

# Optometry

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**Optometry** is a health care profession concerned with eyes and related structures, as well as vision, visual systems, and vision information processing in humans. Optometrists are qualified to diagnose and treat eye diseases such as infections and glaucoma. They also advise customers on aesthetics.

Like most professions, optometry education, certification, and practice is regulated in most countries. Optometrists and optometry-related organizations interact with governmental agencies, other health care professionals, and the community to deliver eye and vision care. Optometrists are one of three eye care professionals, the others being ophthalmologists (medical doctors), and opticians.<sup>[1]</sup>



An optical refractor (phoropter) in use.

## Contents

- 1 Background
- 2 History
- 3 Licensing
  - 3.1 Argentina
  - 3.2 Australia
  - 3.3 Canada
  - 3.4 Colombia
  - 3.5 Europe
    - 3.5.1 Ireland
    - 3.5.2 United Kingdom
  - 3.6 Philippines
  - 3.7 Russia
  - 3.8 United States
- 4 Optometrists and Ophthalmologists
- 5 See also
- 6 References
- 7 External links
- 8 External links

## Background

The term "optometry" comes from the Greek words *optos*, meaning *eye* or *vision*, and *metria*, meaning *measurement*.

The eye, including its structure and mechanism, has fascinated scientists and the public in general since ancient times. Many of the expressions in the English language that mean to understand are equivalent vision terms. "I see," to mean I understand.

Many patients will be more concerned about diseases that affect vision than other, more lethal diseases when told that they may have an eye problem . Being deprived of sight can have a devastating effect on the psyche, as well as economic and social effects. Many blind individuals require significant assistance with activities of daily living and are often unable to continue gainful employment that might have previously been held while they could see. It is also well-known that serious diseases such as myasthenia gravis, diabetes, and atherosclerosis can show their first signs during an eye examination, well-before a patient experiences any symptoms.

The maintenance of ocular health and correction of eye problems that decrease vision contribute greatly to the ability to appreciate the longer lifespan that all of medicine continues to allow. Given the importance of vision to quality of life, many optometrists consider their job to be rewarding, as they are often able to restore or improve a patient's sight.

Behavioral optometry is a related area of non-strabismus vision therapy that some optometrists practice. Generally ophthalmologists and orthoptists do not practice this. It generally involves intense therapy that requires at least a weekly visit with eye exercises at home. In some cases it can improve vision beyond that which eyeglasses alone can do.

In the United States, optometry is currently governed by state boards that determine their scope of practice. The scope of practice can vary dramatically from state to state. Optometrists have been successful in getting the right to use some types of medication, including pills, eye drops, and injections.<sup>[2]</sup> In Oklahoma, optometrists are allowed by the state legislature to perform laser surgery.<sup>[3]</sup>

## History

Optometric history is tied to the development of

- vision science (related areas of medicine, microbiology, neurology, physiology, psychology, etc)
- optics, optical aids
- optical instruments, imaging techniques
- other eye care professions

The history of optometry can be traced back to the early studies on optics and image formation by the eye.

The origins of optometric science date back a few thousand years BC as evidence of the existence of lenses for decoration has been found. It is unknown when the first spectacles were made. According to research by David A. Goss, O.D., Ph.D., they originated in the late 13th century in Italy as stated in a manuscript from 1305 AD where a monk from Pisa named Rivalto stated "It is not yet 20 years since there was discovered the art of making eyeglasses".<sup>[4]</sup> Spectacles were manufactured in Italy, Germany, and the Netherlands by 1300 AD.

Benito Daza de Valdes published the third book on optometry in 1623, where he mentioned the use and fitting of eyeglasses. The term *optometrist* was coined by Edmund Landolt in 1886, referring to the "fitter of glasses". Prior to this, there was a distinction between "dispensing" and "refracting" opticians in the 19th century. The latter were later called optometrists.<sup>[5]</sup>

In 1692, William Molyneux wrote a book on optics and lenses where he stated his ideas on myopia and problems related to close-up vision.

The scientists Claudius Ptolemy and Johannes Kepler also contributed to the creation of optometry. Kepler discovered how the retina in the eye creates vision.

