The Kinker diatom collection: discovery – exploration – exploitation

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Sterrenburg, F.A.S. & Wolf, H. de. The Kinker diatom collection: discovery – exploration – exploitation. *In*: Winkler Prins, C.F. & Donovan, S.K. (eds.), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003*. *Scripta Geologica Special Issue*, **4**: 253-260, 5 figs., 1 pl.; Leiden, August 2004.
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Key words — diatoms, typification.
Johannes Kinker (1823-1900) was a typical representative of the Victorian 'amateur-savant'. As a well-to-do stockbroker he was able to invest considerable time and money into studies of nature, first entomology and subsequently diatoms. The latter subject flourished in the late 19th century and, among his international contemporaries, Kinker was regarded as "the only Dutch diatomist of renown". There is a marked discrepancy between this reputation in his own time and his complete obscurity since, for which there are two reasons; Kinker did not publish, and his collection was not known to exist. Our discovery of the virtually intact Kinker diatom collection after it had vanished for a century can be regarded as a cultural heritage conservation paradigm; the collection is scientifically significant and can be developed into a rich source of information for micropalaeontological, biostratigraphic and biodiversity studies. The conservation project now under way illustrates the importance of a synergy between materials and archives, because Kinker's extensive correspondence and notebooks have been preserved and are essential to the conservation, documentation and future exploitation of these valuable materials. Although Kinker cannot be regarded as a productive scientist, his importance as an 'information node' is now evident.

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Introduction

For a century, the position of the late-Victorian Dutch diatomist Johannes Kinker in the history of diatom research has been enigmatic (de Wolf & Sterrenburg, 1993). The sum total of the available data was limited to the obituary written by the renowned Flemish diatomist Henri van Heurck (1900). Minimal as the information may have been, van Heurck's assessment of Kinker's status amounts to a veritable eulogy, as the following quotations translated from the French may show: "Holland had only one diatomist of renown", "Kinker left a collection …. that can be regarded as masterpieces", "Kinker notably contributed to the study of diatoms … he was in contact with virtually all eminent diatomists of his day."

The discrepancy between Kinker's obscurity now and his eminence in his own time is best illustrated by comparing two facts; Kinker never published a single paper, yet nine renowned diatomists of his time named no less than 28 different species after him, an exceptional distinction. It had never been possible to form an objective idea of Kinker's true relevance because, apart from a very small number of slides with Kinker's labels that have come to light in a few herbaria, as a result of our International Survey of Diatom Collections (de Wolf & Sterrenburg, update 2003) nothing of the reputedly valuable Kinker collection was known to exist. That situation has now changed fundamentally.

Historical background

In the second half of the 19th century the then new field of diatom research flourished. This was inextricably linked to the simultaneous rapid development of the optics of the microscope. Frison (1954) gave a fascinating panorama of this synergy, and pointed out that the quest for visualization of the minute and beautiful structure of diatoms (Fig. 1), and the consequent demand for improved optics, created an excellent market for microscope designers. In less than 40 years, microscope performance was raised from 'mediocre' to the limits allowed by physics.

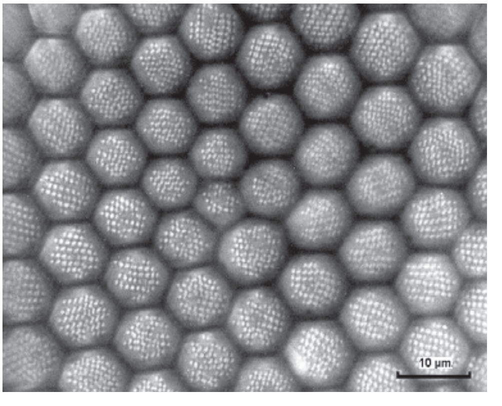


Fig. 1. The fine structure of diatoms requires perfect optics. The hexagonal chambers of a *Triceratium favus* Ehrenberg valve are closed by membranes with nano-scale perforations. Polarized light, objective NA 1.3.

