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M78.	*Rev. Eugene O'Meara*	Report on the Irish Diatomaceae	£6

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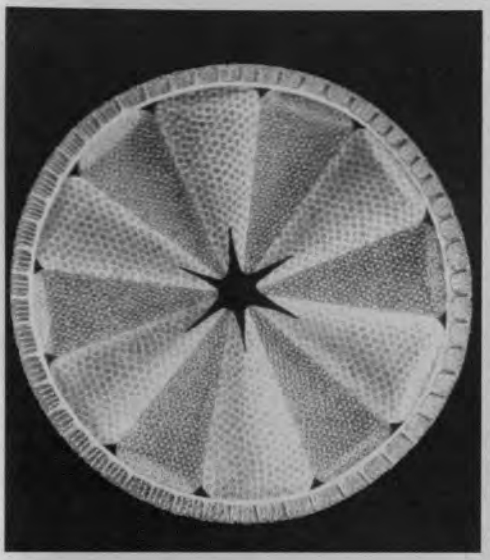
Printed by 1st impression design & print, nobles place, maude street, kendal, cumbria LA9 4QD Tel.: 01539 732660

The Amateur Diatomist

Vol. I. No. 2. June 2002

Little Imp Publications



In this Issue:-

The reception of this new publication has exceeded our expectations, as has been evidenced by the good wishes received.
The publishers welcome contributions to the content of the publication, including articles, letters, photographs, etc. These may be submitted by post in electronic or hard copy format or by email (address details on the back cover).
Advertising in this publication is free to both non-commercial individuals and commercial organisations. A small contribution towards costs would be appreciated from commercial entities but our philosophy is that if it is related to the study of diatoms and is of interest to our readership then it should be included.
There is no strict editorial policy.

Report on the Irish Diatomaceae

by Rev. Eugene O'Meara
1875

Now available on CD. This facsimile version is accessed via a Web Browser and as such requires no special programs or run-times.
Order through Savona Books.

Cover picture:
Frontispiece from The Microscope and its Revelations – William B. Carpenter, M.D. 4th Ed. 1868

Mounting techniques

Part II- The Strew

A good strew can be very much like having a hundred selected slides under one coverslip. However, you might not want a hundred selected slides under a coverslip you might want a representative strew. In considering how to make a strew slide, then, we need first to consider what it is that makes a good strew slide and also what kind of strew you are after.

Strews are made from cleaned material, your method of cleaning will depend on your own proclivities and also on how many of Mike Samworth's articles you read.
The kind of strew you are going to make depends upon the material from which you make the strew. That is, a representative strew contains all the diatoms and all the diatoms component parts, which after cleaning will have become detached., and a 'selective' strew (as opposed to selected) will contain whole diatoms only and none of the associated parts e.g. girdle bands.

Let us deal with the former, the representative strew, as the rules concerning the method are the same as for the latter, only the source material will differ.

Once you have cleaned your sample you will have transferred it to an appropriate stock bottle, clearly marked with its source, the collector and the date.This stock bottle should contain all the material resulting from the cleaning of a sample. It probably has some fungal retardant compound added in dilute form. The sample has probably settled on the bottom of the vessel as a thin (or if you are particularly lucky, a thick) white layer. Swish the bottle about a bit, but gently, until the liquid become milky or ever so slightly opaque and the diatom valves etc. are in suspension. Pipette a small portion of the liquor off into another bottle and dilute with distilled water. Start off by adding the same amount of distilled water as you have liquor. Swirl gently.....is it nearly clear? If not then add the same amount of distilled water and repeat until it is nearly clear. You now have a suspension suitable for mounting a strew.

Take a cleaned slide and place a reasonable drop (a drop is defined here as a volume that when put on the slide is held in the centre by its own meniscus) onto the centre of the slide. Now using a toothpick or similar spread the drop over the central 1 inch of the slide and edge to edge. At this point you need to wait for the slide to dry. Whilst it is drying you might be tempted to hold it, don't. The tiny movements, even of your heartbeat, will cause the valves to move and clump together. If you want to speed the drying up a little then place on a slide heater and leave.

When dry you can hold the slide up to the light and you should just see a film on the slide, maybe very slightly white. Put the slide under the microscope and check the results. If you have diatoms that are evenly spaced out across the field of view then your dilution is right. If they appear dense, one atop another, then the liquor is too concentrated and further dilution is necessary. If they have clumped together then you have driven off the water too quickly or some vibrations have caused the valves to move together. In this state the valves are quite stable and you can turn the slide on its edge, upside down, whatever, though quite why you would want to do this escapes me. Diatom valves have an affinity for glass and unless forced to move, they will not. It is worth remembering this affinity for glass whenever you prepare diatom slides. If you use

glass rods and the like they must be thoroughly cleaned to expunge any trace of your previous samples. If you fail to do this and your diatom slides are for reference then you are in danger of contaminating your samples and your slides are worthless. When you re-use tubes and cleaning apparatus, the same is true, thoroughly clean everything. It is often better to use plastic pipettes which are easier to wash than the glass equivalents. This is probably the most time consuming part of diatom preparation and I am sure that this will be reinforced in Mike Samworth's Cleaning articles.

In the early days, when we first began to prepare diatom slides we made the mistake of being a little sloppy over the cleaning of apparatus and as a consequence some of our first attempts were consigned to the bin after our mentor pointed out one or two rogue marine forms in one of our freshwater samples.

If the dilution is about right then, if you are not going to use all of the diluted material, you should label it up and mark it as 'slide ready'. Even if you have plenty of stock you should do this and put the bottle into our Sales and Exchanges column as someone else, I'm sure, would appreciate it. This might be a way of getting new, uncontaminated bottles for old and save you a huge amount of effort cleaning them!

You are now ready to apply the mountant. It doesn't really matter a great deal which of the mountants you choose though Naphrax is cheap and easily available. Try as many as you can get hold of. For dropping mountant onto a strew we use toothpicks as they are cheap and disposable and don't require cleaning. Let fall two or three drops (the exact size of the drop in this instance is determined by the size of your toothpick) onto the very centre of the slide, place a circular coverslip (about 16mm is right for a strew) onto the mountant. If you get air in it doesn't matter. Take the slide to a spirit burner and boil the mountant. This can be quite vigorous but take care, remember that the slide has a considerable amount of latent heat when the mountant starts to bubble. When it does bubble remove it from the flame and let the action subside a little and then re-apply the heat. Do this until the amount of bubbling is less or the mountant is visibly thicker. (Note that excessive heating of some mountants causes them to discolour). Remove from the heat and as the boiling subsides just touch the top of the coverslip with the tip of a fresh toothpick. The coverslip will settle, there should be no bubbles and the mountant will have been driven into (and the air driven out of) every frustule. Put the slide aside to cool. Having driven off most of the solvent, when the slide is cool it is ready for ringing. If you wish to leave the slide for a while for the mountant to harden more at the edge then you may do so. If you have judged the volume of mountant correctly you should have little, if any, overflow at the edges of the coverslip. If there is any evidence of such then a craft knife will remove this easily, or you may wish to use a cream kitchen cleaner which will also remove small amounts of excess mountant. Ringing is a matter of personal choice. We have used all manner of ringing agents, from Nail Varnish to Model Enamel to Smooth Hammerite. Only use a ringing compound that does not have as its solvent the same one as used in the mountant. All the ringing compounds we use are quick drying and there is little danger of creep under the coverslip (although this does happen from time to time).

If you have followed the instructions above, and we haven't lied to you, you should now be the proud owner of a representative strew.
What of the 'selective' strew?

The selective strew takes two forms -

i. whole frustules only with no girdle bands.
ii. all valve material.

Whichever of these you choose the following operation is necessary. If you read the article concerning the diatom frustule in the last issue you will already know that girdle bands are often open-ended, a little bit like an old-fashioned hair grip (showing my age), from pennates or a circlip from centric forms.

A girdle band of the circlip variety. Photograph by Peter Bruce.

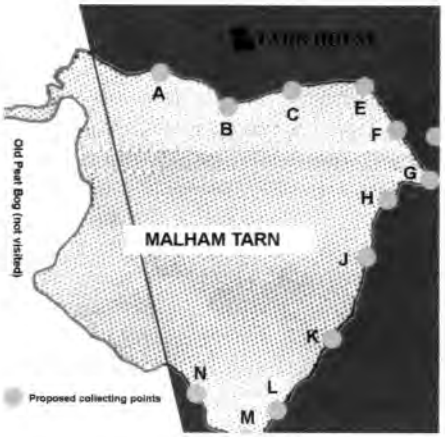
You are able to use this feature to your advantage when you want to remove them from a sample. If you take a semi-diluted sample and swirl it vigorously the girdle bands have a tendency to snag one another and gradually they clump together. When you stop swirling the mass of bands sinks to the bottom faster than the free valves. Decant the liquor off into another bottle and examine a small drop. Many, if not nearly all, the girdle bands should have been removed. You may now further dilute and mount as above.

If you require just whole valves and no valve debris then you will need to perform the above step and you will then need to filter the sample. And that is the subject of another article.

Microscopic - but visible from Space!

"Micro-organisms create a line in the ocean," Science News, Oct. 22, 1994, p. 263.

A massive number of diatoms of the genus Rhizosolenia have congregated at the point of convergence of two Pacific Ocean currents, creating a colourful line of life that is visible from space.



Favourite locations.

No. 2. Malham Tarn

by Steve Gill

My interest in Malham Tarn was first roused by reading Horace Barber's paper which was published in the Quekett Journal 1982 - Vol. 334, pp. 274-380.
Coincident with this was an invitation to attend the Microscopical Weekend arranged by Peter Bruce, of the Postal Microscopical Society, at that particular location.

Horace Barber had lived in Nuneaton, the town where I now live, only some two miles from my own house. This series of coincidences was just too much for me to ignore.

Armed with his paper, a microscope, Mike Samworth, Steve Edgar and a host of other interested individuals, I set off 'In Barber's Footsteps'.

Malham Tarn lies approximately 25 miles northwest of Bradford, at an altitude of 377m. The Tarn surface area is about 153 acres and the average depth is 2.4m. The maximum depth is 4.4m. The Malham Tarn catchment area covers about 6 km.

The Tarn is frozen for most of the winter but in summer the water temperature reaches as high as 20 degrees Celsius. This is still quite cold as anyone who has fallen in will testify.

The inflow to the Tarn consists of a small stream entering at the north-western corner and to a lesser extent the small springs that issue from close to the limestone/shale boundary at the base of the limestone scar on the eastern shore.

There is one outflow at the southern end of the Tarn, called Tarn Foot. The outflow stream flows for only a short distance - depending on outflow strength - before sinking into the limestone. This is the embryonic River Aire.

To the west is a raised bog called "Tarn Moss". A cliff has formed as a result of erosion by the Tarn water subsequent to the raising to the water level in 1771.

Small beds of Carex rostrata (sedge) grow in the NW corner and the sheltered east bay. The north and north-east shores are of limestone with glacial drift covering and variable sized boulders and pebbles of limestone.
The Tarn lies largely over Silurian slates covered with thick glacial drift and marl deposits. Surrounding the Tarn is a karstic limestone landscape of predominately Carboniferous age.

Tarn House Photograph by Mike Samworth

The Tarn below Tarn House Photograph by Mike Samworth

Samples were collected from submerged weed, from the stones forming the bed of the Tarn and also free floating masses.

All samples were cleaned using the hot acid method and mounted in Pleurax.

The descriptions below are taken from 'A Treatise on the Diatomaceae by H. van Heurck'.

Cocconeis pediculus Ehr.
Valve elliptic, plain or very slightly flexed; median hyaline zone of the upper valve enlarged at the centre of the valve, and showing feeble traces of raphe and nodules; lower valve furnished with a ring covered with striae, punctate, distant, about 15 in 1 c.d.m., separated by a hyaline zone from the remainder of the valve, which is covered with radiating striae, very fine, punctate, about 22 in 1 c.d.m. Length, from 1.25 to 3.5 c.d.m.

Cocconeis placentula Ehr.
Valve elliptic, plain or very slightly flexed; median hyaline zone of the superior valve enlarged at the centre of the valve, and showing feeble traces of raphe and nodules; inferior valve furnished with an annulus covered with striae, punctate, distant, about 15 in 1 c.d.m., separated by a hyaline zone from the remainder of the valve, which is covered with radiating striae, very fine, punctate, about 22 in 1 c.d.m. Length, from 1.25 to 3.5 c.d.m.

Diatoma vulgare Bory. Picture left.
Valves broadly lanceolate or linear, with apices scarcely or not rostrate or capitate. Pseudo-raphe indistinct. Costae delicate, about 5 or 6 in 1 c.d.m.; striae fine, delicately punctate 16 in 1 c.d.m. Gidle face quadrangular, with straight margins. Length 4 to 5 c.d.m.

