

An Unexpected Collection

Stuart Clague

Abbreviations

FOV = Field Of View

PPL = Plane Polarised Light

XN = Crossed Nicols (polarisers)

All slides are the 1839 RMS standard dimensions of 1" by 3" (25.4x76.2 mm) unless otherwise specified (only Figure 28). Slides vary in thickness from about 1 mm to 1.6 mm excluding paper covers; wooden slides are 2.5 mm to 3 mm thick.

When I retired after thirty-four years as a geologist in the mining industry, I missed access to a petrological microscope; even though I hadn't used one on a regular basis in the latter decade at work, its availability if needed, was always a comfort. Now with ample time to conduct my own private research and consulting, unfettered by corporate deadlines, I found myself lacking in equipment.

By luck, I found an antique petrological microscope being auctioned on a local online website and won the bidding. It is an Italian Officine Galileo of probably early 20th Century vintage. Its polariser and analyser are the original Nicol prisms constructed from two wedges of calcite bonded together by Canada Balsam. This method of polarisation was superseded by the introduction of Polaroid in 1932. Later, I bought a mirror-lit Hertel & Reuss of slightly-later vintage and then found a more convenient, electrically-lit, c.1950s Reichert in an antique market (Figure 1).

I am impressed by the excellent quality and robustness of these old instruments and, after having them expertly serviced in Johannesburg, they provide easily enough resolution for my requirements.

Whilst shopping for microscopes, I serendipitously discovered that there was a whole online auction market of antique and vintage prepared slides and

was captivated by the beautiful mountings and exquisite, hand-written labels. Most of these slides were prepared for the amateur market. By the mid-19th Century, the middle class had become well established and recreation time was available. The Victorians were fascinated by the natural world, as much as by music and art, and many were accomplished amateur, natural historians. With living space limited by large families, microscopy would have been a compact means of collecting and studying specimens in an era when the pursuit of scientific knowledge was still respected. A comprehensive collection could be housed in specially-designed boxes or cabinets with the slides displayed in trays or narrow drawers.

I bid upon, and won a few slides, and then began to realise the amazing dexterity and artistic skill of the Victorian mounters from a time when working conditions and availability of materials and must have been extremely challenging. The arrangements of diatoms from that era are remarkably impressive.



Figure 1. The microscopes used for examining and photographing the antique slides; Reichert on left and Officine Galileo on right.



Figure 2. Home-made, dust-tight, mahogany slide display box with twelve trays holding six slides each.



Figure 3. The mahogany slide display box open and showing removable trays.

I bought more and more, bidding fanatically; I had become consumed!

As my collection enlarged, I felt the need for a more appropriate means of display than vertical storage in a standard slide box. Unable to justify the cost of an original, I constructed a dust-proof mahogany box with stacked wooden trays (Figures 2 & 3). Instead of varnishing, I finished it by French polishing, a skill I had mastered when restoring old clocks; another hobby of mine.

There is a wealth of well-researched information on the internet for collectors. Also, the Quekett Microscopical Club has a beautifully-produced book, "Microscopical Mounts and Mounters", by the late Brian Bracegirdle with almost a thousand macro-photographs of preparations and twenty-four photomicrographs.

This is an account of my own modest collection of just over a hundred slides. My collecting was often guided by personal connections with places I have visited, or even lived at, or by subjects that have interested me.

Photographs of the slide mounts were taken with a Canon Powershot SX60 HS and Photomicrographs



Figure 4. Stage micrometer by Watson & Sons.

were taken with a Bresser MikrOkular microscope/telescope down-tube digital camera processed by CamLabLite software. Fields of view for each objective were measured with an antique stage micrometer by Watson & Sons purchased as part of the collection (Figure 4).

Quite large specimens are mounted on many slides and require unusually small objectives for use with the Bresser Camera which has an equivalent magnification of a 34x ocular. I managed to find a diminutive, second-hand, 2.5 mm Reichert objective from a friendly seller in Romania.

The Diatomists

The resilience and huge variation in size and intricate, geometrical form of diatoms must have appealed to the Victorian mind; as a large number of slides of specimens of this subject were produced by many mounters.

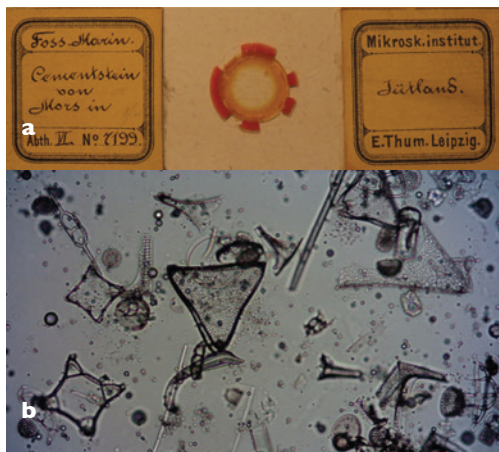


Figure 5. a) Marine fossils from Mors, Jutland by E. Thum. (Note damage to shellac ring). b) Strew of various diatom types. FOV 520x290 μ .

The first slide I bought was by Eduard Thum, showing a strew of diatoms from Jutland (Figure 5). He was considered, “One of the most talented diatom-mounters of all time” (www.microscopist.net). Thoughtful aspects of Thum’s personality rise up through the ocular from over a hundred years ago as you examine his preparations. For instance, another of his slides demonstrates a method of his to guide the microscopist to the main subject; he placed large diatoms, visible with the naked eye or low magnification, on either side of the tiny diatom specimens. Sometimes he would drop in a few extra diatoms of different types as “gifts” (www.



