Anderson, K.L. & C. Thiery (eds.). 2006. Information for Responsible Fisheries : Libraries as Mediators : proceedings of the 31st Annual Conference: Rome, Italy, October 10 – 14, 2005. Fort Pierce, FL: International Association of Aquatic and Marine Science Libraries and Information Centers.

THE STAZIONE ZOOLOGICA ANTON DOHRN AS A PLACE FOR THE CIRCULATION OF SCIENTIFIC IDEAS: VISION AND MANAGEMENT

Christiane Groeben
History of Science Unit and Historical Archives
Stazione Zoologica Anton Dohrn, Villa Comunale
Naples, Italy

ABSTRACT: In 1872 the German zoologist Anton Dohrn (1840-1909) founded at Naples a Zoological Station, the first independent international research facility for marine biology. Dohrn proved to be an able manager of science. He created an 'organism' which soon became a clearinghouse for methods and a privileged place for the circulation of ideas. The SZN has offered hospitality to guest investigators from different parts of the world. As a true 'hotel of science' it favored communication and the exchange of ideas. It also developed vectors for long distance communication such as journals, monographs, animal supply, and international meetings. This paper will briefly trace the history of the Naples Station, showing that the turnover from a German private to an Italian public institute went smoothly thanks to the offices of Anton Dohrn's son Reinhard, as did the change from guest research to in-house research due to Gaetano Salvatore's far reaching vision during the 1980s and 90s. It will then outline some of the factors that may have contributed to the 'creative atmosphere', experienced by many investigators, which has made their permanence at the Stazione Zoologica special, memorable and important for their career.

Introduction

Research institutes are intricate systems of material and intellectual structures; they have their individual history and tradition which result from the interaction of people, ideas, resources and facilities. Research Institutes are places where the more or less controlled input of resources and ideas interacts with in-house conditions in a creative process which often makes the output exceed initial expectations. The future of each research institute depends on the balance of input and output, of growth and adaptation or rather on the ability of creating a sustainable tradition.

The Naples Zoological Station [Stazione Zoologica di Napoli][1] may be considered one of the most outstanding examples for this theory. The following paper will trace the unusual history of its foundation, the vision and managerial gifts of its founder and the sustainable tradition successfully implemented by Anton Dohrn.[2]

From Helgoland via Scotland to Naples (1865-1873): the vision

In September 1873, the Naples Zoological Station started its scientific activity. Wilhelm von Waldeyer-Hartz (1846-1921), anatomist from Strasburg, entered the labs as number 1 of the endless list of guest investigators, diligently compiled over the years by the respective secretaries. The first step of Anton Dohrn's wish to reorganize science in the wake of Darwinism had been done.[3] An eight-year field trip had come to an end. Each of the five stopovers during that period had contributed something to the future research facility at Naples.

Helgoland – the idea

It all had started in August 1865 when a group of 5 scientists arrived on the British island of Helgoland in the Northern Sea.[4] Group leader was Ernst Haeckel (1834-1919). The rest of the group consisted of Richard Greef (1829-1892), later professor at Marburg, Pietro Marchi from Florence (born in 1833), Matthijs Salverda (1840-1886) from Delft and Anton Dohrn (1840-1909). Dohrn was going to stay for six weeks (18 August – 2 October 1865).[5] He had taken along several books[6] as well as 2 microscopes, 1 Brücke magnifier and nets of different quality,[7] and also "Solid winter clothing, macintosh, incredibly beautiful hats for all weathers."[8] Two things happened in Helgoland that are of interest here: first, Anton Dohrn switched from entomology to marine organisms,

---

[1] Since 1982 the Naples Station is called after its founder: *Stazione Zoologica Anton Dohrn di Napoli.* For an overview of the history of the Naples Station see [Fantini, 2000 #340]

[2] Theodor Heuss' 1940 biography of Anton Dohrn is still unrivalled [Heuss, 1991 #21]; on Dohrn, the manager and scientist see also [Groeben, 1985 #245]; [Ghiselin, 1994 #227]

[3] See in this context Dohrn's programmatical essay on the state of biology and the foundation of zoological stations [DOHRN, 1872 #246]

[4] Helgoland had attracted many naturalists ever since in the 1830s Christian Gottfried EHRENBERG (1835), Albert von KOELLIKER and Johannes MÜLLER (both in 1840) had successfully collected there [Florey, 1995 #528]. In 1890 England ceded Helgoland to the German Empire in exchange for Witu and Zanzibar. In 1892 the "Biologische Anstalt Helgoland" was opened. [Florey, 1995 #528] [ZISSLER, 1995 #442]

[5] [Müller, 1976 #687] p. 77

[6] In a letter to Haeckel, dated Stettin 5. Aug. [18] 65 Dohrn mentions the following books: "Vogt, zoolog. Briefe. Bronn, Class. & Ordnung d. Thierreichs I & II. Leydig, Histologie, Siebold & Stannius, Burmeister, zoonomische Briefe, und Carl Vogt, Nordcaps Fahrt". ASZN [Historical Archives Stazione Zoologica di Napoli]: Bc.110. He then asks whether he should also take along GEGENBAUR's Heteropods and MÜLLER and TROSCHEl's work on "Anteriden".

