

## Julia Barlow Platt (1857-1935)

Julia Barlow Platt studied neural crests in animal embryos and became involved in politics in the US during the nineteenth and twentieth centuries. She researched how body and head segments formed in chicks (*Gallus gallus*) and spiny dogfish (*Squalus acanthias*). Platt observed that in the mudpuppy (*Necturus maculosus*), the coordinated migration of neural crest cells in the embryo produced parts of the nervous system, bones, and connective tissues in the head. Platt's research indicated that the neural crest functioned like a germ layer, it challenged existing theories of what sorts of tissues arose from each of an embryo's germ layers, and it described early developmental stages of the nervous system.

Platt was born on 14 September 1857 in San Francisco, California, to Ellen Loomis Barlow and George King Platt. Her father, a lawyer and state attorney in Vermont in the 1840s, died nine days after her birth and her mother raised her in Burlington, Vermont. Platt began her scientific career in 1879 at the University of Vermont in Burlington, where she received a Bachelor's degree in three years. In 1887 she started her graduate studies at Harvard University in Cambridge, Massachusetts, where she researched chick embryo segmentation under the supervision of Howard Ayers, who studied the development of the head and body segmentation in different organisms. At Harvard, Platt published her first paper in 1889. In that paper, Platt studied the formation of embryonic structures called somites in the chick embryo, which give rise to the vertebrae and to other tissues. Into the 1990s, scientists used the plates she had made for her 1889 paper and her description of axial segmentation in chick embryos to identify chick developmental stages.

Platt pursued her graduate career at different institutions because many universities in the United States and Europe didn't grant graduate degrees to women. During the nineteenth century, universities in Germany were among the few places where women could obtain a doctoral degree. In the summer of 1889 and 1890, Platt conducted research at the Marine Biological Laboratory in Woods Hole, Massachusetts, with director Charles Otis Whitman, who studied zoology and became a mentor to Platt. During those years, when she was not at the Marine Biological Laboratory Platt attended Bryn Mawr College in Lower Merion Township, Pennsylvania. Also in 1890, Platt continued her research on head segmentation at the Albert Ludwig University of Freiburg in Freiburg, Germany, and in 1891 she worked for a few months at the Stazione Zoologica in Naples, Italy, upon Whitman's recommendation.

During the winter of 1892 and into 1893, Platt went to the University of Chicago in Chicago, Illinois, where she worked again with Whitman, who had become the first chair of the zoology department at the university. In Chicago, Platt published two preliminary notes about her research on the ectodermic origin of head cartilage in *Necturus*. In 1893, Platt returned to Germany to study at the Ludwig Maximilian University of Munich in Munich, Germany, where she spent three semesters and continued the work she had began at the University of Chicago. In Munich, Platt worked with Karl Wilhelm von Kupffer, at that time director of the Institute for Anatomy. Platt later spent two semesters at Radcliffe College in Cambridge, Massachusetts, where she attended lectures on comparative anatomy and experimental morphology. In 1897, she returned to the University of Freiburg, from which she received her PhD in zoology on 28 May 1898. She became the second woman who received a doctorate from that institution. Platt completed her graduate career after nine years during which she published eleven papers, traveled constantly, and interacted with many biologists.

In her publications, Platt described how the head cartilage, the dentine that forms teeth, and some nervous tissues, develop from the ectoderm germ layer. At that time, scientists maintained that

the head cartilage developed from the mesoderm. The germ layer theory postulated that the three germ layers in the embryo, ectoderm, mesoderm, and endoderm, give rise to different types of cells in the adult. In 1817, Christian Pander had proposed the germ layer theory based on his studies of chick embryos. Pander had claimed that cells had their roles in the body specified in the different layers of the embryo. Karl Ernst von Baer contributed to the germ layer theory by proposing that, in animals of different species, tissues and organs of shared evolutionary origin developed from the same germ layer and only one of the germ layers is associated with any given structure. That thesis was called germ layer specificity. Some scientists had expressed skepticism about germ layer specificity, but most scientists still accepted the theory in the 1890s, during Platt's career.