From 1773 until around 1829, Thomas Young discovered the disability of astigmatism and it was George Biddell Airy who designed glasses to correct that problem that included spherocylindrical lens.<sup>[6]</sup>

A pilgrim named Peter Brown is believed to be the first person to wear a pair of glasses in the US, however, eyeglasses were only made in Europe for a long period of time which made them both expensive and difficult to find. The first man to buy a pair of eyeglasses in the US was John McAllister Sr., from Philadelphia Pennsylvania, in 1783. McAllister, together with his son, John McAllister Jr. started making the first eyeglasses in the US in 1811. Their business continued until the 20th century. The family also taught refraction, and one of their students, James W. Queen also began his own business in 1853.<sup>[4]</sup>

Benjamin Pike and James Prentice were two other early optometrists who studied in England and came to the US in 1847. They trained their sons, and James's son, Charles Prentice, had an important role in the development of optometry in the US.<sup>[4]</sup>

The American Optometric Association was then formed on January 11, 1922 after Morris Steinfeld hold a meeting with seven optometrists to discuss whether optometry should be a business or a profession. At the end of this meeting, they formed the American Academy of Optometry with the vision to transform the entire body optometric to a profession with a scientific base.<sup>[7]</sup> The American Optometric Society was formed in August 2009. Doctors were concerned that policy decisions by the AOA leadership did not represent the desires of the majority of the profession and were considered to not be in the best interest of the profession.

The first schools of optometry were established in 1850–1900 (in USA), and contact lenses were first used in 1940s<sup>[8]</sup>

The first schools of optometry in the US began in the late 19th century, with the Illinois College of Optometry in 1872, and the New England College of Optometry in 1894. In 1914, a program in optometry began at The Ohio State University after Professor Charles Sheard gave a presentation to the Ohio State Optical Association who assisted him financially to open the program. It started as a two-year course that later became a four-year degree-granting program. Until 1937 the program was known as Applied Optics, when it then became known as Optometry.<sup>[9]</sup>

Nowadays, there are many community and local resources to help those with financial difficulties to secure free or reduced cost eye care. Contact can be made to charities or non-profit organizations in the are to receive such help.<sup>[10]</sup>

## Licensing

Most countries have regulations concerning optometry education and practice. Optometrists like many other health care professionals are required to participate in ongoing continuing education courses to stay current on the latest standards of care.

Optometry is officially recognized:

- in North America (Canada and US)
- in Latin America and some Caribbean countries
- in most English speaking countries including UK, Republic of Ireland, Australia, New Zealand and South Africa
- in Europe including Spain, Germany and the English speaking European countries
- in Asia including China, Hong Kong, Malaysia, Philippines,<sup>[11]</sup> Singapore, Taiwan and Thailand

- in the Middle East including Saudi Arabia, Iran and Israel

*See also: List of optometry schools*

## Argentina

In Argentina optometrists are required to register with the local Ministry of Public Information, but licensing is not required. Anyone holding a Bachelor's degree may register as an optometrist after completing a written exam. Fees for the exam are set by the provincial government and vary from province to province.

## Australia

In light of the development of the 'Melbourne Model' at the University of Melbourne, the year 2011 will see the introduction of a new four year Doctor of Optometry Program (OD)[4], which will require students to complete an undergraduate degree prior to entering the OD program. It is anticipated that similar changes will be adapted by the University of New South Wales and the Queensland University of Technology in the years to come, though there is no evidence to support this rumour.

Flinders University in Adelaide, South Australia is now offering an Optometry course. This takes 5 years and consists of a Bachelor of Science (Vision Science) and a Master of Optometry. It is the only optometry degree offered in South Australia.

## Canada

In Canada optometrists hold a Doctorate of Optometry degree and are licensed by the boards in the provinces they wish to practice. There are two schools of optometry, one at the University of Waterloo and the other at Universite de Montreal.

## Colombia

In Colombia optometry education has been accredited by the Ministry of Health. The last official revision to the laws regarding health care standards in the country was issued in 1992 through the Law 30.<sup>[12]</sup> Currently there are eight official universities that are entitled by ICFES to grant the Optometrist certification. The first optometrists arrived in the country from North America and Europe circa 1914. These professionals specialized in optics and refraction. In 1933, under Decrees 449 and 1291, the Colombian Government officially set the rules for the formation of professionals in the field of optometry. In 1966 La Salle University opened its first Faculty of Optometry after recommendation from a group of professionals. At the present time optometrists are encouraged to keep up with new technologies through congresses and scholarships granted by the government or the private sector (such as Bausch & Lomb).