Pinnularia virides *(Navicula viridis* Kutz.) Picture right.
Valve linear-elliptic, without inflations, apices rounded. Costae about 7 in 1 c.d.m., rather approximate to the raphe, and leaving scarcely any marked space round the central nodule; radiate at the middle of the valve, convergent towards the apices. Length, very variable, from 5 to 20 c.d.m.

The table below compares our initial identification of our samples against those identified by Barber.

Species	*Authority*	*Barber 1981*	*2000*
Achnanthes affinis	Grun	*	*
Achnanthes Clevei	Grun.	*	
Achnanthes lanceolata	Breb.	*	
Amphora ovalis v. pediculus	Kutz.	*	*
Caloneis sp.		*	*
Cocconeis flexella v. aepestris	Brun.	*	
Cocconeis pediculus	Ehr.	*	*
Cocconeis placentula	(Ehr.) Hust.	*	*
Cymatopleura elliptica			*
Cymatopleura solea v. constricta(librile?)	Grun.	*	*
Cymbella ? Cistula fa. ? turgida fa.		*	*
Cymbella ? helvetica fa.	Kutz.	*	*
Cymbella affinis	Kz	*	
Cymbella helvetica	Kutz.	*	

Species	*Authority*	*Barber 1981*	*2000*
Cymbella lanceolata	(Ehr.)H.V.H.	*	*
Cymbella microcephala	Grun.	*	
Cymbella obtusa	Greg.	*	
Cymbella prostrata v. aurswaldii	(Rabh.)Reim	*	*
Cymbella prostrata var. oswaldii	(Rab)Rein.	*	*
Cymbella sturii fa.	Grun.	*	
Cymbella tumida		*	
Cymbella ventricosa	Kz	*	*
Denticula tenuis v. crassula	(Naeg.)Hust.	*	*
Diatoma elongatum	Agardh.	*	
Diatoma vulgare fa.		*	*
Diatoma vulgare v. ? auxosporeform		*	
Diatoma vulgare v. grandis	(Sui Sui) Grun.	*	
Diatoma vulgare v. producta	Grun.	*	
Diatoma hiemale v. mesodon			*
Diploneis marginestriata fa.	Hust.	*	
Diploneis marginestriata	Hust.	*	
Epithemia zebra	(Ehr.)Kutz.	*	
Eunotia arcus fa.	Ehr.	*	*
Fragilaria construens v. subsalina	Hust.	*	
Fragilaria construens v. ventis fa.	(Ehr.) Grun.	*	
Fragilaria construens	(Ehr.) Grun.	*	*
Fragilaria crotonensis	Kitton	*	*
Fragilaria intermedia fa.	Grun.	*	
Fragilaria intermedia	Grun.	*	
Fragilaria leptostauron v. harrisonii	Wm.Sm.	*	
Fragilaria leptostauron	(Ehr.)Hust.	*	
Fragilaria sp. ? var. ventis	(Ehr.) Grun.	*	
Frustulia rhomboides ?	-		*
Gomphonema accuminatum v. coronata	(Ehr.)Wm. Sm.	*	*
Gomphonema angustatum	(Kutz.)Rab.	*	
Gomphonema augur fa.	Ehr.	*	
Gomphonema Brebissonii			*
Gomphonema constrictum		*	
Gomphonema olivaceum	(Lyng.)Kutz.	*	
Gomphonema sp.		*	

Species	Authority	Barber 1981	2000
Gomphonema truncatum			*
Gyrosigma attenuatum	(Kutz.)Rabh.	*	*
Melosira varians	Agardh.	*	
Meridion circulare	Agardh	*	*
Navicula intermedia (Near)	Grun.	*	
Navicula radiosa (lanceolate form)	Kutz.	*	
Navicula radiosa (rhombic form)	Kutz.	*	*
Navicula radiosa v. tenella	Breb.	*	
Navicula sp. Near N. veneta		*	
Navicula sp.		*	
Nitzschia augustata v. acuta	Grun.	*	
Nitzschia dissipata	(Kutz.)Grun.	*	
Nitzschia sp. (?Gracilis)(?acuta)		*	
Nitzschia sp.		*	*
Pinnularia virides		*	*
Stauroneis acuta			*
Surirella linearis fa.		*	
Surirella spiralis?		*	
Synedra actinostroides	Lemm	*	
Synedra sp. ? gracillina	Mayer	*	
Synedra ulna	(Nitz.) Ehr.	*	*
Tabellaria flocculosa	(Roth.) Kutz.	*	*

Since this first foray we have visited the Tarn on quite a number of occasions and have never failed to find something we hadn't found before.

Scientific Names

The system used for naming species was initially developed by the Swedish botanist and physician, Carolus Linnaeus in the mid 1700s. Linnaeus is thus, the father of taxonomy, a system which sets out to describe, name and classify organisms. His system of naming species, which is the one we still use today, begins by assigning all species a 2-part Latin name called a binomial. The first word of the binomial is the genus name of the species, and the second word is the specific epithet of the species.

As an example is we take Surirella gemma, then the Surirella portion is the genus name, (a name that is used for many associated diatoms) and the specific epithet, gemma, describes which of the Surirella species is being identified. There are no Common names for diatom species, which we think is a great shame, but then maybe it's already confusing enough.

Some Latin Abbreviations

When perusing the literature relating to the Diatoms one is often confronted by numerous latin abbreviations. The meaning of some of these you might be able to guess, others, however are not so obvious, as in the extract below from 'Seltene und neue Kieselagen II by Dr. Fr. Meister 1937'.

Pinnularia major v. *Hustedti* n. v.

Schalen linear mit schwach bauchiger Mitte und breit gerundeten Enden, 240—350 μ lang, 28—37 μ breit. Axialarea breit linear, gegen die Mitte lanzettlich erweitert, auf der einen Seite stärker als auf der andern. Raphe mässig breit, komplex mit einseitig abgebogenen Zentralporen. Transapikalstreifen 7 in 10 μ, parallel, in der Mitte leicht radial, von einem breiten Längsband gekreuzt.

Tafel 11. Fig. 1.

Darma, Java, südwestlich von Koenningan in der Residenz Cheribon, fossil quartär, Süsswasser. Ich verdanke das Material Herrn Dr C. Schumacher, Zürich.

Plagiogramma paucilineata n. sp.

Schalen linear mit gerundeten Enden, 37 μ lang, 6 μ breit. Pseudosepten tief eindringend, ein Paar um die Schalenmitte, ein weiteres vor jedem Ende. Transapikalstreifen locker, 8 in 10 μ, aus ziemlich groben, ineinanderfliessenden Areolen bestehend.

Sehr selten.

Tafel 11. Fig. 8.

You would probably guess that "n. sp." was New Species and accidentally you would be right it is actually n. - novus and sp. - species. The list below should enable you to read and understand the entries more fully. (be careful about the spacing as n.v. (without a space) has a different meaning to n. v. (with a space).

Latin Abbreviation (word)	Meaning
Al. (alii)	Others
al. (apud)	In the publication of, with or near
auct. (auctorum diversorum)	Of various authors
c. ic. (cum icone)	With illustrations
cap. (caput)	Chapter
cf., cfr. (confer)	Compare
cit. (citatus)	Cited
comb. (combinatio)	Combination
comb. nov. (combinatio nova)	New combination of name and epithet
nom. cons. (nomen conservandum)	Conserved name
comm. (communicavit)	(he) Communicated
del. (delineavit)	(he) drew, (he) portrayed
descr. (descriptio)	description
det. (determinavit)	(he) determined, (he) identified
div. (diversus)	various
e.p. (ex parte)	In part or partly
el. (elaboravit)	(he) revised

Latin Abbreviation (word)	Meaning
f. (fide)	according to (don't confuse with f. in a species name meaning - forma)
g., gen. (genus)	Genus
ic. (icon)	Illustration
id. (idem)	The same
ign. (Ignatus)	Unknown
in litt. (in litteris)	In correspondence
in loc. cit. (in loco citato)	In the place cited
in syn. (in synonymia, in synonymis)	in synonomy (synonomous)
incl. (inclusus)	Included
ined. (ineditus)	Unpublished
i.q. (idem quod)	The same as
lc., loc. cit. (loco citato)	At the place cited
lg. (longus)	Long
lith. (lithographit)	(he) Lithographed
n. (nomen or novus)	Name or new
n.v. (non visus)	not seen
nom. (nomen)	Name
nom. alt. (nomen alternativum)	alternative name
nom. ambig. (nomen amiguum)	ambiguus name
nom. confus. (nomen confusum)	confused name
nom. cons. (nomen conservandum)	Name conserved in International Code of Botanical Nomenclature
nom. illeg. (nomen illegitimus)	illegitimate name
nom. nud. (nomen nudum)	name unaccompanied by a description or even a reference to a published description
nom. obs. (nomen obscurus)	obscure name
nom. tant. (nomen tantus)	name only
nom. superfl. (nomen superfluum)	Superfluous name when published
non. al. (non aliorum)	not of other authors
nov. (novus)	New
op. cit. (opere citato)	in the work cited
sect. (sectio)	Section
seq. (sequens)	following
et. seq. (et sequentes)	and the following
sp. (species)	Species
spec. (specimen)	Specimen
ssp. (subspecies)	Subspecies
st., stat. (status)	rank
stat. nov. (status novus)	New rank
syn. (synonymon, synonymia)	synonym, synonomy
t., tab. (tabula)	Plate (Tafel, Planche)

Latin Abbreviation (word)	Meaning
t. (teste)	based on the evidence of
t., tom. (tomus)	Volume
t.c. (tomus citatus)	Volume cited
trans. nov. (translatio nova)	New transfer
typ. (typus)	Type
u.s. (ut supra)	as above (i.e. it means 'as above')
v., var. (varietas)	Variety
pro. var. (pro varietata)	as a variety
v. (vel)	or
v. (vide)	see
v. (vidi)	having seen
v., vol. (volumen)	Volume

There are variations of these abbreviations but the list above gives you a fighting chance of determining what is meant. There may be more, which we have missed. If you know of any then we can compile them and issue an update in a later issue.

Cleaning Diatoms

by Mike Samworth

Part 2.

In my first article I touched on the range of techniques that could be used to clean material; that is to remove the living part, leaving behind the siliceous frustule so that it can be mounted in some sort of resinous mountant of suitable refractive index for better viewing. As a reminder, these fall into three categories;

1. Incineration techniques
2. 'Mild' methods - hydrogen peroxide/potassium permanganate
3. More drastic chemical methods involving concentrated hot acids.

Though I clean almost all my samples now by a method in the third category, it does require some chemicals not always easy to come by, or use, and needs to be done in a safe environment. As such, in this second article, I want to give some details of the second type of method.

Method A : Hydrogen peroxide.

Hydrogen peroxide is an oxidising agent, and will clear most diatoms eventually. It works better on some types than others, but since hydrogen peroxide can be more easily obtained than acids, and its use is easier, it serves a useful purpose. Considerable care must still be taken though, especially to avoid getting it on the skin, since it is corrosive.

Allow the sample to settle completely, discarding the excess liquid, or supernatant. Add a small quantity (say 10-20 ml) of concentrated (>30%) hydrogen peroxide and let stand for several minutes. Let any foaming subside and only then add a little more

peroxide. Repeat until foaming becomes less violent. Because of the foaming, it is better to use a flask that is much bigger than the sample. If no serious foaming has occurred several minutes after the first small amount of peroxide has been added, add peroxide until the volume is about 10x that of the original sample. Heat gently, preferable using a water-bath for 30 minutes or so (depending on amount of organic dirt). Constantly watch, foaming can still get out of hand. Take the beaker out of the water-bath and place it on the bench, preferably in a wide dish or on a plate. Add a VERY SMALL pinch of finely powdered potassium dichromate. A violent reaction will occur, swirl and let subside. Only then add a little bit more of the dichromate. Continue this until the reaction has stopped, the contents of the beaker should now be orange in colour. Let settle completely, discard supernatant, re-suspend with excess water and repeat. You will only find out if this has been successful when you observe the fruits of your labours under the microscope.

Always wear protective clothing when dealing with chemicals

Method B : Potassium permanganate

Potassium permanganate is easily available from a number of sources, making this method quite convenient. If the sample is likely to contain salts, if from a hard-water area for instance, then first add some dilute hydrochloric acid, then let settle, or centrifuge, and wash with fresh water. Then, add double the sample volume ofsulphuric acid, car battery strength is enough. To this. add half a teaspoon of potassium permanganate and shake. It should be a rich purple colour. Check after a few hours, and add more permanganate if it has turned brown. Leave overnight if possible. Then add a pinch of sodium meta-bisulphite (sold in home-brewing shops or at chemists) upon which the solution should clear. Allow to settle and wash your sample a few times to remove excess chemicals. View under the microscope.

Have a go at these methods, and let us know how you get on. If you are an old hand, perhaps you have developed your own variation. We would welcome such additions greatly.

Next time, hot acid methods.

Diatom Genera List - C and D

The list contains the naming authority and the date when the genus was first described.

