Sir D'Arcy Wentworth Thompson (1860-1948) [1]

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Known by many for his wide-reaching interests and keen thinking, D'Arcy Wentworth Thompson was one of Britain's leading scientific academics in the first few decades of the twentieth century. A prodigious author, Thompson published some 300 papers, books, and articles in the biological sciences, classics, oceanography, and mathematics. He was a famous lecturer and conversationalist—a true "scholar-naturalist," as his daughter wrote in her biography of her father. Of his numerous publications, the acclaimed *On Growth and Form* [4] (1917, 1945) is generally considered to be his most influential. Many highly respected biologists—like John Tyler Bonner [5], Joseph Woodger [6], Sir Peter Medawar [7], and Stephen Jay Gould—have argued for the importance of On Growth and Form [4] for the history of twentieth century biology. In this work Thompson integrates a causal understanding of biological growth and structure with the mathematics of physical laws. Many developmental biologists have drawn inspiration from reading Thompson magnum opus, by focusing on this approach to understanding the physical limitations and mathematical processes of developmental growth and morphological form.

Thompson was born 2 May 1860 in Edinburgh to Fanny Gamgee and the classical scholar D'Arcy Wentworth Thompson. Unfortunately for both father and son, Fanny died a week after giving birth. The younger Thompson's maternal aunt, Clementina Gamgee, raised her nephew. Thompson attended Edinburgh Academy from 1870 to 1877, where he excelled in his studies and took an interest in classics and natural history [8]. In 1878 he entered the University of Edinburgh [9] as a medical student, but was persuaded by marine biologist Sir Wyville Thompson [10] to pursue a career in science instead. Thompson entered Trinity College, Cambridge, where he excelled in the natural sciences, motivated by his mentor Francis Maitland Balfour. In 1881 Thompson was elected to the Cambridge Natural Science Club where he read his first paper on Aristotle's scientific works, a subject that became a lifelong interest. He graduated from Trinity College with honors in Natural Sciences Tripos (final exams), and then became a university demonstrator in physiology under Michael Foster [11].

At Cambridge Thompson began work on his first two major works: a translation of Hermann Müller's *The Fertilization of Flowers* [12] (1883), and his first book entitled *Bibliography of Protozoa* [13]*, Sponges, Coelenterates, and Worms* (1885). In 1884, armed with the recommendations from Arthur Gamgee [14], Michael Foster [11], and Edwin Ray Lankester [15], Thompson obtained the position of Chair of Biology (later Natural History) at the newly opened University College [16], Dundee. He was given his choice of positions, Chair of Mathematics, Greek, or Biology, and his daughter recounts that Thompson chose the latter because he felt it was his weakest subject.

At Dundee that Thompson put his multiple talents into effect. He organized an impressive zoological teaching museum for the university, which was greatly improved through specimens obtained through his amicable relationship with the Dundee whalers. Thompson also worked to improve the scholarship and scientific standing of University College [16]. Early in his career at Dundee Thompson began his work applying mathematics to morphology [17] and biological observation, an endeavor that came to fruition only after decades of study.

Alongside his work in the natural sciences, Thompson also published in classics. *A Glossary of Greek Birds* [18] (1898) and *A Glossary of Greek Fishes* [19] (1945) trace the natural history [8] of these animals throughout ancient scholarship. He also produced an acclaimed annotated translation of Aristotle's *Historia Animalium* (1910).

In 1896, working beyond his duties as biology chairman, Thompson undertook a voyage to the Bering Sea to mediate a debate over the fur seal industry, an undertaking he was recommended for by Prime Minister Lord Salisbury. This post launched Thompson's involvement with the Fishery Board of Scotland, and later the International Council for the Exploration of the Sea [20] (ICES) at its inception in 1902. Thompson also contributed to the statistical tools for fisheries biology. In this capacity his interests in oceanographic and theoretical biology coincided with those of his compatriot naturalist Edward Stuart Russell [21].

In 1901 Thompson married Ada Maureen [22], with whom he had three daughters. During the first decade and a half of the twentieth century he was preoccupied with his growing family and various other non-academic activities; he published less at this time. In 1916, soon after the publication of an important paper entitled "Morphology and Mathematics," the Royal Society elected Thompson a Fellow. He published an expanded version on this subject, *On Growth and Form* [4], a year later, despite wartime difficulties. This book made a considerable impression on the scientific community immediately upon publication, as evidenced by favorable reviews in scientific journals. Commended not only for its scientific importance, *On Growth and Form* [4] has been remarked upon by many, such as Peter Medawar [7], for its literary prose.

Fundamentally, *On Growth and Form* [4] is a work of natural philosophy rather than one adhering to the experimental approach to morphology [17]. The main motivation for writing this book, as described in the first chapter, was to develop an understanding of the importance of physics for biology (though Thompson treatment excludes chemistry). In order to do so, Thompson described the relationships of animal growth and form in mathematical terms because it was only through this perspective of the living world that the natural laws of biology would be comprehensible. By understanding the principal elements of animal form, Thompson hoped, biologists could better explain these features as causal elements of biological structure. Though not directly a work of embryology [23], *On Growth and Form* [4] highlighted the importance of understanding growth mathematically, a perspective that can also be seen in the work of John Tyler Bonner [5] and Julian Sorell Huxley.

After the retirement of William Carmichael McIntosh [24], the University of St. Andrews [25], Scotland, hired Thompson to the Chair of Natural History in 1917. It was there that Thompson lectured until his death on 21 June 1948, after sixty-four years as a full professor. He received numerous awards for his academic contributions, including being elected fellow of the Royal Society of Edinburgh in 1885 and its president from 1934 to 1939, as well as vice-president of the Royal Society from 193 to 1933. He was given numerous honorary degrees from universities worldwide and prestigious awards, such as the Linnean gold medal in 1938 and the Darwin Medal in 1946. He was also the president of the Classical Association in 1929 and the Royal Geographical Association in 1942. By far his most distinguished award, Thompson was knighted in 1937.

Not only was he one of Britain's leading scholars and naturalists in the late nineteenth and early twentieth centuries, D'Arcy Thompson loved teaching and lecturing, endeavors he undertook until his final days.

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