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John Dolan. On Edouard Claparède and Johannes Lachmann (Clap & Lach) and their “Etudes sur les Infusoires et les Rhizopodes”. European Journal of Protistology, 2021, pp.125822. 10.1016/j.ejop.2021.125822 . hal-03323415

HAL Id: hal-03323415

<https://hal.science/hal-03323415>

Submitted on 31 Aug 2021

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Dolan, J.R. 2021. On Edouard Claparède and Johannes Lachmann (Clap & Lach) and their "Etudes sur les Infusoires et les Rhizopodes", *European Journal of Protistology*, <https://doi.org/10.1016/j.ejop.2021.125822>.

On Edouard Claparède and Johannes Lachmann (Clap & Lach) and their "*Etudes sur les Infusoires et les Rhizopodes*"

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Abstract

Accounts are given of the lives and careers of Edouard Claparède (1832-1871) and Johannes Lachmann (1832-1860), the authors of the landmark work of 19th century protistology "*Etudes sur les Infusoires et les Rhizopodes*", published in 3 parts in 1859, 1860 and 1861. Accounts are also given on the origin of the monograph, the relationship of Claparède and Lachmann with Ernst Haeckel, and Claparède's role as a promoter of Darwin's theories. Suggestions as to how to properly cite the monograph of Claparède and Lachmann are provided, as well as a supplementary file listing the protist species currently accepted as having been first described in their monograph.

Keywords: History of Protistology, Ciliates, Rhizaria, Dinoflagellates, Haeckel, Darwin

Introduction

Have you run across a species name noted as "Clap & Lach" and wondered who they were? They were Edouard Claparède (1832-1871) and Johannes Lachmann (1832-1860). They authored a massive tome, "*Etudes sur les Infusoires et les Rhizopodes*" of some 773 pages and 37 plates, containing about 200 protist species descriptions, most described as new. It was published over 4 years (1858-1861) in 3 separate volumes of a Swiss journal, *Mémoires de l'Institut National Genevois*, and also issued in a single large volume in 1868. Because of this major work, Claparède and Lachmann have been given some attention in histories of protistology (e.g., Saville Kent 1880-1881, Cole 1926, Corliss 1978). However, these accounts included few details of their lives and careers and neglect the origins of their landmark work on protists. Here though an attempt is made to shine a light on Claparède and Lachmann (Fig. 1) and their "*Etudes*". First, biographical sketches of both men will be given. These will include little known information on their relationships with their contemporary, Ernst Haeckel and Claparède's role in defending Darwin's views. A short description of the contents and the confusing publication history of the "*Etudes*" will then be provided along with evidence of the confusion in the protistology literature as to how to cite it. A supplementary file is provided which lists the species currently

credited to Claparède and Lachmann's "*Etudes*", along with the names as given by them, and page locations in "*Etudes*" (see supplementary file).

Fig. 1. Edouard Claparède at about age 34 and Johannes Lachmann at about 27. Images from Wikimedia.

Edouard Claparède and Johannes Lachmann

There is a good deal of information available on Edouard Claparède. Several articles of various lengths were published shortly after his death (Anon 1871, De Saussure 1871, Lankester 1871, Monnier 1871, Strickler 1871, Vaucher 1871) or in later years (Vogt 1873, Yung 1907, Roussy de Sales 1967). In contrast, very little is available on Johannes Lachmann. The only information we have is from a short 'memorium' by Claparède in the "*Etudes*" (Claparède 1861a), two brief death notices (Anon 1860a,b), and a short entry in a dictionary of German Botanists (Bohmon 1977). While admittedly fragmentary, and sometimes containing obvious errors, the articles cited above form the basis of the following biographical accounts. Some additional information was obtained from 'Lettres de René-Edouard Claparède' (Morsier 1971).

Jean-Louis-René-Antoine-Edouard Claparède was born on April 24, 1832 into a protestant family in Chancey, a Swiss village near the French border, not far from Geneva. His ancestors had fled the south of France during a period of religious persecution. His father was a minister. After attending '*Gymnase*' in Geneva he took classes at the *Académie* in Geneva from 1850 to 1852. He graduated with a Bachelor's degree and then in 1853 went to the University of Berlin ostensibly to study to be a medical doctor. Once in Berlin, Claparède joined the group of

medical students studying under the renowned physiologist and comparative anatomist Johannes Müller and among them was Johannes Lachmann. The two were the same age and became close friends. With regard to Lachmann, we know that he was from Braunschweig (Brunswick; now in Germany), born August 1, 1832, and that his father was a medical doctor. We do not know when Lachmann joined Müller's group, only that he was awarded his medical degree in 1855, two years before Claparède. When Claparède arrived in Berlin, Lachmann was already an established member of Müller's group. He had even traveled to Trieste with Müller on a collecting expedition in 1852.