There is a marked parallel with the second heyday of diatom research, ushered in a century later by the introduction of the electron microscope, but with one marked difference. Whereas in modern times diatom research is overwhelmingly practiced by professionals, the professional scientist was still largely an emerging phenomenon in Victorian times, notably in diatom research. Ludwig Rabenhorst was an apothecary, William Smith a reverend, Henri van Heurck an industrialist and Johannes Kinker a stockbroker.

It has been fashionable to picture these Victorian investigators as quaint Daddy Longlegs irrelevantly chasing after obscure creatures, but that image is false. Laying the foundations of a science is never irrelevant, and the current classification of diatoms and practical scientific applications of diatom studies were given a sound basis by the work of these earlier investigators. Kinker need not have been modest because he was "only an amateur." So were most of his contemporaries, and the position of "amateur-savant" was a respectable and even distinguished one in his time. In fact, if modern trends in financing of Science continue, we may well see a return to that situation in our lifetime.

Relevance of diatom research

Diatoms (Classis Bacillariophyceae) are unicellular algae and rank among the most diverse groups of organisms. Some 30,000 taxa have been described and estimates of the total number of species range from 100,000 to a million, a spread of one order of magnitude, indicating the uncertainty prevailing. Any figure within this range is sufficient, however, to show that 'species diversity' certainly applies here (Fig. 2).

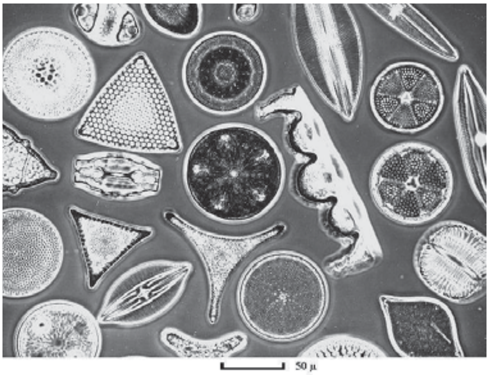


Fig. 2. An impression of the morphological variety of diatoms – a portion of an 'arranged slide' containing 100 diatoms.

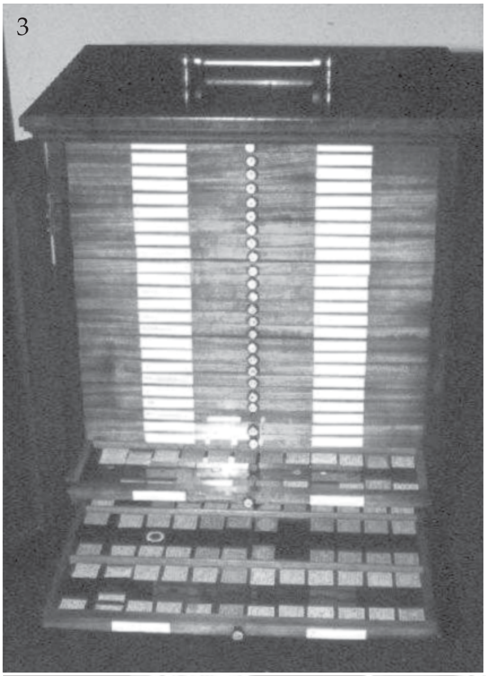
In nature, diatoms are among the principal aquatic primary producers. They are the source of much of the oxygen in the atmosphere and a major component at the base of the entire aquatic food chain. The majority of species are predominantly, or exclusively, linked to a clearly defined environment, from marine to freshwater, from nutrient-poor to nutrient-rich.