Figure 6. a) *Navicula apis* (diatoms) by E. Thum. b) Arrangement of *Navicula Apis* between two “marker” diatoms (detail out of focal plane) and a “bonus” diatom to right. FOV 1370x770 μ . (Note small granules which may be partial crystallisation of mounting medium?).

microscopist.net). When I first examined my example of this, I thought that the two large diatoms were the subject until I noticed the arrangement of tiny ones between; and later I noticed that there was also a different type, carefully placed to the side of one of the guide diatoms (Figure 6). You can almost sense his presence behind you, smiling indulgently over your shoulder as you discover these charms of his art as a supreme mounter.

Many mounters prepared diatom slides for exhibitions that spanned science and art, which the Victorians must have relished in their quest for knowledge and creativity. Diatoms with different morphologies were arranged in exquisite circular

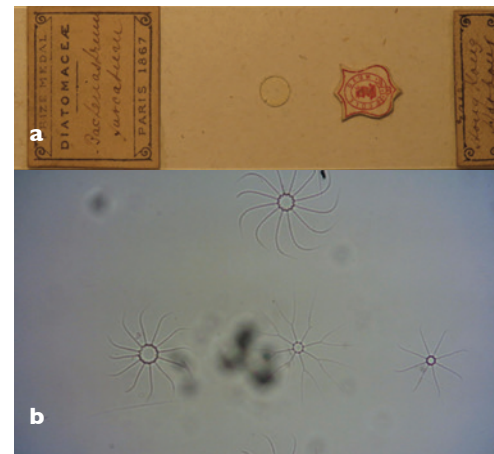


Figure 7. a) *Bacteriastrum furcatum* (diatoms) from Hong Kong Harbour by A. C. Cole; prize medal, Paris 1867. b) Central example shows bifurcate setae FOV 520x290 μ .

and radiating patterns. The microscopic specimens were arranged entirely by an extremely steady hand and unimaginable perseverance. According to my friend Dr Roger Dixon, himself an accomplished microscopist, specimens are positioned with an incredibly-fine, hand-held needle made by corroding the end of a piece of tungsten wire in a melt of sodium nitrite. However fine a needle could have been fabricated over a hundred years ago, I imagine it must have been like arranging postage stamps with a cricket bat during an earthquake.

I have a prize medal slide by A C Cole from an exhibition held in Paris in 1867. The subject is an arrangement of *Bacteriastrum* comprising 4 cells

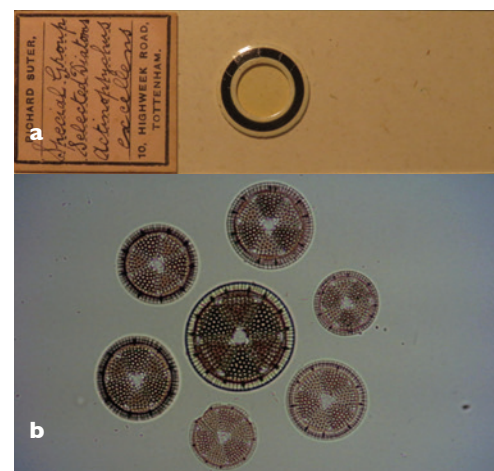


Figure 8. a) *Actinoptychus excellens* (diatoms) by Richard Suter. b) Arranged group of seven. FOV 520x290 μ .

with simple radiating setae surrounding a cell with bifurcate setae (Figure 7). Richard Suter also arranged diatoms as seen in (Figure 8).

The acme of this style must have been realised by the slides of diatoms, butterfly scales and sponge spicules that were arranged to create pictures such as bouquets of flowers and even farm-yard scenes. This time-consuming and seemingly pointless process was an opportunity for the mounter to display his skill and dexterity and an indication of the market for curiosities at that time.

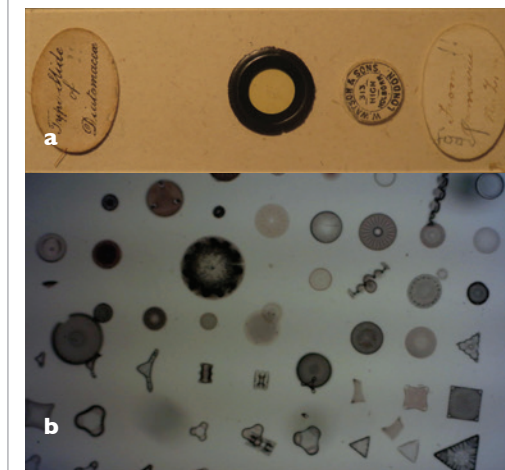


Figure 9. a) Type slide (Typen-Platte) by Watson & Sons of about 80 diatom types from New Zealand. b) Diatom types arranged in grid pattern. FOV 2100x1200 μ .

I have not found a comprehensive guide to identifying diatom species; an “Observer’s Book of Birds” for diatoms; and I suspect that, similar to what I was told by a palynologist concerning palynomorphs, identification results from many years of building up knowledge from individual publications and personal observation. There are possible guides in the amazing feats of fine dexterity in the form of the Typen-Platte (Type slide) of different forms of diatom arranged in a grid. I was ecstatic when I managed to procure one of these by Watson & Sons of London, showing about eighty different forms from Oamaru in New Zealand. Perhaps these were originally supplied with accompanying diagrams providing taxonomy (Figure 9).



Figure 10. a) Foot of Caterpillar by Watson & Sons. b) FOV 2100x1200 μ .



Figure 11. a) Spinneret of Garden Spider *Epeira diadema* by Watson & Sons. b) FOV 2100x1200 μ .

Watson & Sons was well established in Victorian London and prepared slides of many subjects other than diatoms Figures 10, 11 & 12 are examples. Many of the other preparers either worked for Watson or retailed through his firm (www.microscopy-uk.org.uk/mag/artsep12/pp-Watsonnotes.doc).

Mongrammed Slides

Many slide labels and paper covers are monogrammed with initials and researchers have painstakingly identified most of the mounters with a detective-like zeal.