In Müller's group, studies of natural history, rather than strictly medical studies appeared to be the rule. Lachmann's thesis work was on the structure of root nodules in legumes and was published in Müller's journal (*Archiv für Anatomie und Physiologie*) in 1857 (Lachmann 1857a). Claparède's thesis was on a freshwater bivalve, also published in Müller's journal (Claparède 1857). However, however the first publications of both Claparède and Lachmann concerned protists. Claparède's was on the freshwater rhizopod *Actinophrys* (Claparède 1854). Lachmann's first paper was on food processing in vorticellid ciliates (Lachmann 1856). Lachmann's paper received international attention. A version in English was published in the *Annals and Magazine of Natural History* (Lachmann 1857b).

Their bent toward natural history, rather than experimental physiology, is perhaps what motivated Müller to invite both Claparède and Lachmann to accompany him on a trip to Norway in the summer of 1855. According to Claparède's letters (Morseir 1971), the expedition was originally planned to sample in Messina, Italy and the destination was changed to Bergen, Norway due to an outbreak of cholera in Italy. They arrived in Bergen in early August 1855. In early September Müller left, as he did not find the echinoderm larvae he was seeking. They nearly left with Müller but he urged them to stay as they were having success in 'fishing for the infinitely small'. Lucky it was that they did not leave with Müller as his return trip ended dramatically in a shipwreck that Müller survived but the one of the students traveling with him did not. Claparède and Lachmann spent the months of September and October sampling protists, mostly of the marine plankton, traveling around to various localities on the coast, happy to be working on their own rather than under watchful eyes of Müller. They stayed in Norway until late October. The lasting importance of their work in the Bergen area over the three months spent there becomes evident in examining the species described in their "*Etudes*". The majority of forms described as new were found and observed during their stay in Norway (66 of 111 'new' species and 42 still considered today as valid first descriptions). One cannot help but wonder what they would have found had they gone to Messina rather than Bergen.

Claparède and Lachmann returned to Berlin in early November. It was soon after their return to Berlin that they finished work on their first protist monograph. It was created in response to a tempting challenge from the *Académie des Sciences* (Paris). On January 30th of 1854 the *Académie* announced the subject of the competition for the *Grand Prix des Sciences Physiques* for the year 1856 (Anon.

1854). The challenge was to submit a rigorous and methodical study of life-history stages and reproduction of infusoria, i.e. Ehrenberg's "Polygastrica." The questions to be addressed included determining the natural affinities of the major groups of infusoria as some seemed to be more plant-like and others clearly animal-like. The facts established by the study were to be illustrated using figures as much as possible. The prize was a gold medal valued at 3,000 francs, about 10,000 Euros in today's currency. The documents were to be submitted to the *Academie* by January 1st 1856.

Claparède and Lachmann submitted their tome "*Sur La Reproduction des Infusoires*" in December of 1855. It consisted of 302 pages and 11 plates containing 192 figures. Given that the prize subject was announced in early 1854, it is likely they had begun work on the monograph well before their stay in Norway that ended in early November of 1855. However, many observations recorded during their stay in Norway appear in the monograph. For example, their studies of dinoflagellates were based largely on observations made on marine species while in Bergen. Their observations led them to state that many forms appeared to contain ingested food items (Fig. 2), suggesting that dinoflagellates were more animal-like than plant-like.

Fig. 2. Depictions of dinoflagellates, known as "Peridiniens", published in 1861. The illustrations were originally part of the memoir submitted to the *Academie des Sciences* in December of 1855 to be considered for the *Grand Prix des Sciences Physiques* of 1856. The text described colored bodies in the cells which appeared to be ingested food items suggesting that these forms were more animal-like than plant-like, responding to one of the topics the prize candidates were to address.