Consequently, Platt's research was not well-received because her results did not fit in with the germ layer specificity hypothesis, which stated that cartilage and dentine were associated with mesoderm, along with all skeletal, vascular, muscular, and connective tissue. However, Platt's results convinced some of her colleagues who later helped promote her work. One such colleague was Anton Dohrn, who founded and directed the Stazione Zoologica in Naples, Italy, where Platt had worked for a few months in 1891. A few decades later in the 1920s, Leon Stone at Yale University in New Haven, Connecticut, advanced her hypothesis that tissues of the head arose from ectoderm, followed by Sven Hörstadius and Sven Sellman at Uppsala University in Uppsala, Sweden, in the 1940s. In 1978 Drew Noden at Cornell University in Ithaca, New York, corroborated Platt's conclusions in a variety of different organisms.

After Platt obtained her doctoral degree, she studied Paramecium, a one-cell organism, and tried to find a teaching position, which she did not obtain despite her achievements and experience. Historians later argued that Platt did not develop relationships with women-only colleges in the US during her graduate career. Zotolli and Seyfarth argue that those colleges provided the most opportunities for women's employment in the sciences at that time. In 1899, Platt moved to California to work at the Hopkins Marine Station Marine Biology Laboratory in Pacific Grove, California. On 2 June 1899, Platt sent a letter to David Starr Jordan, then president of Stanford University and founder of the Hopkins Marine Station, after a lecture he gave in Pacific Grove. In her letter, Platt asked for advice regarding her frustrating search for a job, and resolved that if the position she desired was not obtainable, she would pursue politics, which she did.

In Pacific Grove, the townspeople noted that Platt was an educated woman living alone, not common at the time. Historians reported that she shot her neighbor's chickens because they did not stop destroying her garden despite her multiple warnings to the owners. Platt's behavior scandalized the citizens, but she used the attention to lobby for zoning ordinance laws to restrict areas for wandering livestock. Platt also promoted and worked in the development of park areas, founded the Women's Civic Club in February 1903, and used an axe to chop down a fence blocking public access to a beach. Platt also led a successful movement to incorporate a council-manager form of government in Pacific Grove, a system that allows a municipality to hire a city manager outside political affiliations to perform administrative duties and supervise its government. After her efforts to change local politics through activism, she was elected in April 1931 and became the first female mayor of the city at the age of seventy-four.

During the 1930s, Pacific Grove's neighboring city, Monterey, California, had an influential sardine canning business. The waste from the canneries and heavy fishing fouled the ocean and air, drove away tourism from both cities, and ravaged sardine populations along with other marine species of the Monterey Bay. Platt sued the canneries with the support of the hotel owners of the area and won the case, though the court victory spurred no action against the canneries. That inaction led Platt to focus on reclaiming the shoreline from the state. To do so, she enlisted the support of the scientists in Hopkins Marine Station and wrote a law that granted Pacific Grove the management rights of the shoreline. The law was passed in 1931 and established a protected marine area, the first in California. The restoration of the shoreline became apparent only decades later when species such as the sea otter returned to the area.

Platt never married, but during her time in Pacific Grove she adopted a son, Harold Platt. She died in Pacific Grove on 31 May 1935 at the age of seventy-eight and, upon her request, she was buried at sea inside a wicker basket covered by flowers.