## Europe

Currently, optometry education and licensing varies throughout Europe. For example, in Germany, optometric tasks are performed by ophthalmologists and professionally trained and certified opticians. In France, there is no regulatory framework and optometrists are sometimes trained by completing an apprenticeship at an ophthalmologists' private office.<sup>[13]</sup>

Since the formation of the European Union, "there exists a strong movement, headed by the Association of European Schools and Colleges of Optometry (AESCO), to unify the profession by creating a European-wide examination for optometry" and presumably also standardized practice and education guidelines within EU

countries.<sup>[14]</sup> The first examinations of the new European Diploma in Optometry were held in 1998 and this was a landmark event for optometry in continental Europe.<sup>[15]</sup>

## Ireland

The profession of Optometry has been represented for over a century by the Association of Optometrists, Ireland [AOI]. In Ireland an optometrist must first complete a four year degree in optometry at D.I.T. Kevin Street. Following successful completion of the a degree, an optometrist must then complete Professional Qualifying Examinations in order to be entered into the register of the Opticians Board [Bord na Radharcmhaisoiri]. Optometrists must be registered with the Board in order to practice in the Republic of Ireland.

The A.O.I. runs a comprehensive continuing education and professional development program on behalf of Irish optometrists. The legislation governing Optometry was drafted in 1956. Some feel that the legislation restricts optometrists from using their full range of skills, training and equipment for the benefit of the Irish public. The amendment to the Act in 2003 addressed one of the most significant restrictions - the use of cycloplegic drugs to examine children.

## United Kingdom

In the United Kingdom, optometrists have to complete a 3 or 4 (Scotland) year undergraduate honours degree followed by a minimum of a one-year "pre-registration period" where they complete supervised practice under the supervision of an experienced qualified practitioner. During this year the pre-registration candidate is given a number of quarterly assessments and on successfully passing all of these assessments, a final one-day set of examinations (Examination details correct for candidates from 2006 onwards). Following successful completion of these assessments and having completed one year's supervised practice, the candidate is eligible to register as an optometrist with the General Optical Council (GOC) and, should they wish, are entitled to membership of The College of Optometrists. Registration with the GOC is mandatory to practice in the UK. Members of the College of Optometrists (incorporated by a Royal Charter) may use the suffix MCOptom. There are 9 universities which offer optometry in the UK.

## Philippines

Optometry is regulated by the Professional Regulation Commission of the Philippines. To be eligible for licensing, each candidate must have satisfactorily completed a Doctor of Optometry course at an accredited institution and demonstrate good moral character with no previous record of professional misconduct.

Professional organizations of optometry in the Philippines include Optometric Association of the Philippines<sup>[16]</sup> and Integrated Philippine Association of Optometrists, Inc. (IPAO)<sup>[17]</sup>

## Russia

In Russia optometry education has been accredited by the Federal Agency of Health and Social Development.

<sup>[*citation needed*]</sup> There are only two educational institutions that teach optometry in Russia: Saint Petersburg Medical Technical College, formerly known as St. Petersburg College of Medical Electronics and Optics, and The Helmholtz Research Institute for Eye Diseases. They both belong and are regulated by the Ministry of Health. The Optometry program is a 4 year program. It includes 1–2 science foundation years, 1 year focused on clinical and proficiency skills, and 1 year of clinical rotations in hospitals. Graduates take college/state examinations and then receive a specialist diploma. This diploma is valid for only 5 years and must be renewed

every 5 years after receiving additional training at state accredited programs.<sup>[18]</sup>

## United States

The American Optometric Association (AOA) and the American Optometric Society (AOS) represent optometrists nationally in the USA. Prior to admittance into optometry school, optometrists typically complete four years of undergraduate study, culminating in a bachelor's degree. Required undergraduate coursework for pre-optometry students covers a variety of health, science and mathematics courses. These courses include: 4 semesters of chemistry to include organic and biochemistry, 2 semesters of physics and biology, as well as 1 semester of calculus, statistics, physiology, anatomy, microbiology, and psychology. Additional requirements are imposed by specific institutions. Once completing these courses in order to be admitted to an optometry doctorate program one must score well on the O.A.T., Optometry Admission Tests.

