

## Protistologist Wladimir Timopheyeovich Schewiakoff (1859–1930). On the shores of the Gulf of Naples

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### Summary

This article narrates the history of Acantharia research in the Gulf of Naples (Mediterranean Sea) by the well-known Russian scientist, Professor W.T. Schewiakoff, as well as his efforts to study Foraminifera and Ciliophora in the same water basin. All those activities are presented against a background of the protistologist's own life story.

**Key words:** Acantharia, Ciliophora, Dohrn, Schewiakoff, Naples Zoological Station, Heidelberg, St. Petersburg, Irkutsk

### Introduction

Recently, on October 29, 2019, we celebrated the 160<sup>th</sup> anniversary of the great Russian protistologist – Wladimir Timopheyeovich Schewiakoff (Fokin, 2000; Groeben and Fokin, 2013; Fokin and Zavoi-skaya, 2016a, 2016b; Fokin, 2019), who is known in the International scientific community as a world-beloved specialist in ciliated protists (Ciliophora) and, simultaneously, in very specific marine planktonic unicellular organisms related to Radiolaria – Achantaria (Schewiakoff, 1889b, 1896, 1902, 1926)<sup>1</sup>. Working on the live acantharians in the Mediterranean Sea (Naples, Italy) and considering additional criteria of their cells, Prof. W.T. Schewiakoff emended the classification of the group in 1926 and set up the main taxonomic framework

<sup>1</sup> He used this German transcription of his first name and surname during whole his life, although according to the Russian language the scientist's names should be spelled Vladimir Shevyakov.

encompassing a total of 130 acantharian species (Schewiakoff, 1926). Minor modifications have been made to this classification only 50–60 years later, and the major taxonomic characteristics proposed by Prof. Schewiakoff for Acantharia's subdivision are still in use (Korsun, 2011). In this publication, I give a short description of what the scientist have done in this field against a background of his life story.

### Path to the Mediterranean Sea

Wladimir Schewiakoff was born in St. Petersburg, Russia. His father was a merchant, who was born, apparently, in Tver province, in the beginning of the XIX century. His mother, Elisabeth Christine Sievers (1819–1879), came from a Danish-German-Baltic noble family which lived near Riga<sup>2</sup>. After

<sup>2</sup> Her hometown, Tukums, belonged at that time to the province of Kurland (a part of Russia from 1795).

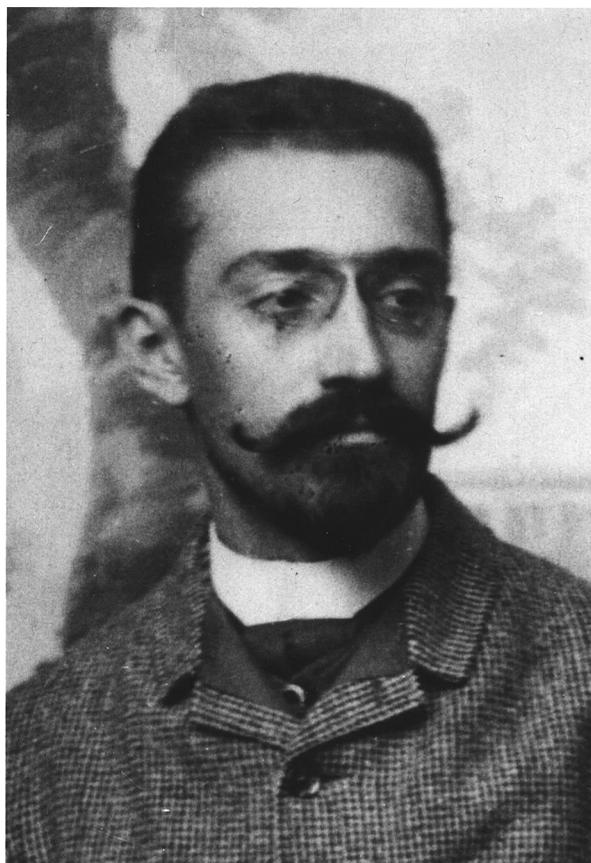


Fig. 1. W.T. Schewiakoff. Heidelberg. 1889.

several years at the St. Petersburg Mining Institute (1877–1881), W. Schewiakoff switched to the metropolitan University, where he studied invertebrate zoology as an external student under the supervision of Prof. Nicolay P. Wagner (1829–1907). In 1885, however, he decided to continue his studies abroad and went to Heidelberg to study in the local University where he met the famous zoologist and protistologist Prof. Otto Bütschli (1848–1920)<sup>3</sup>. Four years later (in 1889) he obtained his PhD degree which was dedicated to the eye of jellyfish (Schewiakoff, 1889a) with the top grade «*summa cum laude*».