While the prize was to be awarded in early 1856, just like today, the review process delayed a final decision until the following year. On February 8th, the announcement was made that 3 studies had been submitted by the deadline and evaluated by a committee (which differed from the composition of the committee originally announced). The *Grand Prix* was to be shared by the authors of two of the studies, whose conclusions largely agreed with one another: the one by Claparède and Lachmann and another one by Nicolas Lieberkühn (Anon. 1858a). The Grand Prix was an important award and news of the identity of the prizewinners was distributed widely. It was reported on by newspapers in France (e.g. Anon 1858b,c) with one reprinting entirely the reviewer's report (Anon. 1858d), in Germany (Anon. 1858e) and in Austria (Anon 1858f). However, nowhere was there any mention of how the prize, a gold medal, was to be split in two!

The monograph they finished in 1855 would not be published until 1861, a year after the death of Johannes Lachmann. It was published as the third and last part of their "*Etudes*". They were given permission to publish it by the Academy but with the stipulation that it be published as submitted in 1855. The other prize-winning work, that of Lieberkühn, who was a colleague of Claparède and Lachmann in Müller's group, was entirely in Latin and apparently was never published. He went on to become an expert on sponges (e.g. Lieberkühn 1864, 1867).

It bears noting that Claparède and Lachmann were quite young when they won (albeit shared) this prestigious prize. Both were but 26 years old, while Lieberkühn was 36. By the time the prize was awarded, Johannes Lachmann had taken a faculty position, at the Royal Institute of Agriculture, Poppelsdorf, in 1857. This was the first steady job he was offered, and was spurred by his recent marriage according to Claparède's memorium on Lachmann (Claparède 1861a and see also the following section). Meanwhile Edouard Claparède had returned to Geneva and married in 1860. His former teacher obtained for him a teaching post at the Academy in Geneva. Lachmann died on July 7, 1860 having not quite reached his 28th birthday. He died, according to Haeckel's letters, of some sort of blood infection following a burst boil. He left behind a widow and two small children.

Claparède turned his attention to a variety of invertebrate groups following the 1861 publication of the last part of the "*Etudes*". Claparède was of renowned perpetual ill health and died in 1871, shortly after his 39th birthday, likely of tuberculosis. Like Lachmann, he left behind a widow and two small children. Thus, both Lachmann and Claparède died remarkably young but left behind a landmark work of protistology, the "*Etudes*". Before leaving historical considerations to focus on the "*Etudes*", a few words on two neglected topics are warranted: the close ties of Claparède and Lachmann with Ernst Haeckel and the Claparède's role as a defender of Darwin.

Lachmann and Haeckel and Claparède

The group studying under the tutelage of Johannes Müller in Berlin included not only Lachmann and Claparède, but among many others, Ernst Haeckel from 1854 to 1857. From Haeckel's letters (available at <https://haeckel-briefwechsel-projekt.uni-jena.de>) one learns that he first met Lachmann and other students during a visit to Berlin in 1853 before joining Müller's group. Both Lachmann and Claparède became life-long friends of Haeckel and his family. Lachmann especially appears to have been close to Haeckel. They apparently vied for the affections of the same young woman in 1856, Luiza Passow, one of the daughters of another Professor at the University. Lachmann won out, with Haeckel graciously conceding defeat (June 8, 1856 letter). Haeckel made his first sampling trip to the Mediterranean in the fall of 1856 and in preparation asked Lachmann for advice. Lachmann had collected samples from Trieste, and spent two months sampling in Norway with Claparède. Haeckel asked what equipment he should take with him, which microscope, and how to sample (July 30, 1856 letter). According to Claparède's letters, on his way to Nice, Haeckel stopped and visited Claparède and his parents and brother in Geneva (Morsier 1971). Haeckel's subsequent success in sampling in Villefranche was likely a key occurrence in his life. It was during his visit to Nice and Villefranche that he first saw radiolaria alive and, on the advice of Müller, decided to study them (Dolan 2019). When Haeckel defended his thesis in 1857, Christian Gottfried Ehrenberg presided and Haeckel's opponents were his friends Johannes Lachmann, Edouard Claparède and Ernst Weiss (March 7, 1917 letter). Two years later Haeckel heeded Müller's advice and traveled to Messina to study radiolaria (Richards 2009).