Optometrists are required to complete a four-year postgraduate degree program to earn their Doctor of Optometry (O.D.) titles. The four-year program includes classroom and clinical training in geometric, physical, physiological and ophthalmic optics, ocular anatomy, ocular disease, ocular pharmacology, neuroanatomy and neurophysiology of the vision system, color, form, space, movement and vision perception, design and modification of the visual environment, and vision performance and vision screening. In addition, an optometric education also includes a thorough study of human anatomy, general pharmacology, general pathology, sensory and perceptual psychology, biochemistry, statistics and epidemiology. There are 19 schools of optometry in the United States. Two new colleges of optometry have received pre-accreditation status of preliminary approval from the Accreditation Council on Optometric Education.<sup>[19][20]</sup>

Upon completion of an accredited program in optometry, graduates hold the Doctor of Optometry (O.D. - Oculis Doctor) degree. Optometrists must then pass a national examination administered by the National Board of Examiners in Optometry (NBEO).<sup>[21]</sup> The three-part exam includes basic science, clinical science and patient care. (The structure and format of the NBEO exams are subject to change beginning in 2008.) Some optometrists go on to complete 1–2 year residencies with training in a specific sub-specialty such as pediatric eyecare, geriatric eyecare, specialty contact lens, ocular disease or neuro-optometry. All optometrists are required to fulfill continuing education requirements to stay current regarding the latest standards of care.

Within the healthcare system, optometrists function as primary eye care providers that are especially experienced in fitting contact lenses and glasses prescriptions. Although they are not technically physicians, in that they do not hold an MD or DO degree, some states, such as Florida, refer to optometrists as "Optometric Physicians" in a legal sense. Optometrists also have the ability to treat a wide variety of eye diseases though the administration of topical, oral and injectable medicines (depending on the state) although their scope is limited to the eye. Optometrists may be trained in some surgical techniques, as a general rule, including those for corneal injury, eyelid & lacrimal disease and others. In Oklahoma, however, the state optometry board has allowed state certified optometrists to perform laser surgeries limited to the anterior segment of the eye. Additionally, VA hospitals have considered having optometrists who have been trained in these laser techniques and licensed are in Oklahoma, to perform laser surgeries in any VA hospital in the country, not just Oklahoma VA hospitals.

Ophthalmologists differ from optometrists, in that ophthalmologists are licensed to perform all eye surgeries, can treat systemic diseases, and complete 4 years of medical school and a residency in ophthalmology. In many cases optometrists and ophthalmologists work together in the treatment and management of patients with various eye conditions. Opticians generally dispense corrective eye wear, and in some cases will also construct the corrective eye wear. The scope of practice in optometry varies as it is regulated by each state.

## Optometrists and Ophthalmologists

Optometrists specialize in correcting refractive errors of the eye and the diagnosis, management, and treatment of eye pathology and medical conditions of the eye. Optometrists have a pivotal role in primary health care of the eye with patients being referred to ophthalmologists for surgical procedures. Therefore, it is part of an optometrist's responsibility to identify and diagnose their patients with eye disorders such as glaucoma, cataracts, age-related macular degeneration, cancer, and tumors, among others. Optometrists can work in a variety of settings, including hospitals, schools/student health centers, under other optometrists, private practices, and group practices. Additionally, after graduation from a certified optometry school, optometrists can apply for a 1 year residency in fields such as low vision rehabilitation, diseases of the eye, pediatric care, as well as numerous others. The different work settings call for interactions with various types of individuals. For example, in many practices optometrists work with lens laboratories to order and customize lenses for glasses and different types of frames.

Ophthalmologists hold medical degrees and are also involved in the treatment and management of diseases of the eye. After graduation from medical school, they begin one year internships, and then residencies with other ophthalmologists for 3 years and can begin practicing after their residencies are over and boards are passed. Some ophthalmologists go on to complete 1 year fellowships in more specialized areas such as the retina. In many cases optometrists and ophthalmologists work together in the treatment and management of patients with various eye conditions.

### See also

- Behavioral optometry
- Orthoptics
- Vision therapy
- Eye care professional
- Eye examination
- Eyeglass prescription
- Ophthalmology
- Visual perception
- Least distance of distinct vision

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## External links

-  Media related to Optometry at Wikimedia Commons

## External links

- World Council of Optometry (<http://www.worldoptometry.org/>)
- U.S. Bureau of Labor Statistics Optometry Page (<http://www.bls.gov/oco/ocos073.htm>)
- State Optometry Boards ([http://www.healthguideusa.org/state\\_optometry\\_boards.htm](http://www.healthguideusa.org/state_optometry_boards.htm))
- Eye Health and Vision Care Magazine (<http://careyeasy.com>)

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