Before starting as an assistant at the Zoological Institute of the Higher Polytechnical School in Karlsruhe, where he worked during less than one year (1890–1891), Schewiakoff undertook a journey around the world to study freshwater protists in different areas of the world: the USA, Hawaii, the Sandwich Islands, New Zealand, Tasmania, the Eastern and Southern coasts of Australia, and some

<sup>3</sup> See my publications dedicated to Prof. Bütschli: Fokin, 2004, 2012, 2013.

of the Sunda Islands. Scientific results of the journey were later summed up in two fundamental works, *Die Geographische Verbreitung der Süsswasser-Protozoen* (1893) and *To the Biology of Protozoa* (1894). In early spring 1890, on the way back to Germany, he visited the Naples Zoological Station. This visit became a landmark for various reasons. At the Station, he met Prof. Anton Dohrn<sup>4</sup> (1840–1909) as well as his countryman Prof. Alexander Kowalewsky<sup>5</sup> (1840–1901). At Kowalewsky's home in Naples which Schewiakoff was invited to visit, he also met the youngest professor's daughter, 17-year old Lydia (1873–1942), who became Mrs. Schewiakoff in 1895.

In the same spring, Prof. O. Bütschli also visited the Station and brought with him a collection of Foraminifera, which he intended to study at home (Groeben and Fokin, 2013). It seems that he never had time to do so. Thus, in 1893 he was very happy that Dr. Schewiakoff, who in the meantime had returned to his Institute and became *privat-dozent*, expressed his wish to study this group in the Gulf of Naples<sup>6</sup>. Wladimir Timopheyeitch wanted to study the morphology and systematics using the preserved specimens at Heidelberg and, after he is well prepared, to come to Naples later for studying the developmental stages. Prof. Dohrn suggested that Dr. Schewiakoff should write a monograph for the Fauna and Flora series, published by the Station.

Although the material and methods were well defined at that point, the project had never been implemented because W.T. Schewiakoff returned to Russia as laboratory assistant at the newly formed Special Zoological Laboratory of the Imperial St. Petersburg Academy of Sciences, headed by Prof. Alexander Kowalewsky, who in the meantime became a full member of the Academy. Dr. Schewiakoff was still confident that he would be able to continue this work on the monograph, but at first he had to get Russian academic credentials: a *Magister's* degree [PhD] in 1894<sup>7</sup>, and a *Doctoral*

<sup>4</sup> The famous German zoologist, student of Prof. E. Haeckel, founder and owner of this Station.

<sup>5</sup> The outstanding Russian embryologist, at that time a professor at the Odessa University.

<sup>6</sup> Dr. Schewiakoff got this invitation from Prof. Dohrn in spring of 1893.

<sup>7</sup> In April 1894, the scientist defended the *Magister's* thesis «*On the Biology of Protozoa*» and published it in St. Petersburg as a large research material with three chapters (Schewiakoff, 1894). In Russia at that time, foreign scientific degrees were not recognized, therefore W.T. had to defend the second dissertation - this time for the degree of a *Magister of Zoology*, which was equivalent to foreign PhD.



Fig. 2. O. Bütschli (left) and A. Dohrn at the Naples Zoological Station. Naples, 1890.

degree (DSc) in 1896<sup>8</sup>. In 1896 he also became the head of the Zootomical cabinet at the St. Petersburg University. Being busy with his administrative duties, the courses he taught at the University, and having the newlywed status (in January 1895), he couldn't any more think about the Rhizopoda monograph (Groeben and Fokin, 2013).

When Dohrn and Schewiakoff met again in 1898 in Cambridge they started another dialogue, this time more at an eye-to-eye level. What had begun as a project soon turned into a sharing of common concerns at the institutional levels and ended up in a deep friendship. Schewiakoff agreed to study the non-colonial radiolarians of the Gulf of Naples. This

was the starting point of Schewiakoff's 27 year-long scientific «Odyssey».

