

The Amateur Diatomist

Volume 5 Part II.

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Richmond Castle sampling site and sample (Mike Samworth)

Editorial

The first online issue seems to have gone rather well. We've been noticed by a few microscope-related sites and even had glowing reviews on two of them. This is really rather satisfying (chest puffed out with pride)! We haven't had much in the way of correspondence though, nor any additional offers of exchanges to promote on the site. We would like to see this area expand. There are many, we believe, who would like to mount diatoms but are wary of using the chemical cleaning methods many of us advocate. Amongst the editors there are good collectors, good cleaners and good mounters, but only one of the editors is skilled in all three disciplines. This scenario is likely to be repeated throughout our readership.

With the advent of the auction sites we realise that folk are reticent about releasing slides and material to people we don't know. No doubt there will be occurrences of the unscrupulous attempting to benefit financially on the back of the generosity of others. Indeed we have experienced this ourselves. However, we believe that the vast majority are honest and good souls and we shall continue to promote the exchange of slides and material between us. If we choose not to do so then the avaricious have won the day and it is we who will be the poorer for it.

One of the editors is currently 'laid-up' after having a hip replaced and is under strict instruction not to sit at his workbench on his swivel chair. He is thus unable to complete a project he has been working on for this issue but sent us a rather evocative image of his last collecting trip to Tyree and has added the title 'Wish I was there!'.



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Removing Sand from a Cleaned Diatom Sample

Sand and grit in a sample is troublesome, particularly if you get a grain on a strew. Various methods can be applied, most of which, particularly suspension in a thick medium, require further washing of the sample and the danger therein of losing some of the precious sample itself.

This method, related in the Journal of The New York Microscopical Society of October 1889, is simple and more importantly it works.

CLEANING DIATOMS FROM SAND.

The Corresponding Secretary presented the following communication upon this subject, also from Mr. Norman N. Mason:—

“After removal of the organic matter with acid, by the usual methods, add to the diatoms and sand in a large bottle thirty, forty or fifty times the quantity, by measure, of water, and gently shake until they are mixed. This water, with the diatoms and sand kept suspended by an occasional shake, is slowly poured in a small stream upon the upper end of a strip of clean glass, three feet long by three inches wide and securely supported. The upper end of the glass should be from one-eighth to one-quarter of an inch higher than the lower end, and the glass should be level transversely. Beneath the lower end place any convenient receiver. The water and diatoms will pass into the receiver. The sand, which will form little bars on the glass, must be removed occasionally, as it gradually creeps towards the lower end of the glass, and there would eventually pass into the receiver.

“The loss of diatoms will be very small. Usually one pouring is sufficient for cleaning. The sand can be re-washed if necessary, or a little clear water, run over the sand on the glass strip, will carry forward almost the last diatom; but this will scarcely pay for the trouble. A short piece of glass will cause a failure, and too great an incline will be found almost as bad.”

“NORMAN N. MASON,

Providence, R. I.”



You need to be patient and resist running the sample down the glass at too great a rate. Conversely too slow and the diatoms frustules get lodged in the 'sand bars'. To ascertain the correct rate a couple of trials need to be done where you examine the sand for retained diatoms. If some are retained the flow is too slow.

The length of the strip of glass used can also be adjusted. Three feet seemed a little too long for my cleaning station.

A couple of colleagues have used standard 3 x 1 slides, overlapped by a quarter of their length and joined with silicone sealant. This creates small waterfalls and turbidity which, they claim, causes the diatoms to ride over the sand bars without carrying with them any unwanted elements.

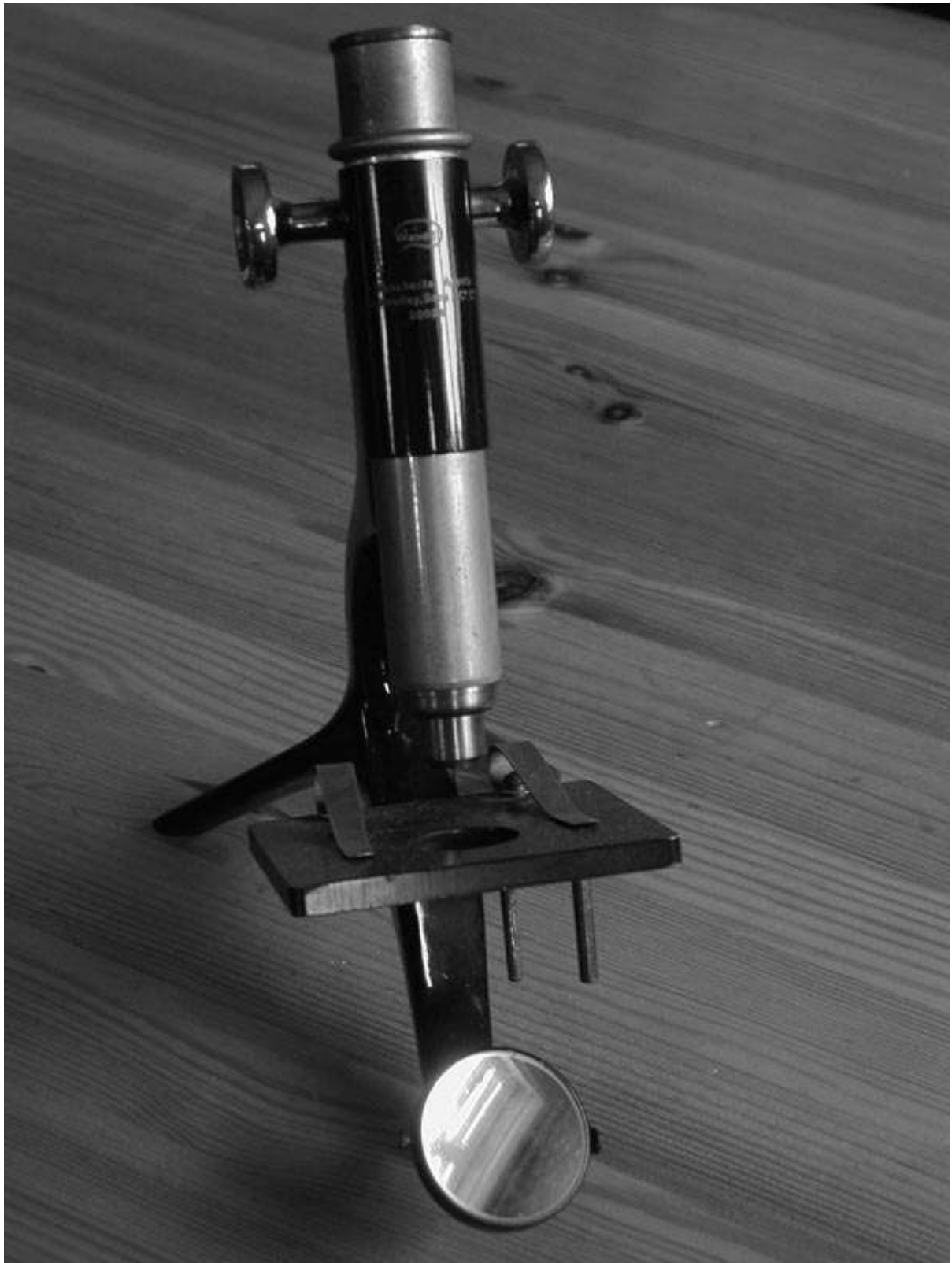
Field Microscopes - The WandS

From the era when leather travel trunks were in vogue.

Not a pocket microscope but certainly something you can carry about relatively easily.

According to my digital scales it weighs in at 2.3kg. However, these scales reckon I'm 85 kilos so something must be wrong with them as my lithe figure can't be that heavy. Mind you, my optician says there's something wrong with my eyes as well, so perhaps I misread it.







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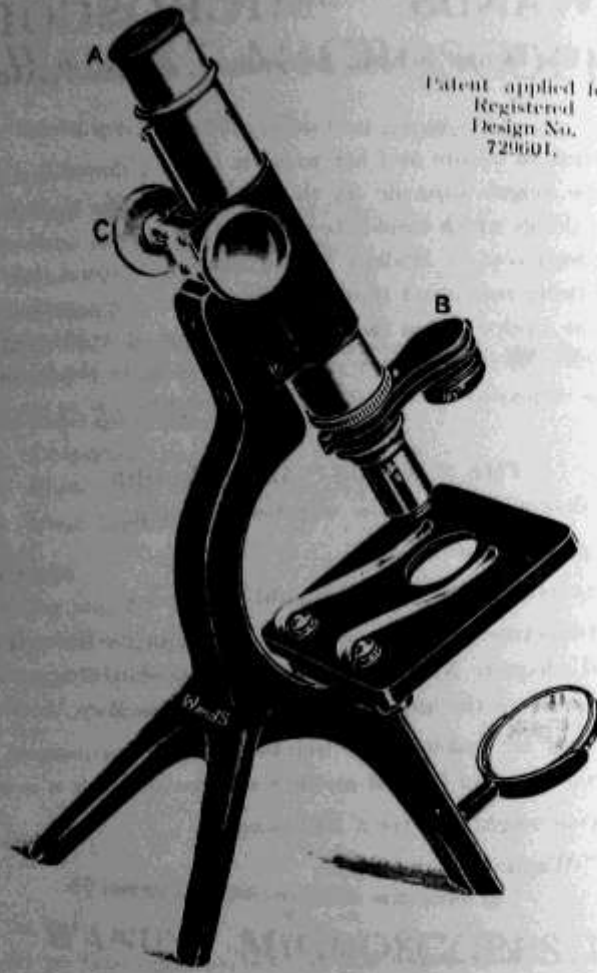
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Patent applied for,
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SPECIFICATION.

