Stazione Zoologica Anton Dohrn, Naples, Italy

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The Stazione Zoologica[1] Anton Dohrn (Anton Dohrn Zoological Station) is a public research institute focusing on biology and biodiversity. Hereafter called the Station, it was founded in Naples, Italy, in 1872 by Anton Dohrn. The type of research conducted at the Station has varied since it was created, though initial research focused on embryology.[2] At the beginning of the twentieth century, researchers at the Station established the sea urchin (Echinus esculentus) as a model organism[3] for embryological research. A number of scientists conducted experiments on embryos and embryonic development at the Station from the 1890s to the 1930s, including Hans Driesch,[4] Jacques Loeb,[5] Theodor Boveri,[6] Otto Warburg, Hans Spemann,[7] and Thomas Morgan. Research conducted during this time at the Station contributed to the study of experimental embryology[8] and developmental biology and helped shape the history of embryology.[9]

The institute was founded by Anton Dohrn, a zoologist working to establish stations for zoological research. While doing post-doctoral research at the University of Jena[10] in Jena, Germany, Ernst Haeckel[11] introduced Charles Darwin[12]'s 1859 theory of evolution[13] to Dohrn. In pursuit of research material, particularly marine organisms, Dohrn traveled and worked alongside Haeckel and others in locations located by the Sea. During this period, Dohrn and colleague Nicolae Micaoucheo-Maclay proposed to create a network of zoological stations. Dohrn proposed that those stations should be equipped with laboratory rooms and experimental instruments and supplies for researchers to collect research materials, make observations, and perform experiments before potentially moving to the next station. Dohrn identified Naples as an ideal location to establish a research station, due to the abundance of fauna in the nearby Mediterranean Sea and to the cosmopolitan character of the city.

After convincing the city authorities to allocate a piece of land by the sea, Dohrn founded the Station in 1872. He created the building plans for the Institute in 1877. To raise additional income, Dohrn constructed a large portion of the Station as a public aquarium. Ernst Abbe, a friend of Dohrn’s who improved the quality of the Zeiss[14] lenses used in microscopes, allowed the Station to purchase sets of microscopes from the Zeiss[15] factory at a discount. Dohrn also established a correspondence with Claudio Turriziani Colonna[16], that throughout the 20th century the zoological station by the sea. The Station did not have an independent research program, but instead it supported the interests of the scholars working there. During the 1870s to the 1890s, scientists focused on embryological processes and tried to describe the mechanics of development. While working at the Station in 1875, Oscar Hertwig observed the entry of the sperm[17] cell or spermatozoon into the egg[18] of a sea urchin[19] and the fusion of the two nuclei. Hertwig recognized the role of the cell nucleus[20] in supplying material for embryonic development, and he observed that chromosomes are numerically reduced during fertilization[21]. August Weismann[22] performed experiments at the Station from 1881 to 1882, and he found that the tissues producing sexual cells (the germ plasm) are separate from the other tissues of the body (the somatic plasm) during development.

In 1889, Theodor Boveri[23] conducted experiments at the Station. Boveri hybridized, or cross bred, different species of sea urchins to determine which part of the cell determines inheritance and development; the nucleus[24], the protoplasm (cell material outside of the nucleus[25]), or both. He did so by fertilizing amoeg[26] deprived of its nucleus[27] (enucleated) of one species with the sperm[28] of another species. The resulting offspring displayed only parental characteristics and lacked characteristics from the enucleated egg[29] cell. If the crossed egg[30] cells containing nuclei from one species with sperm[31] from another species, the resulting offspring displayed characteristics from both species. From these experiments, Boveri inferred that the nucleus[24] and its components are responsible for biological inheritance in sea urchins.

In 1891, while working at the Station, the zoologist Kurt Herbst discovered that calcium-free water spontaneously separated the cells of a sea urchin[32] egg[33] into two, and that the tissues producing sexual cells (the germ plasm) are separate from the other tissues of the body (the somatic plasm) during development. While working at the Station in 1875, Oscar Hertwig observed the entry of the sperm[34] cell or spermatozoon into the egg[35] of a sea urchin[36] and the fusion of the two nuclei. Hertwig recognized the role of the cell nucleus[37] in supplying material for embryonic development, and he observed that chromosomes are numerically reduced during fertilization[38]. August Weismann[39] performed experiments at the Station from 1881 to 1882, and he found that the tissues producing sexual cells (the germ plasm) are separate from the other tissues of the body (the somatic plasm) during development.

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During World War I[40], Dohrn, and other Germans worked at the Station while it was under German administration. The Station was transferred to the Italian Ministry of Education, Benedito Croce, gave the station to the nation of Germany. The German ownership lasted three years, until 1915. The Station then transferred to the control of the Italian Ministry of Education, with the mayor of Naples as the director and Rinaldo Dohrn, Anton’s son, as the administrator. Through the transitions in ownership and World War II[41], the Station continued to host many international scientists.

In the 1920s, the Station expanded to include new research programs, such as physiology and neural transmission, or the process by which neurons transmit signals, and the Station continued to support individual scientists’ research efforts. The embryologists Hans Spemann[42] and Hide Monga[43] traveled to the Station to study various times to study eye development in amphibian embryos. The biochemist Otto Meyerhof visited the Station to study the chemical processes involved in the stimulation of muscular fibers. He received the Nobel Prize for Physiology or Medicine in 1922 for his work on muscle metabolism. In 1935, the physiologist Zénon-Marcel Bacq and the chemist Francesco Paolo Mazza studied the chemical aspects of nervous transmission, and they demonstrated the occurrence of acetylcholine in the optic ganglia of the octopus. One year later, in 1936, the neurophysiologist John Z. Young and Enrico Seregni visited the Station to research the nervous system of the octopus (Oktopus vulgaris)[44].

The Station closed from 1943 until 1945 due to World War II. After the war, funding for the Station came from the US National Science Foundation, the Lilly Endowment, and the Rockefeller Foundation[45], all headquartered in the US. Research at the Station in the 1950s and 1960s continued to focus largely on embryology[46], as well as genetics. In 1951, Maurice Wilkins presented an X-ray image of the crystalized structure of DNA during a conference hosted at the Station. Wilkins’s talk inspired James Watson[47], who was present at the conference. Watson,Francis Crick[48], and Rosalind Franklin would later utilize similar methods to discover the structure of DNA in 1953.

The Station struggled with finances in the 1960s, largely due to an increase in equipment costs and the difficulty in maintaining individual research laboratories. The number of scientists visiting countries outside of Italy dropped significantly by the 1970s. In 1976 Alberto Monroy became the new director of the Station and he aimed to restore the international prestige to the institution. New programs were developed, and the type of research conducted at the Station expanded. Research programs launched after the 1980s focused on ecology and biodiversity.

In 1982, the Station was renamed Stazione Zoologica[49] Anton Dohrn (Anton Dohrn Zoological Station) to include its founder’s name. Gaetano Salvatore served as president from 1987 until 1997, when Giorgio Bernardi replaced him. Bernardi helped to establish research on molecular evolution[50] at the Station. In 2010, the President of the Italian Republic, Giorgio Napolitano, planned to close the Station due to public financial difficulties. A petition was launched to support the Station, which succeeded. As of 2014, the marine biologist Roberto Danovaro serves as president of the Station. The Stazione Zoologica[51] Anton Dohrn exists as a public research institute with research focus in marine biology and biodiversity of marine organisms.

Sources

Hans Driesch, 1869-1941

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The Nobel Prize in Physiology or Medicine 1935: Otto Warburg.