In 1864, while on a hiking trip in the Alps, Haeckel injured his foot and then spent several days recuperating at Claparède's home in Geneva (13 September 1864 letter). Many years later Haeckel wrote to Darwin boasting of his friend Claparède's ardent defense of the "*The Origin of Species*" (Darwin Correspondence Project, "Letter no. 4646"). Haeckel, his parents and his brother remained in contact with both Lachmann and Claparède over the years as well with their widows after each passed away. It is in the realm of speculation to posit that Haeckel's work on protists, especially radiolaria was due in some small part to the influences of Lachmann and Claparède. It is clear, however, that they were protistologists in Müller's group when Haeckel joined them and that they became close friends of his.

Claparède and Darwin

Edouard Claparède is credited as the first French-speaking proponent of Darwin's theories as presented in his "*The Origin of Species*" (Monnier 1871). He wrote a detailed distillation of Darwin's theories published in two parts in 1861 (Claparède 1861b,c), a substantial review totaling 67 pages. He sent copies to Darwin who replied thusly in April of 1862 (Darwin Correspondence Project, "Letter no. 4371")

Dear Sir

I thank you sincerely for sending me your excellent Review & for the generous & most kind manner in which you have spoken of my views. I have read a great many critiques & abstracts of my Book; but I cannot remember one written with so much vigour & clearness & with so full an appreciation of the bearing of all the leading points. It is admirably done; & could have been so done only by one who entered on the subject with spirit, as well as with knowledge. I have been particularly struck by the eloquence of the latter portion of your article. You will have helped much in spreading in France sound views (as I hope & believe they are) on the descent and modification of species; & I have been told that my views were more unpopular in France even than in England; in Germany naturalists are beginning with some rapidity to adopt them.

*Pray accept my sincere thanks & respects & believe me Dear Sir / Yours
very faithfully*

About a year later, Darwin wrote to George Bentham on the many reviews his book had received (Darwin Correspondence Project, "Letter no. 4100") saying that few reviews were worth noting but singling out the Claparède review, stating

"There is a favourable & long Review in Revue Germanique, which is important from coming from so good observer, as Claparede."

Claparède is also credited with the Darwinian quote *"Il vaut mieux être un singe perfectionnée qu'un Adam dégénéré"* with the version in English as "It is better to be a perfect ape than a degenerate Adam" (Wood 1893). If in England during Darwin's time, Thomas Henry Huxley could be thought of as "Darwin's Bulldog", perhaps Edouard Claparède could be considered "Darwin's St. Bernard", rescuing him from the attacks of both the religious and the followers of Lamarck in Switzerland and France.

Etudes sur les Infusoires et les Rhizopodes

The "*Etudes sur les Infusoires et les Rhizopodes*" is one of the fundamental works of 19th century protistology. It followed Dujardin's 1841 "*Histoire naturelle des zoophytes: Infusoires, comprenant la physiologie et la classification de ces animaux, et la manière de les étudier à l'aide du microscope*" and its predecessor Ehrenberg's 1838 "*Die Infusionsthierchen als vollkommene Organismen. Ein Blick in das tiefere organische Leben der Natur*". While Dujardin's monograph was critical of Ehrenberg's work, Claparède and Lachmann's *Etudes* was critical of both Ehrenberg and Dujardin. The enduring importance of the *Etudes* likely lies in the contributions it made to knowledge of marine forms which had been previously neglected (Saville Kent 1880-1882), as well as detailed accounts of protist life histories (Cole 1926). Of the many species described as new in the

Etudes, most of the species currently accepted as having been first described in the *Etudes* are marine (see supplemental file).

In the preface to the first part of the "*Etudes*", dated January 1858, Claparède states (without explanation) that, sadly, Lachmann had no part in writing the first two parts of the 3-part work and participated only in writing the third part which, as we know, dated back to 1855. Nonetheless, in his text, Claparède repeatedly cites Lachmann's observations and sketches, from both their time in Norway and sampling in the environs of Berlin, as the basis of many species descriptions given in the first two parts. For example, in the first part, *Tintinnus ventricosa* is said to have been found in the North Sea by Lachmann, and in the second part *Loxophyllum armatum* is said to have been found by Lachmann from sampling peat near Berlin. Such contributions likely justified a co-authorship.

