the scientist who did a complete contribution in this field before Gullstrand, namely Hermann von Helmholtz, whose famous name will still be well remembered. The pioneer work of von Helmholtz threw so much light on the subjects of refraction and image formation in the eye that it seemed most unlikely that after him work could be produced of such revolutionary impact on the science as that of Gullstrand.

The scope of this work and its very nature are such as to prevent me from reporting in detail on it. I must renounce the idea of describing the preparatory experiments performed, as well as the practical applications resulting from them.

I wish, however, to be permitted to give a brief outline of the development and importance of this work.

It started some twenty years ago. As an ophthalmologist, Gullstrand wanted to answer certain questions relating to light refraction and the optical images formed in the eye. He soon realized that much work still had to be done to formulate the general laws of optical image-formation. The complete solution of this problem became the first task of Gullstrand in his work towards his ultimate goal. He has completed his task. He has transformed the theory of optical image-formation and has formulated the fundamental equation from which are derived the hitherto unknown laws of optical image-formation.

He thus gained a reliable starting-point for a fruitful continuation of his study of the eye. Indeed, some difficult aspects of this problem still remained to be solved. Refraction in the lens, especially, presented difficulties which had previously been insoluble. It is difficult, to say the least, to chart the passage of light through a medium whose refractive index varies from layer to layer. Furthermore, little was known about the laws which govern the changes in the shape of the lens to enable clear images to be formed of objects placed at different ranges; or of the influence which these changes in curvature have on the refractive power of the lens. The importance of the diaphragm of the eye and several other details were imperfectly known or inaccurately interpreted.

Thanks to Gullstrand, the problems to which I have referred have all been solved. He has elucidated the formation of optical images in the eye and has incorporated it in the general laws governing optical image-formation, also established by him.

It has been my intention to give a brief outline of the main scope of the important work of Gullstrand.

By awarding him the Nobel Prize, the Staff of Professors of the Caroline Institute wished to show their respect for Gullstrand's penetrating pioneer work on the dioptrics of the eye.

Professor Gullstrand. I convey to you the felicitations and the respect of the Staff of Professors of the Caroline Institute. Our appreciation of your work goes back a long time. Twenty years ago, when you presented your thesis, we had the pleasure of giving you an attestation which no one had received before you, nor since then. Also, it was with very much pleasure that we watched you pursue your research at our Institute. However, your activity was soon to be transferred elsewhere while still remaining in this country. Your scientific work, as it was from the beginning and as it later developed, thus belongs to the annals of Swedish Medical Science, for which it has been, is and will always be a title to glory.

This is not the first occasion on which this appreciation has been officially expressed. The Swedish Medical Society has already given expression to it and recently the Caroline Institute, when refilling the chair to which appertains the branch which you have advanced with such resounding success, had an opportunity of expressing the high esteem in which it holds your scientific work. Today, this same Council, proud of the success which has crowned the work of a compatriot in the service of Science, has awarded you the highest distinction which is in its power to confer and which is also among the highest in the world.

To our tribute to you we add not only the expression of the high esteem which the scope of your work deserves, but also the warm-hearted expression of our personal affection.

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