Height to Eyepiece, inclined as shown	10 in.
Height to Centre of Stage	4 in.
Span of Feet	5½ 4½ in.

Wands

THE "WANDS" MICROSCOPE DESCRIBED.

The following details will reveal that the "Wands" Microscope departs from conventional microscope construction in several ways—particularly, the Foot and Limb are cast in one piece and set at the angle for most convenient working.

The Coarse Adjustment is by a new method in microscope making, and the Condenser Carrier is simplified. Withal it is sturdy, firm and thoroughly efficient.

THE FOOT. Reference to the illustration on page 4 will show that the Foot, the Limb, and the mirror tail-piece are all in one solid casting. Further, that the angle at which the Limb is inclined on the Foot is that at which the fullest comfort is secured when working in a sitting position at a table. Perfect rigidity is secured. There are no loose parts, and in these respects no other Microscope surpasses the "Wands."

THE FOCUSSING ADJUSTMENT. A novel method of focussing has been introduced in this Microscope. The Body is raised and lowered to focus in a tubular fitting, but the method of doing this is not performed by the conventional rackwork and pinion. Instead, a narrow steel bar of special shape is fixed to the body, and a wheel, also of steel, is fitted to the milled heads. This wheel presses against the steel bar at prescribed angles and enables the Body to be raised and lowered by turning the Coarse Adjustment milled heads. The method adopted in this instrument has proved so successful and so smooth in action that it is not unlikely it may supersede the usual rackwork and pinion in other instruments.

THE FINE ADJUSTMENT. Although the Coarse Adjustment fitted in the "Wands" Microscope is smoothly accurate enough to permit of the exact focussing of a 1.12 in. Oil Immersion Objective by a skilled worker, it is not recommended that a higher power Objective should be used with it than a 1.6 in. This is easily focussed sharply.

A fine adjustment can, however, be made in the following manner. Focus the Object approximately with the Coarse Adjustment in the usual manner, then gently move the Eyepiece outwards or inwards whichever is required, and in order to make the action more precise, gently turn it instead of sliding it direct. It will be found that the best possible focus can be obtained by this very simple means. It is recommended that the Eyepiece should always be used standing out from the top of the body-tube half an inch. Only those who have tried

Wands

It is an extremely sturdy stand with a minimum of moving parts, the limb and foot being cast as a single entity.

Tooth Powders Uses of Diatomite

Following the article in the last issue on Sozodont toothpowder we were wondering which of the other dentifrice products of that era also contained diatomaceous earth.

All of the products that we have 'identified' as being of the right era are American in origin and they may or may not contain calcined diatoms. As UK based diatomists the likelihood of us finding any containers that might just have some contents is pretty remote.

However, this might be a project of interest to our Stateside colleagues.

Below is a selection of products that might be worth having a look for at the next collectable fair you visit.



FREE sample—
Powder or cream
—sent to anyone.

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BETTY'S SISTER'S LETTER—5



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Powder I like it very much. I tell
all my friends how I like it
I use it twice a day I have tried
many other tooth pastes and powder
but I liked yours best
I remain
Yours Truly
Martha



THE letter we
print this time
came from one of
Betty's "sisters."

Perhaps you are in
high school or in
grammar grades,
but wherever you
are, you can do just
as much good as
Martha does. She
tells all her school
friends how much
she likes Dr. Lyons'
Tooth Powder.

Dr. Lyons' Perfect
Tooth Powder or
Dental Cream treats
teeth well and helps
everybody keep well.

If you tell your friends
how much you like
"Dr. Lyons'," you will
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Send 2c. to-day for a trial package of either DR. LYON'S
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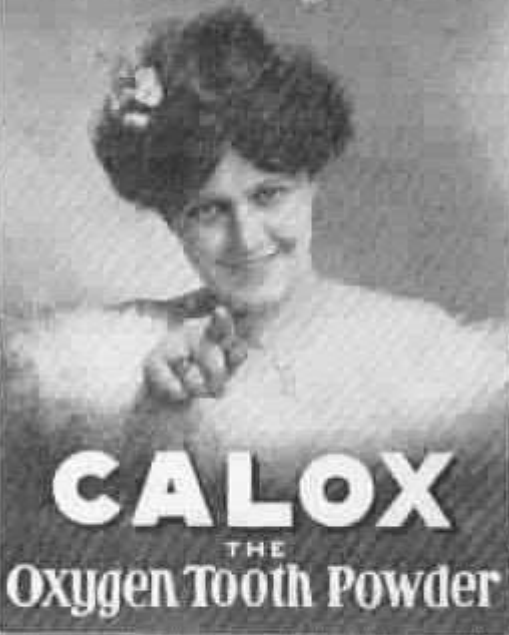
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Children like Sanitol. They will brush their teeth eagerly if you provide Sanitol Tooth Powder. The flavor delights them--the anti-septic properties clean and preserve their teeth.



SANITOL

THE LENS;

A Quarterly Journal of Microscopy and the Allied
Natural Sciences.

WITH THE

Transactions of the State Microscopical Society of Illinois.

VOL. I.—CHICAGO, OCTOBER, 1872.—No. 4.

THE PREPARATION OF DIATOMACEÆ.

IN all the range of microscopic research there is confessedly nothing which offers more seductive attraction than that department of botany which comprises the *Diatomaceæ*. Apart from the exclusiveness with which the microscopist makes his observations and pushes his inquiries, there are charms which attach to the life, the modes, and the extent of the reproduction, and to the vast results which follow the multiplication of these organisms. There is also a pleasing bewilderment in their large variety of form and dimension, from the grosser discoids to the almost infinitely little living chambers; and a perpetual delight afforded by their architectural beauty, and by the marvelous and matchless delicacy of the designs sculptured upon the siliceous skeletons of their frustules. The man of science pauses in his work to pore over the tracery of detail, and the philosophic student exhausts resource to effect combinations in objectives and in oculars which shall serve to bring the "markings" into view and to perpetuate the picture by photography.

However great the interest which life, habits, and reproduction inspire, the structure and configuration of the siliceous part especially command attention; for this flinty framework, resisting time and decay, alone endures, and is a recognizable integral in vast strata of the earth's surface, while the softer organic portion, leaving the character of the Diatom to the skeleton, is caught up

and utilized in obedience to the law which compels organic matter to incessant action, whether it mount successively higher or fall within the scope of the humblest organism. This animated matter loses its identity, and its relations to particular forms, but the silicified cachet of *Triceratium* and of *Coscinodiscus* is as palpable in the pillared rock or the California stratum as in the recent condition, or in the softer "deposits" of Nottingham, Md., and of Moron, Spain, or in the guano accumulations of the Chincha and other islands.

"Preparation of the Diatomaceæ" ought strictly to signify the preservation of individuals or groups of these organisms in a permanent way, and their arrangement in a condition suitable for study and future reference. We would begin with the deep sea-soundings and end with animated pool-water. It is not our purpose, however, to discuss at present the various devices adopted to accomplish a task so extended; but we desire to point out those methods of isolating the siliceous parts of Diatoms to which experience has given reputation.

It may be worth while to premise by stating—what is, of course, familiar to the student—that the coveted forms are to be met with in a great variety of conditions, either swarming fresh and full of life in pools, ponds, or estuaries, clothed in fibres of green, brown, or yellow, or clustering together in springs, pullulating in lakes and rivers, or tossed by the waves of the great ocean itself. In some of these situations the Diatomaceæ become and are the pabulum of myriads of beings, in whose bodies, as the *Acalephs*, the *Salpidæ*, the *Molluscs*, and the *Holothuridæ*, their siliceous remains are constantly found by the microscopists, who use these and other creatures for their dredgers. They live with and upon other *Algæ*, and are met with in the green ooze of *Confervoids*, and even among the *Muscidæ*.

As ancient or recently fossilized, however, forming strata of considerable thickness, of widely different consistency and density, and not unfrequently of wide-spread geographical distribution, the Diatomaceæ astonish even the workers in science by the extent of their proliferation, and by the uneventful quiet of their living and dying, apparently undisturbed for whole ages in the conditions of their existence. Examples of these tedious and slowly cumulative formations may be instanced in Cassel, in California, in Jutland, and in Maryland and Virginia, the latter furnishing so many varie-

ties of configuration and such rare beauty in design and ornamentation. One of these Diatoms, the *Heliopelta*, so much admired, has been selected by a distinguished author to grace the front page of his admirable work on the microscope.