[7] At that time Dohrn owned a „grosses Microscop von Zeiss, ein kleines von Schick, und eine Stativ Lupe nach Brücke". Letter to HAECKEL, May 31, 1865 from Berlin. ASZN: Bc.101.

[8] ASZN: Bc.110.

working on crustaceans, and, second, the idea of a Zoological Station was born. In fact, in Haeckel's notes on the excursion we find the following remark: "First idea of a 'Zoological Station'!! (jar case with 4 compartments). Dohrn".[9]

Hamburg: meeting Lloyd

The next stations of Dohrn's field trip were the Hamburg Zoological Garden and the bay of Kiel (1866) where he worked for several weeks on the development of the crayfish. At Hamburg Dohrn met with the English technician William Alford Lloyd (1815-1880)[10] responsible for the Aquarium built by him in 1865 - an interesting aspect of how to combine lab space with seawater and animal supply.[11] This experience will come in nicely four years later in Dohrn's life when he asked Lloyd to build an aquarium for him in Naples.

Millport: portable Aquarium

Dohrn spent the following two summers (1867, 1868) in Scotland at Millport[12], near Glasgow, to work on the development of Pycnogonids. Dohrn and his host, David Robertson (1806-1896),[13] came up with something certainly innovative: they constructed a portable aquarium of 3 tanks (90 x 60 x 35 cm), easy to take to pieces, although a bit heavy to carry along: 100 kg. Organisms to be observed are put in tank a; overflow from b guarantees circulation and oxygen input, overflow from a is collected in tank c; every 8 hours, water is taken from c (through faucet f) and poured again into b.[14] Tanks b and c and the floor and side walls of tank a were of slate, the main walls of tank a of thick glass panes. This solved the problem of running seawater and oxygen input necessary to keep the daily hauls alive. During the winter 1868-69, at Messina, Dohrn would obtain promising results from this new kind of equipment. He could confirm through observation that the transparent crab Phyllosoma was actually the larva of Palinurus.[15]

---

[9] „Erste Idee der ‚Zoologischen Station'!! (Gläser-Kiste mit 4 Fächern). Dohrn". MÜLLER, I. 1976. p.77 [USCHMANN, 1959 #537] p.65

[10] Since 1853 the English engineer W.A. Lloyd had experimented with solving the problem of adequate seawater supply for aquaria. [Lloyd, 1874 #523] p. 18. His first successful large-scale enterprise was the Hamburg Aquarium (opened in 1863), followed by the Crystal Palace Aquarium in 1870 and the Naples Aquarium (opened on 26 January 1874). By 1855 Lloyd also owned an "Aquarium Warehouse" at St. John's Street in London for private and public aquaria; three years later two adjacent shops where added on Portland Road [Rehbock, 1980 #798] p. 532 and Fig.1.

[11] [Kühl, 1964 #805]

[12] Albert von KOELLIKER had already worked there in 1864 on ….. [Koelliker, 1864 #1105]

[13] David Robertson was a successful owner of a China shop in Glasgow harbor. From his savings he could build a summerhouse in Great Cumbrai Isle where he welcomed guests and shared with them his passion for collecting and studying marine organisms. In 1885 he founded the "Millport Biological Station".

[14] Sketch from a letter from Anton Dohrn to Adolf Stahr, 3 September 1868, Millport. ASZN: Ba.1237.