### Acantharians for the whole life

Ultimately, Prof. Schewiakoff chose to study a group, which was included at that time in Radiolaria as a separate lineage – Acantharia. Acantharia are marine planktonic unicellular eukaryotes nowadays separated from Radiolaria and currently encompassing nearly 50 genera and 160 species. They are distributed worldwide, from subsurface to deep waters, and appear to be most numerous in the oligotrophic seas' surface. Their main distinctive features are an internal star-shaped skeleton made of strontium sulphate mineral ( $\text{SrSO}_4$ , also called celestite) and an amoeboid cell that possesses multiple nuclei, extensive axopods, and contractile myonemes. Acantharia feed on a large variety of prey, but

<sup>8</sup> In February of 1896 he defended in St. Petersburg the Doctor of zoology's thesis «The Organization and Systematics of Infusoria Aspirotricha (Holotricha Auctorum)» which simultaneously was published as a book (Schewiakoff, 1896).



**Fig. 3.** Panorama of Naples and the Gulf of Naples. In the center of the photo is park with white building of the Zoological Station. The beginning of the 1900s. Postcard.

some species are mixotrophs through symbiosis with intracellular eukaryotic microalgae (dinoflagellates). As part of their life cycle, some taxonomic groups form heavy cysts that rapidly sink to deep waters thus becoming biogeochemically relevant (Reshetnyak, 1981; Febvre et al., 2000; Korzun, 2011; Decelle and Not, 2015).

Acantharia were discovered and described in the mid-eighteenth century, in the Mediterranean Sea, by Johannes Müller, who proposed this name and the first classification based on skeleton morphology (Müller, 1859). Then this classification was slightly modified by Hertwig (1879) and Haeckel (1888), but only considering the skeleton of these protists. Quite a little was known about fine structure of the acantharian cell, and almost nothing – regarding their biology when Prof. Schewiakoff began his research of Acantharia in the Gulf of Naples. To work on this monograph, Prof. Schewiakoff visited the Naples Zoological Station four times (in 1899, 1902, 1905 and then in 1925/1926).

Meanwhile, the Imperial St. Petersburg Academy of Sciences elected Prof. W.T. Schewiakoff its corresponding member in 1908. In 1911, he was appointed Vice-minister of the Ministry of Public Education of Russia, and held this position until 1917. He did much for improving education in Russia. Numerous specialized schools were founded in

different regions of Russia with his direct participation. The foundation of the Perm University was a personal merit of Prof. W.T. Schewiakoff. Of course, there was no time to complete the monograph.

In late 1918, the scientist became a professor of the Agricultural Institute in Omsk, also performing the rector's duties. In January 1920, Wladimir Timopheyeitch was elected a professor of the Irkutsk University. He took an active part in the foundation of the Medical faculty therein (later an Institute), where he was the head of the Department of Medical Zoology and Parasitology.

### At Naples Zoological Station

Now let's go back to the beginning of the story. In 1899, Prof. Schewiakoff was granted the use of one of the Russian working places (tables)<sup>9</sup> to work in Naples for six months. His wife and two children (2 and 3 years old) accompanied him. The family rented the same Villa outside Naples where the couple had met in 1890. Schewiakoff started to fill in the first of his 4 notebooks, a kind of a diary on each specimen with the details about dates, locations, and

<sup>9</sup> Russia at that time rented 2 round-year working places at the Naples Zoological Station.

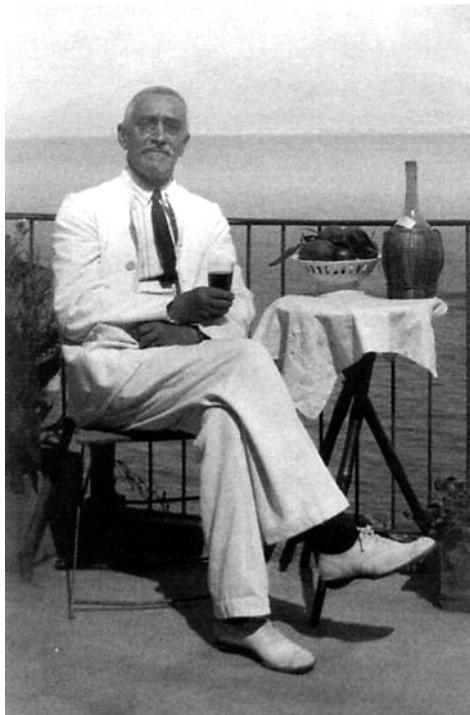


Fig. 4. W.T. Schewiakoff in Naples. 1926.

descriptions, almost always accompanied by colored ink or pencil drawings<sup>10</sup>.