It must be apparent that no one procrustean method of securing the prize can be made applicable in the business of "preparation." The extreme delicacy of *Amphipleura* forbids the rough boiling which *Coscinodiscus* invites; the free recent forms of any kind in "pure gatherings" obviously require nothing more than the destruction of the organic part, else the fairy-like embossing, as shown in lines or dots, is blurred, or disappears; while the so-called Diatomaceous "earths" or clays often tenaciously resist the deliverance of the imbedded gems, made adherent by a filmy, glassy cement, the product of time, an alkali, and a portion of the seeming lithophytes of other epochs. A lacustrine deposit may be washed out clean with water, but rock must be softened and sulphate of lime removed by boiling chlorhydric acid.

In general, the business of preparation involves two distinct processes: *first*, the liberation of the Diatoms (as we shall henceforth, for convenience, call the siliceous skeletons of the *Diatomaceæ*) from all extraneous matters, with the exception of amorphous silex or some silicates; and, *secondly*, the complete isolation of the Diatoms themselves. The former is, at times, toilsome and disagreeable, by reason of acid fumes which arise in its course; the latter is tedious and, like the other, time-consuming. But both call for a clear knowledge of method and precise executive manipulation, and both demand of the operator an intelligent adaptation of means to an end, and the *patience* with which the attainment of the end is made possible.

The simplest methods of cleaning are not always the most easy,—for example, the rescuing of Diatoms from among the *Polycystinæ* of Barbadoes,—nor the most complicated always the most difficult, as, for instance, the treatment required by a sulphate of lime guano known here as the "Algoa Bay." Let us, however, attempt to make the several methods distinctly comprehensible, although in so doing we run the risk of emulating the tediousness of "neighbor Verges."

Apparatus and Chemical Material.—Guided by our experience, the following-named articles are recommended as necessary for the work of cleaning and isolating Diatoms, which should be done in

a chamber high above the ground, if possible, and not heated in winter by a flue. Hot-water pipes are far better, as affording immunity against dust. We enumerate:

German beaker glasses of different sizes, with a number of small china plates to serve as covers; several large watch-glasses, or shallow glass capsules of like shape; solid glass rods for stirring; small glass tubes or pipettes; a sand bath and an apparatus for heating; nitric acid, chlorhydric acid, sulphuric acid,—all the best “commercial,” except the last, which should be “C. P.”; carbonate of soda and carbonate of potassa, both C. P.; Atkinson’s alcohol; freshly distilled water, and a copious supply of filtered soft water.

For displaying a cleaned sediment with the view of securing individual specimens, a number of glass slides one and a half inches by four inches should be provided; and for the preservation of finished work, or clean Diatoms, a score of small bottles, with corks already fitted.

Finally, a large camel’s-hair pencil; a few slender cane (reed) strips, to serve eventually, when pointed very finely, to pick out single valves; a supply of litmus paper; a glass funnel, and Saxony filter paper, complete the category.

Method to be Employed.—As pure Diatoms, guano findings, and diatomaceous earths or clays each require separate modes of treatment, let us first handle a guano specimen, because some of the steps to be trodden may be called fundamental, or we may say they are of very general application: still, they must in certain instances be precluded by others, may not be wholly needed in particular cases, and are of necessity to be followed by supplementary processes demanded by the peculiar nature of the products obtained.

A guano, such as the Chinchá or that of Ichaboë, ought to be coarsely sifted to free it from pebbles, feathers, and masses of crystallized substances. The better part is still, however, very heterogeneous, consisting of Diatoms in a very small percentage, and of much extraneous matter, earthy, salty, and excrementitious. Boiling water dissolves a great part of all these, and should be repeatedly applied to the deposit, and as often suffered to stand after stirring, so as to leave behind the insoluble constituents, among which, of course, are the objects of our search.

The sediment will be materially lessened in bulk by a good boiling in a solution of carbonate of soda, one ounce to the pint, which

dissolves much organic as well as some inorganic matter, and, besides, sets free adherent Diatoms without injuring their structure. Carbonate of potash, however, is not so free from objection.

The residuum, being drained upon a filter, ought now to be boiled in an equal-part dilution of nitric acid for about ten minutes in a beaker glass, the quantity of the fluid being a couple of inches in height above a half-inch of the matter upon which it is destined to act. Lime not in the form of sulphate, and some other elements, are dissolved out as nitrates, and must be poured off in the solution when cold after standing. Hot water should now be added freely to the sediment and poured off after its subsidence until all acid shall have been removed, whereupon the residuum is to be once more drained upon a filter.

The matter remaining is now ready for pure nitric acid, in which it is to be boiled for five or even ten minutes; after which treatment, and before cooling, the whole must be deluged with hot water. After standing, the supernatant liquor is to be poured off, and the refractory deposit washed clean with cold filtered water, and drained as before stated.

The sediment now, much reduced in quantity, is prepared for chlorhydric acid, in which it is to be boiled for the removal of sulphate of lime if in moderate quantity, perhaps of a small percentage of other matter, and of such metallic stains as have resisted the action of the aquafortis. Besides, the chlorine has bleached such vegetable organic débris as have escaped destruction, so that the sediment, now composed of Diatoms, fine sand and siliceous dust, and extraneous vegetable remains, appears of a pale gray color.

When thoroughly washed in filtered or distilled water, and then rendered as free from moisture as possible, either by means of a filter or by gravitation, the deposit must be subjected to the action of sulphuric acid, C. P., which heated to the boiling point carbonizes the vegetable matters, which, in a charred state, blacken the fluid. The removal of this carbon is to be accomplished in the form of carbonic acid by the addition to the still boiling acid of oxygen, which at the very high boiling point of sulphuric acid combines with it, and the gas escapes in ebullition. Nitric acid (NO_5) may be slowly poured in until the black or dusky color gives place to the orange hue of nitrous acid (NO_3), being what is left of the nitric acid that has parted with two elements of oxygen; or else chlorate of potassa in fine powder, after the manner of Bailey, may

be very gradually, and in small doses, dropped into the seething liquid. Upon each contact of the powder a vivid explosion takes place as the carbonaceous particles ignite and consume. Chlorine is evolved, to the great annoyance of the operator, and sulphate of potassa is added measurably to the sand and Diatoms beneath. But soon all is of pearly whiteness, and the process is at an end.

The task of cleaning is near its accomplishment; for all that remains to be done is the abstraction of the acid and the washing out of the sulphate of potash.

Let the tyro be careful, and manipulate with deliberation; for the rapid admixture of sulphuric acid and water occasions a sudden and considerable rise of temperature. Instead of pouring or drawing off the hot or cooled fluid, we would recommend that a large beaker glass two-thirds full of hot filtered or distilled water be made ready, and that into the water, by very tardy pouring, or even dropping, the acid, and all it contains, be thrown. When cold, or nearly so, the supernatant fluid must be flowed away, which process is facilitated by holding a glass rod against the beaker's edge to guide the stream, and after repeated washings with distilled water in a fresh beaker (for the sulphuric acid clings to the pot-beaker), the Diatoms, the sand, and the amorphous silica alone survive. All is now perfectly clean; but the constituents of the white powder must await separation, and this they can do only in *dilute alcohol*, because the particles mat or adhere irretrievably in water, in which, also, confervoids speedily arise. We *label* the vessel, and we choose our own time for isolating the precious forms, observing, however, that the whole sediment has shrunk within very small dimensions, as we set aside the result of so much labor.

Finally, in reviewing the work done, let us have in mind the intention of each of the acids employed, and remember that NO_2 boils at a moderately high temperature, which, as in other fluids, is increased by the presence of pebbles, bits of glass, or coarse sand; that HCl passes into ebullition at a comparatively low indication of the thermometer; and, lastly, that the boiling point of SO_2 is very high indeed,—so elevated, in fact, as to jeopardize all inferior glass-ware.

The foregoing process is open to the charge of being time-consuming,—as are all other methods,—but we have invariably found the results to be excellent. The same success is claimed for a dif-

ferent procedure, practiced and recommended by F. G. Stokes,* and which may be here briefly set forth.

Provide a beaker glass of six or eight ounces' capacity, in which place about two teaspoonfuls of guano, and then fill to near the top with a saturated solution of carbonate of soda. Boil for half an hour, wash well with water, and, after standing, pour off the supernatant fluid very close.

Add now of chlorhydric acid two ounces, boil also for a half-hour, wash well, and pour off very close once more.

Treat the sediment with one ounce of strong sulphuric acid. Let it act for ten minutes, and then add bicarbonate of soda cautiously, either in solution or suspension. Shake well during effervescence, wash well, and, with great caution, add two ounces of nitric acid. After effervescence, drop in two pinches of chlorate of potash, boil a half-hour, or until the deposit becomes white, and, finally, wash the sediment thoroughly.