John Barnett (JB) and James William Bond (JWB) are examples in point (Figure 13) Barnett operated during the latter half of the 19th Century and Bond

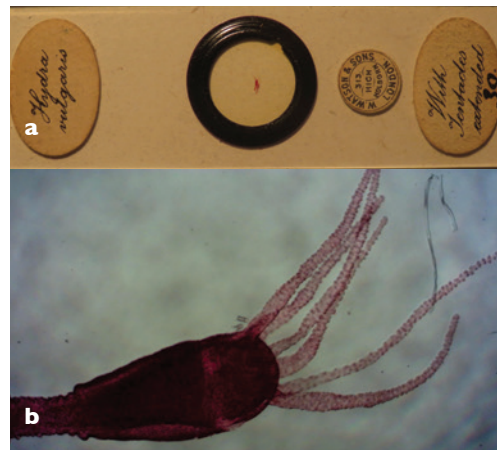


Figure 12. a) *Hydra vulgaris* with Tentacles extended by Watson & Sons. b) FOV 2100x1200 μ .

was one of the earlier mounters, starting around the 1830s; he is accredited as being one of the first users of Canada Balsam as a mounting medium (www.victorianmicroscopeslides.com).

The J&TJ monogram was eventually identified from letters to be Joseph & Theodore Jones who produced slides around the mid-19th Century (www.microscopist.net/JTJ) (Figure 14).

A seemingly common monogram is that of Edmund Wheeler (EW) who produced a large number of slides in the 20 years prior to his death in 1885. I have two of his foraminifera mounts (Figures 15 & 16).

I own two slides for which I haven't yet found the identity of the mounters. One has a printed monogram; JN; (Figure 17) and the other, handwritten-one is difficult to decipher but does not look like that of Rev. William Smith as the seller suggested (Figure 18). Perhaps a reader of *infocus* might be able to enlighten me as to the identity of these two mounters?

Anonymous Slides

Of course there are many slides, both ringed and paper-covered for which the mounter cannot be identified. Sometimes attempts are made to compare handwriting but this is usually used to identify a mounter that sub-contracted for a firm

such as Watson & Sons. Examples are shown in Figures 19, 20 & 21. Sometimes distinctive labels identify the mounter as in W.A. Firth (Figure 22).

Slide Presentation

Slides were presented in various styles. Those I have shown by e.g. Thum, Cole, Suter and Watson were ringed with shellac or enamel to seal the edge of the circular cover slips. Assistance was provided by a ringing table, which comprised a brass disc with clips to hold the slide and was revolved on a spindle and whilst the ring was applied with a fine paint brush. Often a finer pinstripe ring was applied in a different colour, either to aid recognition or merely for aesthetics.

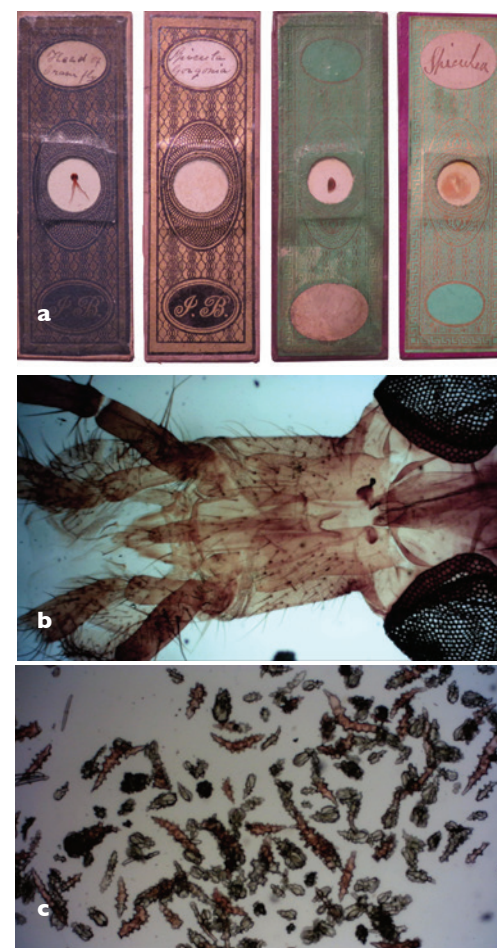
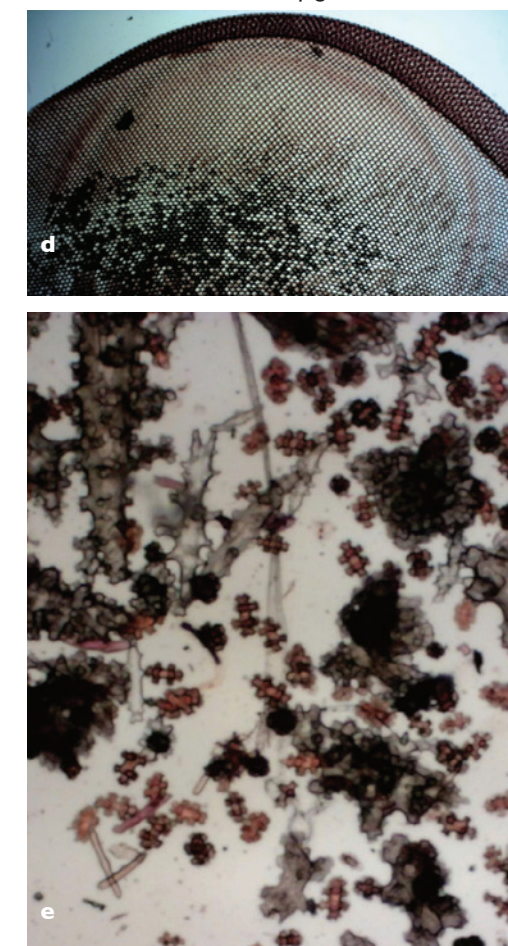


Figure 13. a) Monogrammed slides by John Barnett (two on left) and James William Bond (two on right). b) Head of Crane fly by J. Barnett, FOV 2100x1200 μ (far left). c) *Gorgonia* spicules by J. Barnett, FOV 1370x770 μ (left of centre). d) Eye of Housefly by J.W. Bond, FOV 2100x1200 μ (right of centre). e) Spiculae by J.W. Bond, FOV 1370x770 μ (far right).