Genus	Described by	Date
Calcothrix	N. A. Desvaux	1828
Calcothrix	N. A. Desvaux in C.A. Agardh	1830
Calodiscus	L. Rabenhorst	1853
Caloneis	Cleve	1894
Calophyllum	G. Shadbolt	1854
Calyptosporium	D. M. Harwood & R. Gersonde	1990
Campylodiscus	C. G. Ehrenberg ex F.T. Kützing	1844
Campyloneis	A. Grunow	1862
Campylopyxis	L. K. Medlin	1985
Campylosira	A. Grunow in Henri-Ferdinand van Heurck	1881
Campylostylus	G. Shadbolt ex Henri-Ferdinand van Heurck	1896
Capartogramma	H. Kufferath	1956
Caponea	A. C. Podzorski	1984
Capsula	J. Brun	1896
Carnegia	J. Pantocsek	1912
Carrodoria	S. F. Gray	1821
Castracania	G. B. De Toni	1892
Catacombas	D. M. Williams & F.E. Round	1986
Catenula	C. Mereschkowsky	1903
Catillus	N. I. Hendey	1977
Cavernosa	S. R. Stidolph	1990
Cavinula	D. G. Mann & A.J. Stickle in F.E. Round,	
	R.M. Crawford & D. G. Mann	1990
Cavitatus	D. M. Williams	1989
Centronella	M. Voigt	1902
Centroporus	J. Pantocsek	1889
Ceramium	A. G. Roth1797	
Cerataulina	H. Peragallo ex F. Schött in Engler & Prantl	1896
Cerataulus	C. G. Ehrenberg	1843
Ceratodiscus	S. H. Meakin	1938
Ceratoneis	C. G. Ehrenberg	1839
Cestodiscus	R. K. Greville	1865
Chaetoceros	C. G. Ehrenberg	1844
Chaos	F. Schrank	1823

Genus	Described by	Date
Charcotia	M. Peragallo	1921
Chasea	G. D. Hanna	1934
Cheloniodiscus	J. Pantocsek	1889
Chrysanthemodiscus	A. Mann	1925
Chuniella	G. Karsten	1905
Cistula	P. T. Cleve	1894
Cladogramma	C. G. Ehrenberg	1854
Cladomphalus	J. W. Bailey in Bailey Collection	1877
Clavicula	J. Pantocsek	1886
Clavularia	R. K. Greville	1865
Clevamphora	C. Mereschkowsky	1903
Cleveia	J. Pantocsek in Jean-Clodius Tempère	1895
Clevia	C. Mereschkowsky	1902
Climacidium	C. G. Ehrenberg	1870
Climacodium	A. Grunow	1867
Climaconeis	A. Grunow	1862
Climacosira	A. Grunow	1862
Climacosphenia	C. G. Ehrenberg	1843
Cocconeis	C. G. Ehrenberg	1837
Cocconema	C. G. Ehrenberg	1832
Coenobiodiscus	A. R. Loeblich III, W.W. Wight & W.M. Darley	1968
Cohniella	B. Schröder	1897
Colletonema	A. de Brébisson ex F.T. Kützing	1849
Cometes	H. Edsbagge	1968
Compositus	V. N. Vekschina	1960
Concentrodiscus	G. C. Khursevich, A.I. Moisseeva & G.A. Suchova	1989
Confervea	O. F. Müller	1873
Corethron	A. F. Castracane	1886
Corinna	P. A. C. Heiberg	1863
Corona	P. Lefébure & E. Chenevière	1938
Coronia	C. G. Ehrenberg	1840
Cortinocornus	Z. I. Glezer	1984
Coscinodiscus	C. G. Ehrenberg	1839
Coscinophaena	C. G. Ehrenberg	1854
Coscinosira	H. H. Gran	1900
Cosmiodiscus	R. K. Greville	1866

Genus	Described by	Date
Cosmioneis	D. G. Mann & A.J. Stickle in F.E. Round, R.M. Crawford & D. G. Mann	1990
Costopyxis	Z. I. Glezer	1984
Cotyledon	J. Brun	1891
Craspedodiscus	C. G. Ehrenberg	1844
Craspedopleura	M. Poulin	1993
Craspedoporus	R. K. Greville	1863
Crateriportula	R. Flower & H. Håkansson	1994
Craticula	A. Grunow	1867
Creswellia	Arnott ex R. K. Greville in W. Gregory	1857
Crossophialus	D. M. Harwood & R. Gersonde	1990
Crucidenticula	F. Akiba & Y. Yanagisawa	1985
Crystalia	Sommerfeld in J. B. M. Bory de Saint-Vincent	1824
Ctenophora	(A. Grunow) D.M. Williams & F.E. Round	1986
Ctenophora	A. de Brébisson ex F.T. Kützing	1849
Cuneolus	M. H. Giffen	1970
Cussia	H. -J. Schrader	1974
Cycloites	J. Gruss	1928
Cyclophora	A. F. Castracane	1878
Cycloplea	V. B. A. Trevisan di San Leon	1848
Cyclosira	H. Peragallo & M. Peragallo	1907
Cyclostephanos	F. E. Round ex Theriot, Håkansson, Kociolek Round & Stoermer	1987
Cyclotella	(F. T. Kützing) A. de Brébisson	1838
Cyclotubicoalitus	E. F. Stoermer, J.P. Kociolek & W. Cody	1990
Cylindropyxis	N. I. Hendey	1964
Cylindrospira	A. G. Mitlehner	1995
Cylindrotheca	L. Rabenhorst	1859
Cymatodiscus	N. I. Hendey	1958
Cymatogonia	A. Grunow	1883
Cymatoneis	P. T. Cleve	1894
Cymatonitzschia	R. Simonsen	1974
Cymatopleura	W. Smith	1851
Cymatosira	A. Grunow	1862
Cymatotheca	N. I. Hendey	1958
Cymbella	C. A. Agardh	1830

Genus	Described by	Date
Cymbellonitzschia	Friedrich Hustedt in Adolf Schmid	1924
Cymbellopsis	K. Krammer	1997
Cymbophora	(F. T. Kützing) A. de BrÈbisson	1838
Cymbopleura	(K. Krammer) K. Krammer	1997
Cymbosira	F. T. Kützing	1844
Cypellachaetes	D. M. Harwood & R. Gersonde	1990
Cystopleura	A. de Brébisson ex O. Kuntze	1891
Dactyliosolen	A. F. Castracane	1886
Dalai-Lama	C. Mereschkowsky	1906
Dandrelion	P. Lefébure	1947
Dasyangea	D. M. Harwood & R. Gersonde	1990
Debya	J. Pantocsek	1886
Debya	J. Rattray	1888
Delphineis	G. W. Andrews	1977
Dendrelion	J. Pantocsek	1928
Dendrella	J. B. M. Bory de Saint-Vincent	1822
Denticella	C. G. Ehrenberg	1838
Denticula	F. T. Kützing	1844
Denticulopsis	R. Simonsen	1979
Desikaneis	A. K. S. K. Prasad & R.J. Livingston	1993
Desmidium	C. A. Agardh	1824
Desmogonium	C. G. Ehrenberg in R. Schomburgk	1848
Detonia	J. Frenguelli	1949
Detonula	F. Schött ex G.B. De Toni	1894
Dextradonator	R. Ross & P.A. Sims	1980
Diadema	Klaus-Dieter Kemp& T. B. B. Paddock	1989
Diademoides	Klaus-Dieter Kemp& T. B. B. Paddock	1990
Diadesmis	F. T. Kützing	1844
Diatoma	A. P. de Candolle in Lamarck & A.P. de Candolle	1805
Diatoma	J. B. M. Bory de Saint-Vincent	1824
Diatomella	R. K. Greville	1855
Diatomosira	V. B. A. Trevisan di San Leon	1848
Dichomenis	C. G. Ehrenberg	1862
Dickensoniaforma	R. P. Scherer	1997
Dickieia	M. J. Berkeley ex F.T. Kützing	1844
Dicladia	C. G. Ehrenberg	1844

Genus	Described by	Date
Dicladiopsis	G. B. De Toni	1894
Dictyocysta	C. G. Ehrenberg	1854
Dictyolampra	C. G. Ehrenberg	1847
Dictyoneis	P. T. Cleve	1890
Dictyopyxis	C. G. Ehrenberg	1844
Didymosphenia	M. Schmidt in Adolf Schmidt et al.	1899
Dimeregramma	J. Ralfs in A. Pritchard	1861
Dimeregrammopsis	M. Ricard	1987
Dimidiata	M. Hajós	1974
Dinophysis	C. G. Ehrenberg	1839
Diomphala	C. G. Ehrenberg	1842
Diplomenora	K. Blaze	1984
Diploneis	C. G. Ehrenberg ex P.T. Cleve	1894
Disciferium	A. G. Vologdin	1962
Discodiscus	A. M. Gombos, Jr.	1980
Discoites	J. Gruss	1928
Disconeis	P. T. Cleve	1895
Discoplea	C. G. Ehrenberg	1840
Discosira	L. Rabenhorst	1853
Discus	C. Stodder	1879
Disiphonia	C. G. Ehrenberg	1854
Distephanosira	Z. I. Glezer	1992
Distichanthes	C. G. Ehrenberg	1854
Distrionella	D. M. Williams	1990
Ditylum	J. W. Bailey ex L.W. Bailey	1862
Donkinia	J. Ralfs in A. Pritchard	1861
Doryphora	F. T. Kützing	1844
Dossetia	F. Azpeitia	1911
Drepanotheca	H. J. Schrader	1969
Druridgia	A. S. Donkin	1861

Old Papers - Revisited

In this series of articles we are reproducing some hard to find papers from years gone by.

The following paper was originally published in the Transactions of the Microscopical Society Vol. 9. No. 5. pages 5-9 and pl.II. January 1861.
First a little background material relating to George Norman.

George Norman (b. 1823[Hull] d.5th July 1882[Peebles])
A comprehensive biography of George Norman appears in the Hull Scientific and Field Naturalists Club Journal of 1900.
List of Hull Diatomaceae in Transactions of the Microscopical Society VIII (1860).
Diatoms in Hull Museum, catalogued by R. H. Philip.
References:- Catalogue of Scientific papers compiled and published by The Royal Society, IV, 643., VIII, 517., X, 939., XIII, 541. ; Correspondence of G. A. Walker-Arnott in Department of Botany, Natural History Museum. ; Transactions of the Hull Field Naturalists Club I, 105 (includes portrait) and II, 14. ; The Naturalist 1903, 307. Pleurosigma Normanii Ralfs.
Author - Notes on some new and rare Diatomaceae, from the stomachs of Ascidiae. 8vo, pp. 2. London 1857.
Author - List of Diatomaceae occurring in the neighbourhood of Hull. 8vo, pp. 23. London 1860.
Author - On some Undescribed Species of Diatomaceae. 8vo, pp. 5. plate 1. London 1860.
Author - List of Diatomaceae occuring in the neighbourhood of Hull. 2nd edit., 8vo, pp. 32. Hull 1865
Author - Hunting for Diatoms. 8vo, pp. 10. London 1862.

On some UNDESCRIBED SPECIES *of* DIATOMACEAE.

By George Norman, Esq., of Hull.
(Read November 14th, 1860.)
(Communicated by F.C.S. Roper, F.L.S., F.G.S., &c.)

In purposing to give, in this and future short papers, figures and descriptions of new forms of Diatomaceae from my cabinet, I trust that no apology is needed, but rather, by so doing, to be of service to diatomists.

As a general rule, it may not be deemed advisable to describe a new form from scanty materials, or from single specimens; but when a form occurs that cannot easily be confounded with any described spacies, the sooner it is made known the better, in order that others may have their attention drawn to it.

I gladly make use of this opportunity to call the attention of those who have facilities for obtaining from their correspondents in Australia, the Pacific Islands, West Indies, &c., the alimentary matter of Ascidians and other molluscs. It will be seen that some of the forms described in this paper are from an Ascidian gathering from the west coast of Australia.

For this gathering I am indebted to the kindness of Dr. J. D. Macdonald, of H.M. Surveying Ship Herald. The great bulk of non-diatomaceous matter in this gathering being calcareous, it was readily cleaned by means of acid; and turned out to be by far the richest in new and undescribed forms of any gathering I have had an opportunity of examining. Among the beautiful forms, are such as *Navicula bullata, Campylodicus diplostictus,* &c.; there are a great many which I am unable to refer to any existing genera. The stomach-contents of the larger Mollusca, such as *Strombus* and *Tridacna,* would doubtless be found to be mainly diatomaceous in their nature.

Even land molluscs seem to derive part of their nutrition from the endochrome contained between the siliceous valves of Diatomaceae, for on recently examining the faecal matter of our common garden-snail, *Helix aspersa,* I noticed, among other forms, a good many valves of *Nitzschia Amphioxys,* a species which Ehrenberg has found in a great number of samples of soil from various parts of the world, and which seems to have a wider geographical range than any other species that I am acquainted with.