From what precedes, it must appear that the aim of the operator is the removal of all inorganic substances, either originally soluble or artificially made so, prominent among which is *lime*, and of all organic matters reduced by a destructive process to a soluble or gaseous form. And it is also evident that when certain of these stranger elements are known to be absent, such parts of the processes as are applicable to them ought to be omitted, so that fewer steps are necessary to attain the end. Silex, or sand, of course, is not to be regarded in this connection, as it is as insoluble as the Diatoms themselves.

Suppose we take a clay or earth, that of *Nottingham*, for example. Cretaceous matter forms but a small part of its substance, which consists, in fact, of Diatomaceous skeletons, more or less adherent through the agency of a mortar, probably a silicate of lime, and of fine siliceous particles, or even sand, less closely connected. To disintegrate a mass, let it first be slaked, as it were, by pouring over it a strong solution of carbonate of soda, and when, after a time, the whole falls to pieces in laminæ and in dust, let it be boiled for fifteen or twenty minutes in a quantity of the same solution, and the result will be the reduction of the cement, the formation of silicate of soda and carbonate of lime, and the almost perfect cleaning of the Diatoms. The former is removable by hot water and frequent washings; the latter, by boiling in nitric

* F. G. Stokes, On Cleaning Diatoms, Quar. Jour. Micros. Science, vol. xv. p 222.

acid; while chlorhydric acid dissolves out any sulphate of lime, and, besides, bleaches by the abstraction of unattacked metallic stains. The fine siliceous dust, the torment of diatomists, can only be gotten rid of by elutriation, as will presently be shown, and refractory particles or lumps must be left behind in the washings.

If the reader have followed our *procès raisonné*, he will hardly be at a loss to answer the query, "What are we to do with such clay or rock as the *Monterey*?" some specimens of which we have found to be extremely hard or tenacious. In this instance, again, the difficulty presented is the disintegration of the rock without doing injury to the Diatoms. We may make the mass very hot and then drop it into cold water, by which many Diatoms will be sacrificed; or else we may slightly warm the specimen, drop it into a strong solution of carbonate of potash, and boil for a time, to be ascertained by the breaking down of the original lump. In the same way, carbonate of soda may be employed, with more safety to the forms in request, but with less general success; while the potash, which is more energetic in decomposing the cement, is very destructive, if not carefully watched, of the very objects we seek.

Once reduced to the state of powder, the rules just enunciated are to be followed.

Before leaving the difficult or troublesome, we feel obliged to notice such guanos as contain sulphate of lime in any quantity, but especially in large proportion. *Algoa Bay guano* (South Africa), for instance, as furnished us by a reliable person, was found to consist almost wholly of this refractory substance, which required an especial treatment. Being soluble in boiling and hot dilute chlorhydric acid, it was found necessary to boil the Algoa guano in that dilution, and to pour the whole on a filter, whereby the sulphate of lime in solution ran off and deposited on cooling, while the guano residuum was caught by the filter, to be subjected again and again to the same process as long as it contained the salt of lime. The small portion of decalcified guano was next exposed to the action of NO_3 and HCl , in the usual way, with the result of securing some beautiful *Actinoptychi* and *Aulacodiscus Petersii*.

Pure gatherings, unmixed with sand, mud, or other refractory extraneous substances, are not made to pass through the ordeal of an alkali and so many acids as in the case of a guano, but may be cleaned by the use of one of these agents with the aid of no long-continued heat. Chlorophyll will yield to carbonate of soda,

and all possible lime here, to nitric acid ; but when we have to deal with very delicate *Amphipleuras* or *Grammatophoras*, marked with almost ghostly lines, we should handle our reagents with gloves, and not boil out those exquisite markings which almost rival the art-ruled bands of Nobert. Maceration for a time may be sufficient ; or, if the quantity be small, all phytic substance may be burned away by the heat of a spirit-lamp flame applied beneath a film of mica, on which the "once animated dust" reposes, and on which it may, without change, be mounted in balsam.

It is needless to remind the young operator of the necessity for delicacy in all manipulative procedures, and not least in the washings of pure gatherings, or of those containing the filmy forms. But care is especially to be exercised in the recovery of those most fragile Diatoms which are met with in *Barbadoes earth*. Water alone, poured *gently* on this polycystinous deposit, will suffice to float away and waft them to slides ready for their reception. And this may be done in a beaker, so that the supernatant water, rendered milky by Diatoms and siliceous dust, yields by elutriation the fairest of results.

Isolation of Diatoms.—We have already pointed out the advantage, nay, even the necessity, of preserving the fruits of all cleanings in dilute alcohol, in which they may rest in safety awaiting the separation of the morphous from the amorphous. And we may here add the advice to recommit the Diatoms to alcohol finally before mounting, or incidentally, if interruption temporarily arrest the perfect course of the isolation. The methods of Mr. F. Okeden* by decantation, and by whirling in an evaporating capsule or large watch-glass, as suggested by Mr. J. A. Tulk,† we have found to answer every requirement if they be as dexterously managed as they are ingeniously devised. But we would call attention to a point, not hitherto noticed, incidental to the decantation process, and which has reference chiefly to the discoid forms. It is this: When the Diatoms were nearly or quite free from foreign matters, and beaker glasses were being used in the preparation, we observed that entire disks adhered to the flat bottoms of the vessels. We utilized this knowledge by emptying a beaker, by washing it out quite freely with distilled water, and, finally, by detaching and collecting the

*Method of Washing Diatomaceous Earths and Clays; *Quarterly Journal of Microscopical Science*, vol. iii. p. 158.

† On the Cleaning and Preparing of Diatoms, vol. xi. No. 3, 111.

absolutely perfect Diatoms by means of a soft camel's-hair pencil, well cleaned. In this way we have had excellent success with many gatherings, but with none better than the *Nottingham earth*, as was shown by some of our slides exhibited in Chicago in March, 1871, at the reunion of the State Microscopical Society of Illinois.

We have now, by whatever process employed, attained the cleaning and separation of the Diatoms, and have consigned them to the temporary guardianship of dilute alcohol; but there still remains for us the task of a final preparation of them for mounting. By the plan adopted and suggested by Mr. Okeden they have been "sorted" as to size; yet one washing more is necessary before we can transfer them to the expectant slides. If the Diatoms were to be dipped out by a tube directly, and dropped either upon a cover or a slide, the rapid alcoholic evaporation would keep the whole field in agitation, and the objects would eventually group together in drying and materially mar the beauty of the preparation. This defect may be easily remedied by quickly washing out the alcohol; after which the even display of the diatomaceous forms is readily accomplished, especially if we give the end of the slide a flip with the finger previous to putting it aside to dry spontaneously. At this point the microscopist has the election either of mounting in the *dry way*, or of embalming his tiny treasures in Canada balsam. He may add the balsam drop *au naturel* and gently heat over a spirit-flame before applying the cover, or he may omit the evaporation and mount "soft," placing a small screw, for a weight, upon the cover, or he may use balsam thinned by chloroform, or dissolved in absolute alcohol, and filtered as recommended by Dr. Schaeffer, of the Army Medical Museum, and then apply the continuous pressure of a small weight. By the first method the slide will be immediately ready for use when labeled; by the others, a certain number of hours or days must elapse before the margins of the covers will have become securely attached. But the work is done, and the student may now gloat over the things of beauty which he views by the light of science. It is true that he may regret a few forms which have been floated off under the descending cover; but careful manipulation alone will in future prevent this mishap. But how can he imitate the exquisite groupings of the *Diatomaceen-Typen-Platte* of Möller? He may not equal, but he may, with much practice, approximate to the excellence of that wonderfully skillful preparer by arranging his Diatoms dry

upon a slide or cover previously coated with a thin film of gelatine, and then fixing them by exposure for a moment to the vapor of distilled water. In mounting with balsam the Diatoms cannot change position, but the gelatine disappears, and is seen no more forever.

Before closing this paper, perhaps already too long, we deem it germane to the subject to refer to the plan which we have adopted with success in the selection or picking out of particular Diatoms. It may not be altogether original, yet it is practical, and may aid the inexperienced.

Nothing is easier than to seize particular Diatoms and transfer them to a bottle for future use, or to a slide, provided the field from which we select be rich and clean. Difficulty, however, occurs when forms in any gathering are few and far between. Let such prepared material be spread upon a large slide, covering a space of one inch by two, and let it be filliped as it is set away to dry spontaneously. With a two-third inch objective, search the white field for any Diatoms whatever, and, upon finding, encircle each one with a line, made with the point of a match sharpened and moistened, adding near the circle a dot, or cross, or other sign, always appropriated to the same Diatom, and of which a tallying record is kept on paper. At leisure one may, without trouble, single out any desired object, pick it off with a fine dampened point of cane (reed), not including the siliceous cuticle, and deposit it, free from injury, in a small drop of distilled water placed in the centre of the slide.

And here we leave our subject, with the remarks that none of the methods proposed can lead to success unless aided by patience, pains-taking, the adaptation of means to an end, and by practiced manipulative skill; and that what appears to be present perfection is only to be regarded as one of the widening circles which tend towards, but which never reach, ultimathulan truth.

