Felix Anton Dohrn [1]

By: Wellner, Karen Clark, Kal Schuermann, Brian

Felix Anton Dohrn [5] is best remembered as the founder of the Stazione Zoologica [6] di Napoli, the world’s first permanent laboratory devoted to the study of marine organisms. Dohrn was born on 29 December 1840 in Stettin, Pomerania (now Poland), to a wealthy merchant family. Dohrn’s paternal grandfather, Heinrich, trained as a surgeon and then established a sugar refinery, while Dohrn’s father, Carl August Dohrn, who inherited the family business, became interested in natural history [7] through Alexander von Humboldt, a family friend. Once settled in his career, Anton Dohrn’s own research never strayed far from the origin of vertebrates. He promoted the theory that vertebrates closely resemble and are derived from annelid [8]-like ancestors and he spent years studying the early embryogenesis [9] of lower vertebrates in attempts to prove this.

Early in life Anton Dohrn became familiar with the zoological literature and, inspired by his father, published his first article in entomology when he was sixteen. But he was unimpressed at first with higher education, spending brief spells at the universities of Königsberg and Bonn (where most of his attention was occupied with service in the military) before enrolling in 1862 at Jena where he studied with Carl Gegenbaur [10] and Ernst Haeckel [11]. Haeckel was the originator and a leading proponent of the recapitulation theory [12] of embryological development and played an important role in establishing Dohrn’s interest in Darwinian evolution [13]. It was through Haeckel that Dohrn was introduced to Darwin’s works in the early 1860s, and he was newly invigorated.

Comparative embryology [14] would soon become the focus of Dohrn’s work as he foresaw how this field could be used as a tool to expand and develop Darwinian theory. While Dohrn had great aspirations for himself, both Haeckel and Gegenbaur thought that he would accomplish little in the scientific world. The tension between Dohrn and his two former teachers would intensify over the years. Haeckel went so far as to dissuade his own students from using the Naples station, and Gegenbaur eventually refused to use the same publisher as Dohrn.

But that was in the future. In the summer of 1863, Dohrn suffered a severe case of appendicitis (Gegenbaur nursed him back to health), following which he registered in premedical courses at the Berlin medical school, where he stayed till the spring of 1865. Dohrn received his doctorate from Breslau in November 1865 with his thesis “On the Anatomy of Hemiptera.” In August of the same year he accompanied Haeckel to Helgoland, a small German archipelago in the North Sea. It was a trip that sparked an important methodological and phylogenetic debate about the evolutionary origins of vertebrate morphology [15], and persuaded Dohrn to turn his attention to vertebrates. It was here, too, that Haeckel and Dohrn first discussed the need for a zoological laboratory.

Dohrn conducted research at several other seaside facilities, including Millport, Isle of Great Cumbrae, Scotland, in 1867 and 1868. At Millport he worked with David Robertson, a self-taught zoologist and founder in 1885 of the Millport Biological Station. In April 1867, Dohrn traveled to Hamburg’s Zoological Gardens where he met William Alford Lloyd, who was undertaking the building of a large aquarium at the gardens. Dohrn was offered the position of director of the gardens but he turned it down, returning instead to Jena to work as a Privatdozent of zoology in 1868. During that same year, Dohrn traveled to Messina, Sicily, a key collecting area for German zoologists. While working on the comparative morphology [16] and embryology [14] of marine organisms he met Marie de Baranowski, whom he would marry in 1874, a marriage that would produce four sons and a daughter who died when she was one year old.

In 1870, Dohrn was called up from the military reserves to serve in the Franco-Prussian War, but he was assigned office work and was discharged before the end of the war. He returned to Jena and fell into one of his many serious bouts of depression. A trip to Messina apparently helped to revive him as he set about studying crustacean larvae. He published History of the Crayfish Family, which undoubtedly was aided by his decision to bring a portable aquarium with him to observe the development of crustacean eggs. But even with the use of a small aquarium, he grew increasingly frustrated with the difficulty of keeping specimens alive for his study. What he needed was a permanent field laboratory.