Again, the tadpole of the common Frog seems to be almost exclusively diatominivorous in the selection of its food. I lately examined the stomach-contents of some specimens which had been kept for a few weeks in a small glass tank, when the mass was found to consist of fully sixty per cent. of Diatomaceae.

These circumstances are mentioned here merely for the purpose of attracting the attention of those who have the opportunity of studying the subject more fully. It is also quite possible that such investigations may tend to clear up the yet, I believe, disputed point, as to the vegetable or animal nature of these beautiful organisms.

1. *Astrolampra Stella,* n. sp., Norm. (Plate II, fig. 1). - Valve of six rays, rays club-formed in the centre and gradually becoming linear towards the margin. Outer edge of disc divided into twelve punctate divisions.

   Habitat. - Sierra Leone, in a gathering kindly communicated by Mr. F.Kitton, of Norwich.

   This remarkable disc, I place, provisionally in *Astrolampra,* its structure having little in common with that genus. The unsymmetrical appearance may be, and in all probability, is owing to my specimen being a double valve, for in the centre is seen a series of six indistinct rays, which I have endeavoured to give in the drawing.

   Altogether it is a remarkable form, and, probably, ought to constitute a new genus.

   By giving it a place in this paper, I hope to call the attention of those who have correspondents at Sierra Leone, to urge them to send material from the coast in that locality.

2. *Surirella Baljikii,* n. sp., Norm. (Fig. 2). - Valve pandiform , canaliculi cnspicuous, widening out towards the margin, absent in constricted portion. Centre of valve a smooth cruciform space; the transverse limb being broader than the longitudinal one, and approaching the margin of the valve at its constricted part. Margin of valve striated; striae 40 in .001'.

   Marine, in a deposit from Baldjik, near Varna.

   This deposit is full of beautiful and interesting forms, many of which are new and undescribed. The piece of earthy deposit I picked out of a cargo of bones discharging in the docks. The captain of the vessel informed me that the cliffs about Baldjik are wholly composed of this white-coloured earth.

   It will be worth while obtaining a larger supply of this material, which is the same that yielded the beautiful little form which Mr. Brightwell has described as *Odontidium Baldjikii.*

3. *Coscinodiscus fuscus,* n. sp., Norm. (Fig. 3). - Valve convex, depressed in centre; granules arranged in radiating lines, diminishing in number at intervals, thus forming distinct zones. Granules 20 in .oo1"; diameter of valve .0043" to .0067".

   Marine, stomach of Ascidians, North Sea.

   Valve, under a low power, opaque, brownish black, lighter in centre, where it is green. At first sight it reminds one of *Eupodiscus Ralfsii;* but the colour is much darker, the granules much smaller, and more crowded together. In this respect it appears to be half way between *E. Ralfsii* and a disc which I found in considerable quantities on bones from Constantinople, and which has been doubtfully referred to *Eupodiscus subtilis.*

   The want of anything like a marginal nodule in the species now described, relieves me of any uncertainty as to its proper generic position; hence I refer it, without hesitation, to *Coscinodiscus.* Hitherto it has occurred only in one or t wo ascidian gatherings, and then only sparsely.

4. *Nitzschia vitrea,* n. sp., Norm. (Fig. 4). - Frustule hyaline, broadly-linear, extremeties truncated; valve linear-lanceolate, slightly constricted in its centre, and somewhat produced at the ends; puncta conspicuous, bead-like. Striae very obscure, 58 in .001". Length of frustule .0025" to .0055".

   In brackish water, Hll.

   It is not often that one has the good fortune to detect a new British form. The present one, however, cannot be referred to any of the species given in Smith's 'Synopsis'.

   The only locality that has hitherto yielded it is a small ditch of water influenced by high spring tides. The same locality furnishes *Nitzschia Brebissonii, vivax,* and *bilobata.*

5. *Aulacodiscus Sollittianus,* n. sp., Norm. (Fig. 6). - Disc large, colourless, processes very prominent (about six), submarginal. Granules in radiating lines,

9 in .001", absent in centre valve and around base of processes.

In a deposit from Nottingham, Maryland.

Diameter of valve .009"; processes large, and under a low power, appearing as if they had rings attached to them.
This fine species I have great pleasure in dedicating to Mr. J. D. Sollit, whose long services with the microscope, conjointly with Mr. Robert Harrison, have, I think, been insufficiently recognised.

Unfortunately it is very scarce in the small quantity of the deposit I have hitherto worked upon. I expect soon to have a large quantity of material, when it is to be hoped that it may prove more abundant. The blank centre, large size, and unusual distance from the margin of the nodules, together with the large blank spaces around the same, render this a well-marked species.

Judging from the occurrence, in abundance, of the various species of *Heliopelta* in this deposit, together with *Eupodiscus Rogersii, Craspedodiscus elegans, Aulacodiscus Crux, Sceptroneis caduceus, Triceratium solenoceros, condecorum, undulatum,* and *acutum,* there can be little doubt that it is identical with the Bermuda earth of Professor Bailey, the locality of which has hitherto remained in much doubt. For the small quantity received I am indebted to Messrs. Sullivant and Wormley, of Columbus, Ohio. The deposit was discovered, I believe, by Dr. Johnson, of Baltimore, near Nottingham, Maryland, not far from the Patuxent River, and within a moderate distance of Piscataway, where the well-known rich deposit occurs.

Bermuda Hundred, on the James River, in Virginia, is distant about a hundred miles from Nottingham, but as all the waters of this district find their way into the great Chesapeake Bay, it is quite possible that the locality suggested by Dr. Arnott may have furnished the sample of Bermuda earth originally sent to this country by Dr. Bailey. I understand, however, from Messrs. Sullivant and Wormley, that Dr. Johnson had examined the country at Bermuda Hundred without finding any deposit whatever. When the larger supply of the Nottingham material arrives, I shall be glad to supply my friends with a portion.

6. *Eupodiscus ovalis,* n. sp., Norm. (Fig. 7). - Valve elliptical, nodule single, submarginal; granules arranged in radiating lines, crowded near the margin, sparser towards the centre. Colour, tawny brown. Length of valve .0020" to .0035". Marine, stomach of Ascidians, Shark Bay, Australia. This species approaches *Eupodiscus fulvus,* differing, however, in the elliptical shape, altered position of the nodule, which in the latter is nearer the margin, and also in the arrangement of the granules, the disc being divided into regular segments by the longest line of granules.

7. *Navicula bullata,* n. sp., Norm. (Fig. 6). - Valve elliptical, extremeties slightly produced. Striae in a marginal and two central bands; marginal bands of unequal width. The smooth space between the striated bands studded with a line of circular bosses. Striae moniliform, 14 in .001". Length of valve .0065"; breadth .0030".

Hab. - Stomach of Ascidians, Shark Bay, western coast of Australia; kindly communicated by Dr. Macdonald.

This singularly beautiful form is exceedingly rare in the above-mentioned gathering. It belongs unquestionably to the group of forms of which *Nav. lyra* is the type. The remarkable row of bosses on the smooth bands renders it distinct from any known species.

It may be remarked that, in describing the structure of *Coscinodiscus fuscus* and *Aulacodiscus Sollitianus,* I have designated the markings on the valves "granules", instead of adopting the usual method of calling them areolae, or cells. Hitherto, I believe, most authors have adopted the latter designation in describing the various species of *Coscinodiscus, Aulacodiscus, Eupodiscus, &c.,* and have, by so doing, in my opinion, overlooked the real nature of the construction.

Dr. Wallich has done good service in pointing out the true structure of the markings of *Pleurosigma,* and I feel convinced that all the above-mentioned discs are constructed on the same plan, differing only in the form of the elevations or granules, and their arrangement on the surface of the valve.

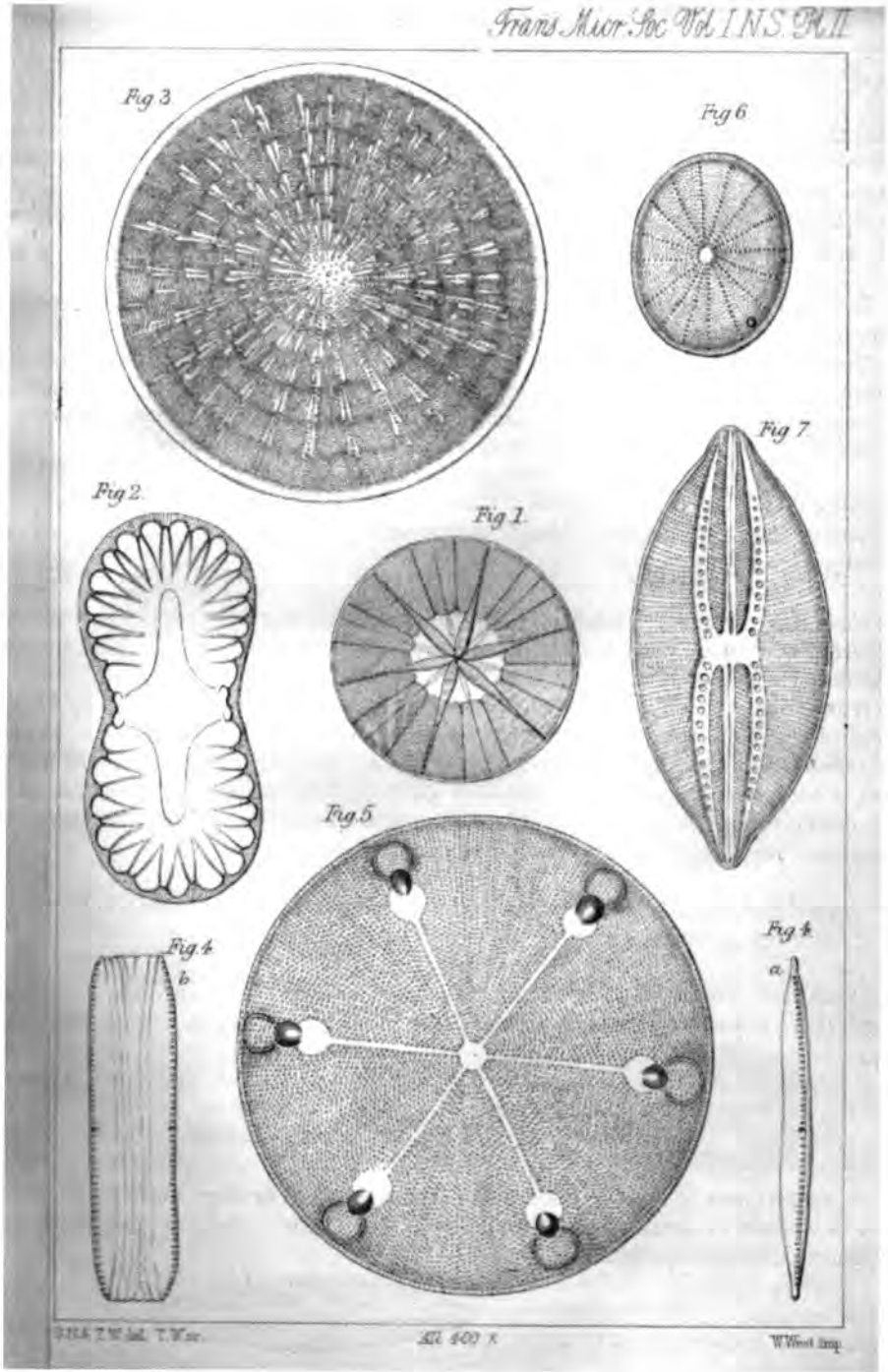
In *Pleurosigma* the markings are four-sided elevations; while in *Coscinodiscus, Eupodiscus, &c.,* they are circular when not crowded, but assuming the irregular or hexagonal form when pressing on each other. The same structure appears to exist in *Biddulphia, Isthmia, &c.,* and probably in all diatoms, not even excepting *Triceratium favus,* the raised portions of silex only differing in form.

On examining a valve of *Coscinodiscus gigas,* or *lineatus,* for instance, with a good one fourth or one twelfth, we find the colour of the valve, in the interstices between the granules, to be pink, whereas the granules themselves are white, or colourless.

The true structure, however, is better seen in valves where the granules are more circular, and not so much crowded together. Here the structure will be apparent at a glance.

DESCRIPTION OF PLATE II.

Fig.1. Asterolampra Stella
Fig.2. Surirella Baldjikii
Fig.3. Coscinodiscus fuscus
Fig.4. Nitzschia vitrea
Fig.5. Aulacodiscus Sollittianus
Fig.6. Eupodiscus ovalis
Fig.7. Navicula bullata
All magnified 400 diameters



The Diatom Frustule

(continued)

In this issue we shall discuss the various valve shapes and the names given to those shapes. Adjacent to each definition is a drawing of a diatom that exhibits the specific feature. (Note:- Drawings are usually presented 'hanging', that is the long side runnimg top to bottom and the thickest apex at the top. We represent them here in whatever attitude best utilises the available space.)

The general outline of a diatom is quite important when considering descriptions, either read or written.

Describing the shape of a diatom has, over the years, become something of an artform, with each nuance of line being assigned a geometric definition.