Paper covers, or wrappings, were an attractive means of presentation used by many mounters. They were pasted over square cover slips with an intricate design on the top paper and with circular holes, top and bottom for viewing and light transmission.

I discovered a practical value of paper covering by inadvertently dropping one onto the tiled floor of my home laboratory (inexcusable carelessness for a microscopist!) and it survived. I have since, however, placed a carpet under my microscope table.

I have two slides with remarkably attractive coverings comprising combed, marbled paper of the type used by book binders for end papers and covers. Different coloured pigments were floated



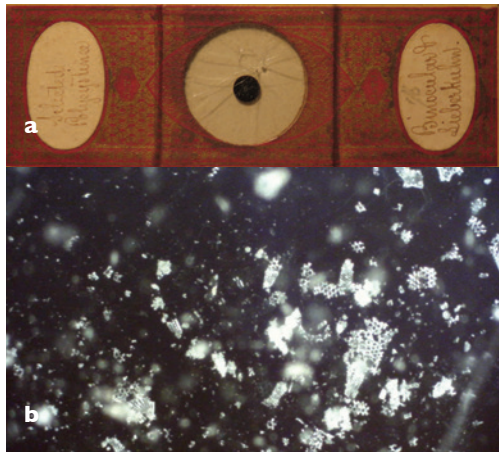


Figure 14. a) Polycystina by Joseph & Theodore Jones. b) FOV 2100x1200 μ (top lit).



Figure 15. a) Foraminifera from Levant by Edmund Wheeler. b) FOV 2100x1200 μ .



Figure 16. a) Foraminifera from Australia by Edmund Wheeler. b) FOV 2100x1200 μ .

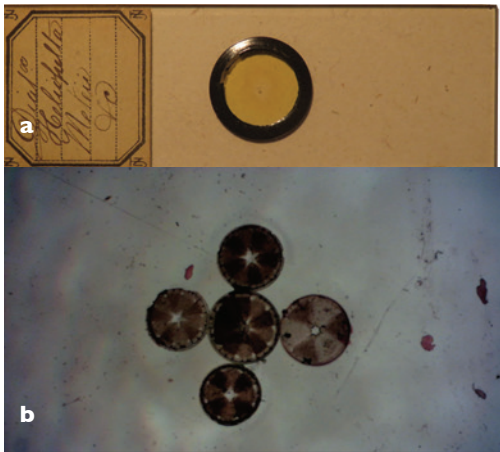


Figure 17. a) Diatoms *Heliopelta* (Metzii?) by unknown JN. b) FOV1370x770 μ .

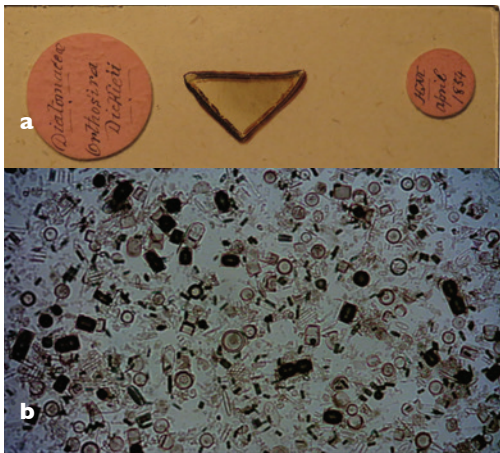


Figure 18. Diatoms *Orthosira Dickiei* by (unknown initials) April 1854 (Note unusual triangular cover slip).

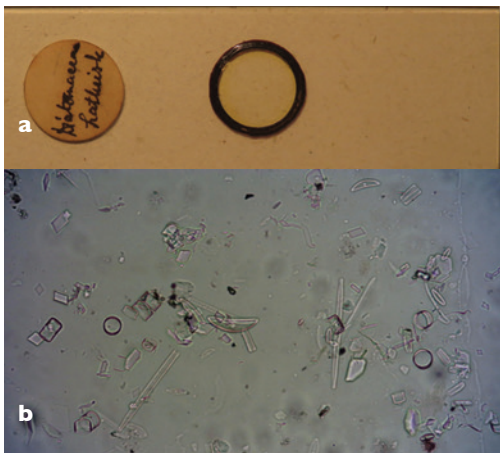


Figure 19. a) Diatomaceae (indcipherable), Anonymous. b) FOV 520x290 μ .

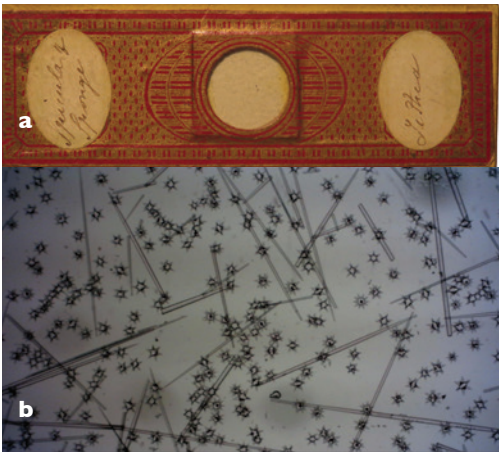


Figure 20. Spicules of Sponge (indcipherable), Anonymous.

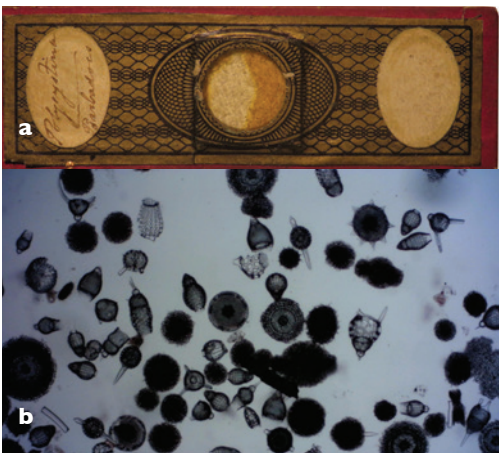


Figure 21. a) Polycystina, Barbados, Anonymous. b) FOV 1370x770 μ .