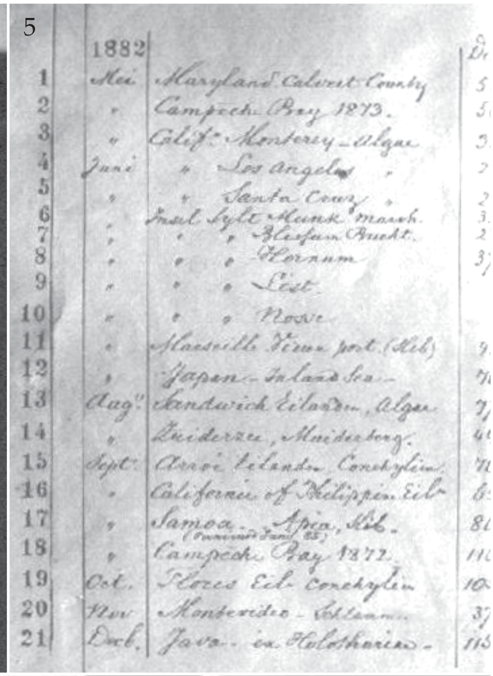
Because the unique silicate exoskeleton of diatoms easily fossilizes after the organism dies and its morphology is species-specific, the nature of, and changes in, the environment can be reconstructed from sediments and sedimentary rocks that contain diatoms over long periods, up to millions of years. Valuable results have been obtained in the reconstruction of ancient coast lines, of acidification and pollution of the environment and of climate change, for example.

For such studies to make any sense at all, good taxonomy is an indispensable requirement and, despite financial constraints, diatom taxonomy has flourished in the past 25 years, just as it did in the second half of the 19th century. It is now universally accepted that taxonomy must be based on the investigation of the original materials from which species were originally described, by the process called typification, as in the course of time misidentifications have accumulated, leading to an erroneous shift in the species paradigm. Hence the crucial importance of collections of original materials.

The collection

By a fortunate course of events we were able to trace the Kinker collection after it had vanished for almost a century. A preliminary investigation (Sterrenburg & de Wolf, 1993) immediately revealed that this is the most valuable diatom collection to be discovered in The Netherlands. It consists of approximately 1300 slides (Figs. 3-4), over 700 'cleaned' samples, hundreds of unprocessed materials still in their original wrappings of a century ago, 600 large-format glass negatives of diatom photomicro-





	1882		
1	Mei	Maryland Calvert County	5
2	"	Campeche Bay 1873.	5
3	"	Calif. Monterey - Algae	3
4	Juni	" Los angeles "	2
5	"	" Santa Cruz "	2
6	"	Insel Sylt Munk march.	3
7	"	" " Bleifam Bucht.	2
8	"	" " Hornum	3
9	"	" " List	
10	"	" " Nose	
11	"	Marseille Vieux port (Sch)	9
12	"	Japan - Inland Sea -	
13	Aug.	Sandwich Eilanden, Algae	
14	"	Zuiderzee, Muiderberg.	
15	Sept.	Arroe Eilanden Conchylien	
16	"	California of Philippijn Eil.	
17	"	Samoa - Apia, Sch.	8
18	"	Campeche Bay 1872.	
19	Oct.	Flores Eil. Conchylien	10
20	Nov	Montevideo - Schlamm	3
21	Dec.	Java - ex Holothurien -	11

Fig. 3. Cabinet with slides in the Kinker collection
Fig. 4. Close-up of a drawer with slides.
Fig. 5. A page from one of Kinker's notebooks.