Christopher Johnston, M.D.,

Corresponding Member of the Microscopical Society of Illinois.

Baltimore, Md., July 26th, 1872.

An Old but Useful Measuring Utility

This utility, that has been made available in the Downloads section of this site, was written some years back and used, we think, quite successfully by a number of diatomists.

Firstly, however, there are two restrictions that potential users should be made aware of.

The utility only works in Internet Explorer. Only jpg and gif file types are supported.

If someone out there wants to take the general principles and create a version that is browser independent then please do so and let us have that version available for download.

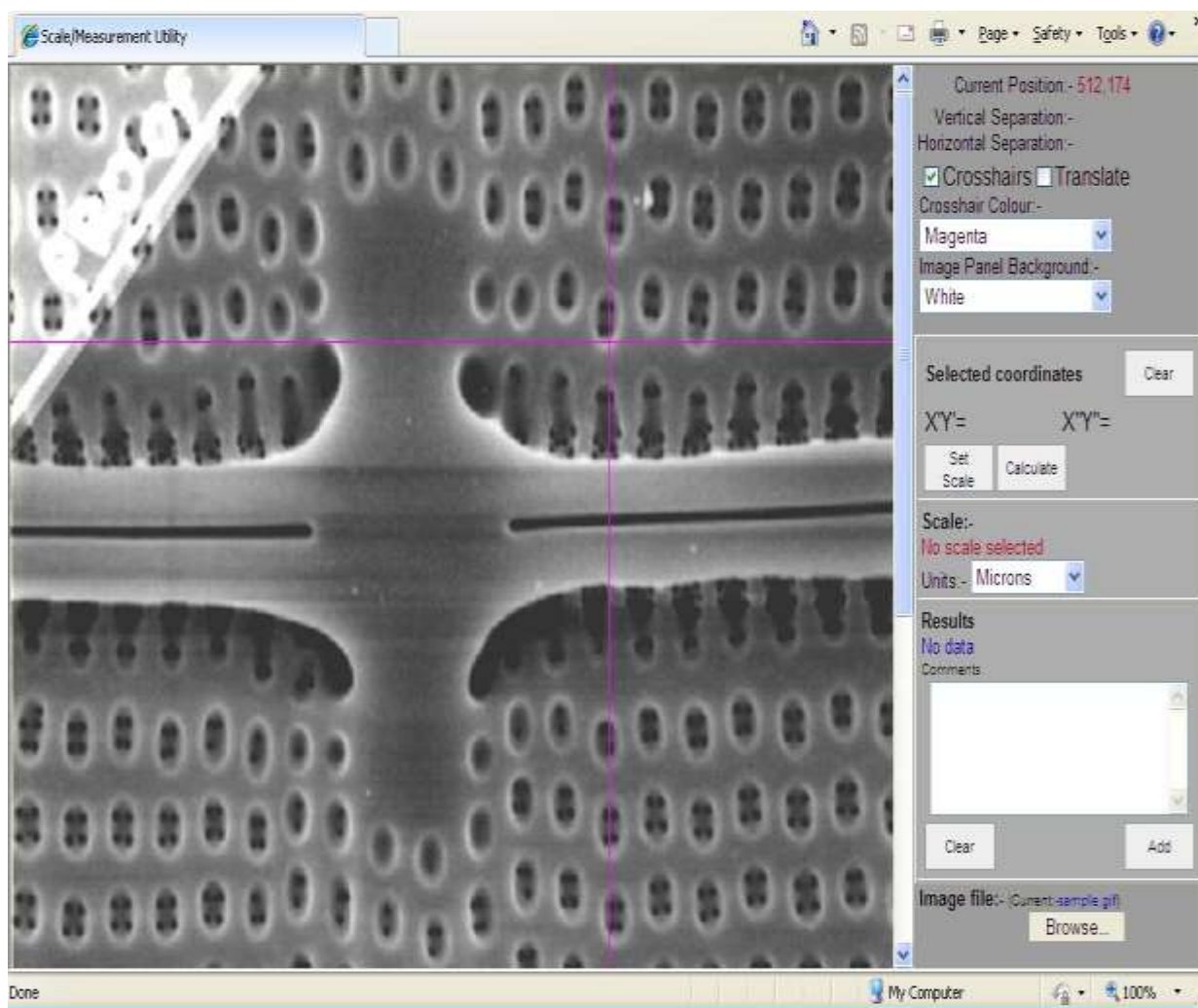
Despite these restrictions most readers should be able to get this utility working quite quickly.

Once you have downloaded the zip file, unzip the contents into a folder and load the file 'scale.htm' into Internet Explorer.

You may see a yellow bar across the top of the page asking whether you want the page to run active content.

Right click this banner and request that you do wish to do so.

In its default presentation there is an electron micrograph presented.

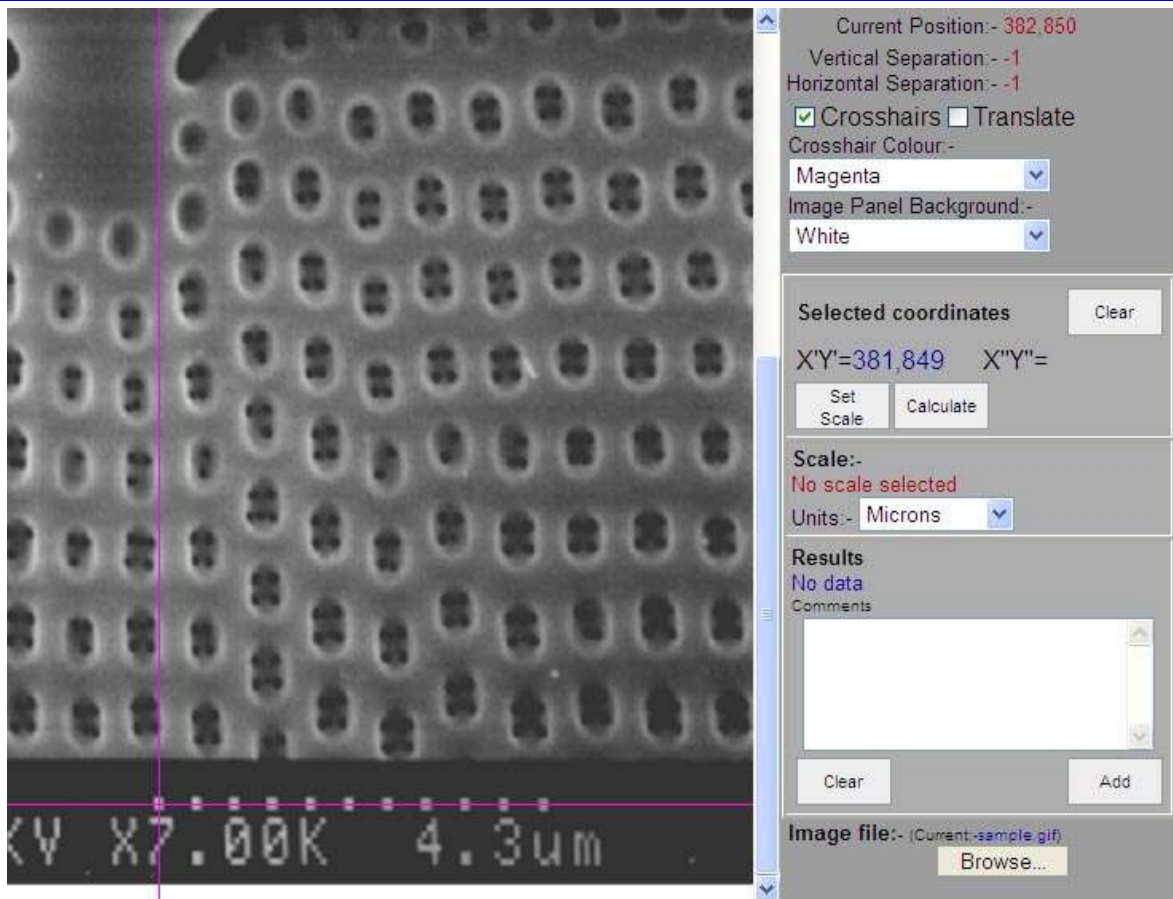


Use this image to become familiar with the functionality, we will cover loading your own images later.