[15] [Dohrn, 1870 #541]

Messina: network of Zoological Stations

The second to last station of Dohrn's 8-year field trip was Messina where he arrived in October 1868 straight from Scotland. There he happened to meet Nikolai Micloucho Maclay (1846-1888) just back from a field trip to the Canary Islands (1866-1867) with his teacher Ernst Haeckel (1834-1919).[16] Maclay and Dohrn, the "Prussian and the Russian Sirs"[17] - as they were called by the local fishermen - shared the flat, put up a makeshift lab and discussed all the problems connected with obtaining serious research results away from home. In the end – they concluded - the efforts never seemed to match the results. By December Dohrn and Maclay had developed a solution as we can learn from a letter to Charles Darwin:[18]

Having stayed now several times on the seashore for zoological studies, I have found how difficult it is to study Embryology without an Aquarium. This want has suggested to me the idea of not only founding Aquariums, but also Zoological Stations or Laboratories in different parts of our European coasts.[19] Such a Station should consist of a little house of perhaps four rooms, an Aquarium connected with the sea and the house, - the Aquarium of perhaps 60 feet in Cubus, where one might have streaming water, - a boat for dredging work, dredges, nets, ropes, - in short all that is necessary for a marine Zoologist. Besides glasses, larger tumblers, bottles; desired materials include acids and other chemical objects, and lastly a library.

And a couple of weeks later, back in Jena, he states in another letter to Darwin: "I have got that idea of the Zoological Stations into my head, and I think I'll not get rid of it, but by building at least one."[20] Which is what he did. Dohrn set out to organize research in a way that would answer the needs of modern – i.e. post-Darwinian – biology.

Naples: the site

After having visited the Berlin Aquarium, opened in May 1869 and directed by Alfred Brehm (1829-1884), Dohrn decided that an aquarium open to the public would be the solution to his financial problems: the entrance fees were going to finance research in the upstairs laboratories. He therefore transferred the Zoological Station from Messina to Naples. One should keep in mind that Naples had been the capital of the kingdom of the two Sicily's, it had 500.000 inhabitants and 40.000 tourists per year, while Rome at that time had only about 50.000 inhabitants. The field trip had come to an end.

---

[16] For Maclay's relation to Dohrn see[Müller, 1980 #387]. In 1878 Maclay founded the Zoological Station at Watson's Bay, near Sydney. For many years he lived in New Guinea, studying the Papua population and fighting for their protection. The Maclay Coast in the northwest of the Island is named after him. For more information on Maclay see [Putilov, 1982 #1120];

[17] AD an Lewald und Stahr, 7.11.1868, ASZN:Ba.1242.

[18] [Groeben, 1982 #15] p.25-26

[19] Dohrn was thinking of stations at Venice, Gibraltar, the Cape Verde Islands, Nice, Ceylon, Australia, the Cape of Good Hope and Suez. [Groeben, 1982 #15] p. 91 n16. In the end a net of such stations – just like train stations - was supposed to cover the globe.

[20] [Groeben, 1982 #15] p.3, 13.1.1870

What Dohrn had in mind was to offer to the scientific world well equipped working facilities at the seashore without interfering in any way in the use guest investigators made of these facilities. He supplied what they needed to solve their problems, but their results were their own. 'Freedom of research' was what he most strongly urged. To reach this goal Dohrn had to optimize his resources in order to make his means match the needs.

The Naples Zoological Station : the management

Good bargains

Dohrn has been defined an able manager of science.[21] He seems to have had an unusual intuition about what he needed to offer for what he wanted to obtain. This was evident from the very start when he was able to convince the Neapolitan authorities to grant him free of charge a plot of land in one of the most beautiful sites of the city, in the Royal park right on the sea shore. In exchange he promised to erect there a representative building. His father, as well as friends and collaborators helped to cover the costs. Construction started in March 1872. The project was Dohrn's: he knew exactly what he needed where to make it all work: sea water tanks, pumps and machines in the basement, the public aquarium on the entrance floor, labs and a room dedicated to leisure and music on the first floor, more labs and storerooms on the second floor. There was lab space for 20 scientists in the whole first building.

Dohrn aptly used his contacts for the benefit of the Station. One example is his friendship with Ernst Abbe (1840-1905). After Abbe had entered the Zeiss Company, the Naples Station received Zeiss instruments at a high discount. In exchange Zeiss had the chance to present its products to an international community of potential clients.

The so-called "table system" may also be considered a perfect "bargain". While looking for sources of regular income to cover running costs Dohrn came up with an idea that seems normal today but has been innovative in his times: he decided to rent out bench space to Universities, scientific institutions or governments. In exchange the contract partners had the right to send one scientist for one year to Naples where he would find everything free: lab space, daily fresh research material, well equipped labs, an excellent Library, assistance from a well trained staff. A service was sold and the client could expect it to be good. Up to then work away from home was based either on a courtesy level (you would share resources with friends or colleagues) or on an academic level (professor teaches students). This so-called "Table-system" worked extremely well. Dohrn had to add a new wing in 1885 and in 1905.When he died in 1909 more than 2200 scientists had worked at Naples at 50 to 60 such tables.