It was here that Dohrn wrote out his plan of building an independent zoological station where scientists could work at their own laboratory bench (“the table system”) and where services would be provided. Dohrn was essentially proposing an “outfitters” approach to marine study. For an annual fee, universities, institutions, and private scientists would get lab space, microscopes,
dissection kits, animal supplies, chemicals, the use of a research library, and collection help from laboratory assistants. His conception became reality with the creation of the Stazione Zoologica di Napoli, which opened in Naples in February 1874. Naples was chosen for its wealth of marine life—a central focus of morphological study at the time. The Stazione was the first laboratory anywhere established for the purposes of providing an international research home where scientists could come together and benefit from excellent research support, interaction with other leading scientists, and the technical support they needed to carry out their work. The Stazione led to the collection of massive amounts of data and also became a home for the new experimental approach to embryology called Entwicklungsmechanik.

To help support the Stazione and provide an outlet for the research, Dohrn created and acted as an editor for three publications. One was a scientific journal, Mittheilungen aus der Zoologischen Station zu Neapel (1879–1915), which changed to Publicazioni della Stazione Zoologica di Napoli (1924–1978) and later gave rise to History and Philosophy of the Life Sciences (1979–) and Marine Ecology (1980–). The second was Zoologischer Jahresbericht (1880–1915), a reference journal to record results and make them available to other scientists. The third was a series of monographs titled Fauna e Flora del Golfo di Napoli (1880–1982).

The Stazione was a private venture supported financially by Dohrn’s family and in other ways by leading scientists. Dohrn had close ties to many British scientists, including Thomas Henry Huxley, who encouraged Dohrn to establish and finish the Stazione in the British natural history tradition. In designing the building, he included a public display of marine aquaria, designed by William Lloyd, that he hoped would generate enthusiasm and income for the Stazione. The Stazione became the home of leading scientific initiatives especially in embryology, evolution, and bacteriology, and through the years developed programs in ecology, neurobiology, and many other areas including music and the arts.

Most of Dohrn’s scientific effort after the mid-1860s was devoted to elucidating the origin and history of vertebrates. He and Karl von Baer hypothesized that vertebrates closely resemble and are derived from annelid-like ancestors, and Dohrn spent years searching for evidence by looking at the early embryogenesis of various lower vertebrates. Central to the evolutionary history of vertebrates was also the question of limb origin. Dohrn proposed that fish fins developed from lateral folds of the skin. Within the folds, cartilaginous rays developed and the base of the rays fused, giving rise to the pelvic and pectoral girdles. This was in contrast to Gegenbaur’s gill-arch hypothesis, according to which some of the gill arches migrated from the head towards the tail, resulting in pelvic and pectoral girdles with paired fins.

Gegenbaur and Dohrn’s ideas ran contrary to one another, and had at their base different research organisms. Gegenbaur used the lungfish Ceratodus as his primitive form (that is, the organism from which the movement of the gill-arches could be traced), while Dohrn selected the shark as the primitive form for his fin-fold hypothesis. Another difference between the two ideas was that Gegenbaur relied on the comparative anatomy of adult forms. Dohrn found his most persuasive arguments when he examined the embryos of sharks.

Haeckel and Gegenbaur thought Dohrn’s work in this area quite unscientific, but Dohrn had an impact on other biologists. Berthold Hatschek and Charles Sedgwick Minot supported Dohrn’s idea that the similar morphology and development of annelids and vertebrates allows one to assume a segmented common ancestor. In 1875 Dohrn published On the Origins of Vertebrate Animals and the Principle Change in Function (Functionswechsel), in which he explains how the transformation of an organ happens through a succession of functions undertaken by that organ. Both Gegenbaur and Haeckel especially ridiculed Dohrn for his transformation ideas.

Dohrn received honorary Doctor of Science degrees from Halle, Breslau, Oxford, and Cambridge. In 1897 he was made Honorary Member of two Russian universities (Kasan and Moscow) and became a member of the Royal Society of Naples and the Swedish Academy. Dohrn died in Germany on 26 September 1909 and is buried in Jena. While Dohrn’s annelid theory fell out of favor in the early twentieth century, recent molecular biology findings have suggested that a new look at Dohrn’s work may be in order.

Sources

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