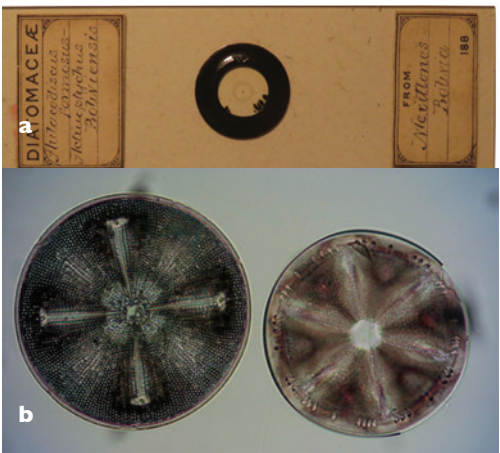


Figure 22. a) Diatomaceae, *Aulacodiscus formusus*, *Actinopterychus boliviensis* from Bolivia, by W.A. Firth (Note; the labels are exactly the same style as others that normally had "W A FIRTH" printed at the bottom of the lower label). b) FOV 520x290 μ .

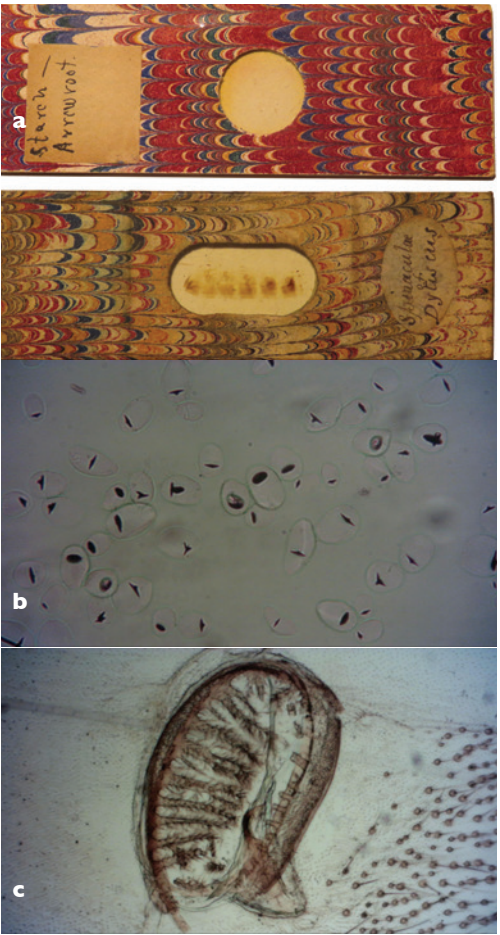


Figure 23. a) Slides with combed, marbled paper covers. b) Starch, Arrowroot, FOV 330x190 μ . c) Spiraculæ of *Dyiscus*, FOV 1550x870 μ . on a tray of water and either stirred into swirls or combed and the paper was laid on top to transfer the pattern (Figure 23).

Slide labels were also engraved directly onto the glass. The neatness of the lettering on my example by John Tyrrell (Figure 24) suggests that a diamond stylus was used. The sharpness of the engraving gives a startlingly recent impression but I found Tyrrell mentioned several times in Volume III of the Quarterly Journal of Microscopical Science, 1855.

I have a deep-cell liquid mounted slide from Loweswater, the nearest of the English Lakes to my birthplace. The cover slip is bonded onto a ring of what appears to be shellac and sealed with rings of enamel and more shellac. There are two fixed air bubbles but an indication of the low viscosity of the

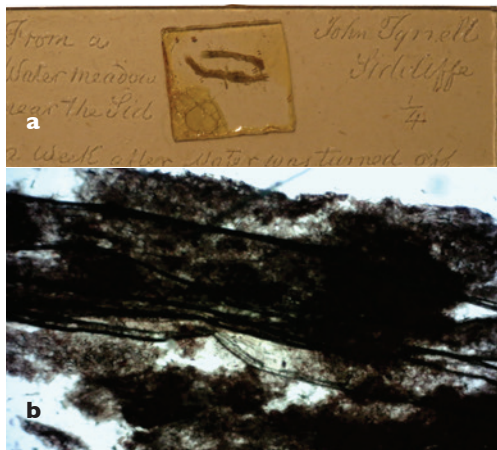


Figure 24. a) Fibres from water meadow by John Tyrell, engraved label. b) FOV 2100x1200 μ .

mounting liquid is shown by small buoyant particles that move rapidly upwards between the daphnia subjects when the slide is turned on edge. Therefore the liquid cannot be glycerine and is perhaps alcohol (Figure 25). The printed labels suggested that it is as relatively recent despite the apparent use of shellac. Further research revealed that the N.B.S. logo abbreviates “Northern Biological Supplies” and the slide was probably mounted as late as the 1980s; possibly by Eric Marson (www.micrographia.com/edito/editoria/ediori/edit0100).

Wooden slides were used as an early method for dry mounts, with the specimens glued into a cavity and a paper label on the back. Two of my examples are shown in Figures 26 & 27.



Figure 25. a) Freshwater Plankton, Zoo Forms, Loweswater, Lake District, Deep Cell N.B.S. (Northern Biological Supplies). b) FOV 2100x1200 μ .