[21] [De Masi, 1987 #159]

Sharing resources

Dohrn, the scientist, should be defined, as Michael Ghiselin has shown, a "comparative anatomist with a functional outlook".[22] Dohrn applied the same "functional outlook" to the Zoological Station, shaping it as a co-adapted system of independent parts where labor was both divided and combined within the organization, optimizing resources. This can well be seen in Dohrn's assignment of tasks to his collaborators. Guest investigators had highest priority at all times, their needs and wishes came first. But at the same time each of the assistants and some of the technical staff also had several other tasks and commitments.[23] By 1894 he had a scientific staff of 8 and a total of 40 persons on his payroll. Dohrn also hired two professional artists, Comingio Merculiano (1845-1915) and Vincenzo Serino (1876-1945), for true to nature scientific illustrations. Dohrn soon increased his own "fleet"; the Italian Navy gave him a Scaphander diving apparatus for on-site research.

Based on daily experience, tools and instruments were constantly improved by Dohrn's staff and in collaboration with outside firms such as Zeiss in Jena for microscopes. Jung in Heidelberg for microtomes or Merck in Darmstadt for dyes and other chemicals. Staining and section cutting methods were collected, tested and improved in Naples. In 1910, Theodor Boveri summarized the result of Dohrn's efforts in the following words:

> Not only have personal relations and friendships among scientists from different countries started there, not only have views, ways of research and methods passed directly from one to the other, but all those who have worked at the Station have also left there, more or less consciously, gifts from their scientific property which have slowly but continuously formed a stock of inestimable value for the benefit of those who would come next. They have thus imperceptibly contributed to the continuous development of the Station.[24]

Outsourcing

Dohrn did not limit himself to creating perfect in-house research conditions; he also had a broader view of the needs of his time and tried to find an answer. With the three serials published by the Naples Stations Dohrn, e.g., answered multiple needs. The in-house journal Mittheilungen aus der Zoologischen Station zu Neapel[25] offered staff and guest investigators an opportunity for quick publication of their results. The series of monographs Fauna and Flora of the Gulf of Naples[26] was intended as an inventory of the Mediterranean. Dohrn often hired the monographers as assistants in order to guarantee them easy access to research material and relief from worries about how to make a living.

---

[22] [Ghiselin, 2000 #290] p.273

[23] ASZN:La.125.24.

[24] [Boveri, 1910 #154] p. 40-41

[25] Renamed after WWI: *Pubblicazioni della Stazione Zoologica di Napol*i; continued as *Marine Ecology* (1979-) and *History and Philosophy of the Life Sciences* (1978-)

[26] For a complete list of volumes 1-39 (1880-1970) see [Groeben, 1975 #278] p.64-68; last volume published in 1982 (vol. 40[Schmekel, 1982 #1119]

And lastly, the reference journal Zoologischer Jahresbericht guaranteed fast and precise information and reviews of the research literature of the previous year. Experts from all over the world were responsible for the various sections, creating an important network of outside collaborators. The reviewed material was then put into the Library collections, making the Station's Library an unrivalled facility for marine biology and related fields in Europe.

As an answer to the growing need of preserved marine organisms for museums, courses and private collections Dohrn started to sell such collections at a commercial level to clients from all over the world. This was mainly due to the unusual skills of Salvatore Lo Bianco (1860-1910). He had started his career with Dohrn at the age of 14, six years later Dohrn nominated him head of the department of preservation. Lo Bianco, Neapolitan with Sicilian origins, soon brought preservation methods to unrivalled perfection. An independent "Export Department" was successfully established in 1877.[27] His methods were kept secret for many years for – unnecessary - fear of competition.[28]

Dohrn implemented changes or improvements only when he was sure of the need and that the answer would not destroy the delicate, but perfect balance of the Station's organization and purpose. With its solid administrative and financial structure the Station was always ready to receive new input, to absorb it and to turn it into a new output. Through the various levels of networks (guest investigators, collaborators in publications, addressees of research material from Naples) Dohrn created an international awareness of the Naples Station that was going to serve as a feedback in difficult times such as the two World Wars[29] or 20 years of commissary administration.

Landmarks

There have been two moments in history that did affect the legal/administrative status of the Zoological Station, but did non-affect its inner essence. In 1923 the Station became an Italian "Ente morale" with Reinhard Dohrn (1880-1962), Anton's son and successor, as director and an Italian board of Administration. It took all of Reinhard Dohrn's diplomatic skill to bring the Station back to pre-war levels as to scientific standard and international participation. However, the management started by Anton Dohrn went on much in the same way.