In October 1901, Prof. Schewiakoff presented the first results of this work in a paper on the *Acanthometrea* to the Academy of Sciences (Schewiakoff, 1902). A second trip to Naples took place from April to November 1902. Wladimir Timopheyeitch resumed filling up his notebooks and prepared microscopic slides which he continued to study upon his return to St. Petersburg, along with the perfectly preserved specimens that the Station employee Salvatore Lo Bianco (1860–1910) continued to send him at least once a month. By August 1904, 70 plates with illustrations and the anatomical-morphological part were finished and a first draft of a revised system of Acantharia could be outlined.

In January 1905, Schewiakoff could finally announce his third visit to Naples. He completed his research journal No 3 and started No 4. The result amounted to 800 developmental stages and 10,000 skeletons isolated by Schewiakoff. After heating, the latter accounted for 2 centigrams of perfectly pure

<sup>10</sup> The scientist initially made all notes in German (the language of the monograph). After the monograph's publication (1926), 4 notebooks with notes, drawings and all slides produced were transferred to the Station's archive.

skeleton substance that allowed for a quantitative chemical analysis.

Leaving Petrograd (the former St. Petersburg) after the Bolsheviks seized the political power there, in the spring of 1918, the professor took with him the manuscript of a monograph on which he was again working since 1917.

In Irkutsk in 1922, the monograph on Acantharia, which had been promised to Anton Dohrn in 1898, was close to completion, but Schewiakoff needed the recent denominations and some additional field studies. He should have made a business trip abroad for the six months in 1923, but due to illness he could not use this opportunity for working on the book. Fortunately, in 1924 both the Administration of Irkutsk and Glavnauka (the State Committee on Science) responded positively to his new application. Schewiakoff made the fourth trip from Irkutsk to Naples during the end of summer 1925 till the autumn of 1926 (for almost a year). As a result, the work of his lifetime, the monograph on the Acantharia of the Gulf of Naples (*Die Acantharia des Golfes von Neapel*), was printed in Italy 27 years after it had been started. Only field observations required for the research took more than three years. It was Anton's son Reinhard (1880–1962), the next director of the Station, who supported Schewiakoff's visit and work at the Station as much as possible and saw the monograph finally published in 1926. In 1928, the book was awarded a special prize from Sovnarkom (the Soviet Government).

The Acantharia's system he elaborated has been used almost until nowadays. Prof. Schewiakoff's system of Acantharia takes the character of the cell body into account, whereas his predecessors used exclusively the skeletal morphology as taxonomic criteria (Febvere et al., 2000). The book contains a number of remarkable hand-drawn plates and expanded description of acantharian taxonomy and morphology based on the accurate in vivo observations of 80 species. Among the 16 established acantharian families, 11 were set up by Prof. Schewiakoff.

### Acantharians for the whole life

Since 1927, Prof. Shewiakoff was investigating the ciliated protists (Ciliophora) of the Gulf of Naples, because he had been asked by Prof. R. Dohrn to prepare the next monograph for the Naples Zoological Station (Ciliates of the Gulf of Naples).