The earliest types of mounts are demonstrated by two slides waiting for me with my brother in England who sent me the photograph. The boxwood slide (Figure 28a) is an example how mounts were first marketed. Related specimens were mounted in windows in a sliding box to be viewed in turn via a slot in the microscope, similar to the plates and wedges in the petrological microscope but in a different focal plane. In fact from these, the name “slide” is probably derived. The glass slide (Figure 28b) features a version of the Darker-Pritchard mount where two slides were held together with sealing wax before the advent of cover slips (www.microscopist.net/DarkerWH).



Figure 26. a) Mahogany slide with black painted cavity for dry mount. b) Label on reverse of slide, Blue clay, Bracklesham. c) Eocene Microfossil fragments (46 Ma), FOV 2100x1200 μ (top lit).

Staining enhances internal tissue structures and saffron and carmine (from the bodies of *Dactylopius coccus cacti* beetles) were commonly used with an alum solution mordant. Haematoxylin and eosin were developed as early as the mid-19th Century though; Eosin being named after a girl the inventor admired (www.agarscientific.net/h-and-e-part-one-history-background-and-solutions/) Use of carmine is shown in the slide by Abm Flatters (Figure 29).

HMS Challenger

I have long been fascinated by, and own two books on the Challenger Expedition of 1872 to 1876, a voyage totalling 68,000 nautical miles for oceanographic research. Occasionally slides from the many depth soundings taken on this voyage, came on the market. Each time I was outbid

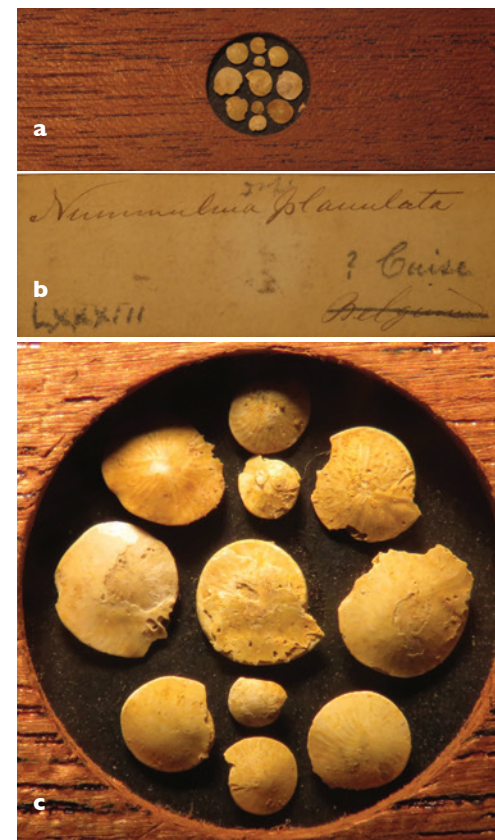


Figure 27. a) Mahogany slide with black painted cavity for dry mount. b) Label on reverse of slide *Nummulina planulata*, Belgium. c) Planulate *Nummulina* Foraminifera, FOV 15 mm (Note: Macrophotograph).

beyond my budget. I eventually won the bidding on a Challenger slide of foraminifera from a sounding at 1450 fathoms (2652 m), mounted in 1977 (Figure 30). I thought perhaps that it was a sample taken on the Challenger Expedition, mounted at a much later date. I now think it could come from the Glomar Challenger deep-sea drilling project of the 1970s, where soundings were also taken. If the latitude and longitude are entered into Google



Figure 28. a) Four-cavity wooden slider (Slide dimensions 130 mm x 21 mm x 5 mm). b) Humming bird feathers, example of Pritchard mount using sealing wax.

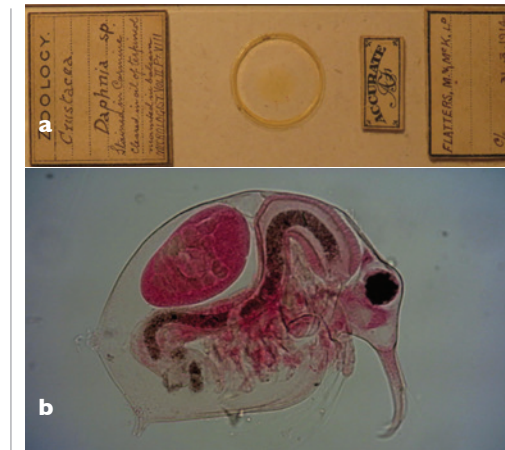


Figure 29. a) *Daphnia* stained in Carmine by Flatters, M & McK Ltd, 1914. b) Single *Daphnia* showing carmine stain FOV 520x290 μ .

Earth the sounding is exactly on the Mid-Atlantic Ridge between two transform faults. Research was aimed at this structure and provided conclusive evidence of sea-floor spreading and plate tectonics. During the time I was at university, our Head of Department of Geology, a plate tectonics specialist, took part in this later expedition.

As a point of interest, calcareous foraminifera only exist in ocean-floor ooze to the depth of the carbonate compensation depth, about 5000 m in the Atlantic Ocean. Calcium carbonate becomes more soluble a higher pressure, lower temperature and increase in carbon dioxide. Below this depth, ocean-floor ooze is composed largely of siliceous radiolaria.

Petrological Thin Sections

The production of petrographical thin sections must have been extremely laborious before the ready availability of mechanised diamond saws and abrasive grinding laps. Slices of rock were bonded to slides then ground thin by hand on glass plates with abrasive powders.

As a geologist these slides are of particular interest to me but they go for high prices so I only have a few.

One of my first geological field trips was to the Shap Granite quarry in Cumbria, The rock is technically an adamellite (Figure 31).