The first two parts are actually one single work published in two separate volumes, the first in 1858 and the second in 1859, of the *Mémoires de l'Institut National Genevois*. As the two do not stand alone, publication in two volumes was quite possibly due to a page limit of a volume. The parts one and two total 482 pages plus the plates. The preceding 1857 volume of the *Mémoires de l'Institut National Genevois* consisted of about 200 pages. While the two first parts of 1858 and 1859 do not stand alone, they could, and likely should, be cited separately depending on the material cited. For example, the first part published in 1858 contains all the species descriptions of tintinnid ciliates, so reference to any tintinnid species description concerns only material in the 1858 publication. Likewise, any reference to a dinoflagellate species description should be 1859 as only it contains dinoflagellate species descriptions. In contrast, with regard to the possibility of phagotrophy in dinoflagellates, the subject is treated in both the 1859 volume as well as in the 1861 volume. The 1868 reprinting of all 3 parts should not be cited in any case as 'first published in...' as it consists of previously published material. The many covers of the "*Etudes*" are shown in Fig. 3, along with bullet descriptions of the contents.

Fig. 3. The many covers of the "*Etudes sur les Infusoires et les Rhizopodes*". Bullet descriptions and page ranges of the contents were added.

Given the publication history of the "*Etudes*", stretched out over 4 years, it is not surprising that it has been cited in various forms. However, it is a bit surprising

that it has been incorrectly cited in recent years in our own journals of protistology. Table 1 shows a variety of incorrect citations in *Acta Protozoologica*, *European Journal Protistology*, *Journal of Eukaryotic Microbiology* and *Protist* in articles published from 2000 to 2021. In deference to authors who likely made inadvertent mistakes, reviewers and editors who cannot be expected to verify references, and copy editors who are not protistologists, specific articles are not given, only the year published and journal are indicated. The incorrect literature references include oddities ('vol 5 mem. 3'), mismatches of volume number with year published, omitting volume number and page range, etc. As the "*Etudes*" is available and searchable online (e.g. Biodiversity Heritage Library, Google Books, etc.) it is easy to verify that the reference you want to cite is correct.

Table 1. The variety of incorrect citations to material in the *Etudes sur les Infusoires et les Rhizopodes* in *Acta Protozoologica* (AP), *European Journal of Protistology* (EJOP), *Journal of Eukaryotic Microbiology* (JEM) and *Protist*. The "*Etudes*" were published in 3 volumes of the *Mémoires de l'Institut National Genevois*: in 1858 vol. 5:1-260, in 1859 vol. 6:261-482, and in 1861 vol. 7:1-291.

Year	Journal	Cited Year	Cited Vol	Cited pp
2000	AP	1858	none	none
2002	EJOP	1859	1-2	none
2004	EJOP	1858	none	none
2007	JEM	1858-1861	1-2	1-481
2010	JEM	1858	5: mem. 3	203-204
2011	AP	1859	5	1-260
2015	JEM	1858	5: mem. 3	203-204
2015	EJOP	1868	none	none
2017	EJOP	1859	5	1-260
2018	EJOP	1859	5	1-260
2019	Protist	1859	none	261-482

Conclusion

Edouard Claparède and Johannes Lachmann lived short lives but made a major contribution to protistology. Today, Johannes Lachmann is better known to botanists than protistologists. His thesis work on the root nodules of legumes belatedly earned him recognition as an early proponent of the importance of the nodules and their bacterial communities in plant nutrition (Bohmon 1977). Edouard Claparède worked on a wide variety taxa and among them were worms, and insects. In his day, and in more recent times, he is recognized as invertebrate zoologist more than as a protistologist (e.g., Lankester 1871, Petit & Théoridèse 1972). I hope that telling the stories of their lives, and of their monograph on protists, will lead to an appreciation of them as both remarkable people and pioneer protistologists.

Acknowledgements

The comments and suggestions of the reviewers on a previous version led to significant improvements in the manuscript. Their thoughtful work is appreciated. Nonetheless, I retain full responsibility for all errors of fact, interpretation, or omission

Supplementary File Information

The supplementary file is a spreadsheet file composed of two sheets: one listing the protist species described as new in the "*Etudes*" that are currently listed as valid first descriptions and attributed to the "*Etudes*" by the World Register of Marine Species (<http://www.marinespecies.org/index.php>). The second sheet gives the full references (titles are not abbreviated) cited to facilitate location of the references.

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