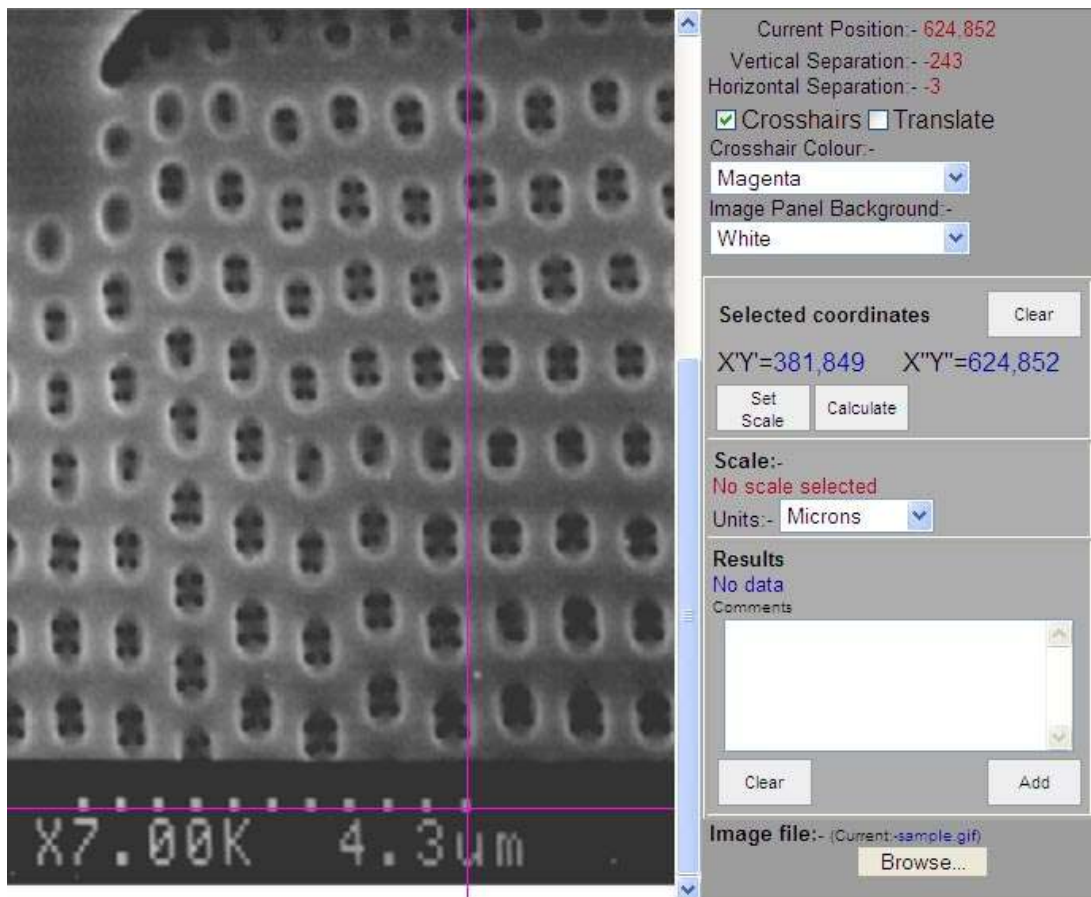
The first action you need to perform is to set the scale.

Notice that as you move the mouse pointer over the image a pair of crosshairs follow the mouse pointer. These just make it easier to gauge the position of the mouse pointer when selecting a point on the image.

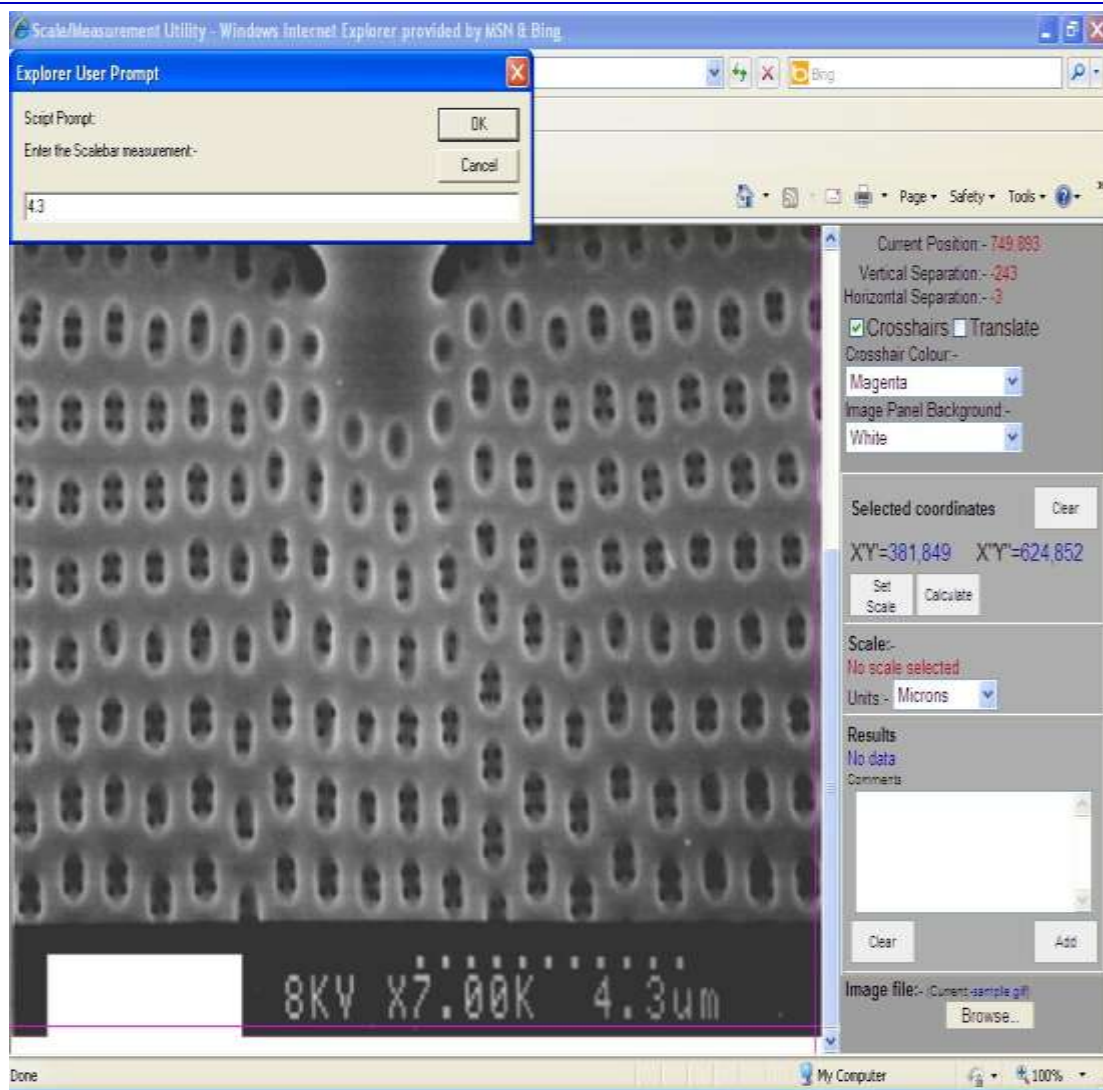
Scroll the picture up until you see the scalebar at the bottom right of the image (a series of blocks). Click on the first block. In the right hand pane the position will be displayed as the X'Y' coordinate



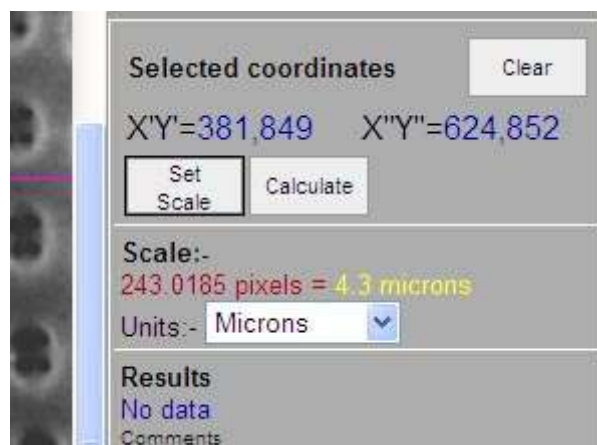
Click the last block and in the right hand pane the position will be displayed as the X''Y'' coordinate.



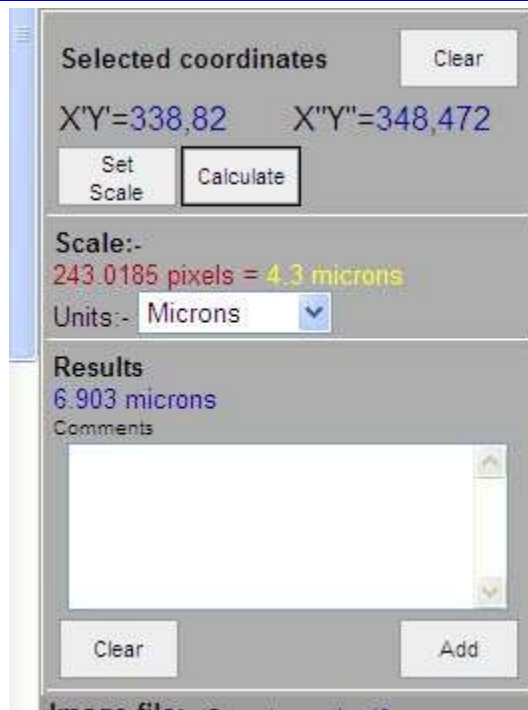
Now click the Set Scale Button in the right hand pane and you will be prompted to enter the scale value (in this case 4.3).