Take for instance, a description found in a modern work - 'A guide to the Morphology of the Diatom Frustule by H. G. Barber and E. Y. Haworth'.

Caloneis.
Valves elliptic, lanceolate or linear, occasionally gibbous or triundulate in outline.
Isopolar and isobilateral.

Now this particular work is excellent in that it contains descriptions of all these terms and by flicking back and forth one may gather the sense of it all. It is, however, difficult to remember all these terms and form a picture in ones mind.

It must be the case that the preponderance of geometric terms in Diatom morphology is one of the things that can put people off. If a beginner is trying to describe a frustule to someone who insists on asking whether it is lanceolate or linear, a point is soon reached where the beginner gives up. Using these terms is also fraught with complications and the potential for error and misunderstanding quite large. Take for instance the dictionary definition of **'lanceolate'**:-

shaped like a lance-head: lancet shaped: tapering toward both ends and two or three times as long as broad

What does a lanceolate valve actually look like and which of these descriptions apply. There is room for considerable interpretation. If the valve is shaped like a lance head -

but its length (apex to apex) is substantially more that two or three times its length, can it be described as lanceolate? The answer is yes it can and is, so only part of the dictionary definition applies.

Navicula lanceolata
Schmidt Atlas der Diatomaceenkunde Taf. 47 f.49

What about **linear** then?

of or belonging to a line: of one dimension: consisting of, or having the form of lines: long and very narrow, with parallel sides.....

Only a little clearer here, as we could apply part of this description to a lot of valves. Simply - are the two long sides parallel and is it not square at the ends?

Diatoma elongatum
Schmidt Atlas der Diatomaceenkunde Taf. 268 f.55

Rectangular - A simple one - Opposite sides parallel to each other and at 90 degrees to the adjoining sides.

Cistula Lorenziana
Schmidt Atlas der Diatomaceenkunde Taf. 212 f.55

Elliptic - An ellipse - A squashed circle.

Surirella fastuosa
Schmidt Atlas der Diatomaceenkunde Taf. 206 f.6

Ovate - Egg-shaped - Both ends rounded but with one end more pointed than the other.

Surirella cuneata
Schmidt Atlas der Diatomaceenkunde Taf. 206 f.15

Clavate - Club-shaped
Meridion Circulare
Schmidt Atlas der Diatomaceenkunde Taf. 267 f.43

Circular - This one is easy.

Asterolampra vulgaris
Schmidt Atlas der Diatomaceenkunde Taf. 202 f.16

Semi-Circular - Half a circle

Cymbella norvegica
Schmidt Atlas der Diatomaceenkunde Taf. 10 f.38

Sub-Circular - This is a shape that is closer to a circle than a squashed circle (elliptic).

Surirella sp.
Schmidt Atlas der Diatomaceenkunde Taf. 206 f.13

Rhombic - Opposite sides parallel but not at ninety degrees to the adjoining sides.

Isthmia nervosa
Schmidt Atlas der Diatomaceenkunde Taf. 135 f.6

Triangular - Yes, triangular.

Entogonia graciosa
Schmidt Atlas der Diatomaceenkunde Taf. 204 f.2

Cruciform - In the shape of a cross or a plus sign.

Triceratium siderium
Schmidt Atlas der Diatomaceenkunde Taf. 152 f.21

Crescentic - Crescent shaped with thick middle, narrow ends.

Cocconema arcus
Schmidt Atlas der Diatomaceenkunde Taf. 10 f.5

Arcuate - Crescent shaped but of a similar width throughout its length.

Epithemia hyndmani
Schmidt Atlas der Diatomaceenkunde Taf. 249 f.5

Trilinear - With three arms but not joined to make a triangle.

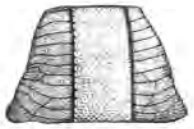
Triceratium Clavatum
Schmidt Atlas der Diatomaceenkunde Taf. 204 f.3

Quadrate - Square

Triceratium intermedium
Schmidt Atlas der Diatomaceenkunde Taf. 204 f.5

Trapezoid - A shape of four sides, where the angles created by one side joining two others has one greater than 90 and one less than 90, but don't confuse it with Rhombic.

Isthmia nervosa, Schmidt Atlas der Diatomaceenkunde Taf. 135 f.4



Pentagonal - Five Sided

Triceratium Cyclamen
Schmidt Atlas der Diatomaceenkunde Taf. 165 f.5

Polygonal - Symmetrical with lots of sides.

Actinoptychus decorans v. japonica
Schmidt Atlas der Diatomaceenkunde Taf. 155 f.15

Sigmoid - According to the dictionary
C-shaped: S-shaped.

Nitzschia vermicularis
Schmidt Atlas der Diatomaceenkunde Taf. 332 f.5

In relation to diatoms you should only consider the S-shape definition as applicable. However, sigmoidal is also a mirrored-S, and it is only an S if you use your imagination and unravel it a bit.

Panduriform - This word is not in my dictionary. It actually refers to 'having a waist'.

Surirella mollis
Schmidt Atlas der Diatomaceenkunde Taf. 206 f.19

Reniform - broadly kidney-shaped. This shape is very similar to Auricular (see below).

Spatulate - This form takes the shape of the rounded end of a spatula cut off at the stem. - This sort of form might also be described when looking at something like Isthmia enervis from a peculiar angle.

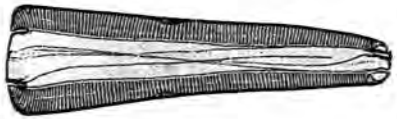
Biddulphia Baleana
Schmidt Atlas der Diatomaceenkunde Taf. 121 f.5

Bilobate - Having two lobes. One at each end of the frustule.

Navicula nodesa
Schmidt Atlas der Diatomaceenkunde Taf. 45 f.55

Hastate - The dictionary defines this as being spear shaped whereas it seems most often to be used with valves that are sword shaped, that being the blade of the sword.

Gomphonema exiguum v. artica f. angusta
Schmidt Atlas der Diatomaceenkunde Taf. 233 f.26



Cuneate - meaning wedge shaped - Most often used these days when referring to the girdle view of something like Gomphonema.

Gomphonema transilvanicum
Schmidt Atlas der Diatomaceenkunde Taf. 233 f.31

Auricular - Shaped like an ear.

Stoschia admirabilis
Schmidt Atlas der Diatomaceenkunde Taf. 140 f.17

Acicular - Needle shaped or slender and sharp pointed. Effectively the same as very narrow lanceolate.

Fusiform - spindle shaped, also **narrow lanceolate.**

Amphipleura pellucida
Schmidt Atlas der Diatomaceenkunde Taf. 369 f.12

That's the easy ones dealt with.

Semilanceolate - Consider the valve and if you were to mirror image it, the two parts would form a lanceolate shape. The original valve is considered to be semilanceolate. Half a lance head when sectioned apex to apex.

Gomphonema geminatum
Schmidt Atlas der Diatomaceenkunde Taf. 9 f.40

Some of the definitions you will find use variations and combinations of the above as the frustules are 'sort of like' the description but contain some variation for which a more lengthy description would be necessary.
Take as an example the aforementioned *Caloneis* description:-

Valves elliptic, lanceolate or linear, occasionally gibbous or triundulate in outline. I sopolar and isobilateral.

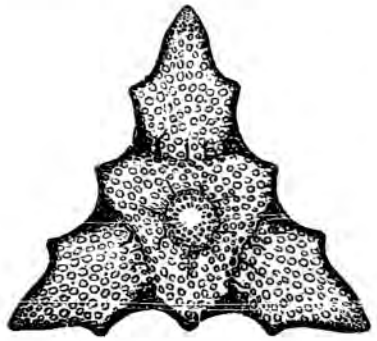
Gibbous - An unlikely sounding feature.
hump-backed: humped: unequally convex on two sides, as the moon between half and full.

This word is variously used to describe:-

a. an outline that has a single bulge in what might otherwise be a straight side.
b. a side that bulges outward and is dissimilar to the opposite side.

Now let us consider the **triundulate** portion.
This is simply describing a number of undulations in a single side of a valve - apex to apex. If there are two then it is **biundulate,** if three then **triundulate** and if more than this and you can't be bothered to count, then simply **undulate.**

Eunotia diodon f.17 *Eunotia triodon f.21* *Eunotia robusta v. decaodon*
All from Schmidt Atlas der Diatomaceenkunde Taf. 270



There is a term used that almost describes the same thing but is subtly different - **Crenulate.**

It also seeks to describe undulations as above but whereas **undulate** describes smoothly progressive undulations **crenulate** describes the sort of shape you often see in cartoons where someone has taken a bite out of an apple or a slab of cheese. The juncture of two undulations forms a point.

Triceratium crenulatum
Schmidt Atlas der Diatomaceenkunde Taf. 128 f.20

The other two terms commonly used in describing the valve shape are '**concave'** and **'convex'**. These terms are generally used when a valve bows smoothly apex to apex.

Thus the form to the right would be described as 'triangular convex'.

and this form on the left as 'triangular concave' whilst this form would be 'triundulate concave'.

Eunotia triodon
Schmidt Atlas der Diatomaceenkunde Taf. 270 f.21

These latter two examples illustrate how important it is to read the description properly and not read 'triangular concave' where it actually states 'triundulate concave'.

This now brings us to the last two items in the description - Isopolar and Isobilateral.

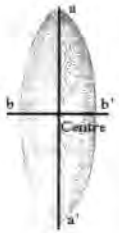
Isopolar simply means that the ends of the valve take the same form and are broadly the same size.

The opposite of this, where the valve ends are different shapes and/or different sizes is **Heteropolar.**
(**iso** = from the Greek *isos* meaning equal, **hetero** = from the Greek *heteros* meaning one or other but as a prefix meaning different.)

Isobilateral - this means the shape on either side of the apical axis is the same (apical axis - a line drawn along the length passing through the centre and apices).

The opposite of this is **bilateral** meaning that the shape of the valve either side of the apical axis differs.

You may also come across the terms Symmetrical and Asymmetrical. These two terms refer to the symmetry about an axis and will usually be used in conjunction with a definition of which axis is being cited.



The two axes usually mentioned are the apical axis (apex to apex) and the transapical axis (at right angles to the apical axis).
An apical axis is an imaginary straight line (a-a') running between the apices and through or as close to the mid point as possible (this mid point may also be imaginary as in the second example below).
A transapical axis is a line (b-b') which runs through the centre of the valve and forms a right angle at the point it bisects the apical axis.

In the next issue we will discuss the various named portions of a valve surface, how thay may vary and the names given to those characters.

By the end of the next article you will be able to converse in pure Diatomese and from a description you should be able to draw the valve (assuming an artistic flair).

What use is a Diatom test plate?

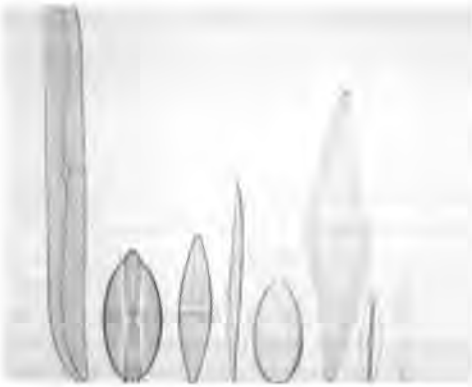
by Klaus-Dieter Kemp

In many years of watching amateur and professional microscopists using their microscopes, it has astounded me that these instruments are placed on a workbench and then used without any attempts to set the instrument up for optimum performance.

Just like a camera, a microscope can give very spurious and varying images, critical setting up alleviates the fact that the microscope can lie. Much has been written on the subject, often these go into very technical jargon and difficult to comprehend. In short one must ensure the following:-

a) The light path must be true that is to say it must not in any way be oblique.
b) The condenser must be aligned centrally.
c) The bulb filament also must be central.
d) For critical work any ground glass screen must be removed (Kohler illumination).
e) Objectives checked and cleaned of any residual oil.
f) Eyepieces cleaned of dust.

There are those who seem to think that a test plate will somehow magically set up a microscope, this it does not. The purpose of a test plate is to see how well each objective works under optimum conditions and the microscope should not be used without establishing these ideal conditions. Test plates have in the past used Podura (Silverfish) scales, Diatoms, Ruled gratings (Noberts test plates) and Blowfly tongues. A very good article by the late Saville Bradbury on this subject appears in the Quekett Journal Volume 39 Part 3 (Summer 2002). As Diatoms have fairly regular markings or structure they have found favour with microscopists for testing the resolving power of objectives and the microscopists demand for better objectives was driven in the main in their endeavor to resolve the finest of structures on Diatoms.



A slide currently available is an eight form test plate, the slide is graded from perhaps one of the most difficult Diatoms to resolve *(Amphipleura pellucida)* to one which can be resolved with a fairly low power objectives *(Gyrosigma balticum)*. There follows below a list of the Diatoms with quoted striae or punctae count. Striae being thickenings of silica usually at right angles to the raphe, at regular intervals. Some structures that you see as striae under low power objectives, when viewed under a higher magnification will then separate into dots (punctae).