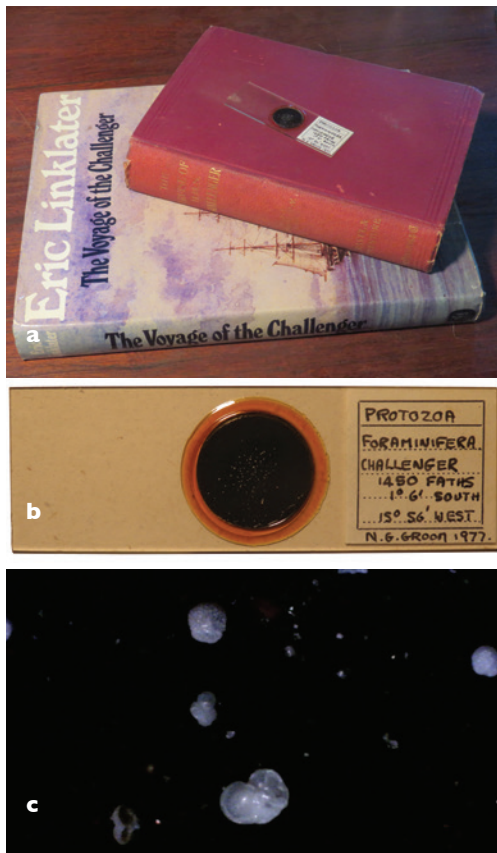


Figure 30. a) Two accounts on the 1872 to 1876 Challenger Expedition written in 1897 and 1972. b) Foraminifera from Challenger sounding 1450 Ftm. c) FOV 2100x1200 μ (top lit).

Another Lakeland rock encountered in my youth was the Horneblende picrite of Little Knott (Figure 32).

I found and won the bidding on a slide of foraminifera in the Carboniferous limestone from Humphrey Head, a peninsular projecting from the northern coast of Morecambe Bay. I lived at Humphrey Head during most of my teenage years (Figure 33).

A slide of microfossils in Liassic limestone from Höhen Goll in Bavaria has a sinister curiosity. This was the location of Hitler's lair where he had planned to hide as it became evident that the Allied advance on Berlin was imminent. The slide was made long before this though; by Clarke & Page, who were in partnership from 1904 to 1924 (Figure 34).

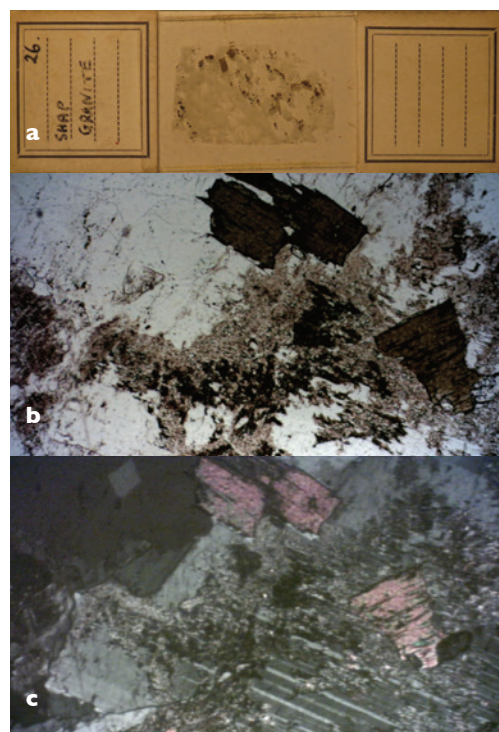


Figure 31. a) Shap Granite. b) Quartz (white), plagioclase (grey and white) and pleochroic biotite (dark brown), FOV 1370x770 μ , PPL. c) Quartz (grey), plagioclase (albite-twinning, dark grey and white stripes) and biotite (purple birefringence), same FOV 1370x770 μ , XN.

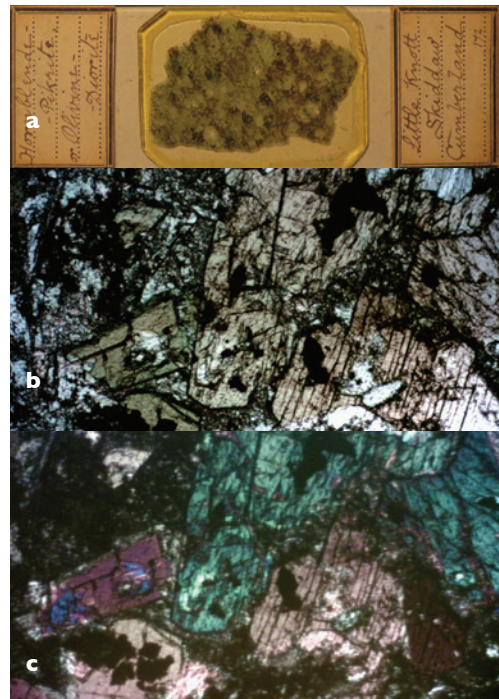


Figure 32. a) Horneblende Picrite or Olivine Diorite, Little Knott, Skiddaw, Cumberland. b) Plagioclase grey and white, hornblende brown, FOV 1370x770 μ , PPL. c) Plagioclase, grey and hornblende purple, blue and green birefringence, same FOV 1370x770 μ , XN.

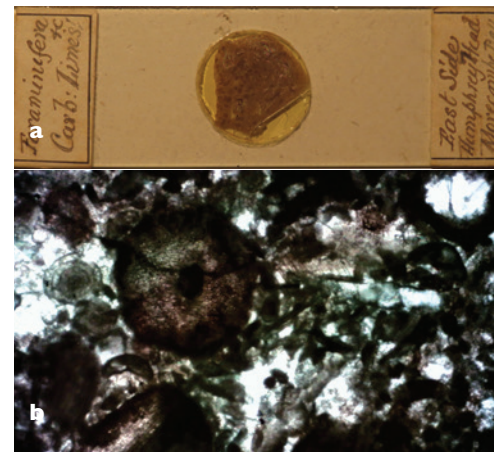


Figure 33. a) Foraminifera, Carboniferous Limestone, East Side, Humphrey Head, Morecambe Bay. b) FOV, 2100x1200 μ , PPL.