This done, the scale value is calculated and displayed. By default the scale unit is microns but this can be selected from the drop down list should it be anything other.



You are now in a position to start measuring the various features in your image. Click a point on the image, move the mouse to the next point and click (both X'Y' and X''Y'' coordinates should have values displayed). If you now click the Calculate button the distance between the two points will be calculated and appear in the Results section.



This result may be added to the Comments area by clicking the Add button. It is as well to enter some data into the comments first recording information about what you were measuring.



You can clear the Comments area by clicking the Clear button.

The above measuring actions can be repeated as long as there are features to measure.

When you have done you can mark the text in the Comments area in the normal way and copy into whatever text process you use.

To load an image of your own you should transfer an image onto your computer or make it available on a card or memory stick. Click the Browse button and navigate to the file location. Double click the desired image file and it should be loaded into the image pane. If it does not load then it is likely that your system security does not allow files to be loaded outwith the initial folder in which case copy the image file into the folder you unzipped the utility to and try again.

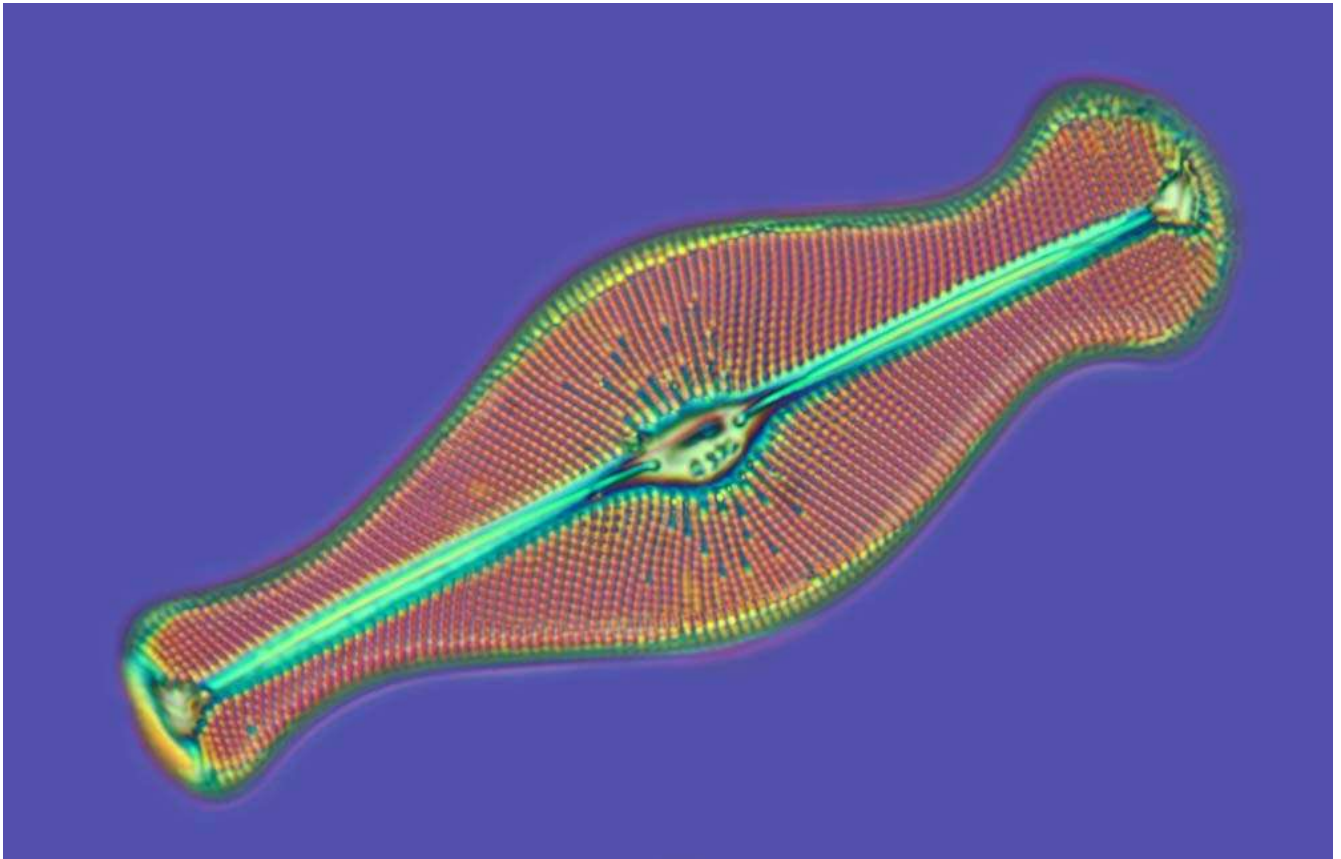
There are no guarantees, but it has worked OK for us.

Diatoms in Colour

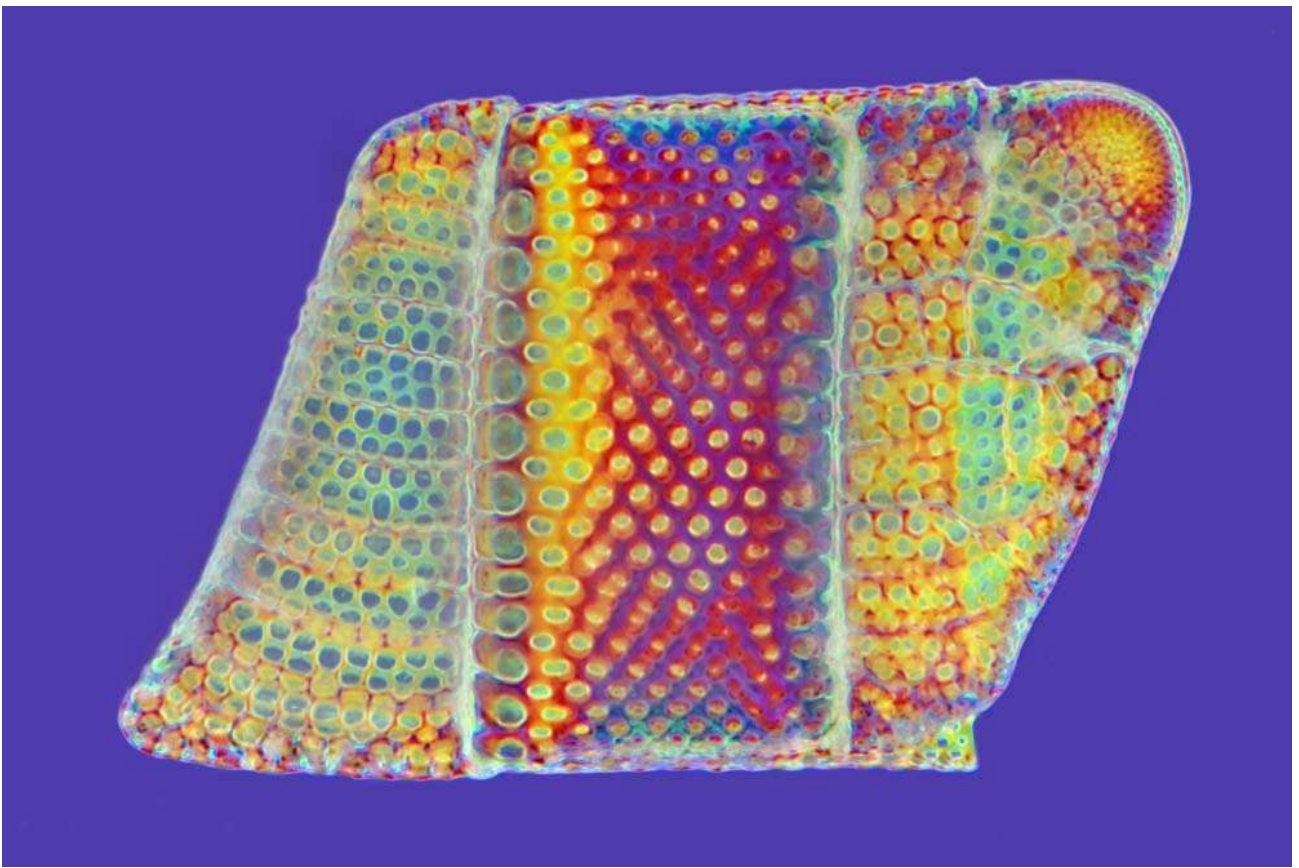
Spike Walker's Diatoms in Colour Gallery