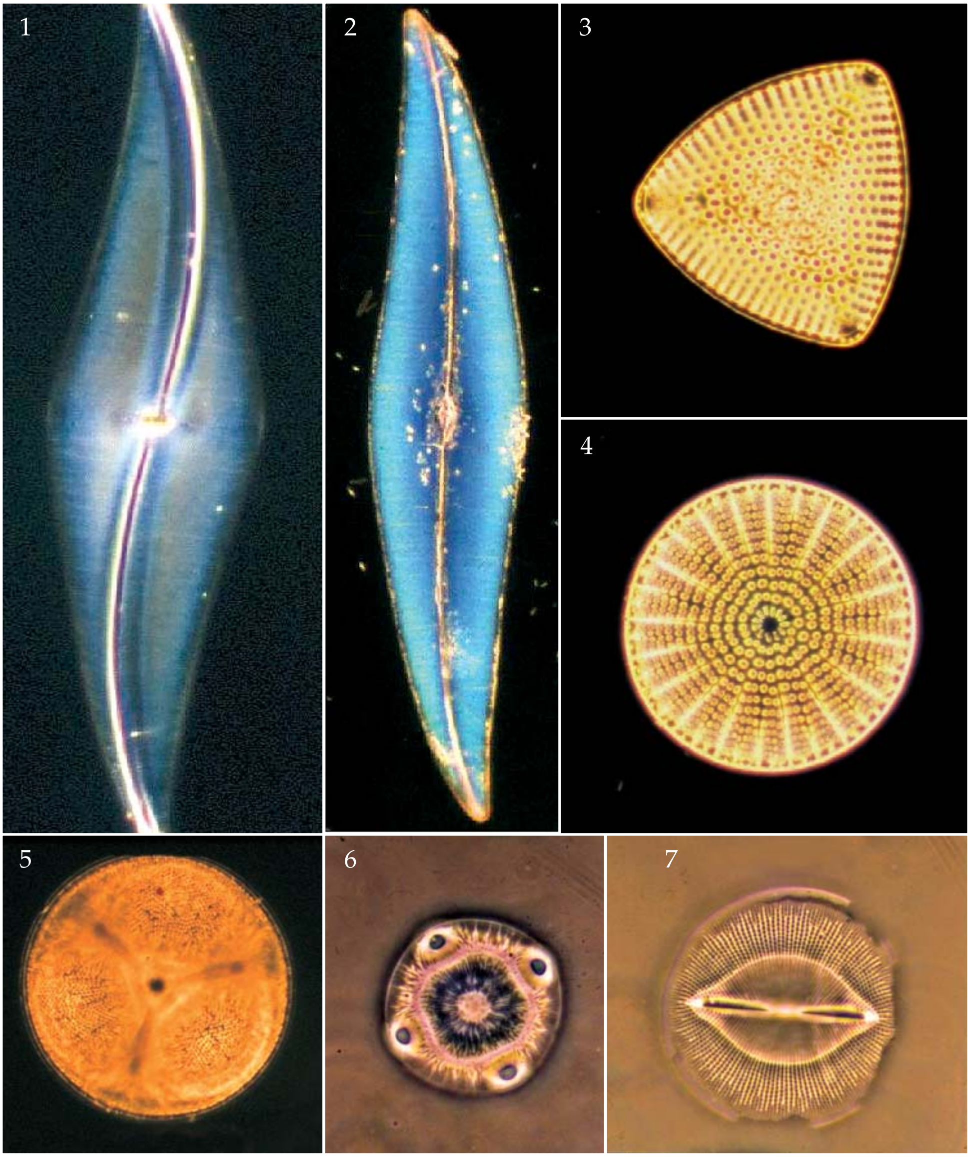


Plate 1

Fig. 1. *Pleurosigma rhombeum*, a (sub)tropical species. Darkfield, objective NA 0.55.
Fig. 2. *Pleurosigma angulatum*, a species from temperate waters. Darkfield, objective NA 0.55.
Fig. 3. *Stictodiscus kinkerianus*, from the deposits at Jeremie, Haiti. Darkfield, objective NA 0.55.
Fig. 4. *Arachnoidiscus barbadensis*, from the classic Barbados deposits. Darkfield, objective NA 0.55.
Fig. 5. *Aulacodiscus tchestnovii*, from the Kuznetsk, Russia deposits. Darkfield, objective NA 0.55.
Fig. 6. *Glyphodiscus stellatus*, from a deposit in Montana, USA. Phase contrast, objective N.A. 0.65.
Fig. 7. *Rhaphidodiscus marylandicus*, from the original Maryland, USA, deposits. Phase contrast, objective N.A. 0.65.

graphs and, very importantly, Kinker's notebooks (Fig. 5) plus a collection of hundreds of letters. These confirmed that Kinker was indeed in contact with the "eminent diatomists of his day" as van Heurck (1900) wrote, including Möller, Thum, Witt, Pantocsek, Peragallo and others. Copies of the letters written by Kinker himself are also present so that the record of this correspondence may be largely reconstructed.