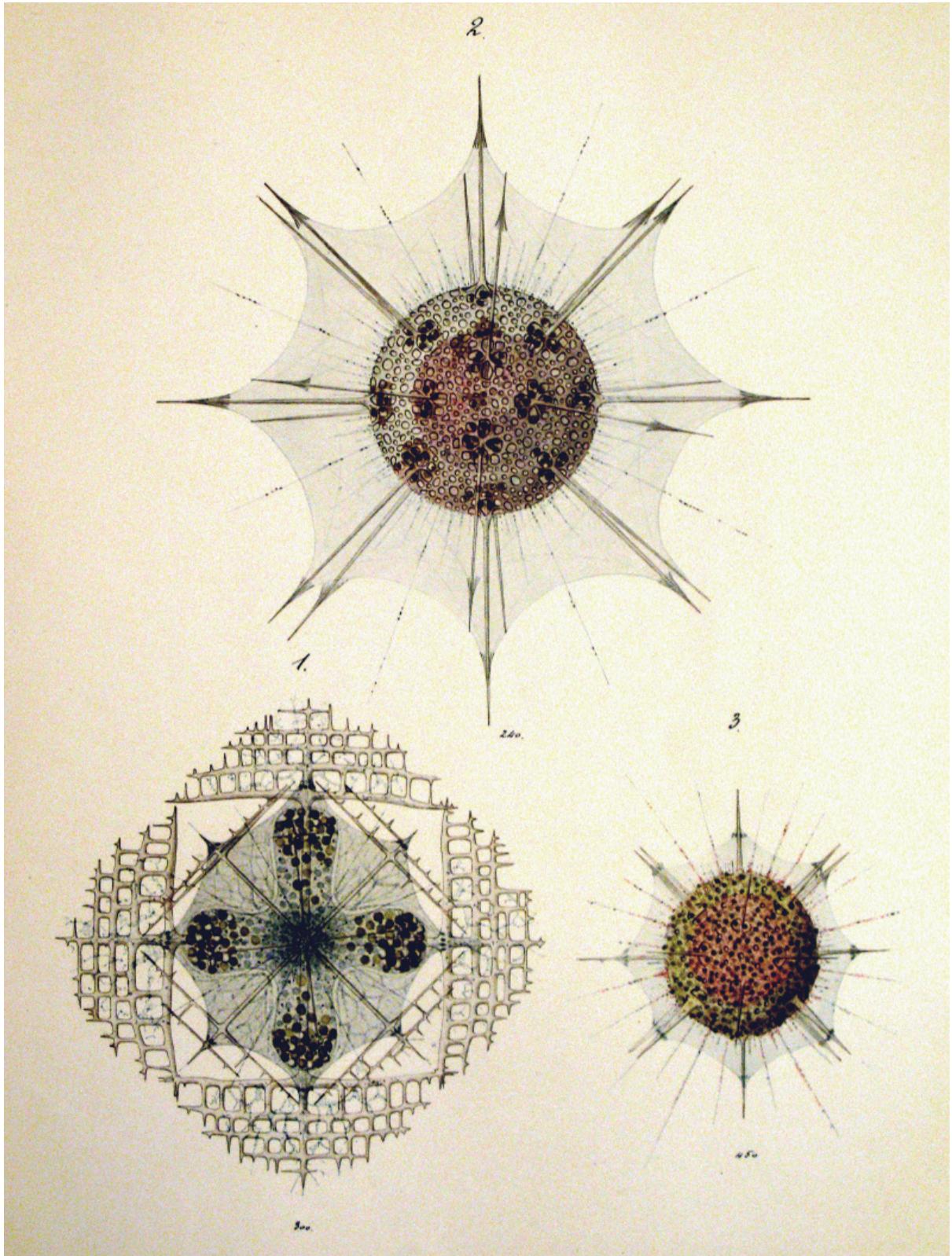


Fig. 5. Table 30 from the Acantharia book. 1 – *Lithoptera mulleri*, 2 – *Leosaspis elegans*, 3 – *Dorataspis gladiata* (Schewiakoff, 1926).

