

## Andrew Francis Dixon (1868-1936)

Andrew Francis Dixon studied human anatomy and egg cells at the turn of the twentieth century in Ireland and Great Britain. Dixon studied the sensory and motor nervous system of the face, the cancellous bone tissue of the femur, supernumerary kidneys, and the urogenital system. In 1927 Dixon described a mature human ovarian follicle. This follicle, Dixon noted, contained an immature human egg cell (oocyte) with a visible first polar body and the beginnings of the second polar body. Dixon's work helped researchers describe many of the items found in follicles during the production of oocytes, and it helped them identify when, where, and how those items were produced. Based upon his descriptions, later researchers further described polar bodies and investigated their functions.

Dixon was born in 1868 at his family's home in Dublin, Ireland. Andrew Francis was one of eight Dixon children. Dixon received his early instruction at Rathmines School in Dublin. In 1883 he entered Trinity College, also in Dublin. Originally interested in zoology, Dixon was encouraged to study anatomy and embryology by the Chair of Anatomy of Trinity College at the time, Daniel John Cunningham. In 1885, Dixon's interest in natural science helped him gain Senior Moderatorship, a term Trinity College used to denote undergraduate honors, and a gold medal for academic excellence. In 1893, Dixon received his Bachelor of Medicine degree from Trinity College and became a member of the Anatomical Society of Great Britain and Ireland. In that same year, he left Ireland for Leipzig, Germany, to study with Wilhelm His.

Dixon returned to Dublin in 1894 and became Chief Demonstrator to Cunningham, still at Trinity College. In 1896 Dixon investigated the development of the fifth cranial nerve using the glass plate method of reconstruction. Traditionally, microscopic reconstructions were done in wax plates, but Dixon found this method poor for reconstructing the fine structure of nerve fibers. Dixon made and worked with a series of drawing, which depicted the sections of a sliced embryo head. At the suggestion of Wilhelm His, Dixon traced the drawings on to glass plates that were twenty-five to fifty times thicker than the original section. He next covered these plates with a transparent varnish and stacked one on top of the other to create an illusion of a three-dimensional embryo head with its nerves, arteries, and other structures drawn in different colored ink. With this form of modeling, Dixon studied a series of sections relevant to a nerve pathway, which he used to detail the pathway of the fifth cranial nerve.

In 1897, Dixon became the Chair of Anatomy at University College, Cardiff. In 1900, Cunningham included in his 1914 Textbook of Anatomy Dixon's research on the form of the empty bladder and his research on the supports of the uterus. When Cunningham retired in 1903, Dixon succeeded him, filling Cunningham's position as Chair of Anatomy and Chirurgery at Trinity College. The two men collaborated until Cunningham's death in 1909. Dixon became president of the University Biological Association in 1904. That same year he published his study on the impressions of the calvaria surface, or skullcap, in different human races. Dixon was a Fellow of the Royal Academy of Medicine in Ireland and was president of the Section of Anatomy and Physiology of this institution from 1906 to 1908. In 1916 he became Trinity College's representative on the General Medical Council. In 1924 Dixon was appointed Chair of Human Anatomy and Embryology at Trinity College.

In 1927 Dixon published "Human oöcyte Showing First Polar Body and Metaphase Stage in Formation of Second Polar Body." In the article, he described a human ovarian follicle that had an oocyte within it. He described the oocyte, and next to it in the zona pellucida, the first polar body. Researchers in the early twentieth century, including Arthur Thomson at the University of Oxford in Oxford, UK, had identified and studied the first, second, and third polar bodies, which appeared

around an ovum as it developed from an immature ovum into a mature ovum. Those researchers worked to describe the functions of the polar bodies, how they were produced, and when during the production of ova they were produced.

Dixon cut the oocyte from the follicle into fine sections and looked at those sections under a microscope. Dixon described the first polar body, its nucleus, and the chromatin within it, but he couldn't count the number of chromosomes. The first polar body of an oocyte is a cytoplasmic substructure, formed during the first stage of meiosis, that enfolds excess DNA in a maturing egg. Second and third polar bodies are formed through meiosis. Dixon noted that the specimen showed the oocyte in the metaphase stage of oocyte division, during which the second polar body forms. Dixon's descriptions confirmed Thomson's 1919 proposal that, in humans, the second polar body forms before the oocyte leaves the follicle and before fertilization. Dixon also concluded that the second polar body forms before the first polar body forms.

Later in life, Dixon was the Honorary Secretary for the Dublin zoo and later its president. He was also a member of the Council of the Royal Zoological Society of Ireland and maintained the Office of the President for this organization from 1927 to 1931. From 1933 to 1935 Dixon was president of the Anatomical Society of Great Britain and Ireland. Dixon died on 15 January 1936.

## Sources

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