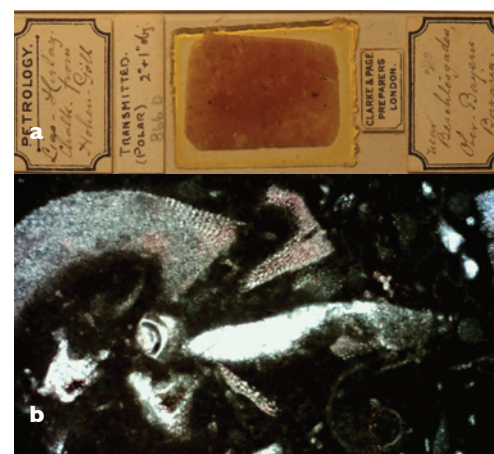


Figure 34. a) Liassic Hirlatz chalk from Hohen Goll, near Berchtesgaden, Upper Bavaria by Clarke & Page. b) Showing fossil fragments, FOV 2100x1200 μ .

Medical Slides

The Victorian breakthroughs in medicine required a large amount of research material in the form of medical microscope slides. After the Anatomy Act of 1832, human histological material could be obtained with a licence so adequate material became available and an end was put to the grisly practice of body snatching to supply medical researchers.

Unrestricted research probably helped towards medical breakthroughs such as the discovery of penicillin in 1928. I was perturbed to learn, from a medical student friend of our daughter, that the use of a microscope is no longer taught at her medical school and histology, bacteriology etc, is learned from computer presentations.

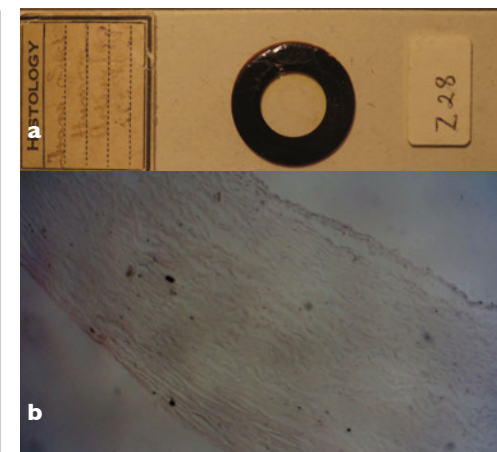


Figure 35. a) Trans-section of Human Artery. b) Showing concentric muscle fibres, FOV 1550x770 μ .

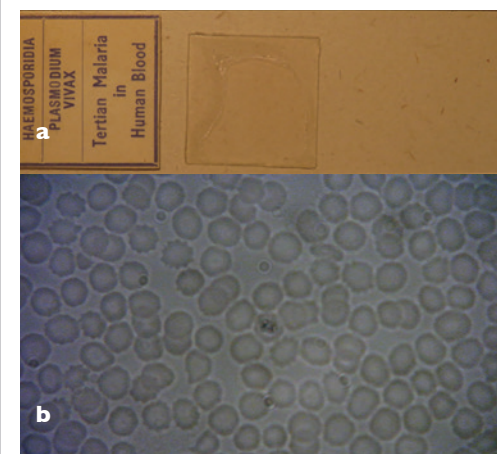


Figure 36. a) Haemosporidia, *Plasmodium vivax*, Tertian Malaria in Human Blood. b) Showing possible plasmodium (and possible Schüffner's dots?), FOV 140x80 μ .

Examples of old medical slides are shown in Figure 35 & 36. I also have a set of twenty old histological slides from Charing Cross Hospital Medical School (Figure 37). Unfortunately these are unlabelled apart from with numbers; they were perhaps used for examinations. I have offered our daughter's friend extra classes where I will teach her how to use a microscope and she can identify the tissue-types for me in return.

Lives of the Mounters and Conclusion

Little is known of the lives of many of the mounters but it is sure that, certainly those who worked in cities, must have been plagued by dust and difficult



Figure 37. A set of 20 histological slides from Charing Cross Hospital Medical School Department of Pathology.

lighting, especially in winter and even more so in the London smog.

A couple of anecdotes caught my interest:

H G Wells, the science-fiction writer famous for, “The War of the Worlds” written in 1897, and later the subject of a number radio broadcasts, films and the 1978 best-selling musical album, had shared a work-room in London in 1888 with a microscopist called Martin Cole. Cole sat at the window preparing slides for medical students, surrounded by jars of preserved body parts. Meanwhile Wells, who was basically unemployed, worked on some drawings for a teacher (H G Wells, Experiment in Autobiography, 1934). It turns out that Martin Cole prepared slides for Watson & Sons and was the son of the mounter, A. C. Cole. (www.antiquemicroscopesandslides.com/antique-microscope-slides-I-hgwells)

ABM Flatters apparently had a “difficult temperament” and was unable to work with others for long (Bracegirdle, Brian, Microscopical Mounts and Mounters, 1998, Quekett Microscopical Club).

The scene I imagine amuses me; the man throwing rages and hurling laboratory glassware against the walls and to the floor. I totally understand; if someone slammed a door and dislodged my carefully arranged diatoms, I’d also, “Strip my objective”.

Every mounter would have undoubtedly produced many replicates for sale. I occasionally saw after I had bought a slide, a similar one would appear on the market. These slides seem now to becoming scarce and I hope they go to appreciative collectors who will study them properly.

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www.victorianmicroscopeslides.com

Biography

Stuart Clague is a geologist living in southern Africa.

He qualified with BSc (Hons) in geology at the University of Newcastle upon Tyne in 1981 then moved to South Africa to work as an exploration geologist for a mining company.

He ran mineral exploration projects for base metals and gold all over South Africa and Namibia and technically evaluated exploration opportunities for the company elsewhere in Africa, as well as Turkey, Argentina and Australia. He then took the position of Principal: Structural Geology at the company’s Headquarters in Pretoria from where he provided direction and advice to all the company’s mining and exploration operations.

He retired in early 2016 and now conducts his own scientific research as well as providing voluntary supervision and guidance on university geological field trips and workshops.



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