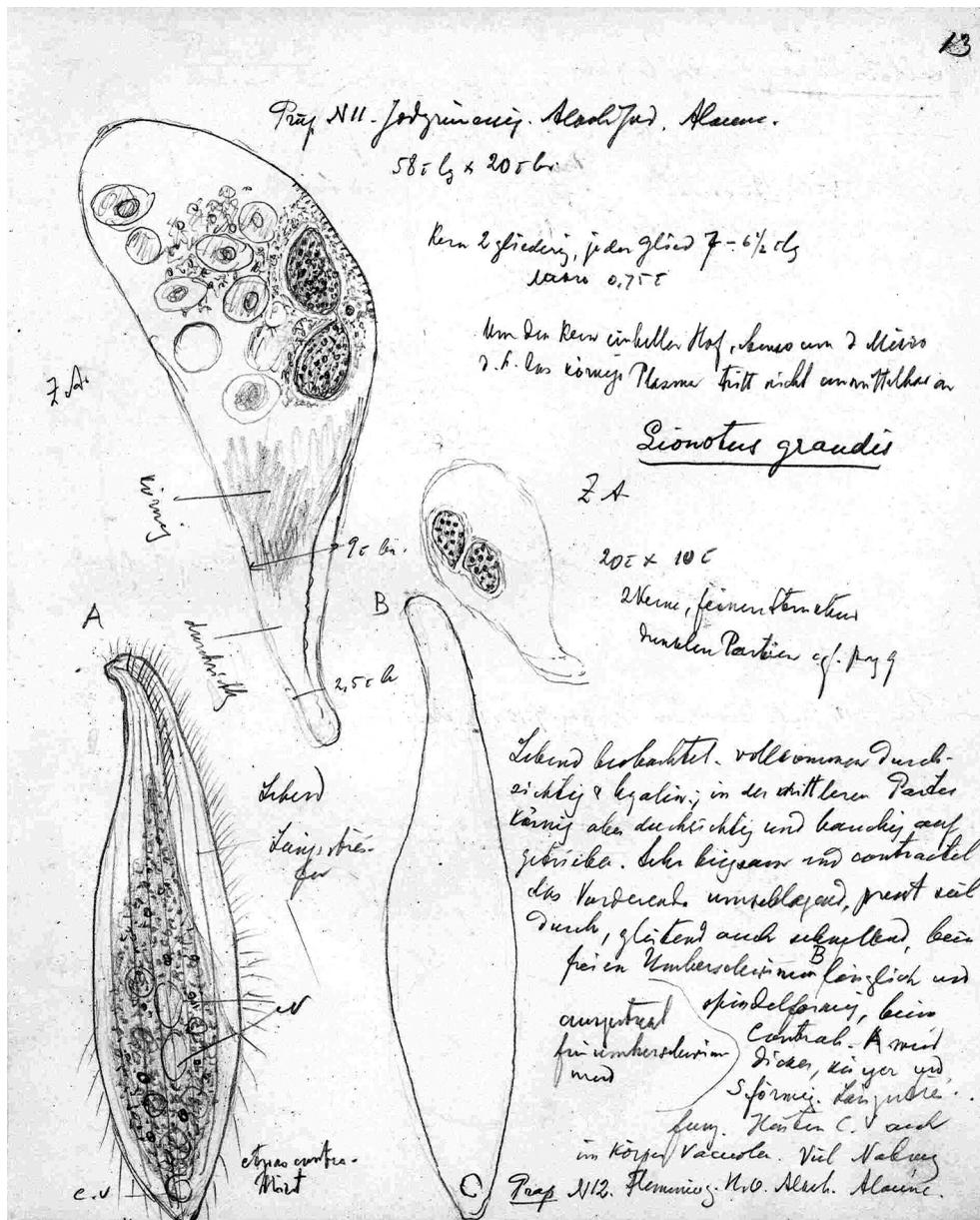


Fig. 6. *Lionotus grandis*, a page from Schewiakoff's notebook. Naples, 1928.

He spent more than 5 additional months at the Naples Zoological Station for this reason (the fall of 1927, and the summer-fall season in 1928). During his last visit to Naples in 1928, Prof. Schewiakoff selected for study several species of littoral ciliated protists – mainly the members of Spirotrichea. As simpler objects for cultivation in the laboratory, several *Euplotes* species collected at the littoral of the Gulf of Naples were taken. In fact, already since 1896 he had a hope to study Hypotrichia more deeply, but never did it before 1928. In the field of Schewiakoff's interest in that season were also

representatives of Haptoria and Scuticociliatia. As before, the scientist was making the initial records of his observations in the German language. They had already filled up one and a half notebooks. However, only one article dedicated to the unusual lability of the encystation-excystation process in *E. harpa* was published in the scientific journal of the Station (Schewiakoff, 1928). Unfortunately, this study remained far unaccomplished, because of compulsory reduction of the international activity of Soviet scientists after 1928 and Schewiakoff's premature death. Wladimir Timophejevitch died

