Topic Page: Gabor, Dennis (1900 - 1979)

Definition: **Gabor, Dennis** from *Philip's Encyclopedia*

British physicist, b. Hungary. He received the 1971 Nobel Prize in physics for his invention (1947) of holography. He developed the basic technique of creating a three-dimensional image, but it was not until the invention (1960) of the laser by Charles H. Townes that holography became commercially feasible.

Summary Article: **Gabor, Dennis (1900-1979)**
From *The Hutchinson Dictionary of Scientific Biography*

Place: United Kingdom, Hungary

Subject: biography, technology and manufacturing

Hungarian-born British physicist and electrical engineer, famous for his invention of holography - three-dimensional photography using lasers - for which he received the 1971 Nobel Prize for Physics.

Gabor was born on 5 January 1900 in Budapest. He was educated at the Budapest Technical University and then at the Technishe Hochschule in Charlottenburg, Berlin. From 1924 to 1926 he was an assistant there, and for the next three years he held the position of research associate with the German Research Association for High-Voltage Plants. He was a research engineer for the firm of Siemens and Halske in Berlin from 1927 until he fled Nazi Germany for the UK in 1933. He then worked as a research engineer with the Thomson-Houston Company of Rugby 1934-38, and later became a British subject. In 1949, he joined Imperial College, London, as a reader in electronics. He was professor of applied electron physics 1958-67, when he became a senior research fellow. From 1976 until his death he was professor emeritus of applied electron physics at the University of London. He died in London on 8 February 1979.

Gabor first conceived the idea of holography in 1947 and developed the basic technique by using conventional filtered light sources. Because conventional light sources provided too little light or light that was too diffuse, his idea did not become commercially feasible until the laser was demonstrated in 1960 and was shown to be capable of amplifying the intensity of light waves.

Holography is a means of creating a unique photographic image without the use of a lens. The photographic recording of the image is called a hologram. The hologram appears to be an unrecognizable pattern of shapes and whorls, but when it is illuminated by coherent light (as by a laser beam), the light is organized into a three-dimensional representation of the original object. Gabor coined the name from the Greek *holos* ('whole') and *gram* ('message'), because the image-forming mechanism that he conceived recorded all the optical information in a wavefront of light. In ordinary photography, the photographic image records the variations in light intensity reflected from an object, so that dark areas are produced where less light is reflected and light areas where more light is reflected. Holography records not only the intensity of light, but also its phase, or the degree to which the wavefronts making up the reflected light are in step with each other. The wavefronts of ordinary light waves are not in step - ordinary light is incoherent.

When Gabor began work on the holograph, he considered the possibility of improving the resolving power of the electron microscope, first by using the electron beam to make a hologram of the object

and then by examining this hologram with a beam of coherent light. It is possible to obtain a degree of coherence by focusing light through a very small pinhole, but the resulting light intensity is then too low for it to be useful in holography. In 1960, the laser beam was developed. This has a high degree of coherence and also has high intensity. There are many kinds of laser beam, but two have special interest in holography, the continuous-wave (CW) and the pulsed laser. The CW laser emits a bright continuous beam of light of a single, nearly pure colour. The pulsed laser emits an extremely intense, short flash of light that lasts only about 10^{-8} second. Two US scientists, Emmett Leith and Juris Upatnieks have applied the CW laser to holography with great success, opening the way to many research applications. To achieve a three-dimensional image, the light streaming from the source must itself be photographed. If the waves of this light, with its many rapidly moving crests and troughs, are frozen for an instant and photographed, the wave pattern can then be reconstructed and will show the same three-dimensional character as the object from which the light is reflected.

Pulsed-laser holography is used in the study of chemical reactions, where optical properties of solutions often change. It is also used in wind-tunnel experiments, where it can be used to record refractive index changes in the air flow, created by pressure changes as the gas deflects around the aerodynamic object. This recording is done interferometrically (by observing interference fringes).

Apart from the invention of holography, Gabor's other work included research on high-speed oscilloscopes, communication theory, physical optics, and television. He took out more than a hundred patents for his invention and became renowned as an outstanding engineer and physicist of the 20th century.

© *RM, 2018. All rights reserved.*

APA

Gabor, Dennis (1900-1979). (2018). In Helicon (Ed.), *The Hutchinson dictionary of scientific biography*. Abington, UK: Helicon. Retrieved from https://search.credoreference.com/content/topic/gabor_dennis_1900_1979

Chicago

"Gabor, Dennis (1900-1979)." In *The Hutchinson Dictionary of Scientific Biography*, edited by Helicon. Helicon, 2018. https://search.credoreference.com/content/topic/gabor_dennis_1900_1979

Harvard

Gabor, Dennis (1900-1979). (2018). In Helicon (Ed.), *The Hutchinson dictionary of scientific biography*. [Online]. Abington: Helicon. Available from: https://search.credoreference.com/content/topic/gabor_dennis_1900_1979 [Accessed 23 October 2019].

MLA

"Gabor, Dennis (1900-1979)." *The Hutchinson Dictionary of Scientific Biography*, edited by Helicon, 2018. *Credo Reference*, https://search.credoreference.com/content/topic/gabor_dennis_1900_1979. Accessed 23 Oct. 2019.