Completely different were the consequences of the second landmark in the Station's history which lasted more than 20 years until the nomination of Gaetano Salvatore (1932-1997) - seen here next to Rita Levi Montalcini - as President of the Stazione Zoologica in 1987. In 1982 the Station had become a non-profit public institution under the direct supervision of the Italian Ministry of Scientific Research. It needed Gaetano Salvatore's

[27] [Groeben, 2002 #548]
[28] [Lo Bianco, 1890 #213]
[29] [Gemelli, 2002 #810]

vision and drive to fill the new frame with new life. His vision was to turn the Zoological Station from a guest research laboratory to a research laboratory with guests and to raise the standard of the Station's scientific output again to international levels. He succeeded in doing so in the ten years of his presidency. Today, the internationality is no longer based on the table system, but rather on individual collaboration and on institutional agreements. The change from a resource centre to in-house research also granted the freedom to start weekly seminars and teaching activities for graduate students and post docs. This summer the 9th international summer school has taken place in our Ischia lab.

Factors of success

132 year old and still around – there must be some factors envisioned and activated by Anton Dohrn that have contributed to the Station's "survival", or rather that have allowed for continuity in development.

In 1897, asked for an opinion on the future of the Naples Station, the Italian zoologist Giuseppe Jatta (1860-1903) listed three factors as being essential for keeping the Zoological Station going:[30] (1) internationality, (2) independence from institutionalized academia, (3) a solid financial base.

He seems to have been right. But it also needed a good portion of "family spirit" on behalf of staff and guests, a feeling of being part of this 'organism' where opportunities for individual research also meant contributing to its success. Many factors have contributed to the 'creative atmosphere' experienced by many, many guest investigators and collaborators of the Zoological Station.[31] [At Naples scientists could experience interdisciplinary research. They met at different levels of their career; there were no generation gaps. They could also enjoy the freedom from teaching responsibilities and family ties and experience the stimulating effect of cross-fertilization of the "two cultures".

For Anton Dohrn arts and science were still the two sides of – one – human culture. This is symbolized in his initial project to have on the main floor of his research lab one big room dedicated to music and leisure and another one to research. Until recently music could never be heard at the Stazione Zoologica because the Frescoe Room, decorated in 1873 by Hans von Marées (1837-1887) and Adolf von Hildebrand (1847-1921), had to house the Library.[32]

---

[30] [Jatta, 1897 #1106]

[31] See in particular the statistics of the sociological study published by O. SKALOVÀ on behalf of UNESCO in 1975. The results are based on more than 250 questionnaires returned by as many past guest investigators at the Stazione Zoologica. [Skalova', 1975 #341]

[32] [Groeben, 2000 #239] [Groeben, 1995 #23]

However, as perfect as working conditions may be, one always needs a counterbalancing factor, something to put the investigating mind temporarily slightly off-track, give it a chance to rest, to roam around, and to gain strength and speed again and again. At Naples this necessary counterbalancing factor consists in having natural beauties and European culture right on your doorstep. Different dimensions of space (nature), mind (art) and time (archaeology) can be experienced at low cost of time.

Conclusion

Let me close with one striking example of what this "creative atmosphere" can do: In May 1951 the Naples Station had organized a Symposium on the "Submicroscopical Structure of protoplasm". Among the attendees there was Jim Watson (born 1928), slightly fed up among all these embryologists after several days as a reader in the Library of the Naples Station. This is how he has described his expectations:
«No one was expected to prepare an elaborate talk for Italian meetings like this one. Such gatherings routinely brought together a small number of invited guests who did not understand Italian and a large number of Italians, almost none of whom understood rapidly spoken English [...] the high point of each meeting was the day-long excursion to some scenic house or temple. Thus there was seldom chance for anything but banal remarks». (The double Helix, p.30)

He became all excited when Maurice Wilkins (1916-) lectured on x-ray diffraction and showed some slides, because he suddenly knew that genes could crystallize and hence must have a regular structure. While strolling in front of the splendid Greek temples in Paestum, south of Naples, Wilkins and Watson went on discussing this possibility. Something magic happened and shortly after that Watson and Crick had found the Double Helix. That the meeting with Wilkins at Naples was crucial has been acknowledged by Watson several times.[33]

During all these years, twenty Nobel Laureates have worked at the Naples Station. As far as we know at the moment, for three of them at least, namely Thomas Hunt Morgan, Otto Warburg and Jim Watson, the 'Naples experience' marked a turn in their scientific career. Although, we recently started to have our doubts whether it had actually been Wilkin's slides and the gorgeous temples of Paestum to put Watson on the right track, and not rather this structure that he could see every day in the east wing of the Naples Station.

[33] [Watson, 1968 #1118] p. 32-33