All images © M. I. Walker 2013

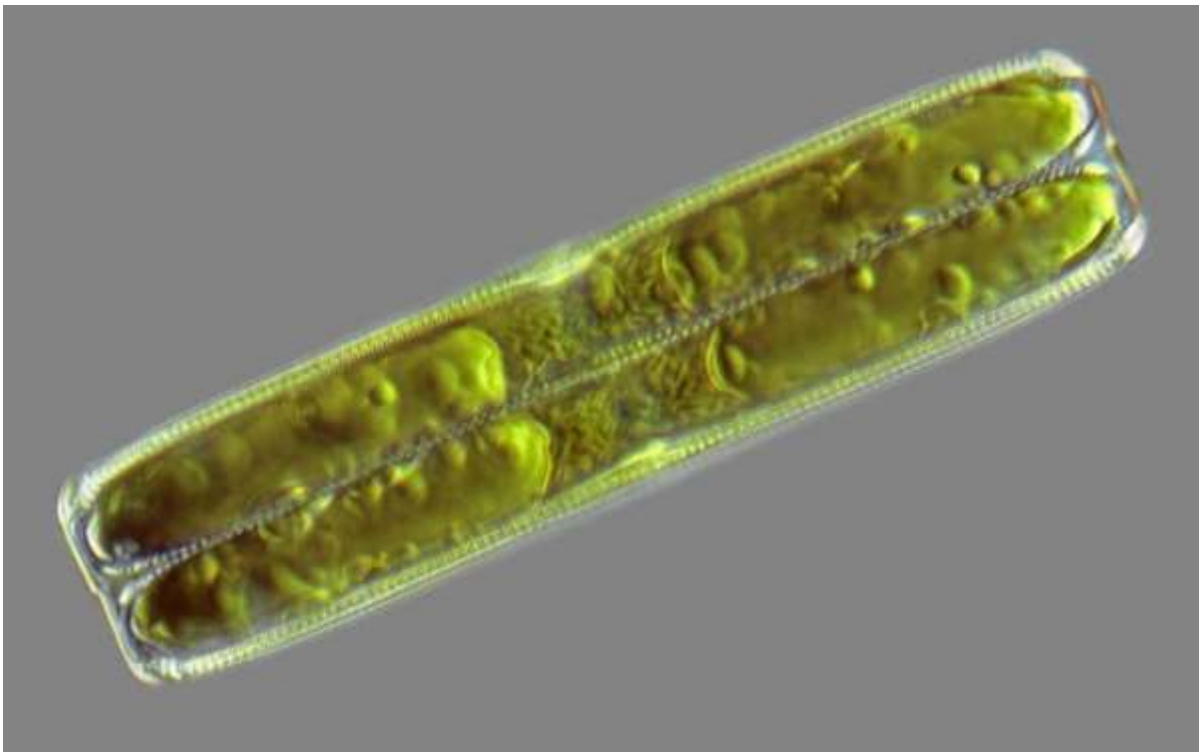
Spike Walker has generously given us permission to use some more of his quite exquisite images. We are careful to ask for such during the euphoria of our occasional 'get togethers'. Spike has always been most accommodating in allowing us the use of his material and once again we thank him wholeheartedly.



Gomphonema



Isthmia



Pinnularia

Extracts from a Diatomists' Notebook (I)
Dr. Michael Vaughn Salmon (Laboratory Notebook I)

15 May 78 Objct of Expt. To try to see connections in a chain of zig-zag diatoms from Selkome Brook.

Apparatus:- T₂; Res. Lamp; dry objectives; oblique light; diatoms in thin live box.

Results:- Chains observed to move rigidly, therefore connection at the corners must be fairly substantial. With careful use of oblique light and signal green filter no diffusers but careful Köhler illumination a band of gelatinous(?) substance was seen

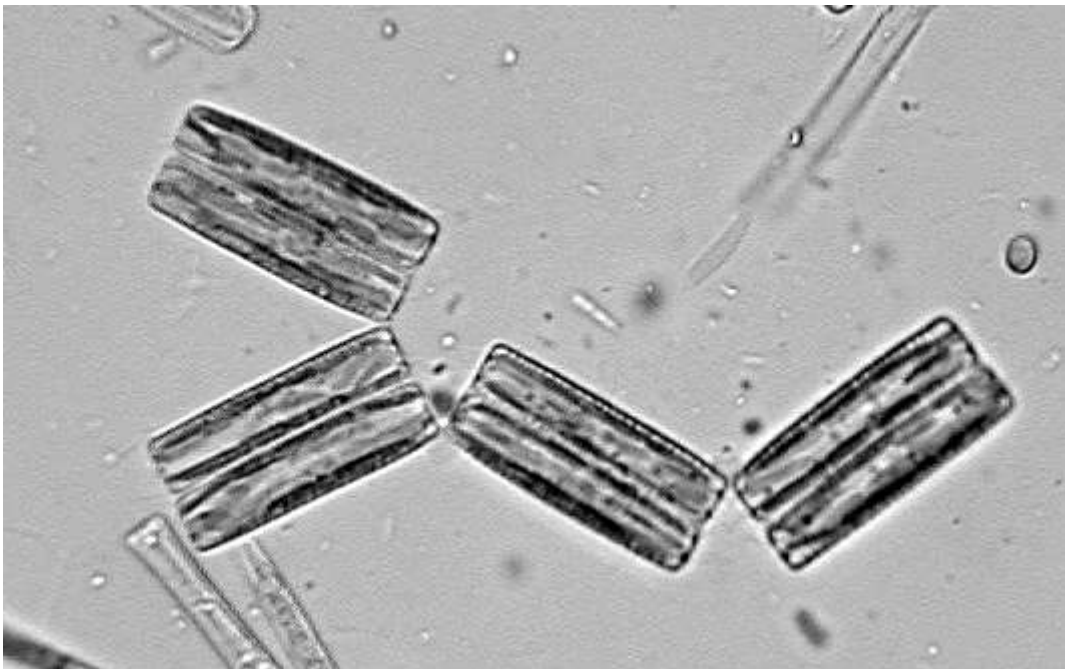
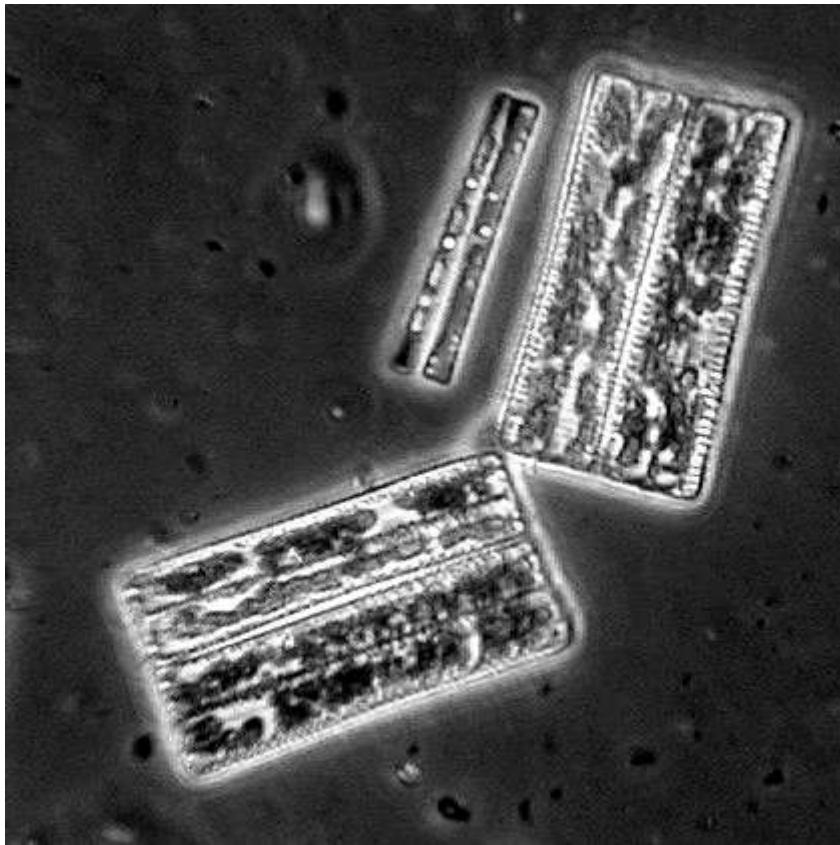


felt of substance almost indistinguishable from water; some RE more nearly like water than amoeboid protozoa, and clearly stiff enabling a chain of diatoms (about 10) to move without bending of the joints.

This drawing is in correct proportion except for form of diatom c which is shown attached by the wrong corner

Conclusion. It appears that as the diatoms divide and part as shown by arrow, the enveloping coating moves down to the attaching corner and stays there as a non-separating thread or blob, like pulling two pieces of hot toffee apart. These connections are most difficult to see and require a high power dry spf ~~type~~ Zeiss 5 mm 0.95 NA with carefully adjusted collar to make them visible (diatoms on the cover glass) oblique light is essential and this must be carefully adjusted on test.

Editor's Note: The connections are particularly apparent when using Phase Contrast but can be seen using ordinary transmitted light.



The Diatomists' Lament



I saw a special diatom, it floated into view,
It was there again much later upon a half cleaned stew,
Like none I'd ever seen before, I would swear it was something new.

I saw a special diatom, but never saw again,
It pains me to relate to you, but I feel I should explain,
Not in the final cleaning, it must have disappeared down the drain.

I saw a special diatom...