Conservation

The Kinker collection appears to be just manageable enough to permit its conservation in the form of a finite, instead of open-ended, project. The first phase involves the examination, numbering and, where necessary, restoration of the slides and their documentation in the form of a database. Most slides were made by Kinker himself, from documented materials donated by his correspondents. Also, the cleaned samples are being documented and safeguarded. The link between archival data and materials supplied by the notebooks and letters is of outstanding importance in this respect. The samples will be entered in a database and this work is now in progress.

The second phase will address the tantalising intact packets. Tantilising because we have no idea as yet how many there may actually be. When we examined one packet, which was in danger of falling apart, it was found to contain 20 smaller packets, which, fearing a Matrushka effect, we then wisely left alone until a later moment. These packets need to be conserved, taking extreme precautions to avoid mutual contamination, and entered in a database. Finally, the notebooks and correspondence must be copied; the originals have now been stored under appropriate conditions.

Exploitation

The first phase of renewed research on the Kinker collection is already yielding new data. Our preliminary investigation (Sterrenburg & de Wolf, 1993) had shown that most of the slides contain specimens selected from the original materials which Kinker had received from his correspondents. Thus, we will be able to typify and for the first time photographically document a large number of species of several important authors. Designation of types so far covers only a fraction of the diatom species described; the illustrations accompanying the protologues of the authors mentioned consisted of line drawings of unknown accuracy. Here are some examples of interesting species that have come to light in Kinker's slides:

- *Pleurosigma rhombeum* Grunow (Pl. 1, fig. 1): this is a typical inhabitant of (sub) tropical waters. In the literature, it has been confused with *P. angulatum* (Quekett) W. Smith (Pl. 1, fig. 2), leading to a distorted biogeographical range because the latter species inhabits the temperate marine littoral.
- *Stictodiscus kinkerianus* Truan & Witt (Pl. 1, fig. 3): one of the 28 species named after Kinker awaiting typification. Only known from Miocene deposits.
- *Arachnoidiscus barbadensis* A. Schmidt (Pl. 1, fig. 4): some 60 taxa have been described in this genus, all very difficult to separate, and a taxonomic revision is necessary.
- *Aulacodiscus tchestnovii* Pantocsek (Pl. 1, fig. 5): one of the Pantocsek species from Miocene deposits that can now be typified.

- *Glyphodiscus stellatus* Greville (Pl. 1, fig. 6): a species originally described from Miocene deposits, which turned out to be still extant some 120 years later (Stidolph, 1985).
- *Raphidodiscus marylandicus* Christian (Pl. 1, fig. 7). This is such a curious organism that Christian's contemporaries in the late 19th century were reluctant to accept it as "real".

The samples include many 'classic' fossil deposits collected in the 19th century, from which several authors described new species. Such well-documented materials are of outstanding value as they may permit the first scanning-electron microscopy investigation of many species.

Examination of the correspondence will yield a wealth of information that has been lost otherwise. For example, about 80 % of Pantocsek's collection in Budapest, Hungary, was destroyed during the Second World War, and from the Kinker collection at least a partial reconstruction of Pantocsek's scientific legacy will be possible.

Once we have made the data available, other researchers will be able to further use the Kinker collection for their specialist investigations into taxonomy or micropalaeontology, for instance. Several colleagues have already asked for information and loans.

Epilogue

So what was Kinker's relevance for diatom research? It remains a mystery why he never published. He wrote easily and had a good command of French, German and English. From an objective point of view, his scientific relevance in his own time was, therefore, minor. But a century later, the perspective is different. In the pre-Internet era, Kinker's isolated position as the only seriously interested diatomist in Holland gave him no alternative but to contact renowned investigators abroad by letter. Apparently his questions and views were good enough to be taken seriously by these authorities in the field, and a lively exchange of materials and rich correspondence resulted. Thus, Kinker indeed became 'eminent' as the obituary suggests, but in the sense of an 'éminence grise'. Now, a later generation of investigators, blessed with superior equipment and a more profound understanding of taxonomic issues, can study his legacy, exploiting the synergy between his materials and archival data.

Acknowledgements

The museum of Groningen University donated the collection to the Nationaal Natuurhistorisch Museum, Leiden, The Netherlands, thus enabling us to conserve, document and study it.

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