Below is a list taken from various works showing the range of striae/punctae for each species on the test plate.

	Striae count
Amphipleura pellucida	37-40 in 10um
Frustulia rhomboides	20-30 in 10um
Pleurosigma angulatum	18-22 in 10um
Surirella gemma (Petroneis gemma)	23-25 in 10um (Punctae)
Nitschia sigma	20-30 in 10um
Stauroneis phoenicenteron	12-17 in 10um
Navicula lyra (Lyrella lyra)	10-20 in 10um
Gyrosigma balticum	11-13 in 10um

Some years ago the late Horace Dall sent me a slide of *Amphipleura pellucida* coated with Titanium, I believe he was the first to realise the potential of using the Electron Microscopy tools to enhance the visibility of Diatoms. Currently Mr. Jeremy Sanderson is employing the same technique with some wonderful results. One however must not mistake the fact that it is now possible to resolve Diatoms with this technique and assume that the microscope is now better set up. The technique merely enhances the structures and confirms many of the structures previously noted with diligent viewing. Whether or not one can resolve these structures therefore depends on may factors:-

1) The Refractive Index of the mountant.
2) The correct set up of the Microscope.
3) The type of illumination being used.
4) The type of filters in place.
5) Maximising the N.A. of the objective.

It is hoped to include in a future article a discussion on the various mountants that have been used for studying Diatoms, including where possible their Refractive Index.

When I had the chance to stay with the late John Carter he was able to drag out some of the finest structures (helped by better eyesight than my own) on an old microscope, utilising an external light source, a 1.4 N.A. objective and one of the only 1.4 N.A. condensers I have ever seen. His favourite trick was to use oblique illumination by inserting a card between the light source and the condenser, it was important to get the resultant shadow to fall across the Diatom at right angles. That is if the Diatom was mounted in a North/South configuration, then the shadow should show across the Diatom in an East/West configuration. At the intersection of light and dark one could then see very fine structure. It was explained to me that this is the same as the effect to be experienced when one is on a beach at noon with the sun overhead, very little of the structure of the beach can be seen. However, later on in the afternoon with the sun nearer the horizon one is able to see all the dips and hollows due to the sun casting shadows from the high points. In astronomy terms it is the same effect when looking at structures on the Lunar surface, with a full-moon little can be seen, however once the moon shows the various phases, at the point of the shadow it is possible to make out the mountain ranges easily.

It is hoped that the above article will encourage you to see just how well your instrument is working or how well you have set it up.

The 8-form test plate is available from Klaus Kemp. See advertisement in side front cover for contact details.

Editor's Notes: - In 1875 J. D. Moller's Institut fur Mikroskopie, Wedel I Holstein, Germany, produced a twenty form test plate (probe-platte). It contained species whose striae in 1/1000 inch ranged from 3 to 95.
The species list and details were as follows:-

Specie Name	Direction of striae	Striae in 1/1000 of an inch,after Morley
Triceratium favus Ehrbg.		3.7
Pinnularia nobilis Ehrbg.	Transverse	13.0
Navicula lyra Ehrbg. *var.*	Transverse	16.0
Navicula lyra Ehrbg.	Transverse	24.5
Pinnularia interrupta Sm. *var.*	Transverse	26.0
Stauroneis phoenicentron Ehrbg.		34.5
Grammatophora marina Sm.	Transverse	38.4
Pleurosigma Balticum Sm.	Transverse	33.1
Pleurosigma acuminatum (Kg.) Grun.	Transverse	46.4
Nitzschia amphioxys Sm.		49.2
Pleurosigma angulatum Sm.	Diagonal	47.0
Grammatophora oceanica Ehrbg. *(=G. subtilissima)*	Transverse	61.6
Surirella gemma Ehrbg.	Transverse	53.5
Nitzschia sigmoidea Sm.	Transverse	62.0
Pleurosigma fasciola Sm. *var.*	Transverse	58.0
Surirella gemma Ehrbg.	Longitudinal	67.0
Cymatopleura elliptica Breb.		63.0
Navicula crassinervis Breb *(=Frustulia saxonica* Rabh.)		86.0
Nitzschia curvula Sm.		90.0
Amphipleura pellucida Kg.	Transverse	95.2

Klaus Kemp is prepared to mount this test plate for anyone wishing to try it out. Please contact him for details of cost and availability.

Mollers test plate of 60 diatoms was also available and according to the article "A micrometrically standardised diatom test plate" by A. A. C. Eliot Merlin that appeared in Watson's Microscope record in May 1927, consisted of the following species:-

Specie Name	Direction of Striae	Spacing counted in 1/1000 inch
Navicula nobilis	Transverse	11.5
Navicula Lyra Ehr. *var.*	Transverse	19.5
Navicula Lyra var.	Transverse	25.5
Navicula Lyra var.	Transverse	28
Navicula permagna Bail.	Transverse	29
Navicula cuspidata Kg.	Transverse (64 Longitudinal)	30
Navicula rhomboides (North America)	Transverse	60
Navicula rhomboides (Sweden)	Transverse	68
Navicula crassinervis Breb.	Transverse	84
Navicula Lewisiana Grev.	Transverse	62
Stauroneis Phoenicentron Ehrb.	Transverse	34
Gramatophora serpentina Ralf.	Transverse	45
Gramatophora marina Sm.	Transverse	38
Gramatophora oceanica Ehrb.	Transverse	68
Striatella unipunctata Ag.	Transverse	58
Fragilaria capucina	Transverse	42
Rhizosolenia styliformis Schultze	Transverse	45
Rhizosolenia arctica Cl.	Transverse	58
Hyalodiscus Marinus Gnl.	Dots	32
Hyalodiscus subtilis Bail.	Dots	63
Surirella gemma Ehr.	Transverse	52
Surirella gemma Ehr.	Transverse	48
Surirella gemma Ehr.	Longitudinal	64
Surirella gemma Ehr.	Longitudinal	68
Nitzschia Graeffei Grun.	Transverse (52 Longitudinal)	30
Nitzschia sigmoidea Sm.	Transverse	66
Nitzschia amphioxys Sm.		45
Nitzschia sigma	Transverse (72 Longitudinal)	48
Nitzschia curvula Sm.	Transverse	92
Nitzschia obtusa Sm. var.	Transverse	80
Amphipleura pellucida Kg.	Transverse	97

Specie Name	Direction of Striae	Spacing counted in 1/1000 inch
Amphipleura Lindheimeri Grun.	Transverse (72 Longitudinal)	70
Endosigma eximum Breb.	Transverse	56
Pleurosigma scalproides Rubb.	Transverse	44
Pleurosigma fasciola Sm.	Transverse	53
Pleurosigma littorale Sm.	Transverse	40
Pleurosigma acuminatum Grun.		45
Pleurosigma hippocampus Sm.	Transverse	46.5
Pleurosigma hippocampus (Ostsee)	Transverse	36.5
Pleurosigma attenuatum Sm.	Transverse	34.5
Pleurosigma strigilis Sm.	Transverse	31
Pleurosigma spectabile Grun.	Transverse	44
Pleurosigma balticum Sm. (Cal.)	Transverse	37.5
Pleurosigma balticum (Frankreich)	Transverse	36.5
Pleurosigma balticum (Brazil)	Transverse	34.5
Pleurosigma naviculaceum Breb. (Samoa)	Transverse	53
Pleurosigma aestuarii Sm. (Frankreich)	Transverse	50.5
Pleurosigma angulatum Sm. (England)	Transverse (48 Obique)	47
Pleurosigma angulatum (Frankreich)	Transverse	46
Pleurosigma quadratum Sm.	Transverse	45
Pleurosigma convexum Grun. (Samoa)	Transverse	54
Pleurosigma rhombeum Grun. (Samoa)	Transverse	48
Pleurosigma strigosum Sm. (Sch.)	Transverse	46.5
Pleurosigma rigidum Sm. (Sch.)	Transverse	46.5
Pleurosigma elongatum (Ostsee)	Transverse	49.5
Pleurosigma decorum	Transverse	46
Pleurosigma formosum	Transverse (23 Oblique)	38

Those eagle eyed amongst you will have noticed that there are only 57 species listed here. This is because the original list only noted that number. We would like to know what the three missing species are. If anyone has this missing information please communicate such to the editors.

Watermills - North West

by Steve Gill

Watermills figure highly in my preferred collecting sites. They are often situated in idyllic locations and visting them brings back memories of those halcyon days of my youth when I lived in a small village with the countryside all around. My attention then was more likely to be drawn towards the mill-owners daughter than to the glistening wood and stone surfaces. The mill-pond was considered a place for swimming rather than a habitat packed full of little plants in glass-houses.

But now I don't look quite so athletic in my swimming trunks and the mill-owners daughter doesn't either!

If you visit a watermill, and I hope you will, then take plenty of sample tubes. Retaining walls of the millpond where water seepage is almost constant provide isolated communities that may throw up the occasional oddity. Splash zones in the millrace and wooden pilings often have diatom films. The reed fringed margins provide homes for others as do the weeds in the deeper parts. Always seek permission to sample and don't attempt to collect in the vicinity of a working wheel. If you are prone to falling in, as I am, take a towel.

I have rarely had any problems collecting at such sites. An explanation of what you are doing and a look down a portable microscope is often all that is required.

Below is a list of Watermills in the North West of England. I have not visited all of these, so it is worth a telephone call before you set out. Many of these sites are now of historic interest and are run by Conservation Groups. They often have a tea room, so treat yourself to scones and a pot of tea before you set off home to examine your haul. I do!

Watermills of Cumbria and County Durham

Acorn Bank Garden & Watermill, Temple Sowerby, near Penrith, Cumbria, CA10 1SP
(signposted off the A66 between Penrith and Appleby) National Grid Ref: NY 612281

Acorn Bank is a National trust garden particularly notable for having the largest collection of medicinal and culinary plants in the North of England. However, the property also includes a mill which has been under restoration for several years and runs beside the Crowdundle Beck. A mill was first mentioned on this site in the 12th century. The partly restored mill will be open to the public at the same times as the garden.

Gardens Open 31st March - 4th November: Daily 10am - 5pm Last admissions 4:30pm
Prices: £2.50, children £1.20, family £6.20 - On-site car parking, refreshments, shop and plants for sale
Owner: The National Trust Tel: +44 (0) 17683 61893

Killhope Lead Mining Centre, Cowshill, Upper Weardale, County Durham, DL13 1AR
National Grid Ref: NY826424

A magnificent 34 foot working overshot iron waterwheel dominates England's best preserved lead mining site The wheel designed and built by W.G. Armstrong at Newcastle in 1859 drove crushing and separation machinery.

Open daily: April 1st - End September. 10:30am - 5pm and in October on weekends and

half-term week 10:30am - 4pm. Extended opening hours in summer holidays and on Bank Holidays. Last entry is half an hour before close
Prices: Adult £3.40, Child, UB40, Registered Disabled £1.70
Over 60 £2.40. Family ticket (2 adults 2 children) £8.50
Owner: Durham County Council Tel: +44 (0) 1388 537505

Little Salkeld Watermill, Little Salkeld, Penrith, Cumbria, CA10 1NN
National Grid Ref: NY 567361

A delightful 18th Century corn-mill, still producing ORGANIC stone-ground flour the traditional way. Close to the Settle-Carlisle railway (station Langwathby 11/2 miles); on Cumbrian Cycle-way and Coast to Coast Cycle-way; Close to Long Meg Stone Circle and Lacy Caves on River Eden.

Tea room serving morning coffee, delicious home-made vegetarian lunches and afternoon tea.

Open for Mill tours: Mondays, Tuesdays, Thursdays 11am - 12 noon , 2:30pm - 3:30pm
Tea room open Mondays to Fridays inclusive 10:30 am to 5pm Tel: +44 (0) 1768 881523

Muncaster Watermill, Ravenglass, Cumbria, CA18 1ST National Grid ref: SD096978

Off the A595, one mile NE of Ravenglass. Trains of the Ravenglass and Eskdale Narrow Gauge Railway (L'al Ratty) stop at the mill station by request The only mill in the beautiful English Lake District still producing ORGANIC STONEGROUND flour as it has done since at least 1455. This one time manorial mill is a layshaft mill with early 19th century machinery, three pairs of millstones boulting flour dresser and drying kiln. The only means of power is the 13 foot overshot waterwheel.