## Sources

1. Creese, Mary R.S. *Ladies in the Laboratory? American and British Women in Science, 1800-1900: A Survey of Their Contribution to Research*. Lanham: Scarecrow Press, 1998.
2. Hörstadius, Sven. *The Neural Crest. Its Properties and Derivatives in Light of Experimental Research*. Oxford: Oxford University Press, 1950.
3. Noden, Drew M. "The Control of Avian Cephalic Neural Crest Cytodifferentiation: I. Skeletal and Connective Tissues." *Developmental Biology* 67 (1978): 296-312.
4. Ogilvie, Marylin, and John Harvey, eds. "Platt, Julia Barlow (1857-1935)." *Biographical Dictionary Women in Science, Vol. 2*. New York: Routledge, 2000.
5. Palumbi, Stephen R., and Carolyn Sotka. *The Death and Life of Monterey Bay: A Story of Revival*. Washington: Island Press, 2010.
6. Pander, Christian. *Beiträge zur Entwicklungsgeschichte des Hühnchens im Eie [Contributions to the Developmental History of the Chicken in the Egg]*. Würzburg: 1817. <http://echo.mpiwg-berlin.mpg.de/ECHOdocuView?mode=imagepath&url=/mpiwg/online/permanent/library/TAQKCW5C/pageimg> (Accessed July 26, 2016).
7. Platt, Julia Barlow. "Studies on the Primitive Axial Segmentation of the Chick." *Bulletin of the Museum of Comparative Zoology* 17 (1889): 171-90. <https://archive.org/details/studiesonpri/mit00platgoog> (Accessed December 1, 2015).
8. Platt, Julia Barlow. "The Anterior Head-Cavities of *Acanthias* (Preliminary Notice)." *Zoologischer Anzeiger (Zoological Gazette)* 13 (1890): 239. <http://biodiversitylibrary.org/page/9743394> (Accessed June 26, 2016).
9. Platt, Julia Barlow. "A Contribution to the Morphology of the Vertebrate Head, Based on a Study of *Acanthias vulgaris*." *Journal of Morphology* 5 (1891): 79-112. <http://biodiversitylibrary.org/page/28523603> (Accessed June 26, 2016).
10. Platt, Julia Barlow. "Fibres Connecting the Central Nervous System and Chorda in *Amphioxus*." *Anatomischer Anzeiger (Anatomical Gazette)* 7 (1892): 282-4. <http://biodiversitylibrary.org/page/11784082> (Accessed June 26, 2016).
11. Platt, Julia Barlow. "Ectodermic Origin of the Cartilages of the Head." *Anatomischer Anzeiger (Anatomical Gazette)* 8 (1893): 506-9. <http://biodiversitylibrary.org/page/11789484> (Accessed June 26, 2016).
12. Platt, Julia Barlow. "Ontogenetic Differentiations of the Ectoderm in *Necturus*. (Preliminary Notice)." *Anatomischer Anzeiger (Anatomical Gazette)* 9 (1894): 51-6. <http://jcs.biologists.org/content/joces/s2-38/152/485.full.pdf> (Accessed December 1, 2015).
13. Platt, Julia Barlow. "Ontogenetische Differenzirung des Ektoderms in *Necturus*. Studie I." (Ontogenetic differentiation of the ectoderm in *Necturus*. Study I.). *Archiv für mikroskopische Anatomie (Archive for Microscopical Anatomy)* 43 (1894): 911-66. <http://biodiversitylibrary.org/page/13291721> (Accessed June 26, 2016).
14. Platt, Julia Barlow. "Ontogenetic Differentiations of the Ectoderm in *Necturus*. Study II. On the Development of the Peripheral Nervous System." *Quarterly Journal of Microscopical Science* 38 (1896): 485-547. <http://jcs.biologists.org/content/s2-38/152/485.full.pdf> (Accessed December 1, 2015).
15. Platt, Julia Barlow. "On the Specific Gravity of *Spirostomum*, *Paramecium*, and the Tadpole in Relation to the Problem in Geotaxis." *American Naturalist* 33 (1899): 31-8. [https://archive.org/stream/jstor-2454170/2454170\\_djvu.txt](https://archive.org/stream/jstor-2454170/2454170_djvu.txt) (Accessed December 1, 2015).
16. Stone, Leon Stansfield. "Experiments on the Development of the Cranial Ganglia and the Lateral Line Sense Organs in *Amblystoma Punctatum*." *Journal of Experimental Zoology* 35 (1922): 420-96. <http://biodiversitylibrary.org/page/11786220> (Accessed June 26, 2016).
17. Stone, Leon S. "Experiments Showing the Role of Migrating Neural Crest Cells (Mesectoderm) in the Formation of the Head Skeleton and Loose Connective Tissue in *Rana Palustris*." *Wilhelm Roux's Archiv für Entwicklungsmechanik der Organismen (Roux's Archives of Developmental Mechanics)*. 118 (1929): 40-77.
18. von Baer, Karl E. *Über Entwicklungsgeschichte der Thiere. Beobachtung und Reflexion*. ([On the Developmental History of Animals. Observation and Reflection). Gebrüder Bornträger: Berlin, 1828. <https://archive.org/details/berentwicklung01baer> (Accessed December 1, 2015).
19. Whitman, Charles O. *A Contribution to the History of the Germlayers in Clepsine*. Boston:

Ginn and Company, 1887. <https://books.google.com/books?id=ADMtAAAAYAAJ> (Accessed December 1, 2015).

20. Zottoli, Stephen J., and Ernst-August Seyforth. "Julia B. Platt (1857-1935): Pioneer Comparative Embryologist and Neuroscientist." *Brain, Behavior and Evolution* 43 (1994): 92-106.