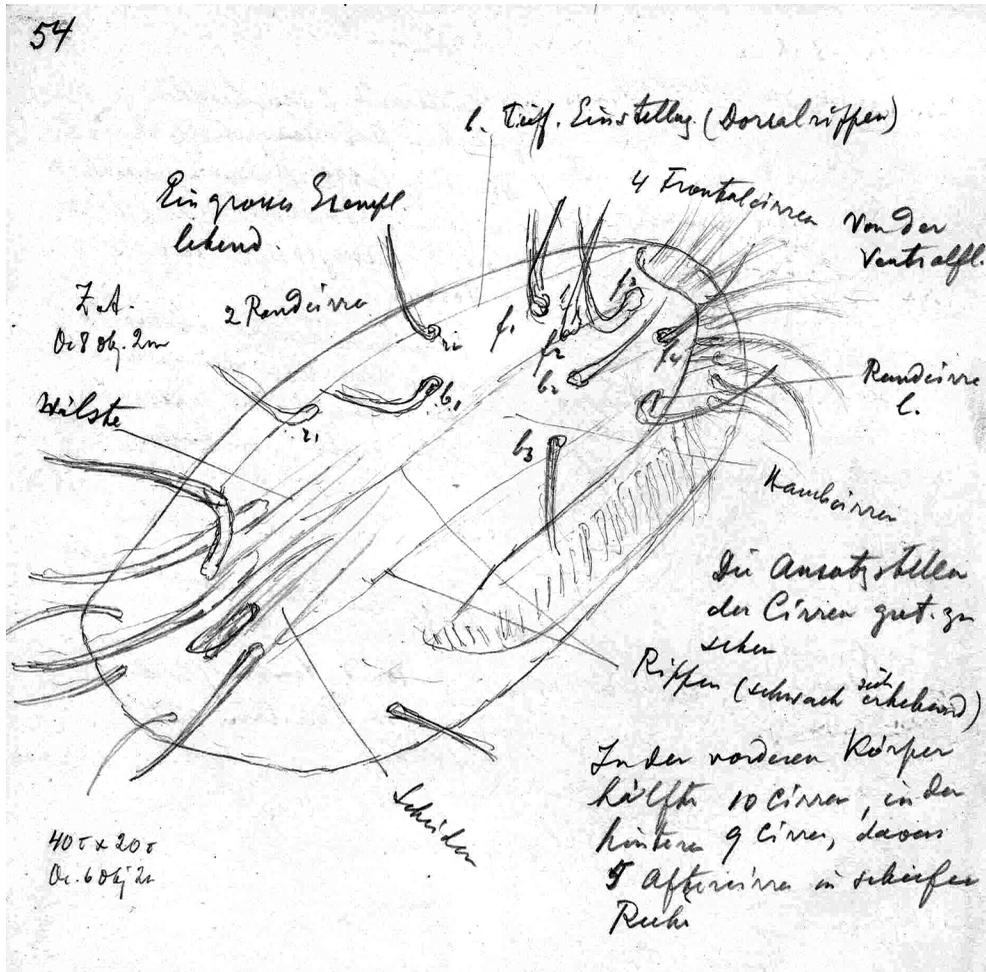


Fig. 7. *Eupletes* sp., a page from Schewiakoff's notebook. Naples, 1928.

of pneumonia on October 18, 1930 in Irkutsk and, regretfully, left many of his hopes unrealized.

Of his five children, none became a biologist. The oldest son, Alexander (1896–1919), was killed during the Civil war (he was the artillery commander on an armored train in the Kolchak's Army) and the youngest, Boris (1908–1937), was shot in the fall of 1937 at Sandarmoch (Karelia) after a couple of years in the Solovetskiy prisoner camp ("Solovetskiy camp of special purpose"). Only his daughter, Tatiana (1897–1984), and one of his sons – Georgiy (1900–1973) have lived long lives after they had immigrated to the USA. Georgiy Vladimirovich became a professor of psychology in California (San Francisco). The third son – Vladimir (1904–1924) died of food poisoning at the age of 20.

The story of Schewiakoff's researches on the Mediterranean protists was possible to reconstruct because of the large volume of archival documents collected by me during the last 20 years, especially

the previously unpublished German correspondence between Schewiakoff (and his wife) and the Naples Zoological Station' directors, professors Anton and Reinhard Dohrn, and other colleagues.

The importance of the scientific and administrative activities of Prof. W.T. Schewiakoff for Russia cannot be overestimated. He was one of the founders of the Russian protistological school; he introduced a system of teaching Invertebrate Zoology that trained a pleiad of eminent national scientists at the first part of the XX century. Among them are such renowned personalities as K.N. Davidov, V.A. Dogiel, Yu.A. Philipchenko, I.I. Sokolov, V.N. Beklemishev, F.F. Talizin, and many others. The Department of Invertebrate Zoology at the St. Petersburg State University, the Pedagogical Institute named after A.I. Herzen, the Perm University and the Irkutsk Medical Institute are the monuments of Schewiakoff's administrative activity in the field of education in Russia (Fokin, 2019). For

the international scientific community, this scientist until now holds one of the first positions among Russian protistologists.

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Fig. 8. W.T. Schewiakoff. Irkutsk, 1929 (?).

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