Home made scones, bread and cakes available in the Tea Shop

Mill and Tea Shop open April, May, September, October : Saturday - Thursday 11:30am - 4:30pm, Closed Friday, Easter, May Bank Holidays. June, July, August Daily 10am to 5pm. Other times by prior arrangement. Closed November to March.
Free parking, Mill tours, Tea Shop, Disabled toilet access Tel: +44 (0) 1229 717232

Eskdale Mill, Boot Village, Eskdale, Cumbria, CA19 1TG National Grid Ref: NY 176012

One of the oldest working mills in England, Eskdale mill's two overshot wheels are driven by Whillan Beck as it tumbles down spectacularly from Sca Fell. All the original machinery for grinding oatmeal is in full working order and operated daily. Visitors get a guided tour with children allowed to operate the mill. Boot Village is a short walk from Dalegarth station, the inland terminus of the famous Ravenglass and Eskdale steam railway or you can visit by car over the exhilarating Hardknott Pass

Open: April to October 11am - 5pm. Closed Mondays - Small admission fee
Tel: +44 (0) 19467 23335

Heron Corn Mill and Museum of Paper Making, By Waterhouse Mill, Beetham, Milnthorpe, Cumbria, LA7 7AR National Grid Ref: SD497799

Present building c1740, some contemporary machinery. Example of Lowder mill with four stones. Working (not producing) demonstrations given. Internal high breastshot wheel with water taken from a natural sill on the River Bela. Paper museum showing a history of the last 500 years of paper making.

Free Parking; No disabled access without help due to the nature of the site.

Open daily except Mon. (open Bank Holidays) 1st April - 30th Sept 11am - 5pm (open in Oct for school parties).
Prices: Adult £1.50, OAP £1.00, Child £1.00
Owner: Heron Corn Mill Beetham Trust
Tel: +44 (0) 15395 65027 Fax: +44 (0) 15395 65033

Gleaston Watermill. Gleaston, Nr. Ulverston, Cumbria, LA12 0QH
National Grid ref. SD260709
Follow signs from the A5087 into the country lanes of rural Cumbria. This historic watermill is in working order and abounds with atmosphere, artefacts, archaeologists and apiary.
Easter - 31st October Tues to Sun 11am - 5pm. Open Bank Holidays. Winter Sat and Sun 11am - 5pm
Admission Charges apply. Discounts for pre-booked groups and NWMG Members. YAC
Tel +44 (0) 1229 869244 Fax +44 (0) 1229 869764

Farfield Mill, Garsdale Road, Sedburgh, LA10 5LP National Grid Ref: SD 676918
A typical Victorian stone built 4 storey mill, in a rural location, built in 1837. This is the last of 5 mills which were working in Sedburgh in the 19th Century. An industrial town never developed around the mill so it is easy to imagine how manufacturing first developed in the countryside using only water power.
Open Easter to October 10am - 5pm. Other dates 10am - 5pm weekends only or by arrangement
Owner Operator ; Sedburgh & District Buildings Preservation Trust Car parking, picnic area, fully accessible, cafe, shop, riverside walks Tel: + 44 (0) 15396 21958
Editors Note:- This mill does not have a waterwheel or millpond but is a useful base from which you can explore the riverside walks.

Lancashire Watermills

Helmshore Textile Museums, Holcome Road, Helmshore, Rossendale, BB4 4NP
National Grid Ref: SD 778214
There are two textile mills on the site. Higher Mill was built in 1789 as a water-powered fulling mill and retains its double rim geared waterwheel. This is regularly demonstrated to visitors driving some of the 19th century woollen finishing machinery. Whitakers Mill was rebuilt in about 1860 following a fire and contains a complete condenser cotton spinning plant. Mule spinning is regularly demonstrated to visitors. "Bringing History Alive" role play sessions during 2001 - please phone for details.
Museum shop, parking, picnic area, riverside walk, disabled access, snacks.
Anticipated opening hours - please telephone for confirmation before making a long journey
April 1st to June 30th and October. Mon - Fri 2pm - 5pm, Sun 1pm - 5pm
July 1st to September 30th. Mon - Fri 12 midday - 5pm, Sun 1pm - 5pm
Guided tours for schools and pre-booked parties throughout the year
Owner: Lancashire County Council Higher Mill Trust
Operator: Lancashire County Museum Service
Tel: + 44 (0) 1706 226459 Fax: + 44 (0) 1706 218554

Cheshire and Greater Manchester Watermills

Dunham Massey Mill, Dunham Massey Hall, Altrincham, Cheshire, WA14 4SJ
Nat. grid ref: SJ735874
Built in 1616, originally as a corn mill and later converted to a saw mill, Dunham Massey Mill remains a fine example of industrial architecture. It was fully restored by Dr. Cyril Boucher in 1979 after nearly 90 years of disuse and is now in the care of The National Trust along with the mansion and formal gardens, all set amongst 250 acres of wooded deer park. Thanks to a Heritage Lottery Grant major restoration work is taking place in 2001, and as a result from 2002 the mill will be open 5 days a week from April to October with much improved access.
Deer Park, Restaurant and Shop open daily all year. House, Garden and Mill open 31st March to 4th November 2001. House open Sat-Wed. noon - 5pm, Last entry 4.30pm. Garden open daily from 11:00, last entry 5:00
Entry : National Trust Members - no charge
Non-members Park entry to the car park (with access to the Mill) £3.00 per car
Mill entry - no charge Further information Tel +44 (0) 161 941 1025

Quarry Bank Mill, Styal, Wilmslow, Cheshire, SK9 4LA National grid ref: - SJ834831
A Georgian cotton mill, built in 1784, restored as a working museum of the cotton textile industry. 1851 Fairburn 100hp high breastshot working water wheel. Award winning Power Project tells the story of steam at the mill. 1830s beam engine steaming daily, fantastic hands-on exhibits and audio visual theatre. New 1870s Horizontal Engine being installed this year. Uniquely preserved factory site with Apprentice House and Village. Parking, Mill Shop, Restaurant, Picnic areas, limited disabled access.
Teachers' resource book available. Education and group visits by arrangement.
Open: All year. April to Sept daily 11am - 6pm, Oct to March 11am - 5pm (Closed Monday)
Owner: The National Trust. Operator: Quarry Bank Mill Trust Ltd
For further information and admission charges +44 (0) 1625 527468

Nether Alderley Mill, Congleton Road, Nether Alderley, Macclesfield, Cheshire, SK10 4TW
National Grid Ref: SJ844763
A 15th Century corn mill with tandem overshot wooden waterwheels. Machinery was in use until 1939. Given to the National Trust in 1950 and restored to working order in 1967. Mill stones are French Burrs.
Limited parking. Coaches MUST book (only one at a time); NO wheelchair access
Open: April, May, Oct: Wed, Sun & Bank Holiday Mondays 1pm to 4:30pm.
June to Sept: Tues to Sun and Bank Holiday Mondays 1pm to 5pm. Group bookings at other times by arrangement. Teachers' resource book available Prices: Adult £2.00 Child £1.00
Owner: The National Trust. For further information and bookings The National Trust,
Forester's Lodge, Nether Alderley, Macclesfield, Cheshire SK10 4UB
Tel: +44 (0) 1625 584412

Bunbury Watermill, Bowes Gate Road, Bunbury, Tarporley, Cheshire, CW6 9PP
National Grid Ref: SJ573580
First mentioned in 1290, then recorded in a survey of 1775, the mill was rebuilt c1850 and was operated regularly until 1960 when a massive flood ended its working life. After years of decay it was fully restored by North West Water in 1971. Free parking; Flour on sale at the mill.
Open: Easter to end Sept, Wed, Sun and Bank Holidays 2-5pm. Groups by arrangement
Prices: Adult £1. Child, if accompanied by an adult, free. School Parties also free
Owner: North West Water Ltd., For further information and bookings:-
Tel: Warden +44 (0) 1829 261422.
Recreation and Conservation Officer +44 (0) 1457 864187

Stretton Water Mill, Mill Lane, Stretton, Tilston, Malpas, Cheshire, SY14 7HS
Signposted from A534 National Grid ref: SJ 454530
A small working watermill set in beautiful countryside 10 miles from Chester. The four sets of stones are driven by an external overshot waterwheel, installed in 1777, and a breastshot wheel dating from 1852.
Car parking, picnic area: display and shop in adjacent stable block.
Open Apr & Sept, Sat & Sun 1-5pm, May-Aug, Tues - Sun 1-5pm
Prices: Adult £1.80, Child 65p - Pre-booked groups £1.60 (max. 40)
Owner: Cheshire County Council
Operator: Cheshire Museums
For further information Cheshire Museums - Tel: +44 (0) 1606 41 331

Editor's Note: If any readers know of other watermills, with public access, in their locality then we will be pleased to print details.

R. I. Firth Slides

Many of you, no doubt, will possess slides by R. I. Firth. We ourselves have a number in our collections. We have, until recently, never seen evidence of his commercial activities. However, a year or so back a typed price-list came into our possession detailing his offerings and pricing structure. Though the slides themselves are exquisitely mounted and turned out, knowing something of their origin and originator adds to their value as reference material.

Accordingly we here reproduce the price list, but first a little about the man himself.

Robert Isaac Firth. (1902-1982) - was an Education Officer by profession.
In conjunction with Bernard Hartley he prepared over 2000 slides of British Diatoms. This collection now resides in the British Museum and is appropriately called the Firth-Hartley Collection.
He was elected an Honorary Member of the Quekett Microscopical Club, on 15th November 1977

The following list of papers is by no means complete:-

1977 The diatoms of Broad Oak Water, Accrington. Journal of the Accrington Naturalists and Antiquarian Society Volume 7 pages 22-24.

1981 The diatoms of the tarmac runway of 5 Albany Road, Seaford Sussex. Journal of the Accrington Naturalists and Antiquarian Society. Vol. 11. Pages 34-36
and in co-authorship with Bernard Hartley - In the Quekett Journal

1971 A Pennine Diatom Site Vol. 32, pages 108-113

1981 A collection of Microscope Slides of British Diatoms, including 1,000 Slides of Selected and Named Species, and over 500 Strewn slides from British localities. (London:Department of Botany, British Museum (Natural History).

The following advertisements have also been located:-

An advertisement in The Microscope October 1938, March 1939, May 1939 - 'Diatom slides in exchange for cleaned and uncleaned Diatomaceous Earths, Slides, etc. - R. I. Firth, 52 Queens Road, Accrington, Lancs.'

An advertisement in The Microscope November 1939 - 'For Sale: Choice mounts of Actinoptychus heliopelta in Styrax, 1s. 3d. post free. Firth, 52 Queens Road, Accrington.'

An advertisement in The Microscope January/February 1940 - 'Diatomaceae: 15 beautiful diatoms perfectly arranged in rosette 2s. 6d. List of localities and species slides post free. Firth, 52 Queens Road, Accrington.'

January of 1946 saw R. I. Firth giving two demonstrations at meetings of the Brighton and Hove Natural History Society at the Booth Museum, Brighton. One demonstration was on the cleaning and preparation of Diatoms and the other on Mounting Spread Slides.
Attended a Conversazione of the Brighton and Hove Natural History Society at the Royal Pavilion, Brighton on October 13th 1951 with an exhibit.

An advertisement in The Microscope Vol. VI. No. 3 1946 - 'For Sale: American Monthly Microscopical Journal (1880-3), 4 Vols., 45/-; American Journal of Microscopy (1876-8), 5 vols. In 2, 42/-; Spitta: Microscopy, 1909, 21/-; Taylor: Notes on Diatoms, 12/6; Index to Schmidts Atlas, £1; Diatom Species and Localities Index, 10/-; Leitz Bench Microtome, £4; Eyepieces, Camera Lucidas, Dissecting Lens, Botanical, Entomological and Foram Slides, Dancer Microphotographs, etc. Stamp for particulars and list. FIRTH, 6 Windover Crescent, Lewes, Sussex.

In the Small Advertisements column of The Microscope November/December 1953 Vol. 9. No. 10. 'Van Heurck Circuit Stage, stand only: £37 10s. Objectives, eyepieces, slides, books, etc.: S.A.E. list. Firth, 6 Windover Crescent, Lewes.'

An advertisement in The Microscope Vol. 12, No. 1 July/August 1958 - 'P. & L. Grand Model Microscope, fully mechanised, stand only: £25. Swift "Universal", 3 objectives, 2 eyepieces, etc. : £35. Leitz Low-power binocular, 4 objectives, 2 pairs eyepieces: £27 10s. 0d. Objectives, eyepieces, condensers, etc. : List. Firth, 6 Windover Crescent, Lewes, Sussex.'

This last advertisement is particularly interesting - *A Powell and Lealand Grand Model for £25!* Where is that time machine?

The Price List

MICROSCOPICAL PREPARATIONS OF DIATOMS
R. I. FIRTH, 6 Windover Crescent, LEWES, Sussex, England

NAMED DIATOMS

Mounted in Styrax specially prepared to ensure its stability and high refractive index. 1, 2 or 3 specimens according to species.
The diatoms are mounted with the utmost precision with outer face of valve next cover glass and all slides are given suitable tests before despatch.
In addition to the species listed, many others are available. Price per Slide 3/6d.

Actinocyclus octonarius
(ehrenbergii)
Actinoptychus grundlerii
heliopelta
seductilis
splendens
szontaghii
senarius
(undulatus)
rachnoidiscus ehrenbergii
indicus
ornatus
russicus
Aulacodiscus archangelskianus
novae zealandiae
oregonus
Navicula maculata
praetexta
marina
Neidium iridis
tumescens
Pinnularia alpina
cardinalis
major
nobilis
Polymyxus coronalis
Rattrayella oamaruensis
Stauroneis acuta
inflata
Stephanodiscus astraea
Stictodiscus californicus
hardmanianus

Auliscus punctatus
pruinosus
sculptus
Biddulphia edwardsii
rhombus
tuomeyi
Climacosphenia moniligera
Coscinodiscus asteromphalus
lineatus
marginatus
Crapedodiscus coscinodiscus
Cymbella aspera
heteropleura
Ceratophora granulata
Epithemia turgida
Gomphonema geminatum
Grammatophora robusta
Mastogloia splendida
Melosira clavigera
sulcata
Surirella cuneata
elegans
fastuosa
nevadensis
striatula
Synedra crystallina
formosa
baculus
robusta
Triceratium archangelskianum
arcticum
favus
fractum
morlandii
pentacrinus
pulvinar
secedens
weissii
Trinacria excavata
exsculptu

TEST DIATOMS

Price per Slide 3/6d.
Mounted in styrax or aroclor.

Amphipleura lindheimeri
pellucida
Coscinodiscus asteromphalus
Cymatopleura solea
Cymbella aspera
Frustulia rhomboides
saxonica
Navicula cuspidata
lyra
lyroides
Nitzschia circumsuta
scalaris
sigma
sigmoidea
Pleurosigma acuminatum
angulatum
attenuatum
balticum
formosum
strigosum
terryanum
Stauroneis phoenicentron
Surirella gemma
Synedra capitata
crystallina
robusta
Triceratium favus

TEST PLATES

Number of species	Price
5	7/6d.
8	12/-
12	17/6d.

DIATOM TYPE SLIDES

Selected species mounted in rows, each slide with list of names.

No. of forms	Price
12	9/6d.
20	15/6d.
30	21/-

EXHIBITION SLIDES

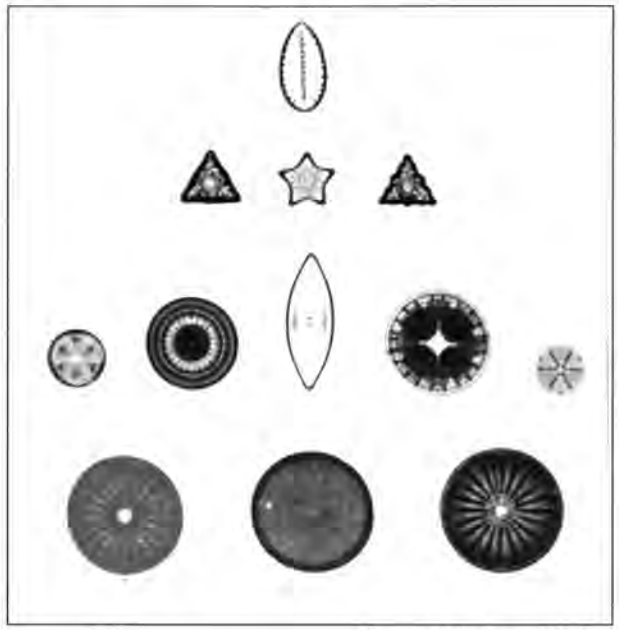
Selected diatoms symmetrically arranged in star or rosette form.
About 25 15/- 50 25/-

LOCALITY STREWN DIATOM SLIDES
Price per Slide 2/6d.
Selected for variety and beauty of species.

British Isles	Black Moss, Aberdeen
	Burton Pond, Sussex
	Chichester Channel, Sussex
	Isle of Arran
	Isle of Lewis
	New Ferry, Ireland
	Toome Bridge, Ireland
Continent of Europe	Bory, Hungary
	Carlovo, Russia
	Inza, Russia
	Kamischev, Russia
	Mors, Denmark
	Simbirsk, Russia
	Singilewsky, Russia
	St. Laurent la Vernede, France
	Ananino, Russia
Africa	Cape Agulhas
	Orange River Dredgings
	False Bay, S. Africa
	Ramleh, Egypt
	Alexandria
Asia	Hakodate, Japan
	Port Dickson, Malaya
Australasia	Oamaru, N.Z.
New Zealand	Oamaru (several horizons)
	Takapuna
U.S.A.	Cherryfield, Maine
Calvert Co., Maryland	Dunkirk, Maryland
Deschute River, Oregon	Jewell, Maryland
Golden Gardens Beach, Seattle	Monterey, Cal.
Kreyenhagen Shale, Cal.	Newport, Cal.
Moreno Shale, Cal.	Palos Verdes, Cal.
Nottingham, Maryland	Richmond, Virginia
Petersburg, Virginia	Santa Monica, Cal.
San Pedro, Cal.	Sharktooth Hill, Cal.
Santa Rosa Sound, Florida	
Chile	Toco

On the sheet is a penned note in the hand of R.I. Firth which relates to the Sharktooth Hill deposit - "in Kern County, N. side of Kern River, 7 miles N.E. of Bakersfield.".

R.I.Firth slides are of the highest quality. Reproduced below is a photograph of one of his selected mounts.



Photograph by Bernard Hartley

Key to the photograph:-

Top:	Surirella striatula (Conn., U.S.A)
Second row (L to R):	Triceratium flos (Simbirsk)
	Triceratium pentacrinus (Egypt)
	Triceratium flos (Simbirsk)
Third row (L to R):	Actinoptyvhus heterostrophus (Simbirsk)
	Actinocyclus Ehrenbergii (Maryland)
	Navicula tumescens (Cherryfield)
	Actinoptychus Heliopelta (Maryland)
	Actinoptyvhus undulatus (Maryland)
Bottom (L to R):	Arachnoidsicus ornatus (California)
	Coscinodiscus asteromphalus (Maryland)
	Arachnoidiscus Ehrenbergii (California)

Policy Statement - Names, Synonyms and Taxonomy

The editors of this publication will not presume to alter names to 'conform to the current taxonomy'. Taxonomists maintain a state of flux and what might be correct today will be wrong tomorrow. Where a species name is given we (and authors) should where possible state the authority they are using when naming. This simply means that if someone else has subsequently renamed the species or re-categorised it in some fashion the basis for the identification will be clear.

Correspondence

Dear Editor,
I have thoroughly enjoyed reading 'The Amateur Diatomist'. Excellent!.
You and your co-workers should be very pleased. I saw that you were inviting comment - so as someone who still has quite a collection of diatom related slides - but sadly isn't all that well informed - your publication has not only ensured that I'm better informed but also given me some encouragement! I particularly liked (a small point) the explanations in brackets - and a host of other points.
Thanks and good luck.

Name and Address supplied

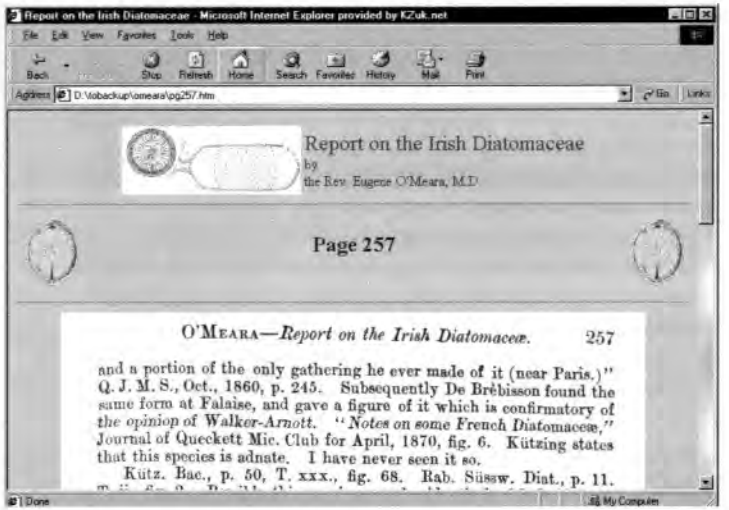
Dear Editors,
A good start but hoping for a little more substance in the future!

Name and Address supplied

We'll do our best. - Eds.

Report on the Irish Diatomaceae

We have reproduced this important paper on CD. It is suitable for most browsers, regardless of platform. This CD is available via Savona Books.



Part of facsimile page 257

Part of the Plate Index

Sales, Wants and Exchanges

Exchanges should be described accurately and fully. They should be FAIR.

Burton Pond - Exchange - I would be glad to receive any odd unwanted samples containing unusual diatoms, and also marine plankton. For my part I can offer some cleaned material from Burton Pond in West Sussex that has a variety of freshwater forms. Contact - J. A. Miles, 43 Singleton Crescent, Ferring, West Sussex BNN12 5DG. Tel:- 01903 245319. Please contact before sending material.

U.S.A. Material Exchange - I am seeking to swap fossil material from any location worldwide, but would prefer Hungarian, Danish or Russian samples. Raw material preferred of 5 to 10 grams weight. In exchange I can trade excellent quality raw fossil material from the following locations: Klammath Falls, Oregon, U.S.A. (fossil freshwater, very diverse species represented), Terrebone, Oregon, U.S.A. (fossil freshwater about 97% whole frustules), Brady Hotsprings, Nevada, U.S.A. (fossil freshwater, primarily small Melosira with lots of carbonates present) and Dunkirk, Maryland (fossil marine, cleans easily, very diverse). Please reply in the first instance to Stephen Nagy, M.D. via email: snagymd@pol.net.

Diatomaceous Earth - from Oamaru. Small samples exchanged for fossil earths from other locations. Mike Samworth Tel. 01969 667119 or email apochrom@ukgateway.net with details before sending.

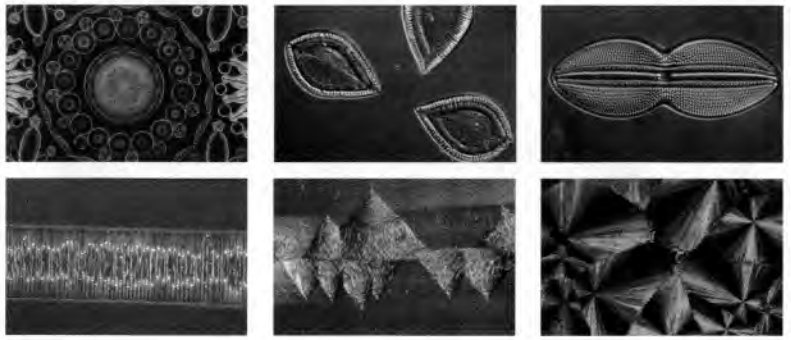
Peragallo et Peragallo etc. - Little Imp CDs exchanged for well mounted diatoms. See publications list for offerings. Contact the publishers to discuss exchange.

Material from exotic locations - wanted. Contact Klaus Kemp (see advertisement - inside front cover). Exchange for slides of material supplied.

Old diatom mountants wanted. - Particularly Hyrax amd Styrax. Any condition. Contact Steve Gill. Tel. 024 76 327989. Diatom strew slides in exchange.

Filter material - Does anyone know of a supply of material suitable for diatom filters? If so contact the publishers, or contact the supplier and get them to contact the publishers.

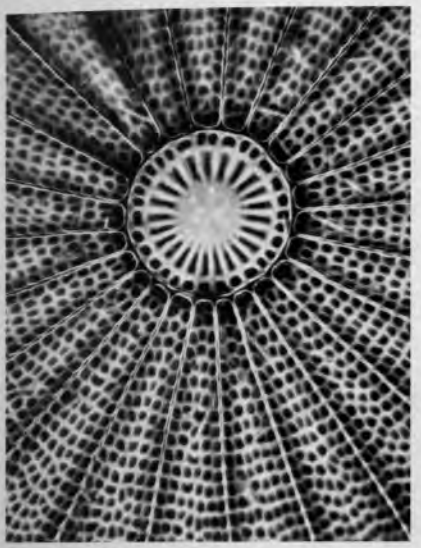
Postcards - The publishers have printed a set of six colour postcards, 4 depicting diatoms and two polarising objects



These are available direct from Mike Samworth 01969 667119 or email apochrom@ukgateway.net @ £2.50/set.

The next issue of

The Amateur Diatomist



In the next Issue:-

Mounting techniques III Dry mounts
Cleaning Diatoms II
Diatom Genera Part III E,F,G,
and Famous Diatomists (I)- Henri van Heurck
Diatom Reproduction
Old Papers - On the Genus Arachnoidiscus
Authority/Provenance
Species Lists
Dark-Ground Technique I
Sales, Wants Exchanges
The Diatom Frustule III
Useful Notes
Correspondence
WWW Sites of Interest

Notes for contributors.

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If you wish to name anyone then get their permission first as seeing your name in print, and perhaps associated with something you would rather was forgotten, can come as something of a shock.
We hope that by adopting this relaxed approach to the submission of copy you will all break out the notepads and begin writing. What you have to say concerning Diatoms, mounting and Microscopy is of interest to us all.

"No one of us know all there is to know, and yet we
do not know what we do not know." - Anon.