CD Publications of interest to Diatomists

All titles available from Savona Books

	Author/Company	Title/Description	Price UK Pounds
M3.	Griffith and Henfrey	Micrographic Dictionary 4th Edition. 1883. Plates only	£8
M4.	Flatters & Garnett	1929 Microslide Catalogue includes images of slides.	£10
M7.	P. T. Cleve	Diatoms from the West-Indian Archipelago 1878. pp20 Text Pages, 5 Tafels.	£10
M8.	J. Brun et J. Tempere	Diatomees fossiles du Japon 1889. 73 Pages, 9 Plates.	£10
M9.	Peragallo et Peragallo	Diatomees marines de France. 1897-1908. 137 Plates and Plate text only (with hyperlink indices)	£15
M10.	F. T. Kutzing	Synopsis diatomearum. 1834. 93 Pages, 7 Plates.	£8
M16.	Hilmar v. Schonfeldt	Die Deutschen Diatomeen des Susswassers und des Brackwassers - 1907. 19 Plates	£8
M17.	Adolf Schmidt	Atlas der Diatomaceenkunde - first 268 plates with hyperlink Index.	£35
M19.	Leuduger-Fortmorel	Diatomees Marines de la Cote Occidentale d-Afrique (Plates and hyperlink Index) 1898. 39 Pages, 8 Plates.	£6
M20.	Luard and Witt	Die Diatomaceen der Polycystinenkreide von Jeremie in Hayti. 1888. 25 Pages,7 Plates.	£5
M35.	Arthur Scott Donkin	The Natural History of the British Diatomaceae	£10
M36.	Jacob Whitman Bailey	Notes on New Species of microscopical Organisms £5	
M37.	Charles Pooley	The Diatomaceae of Weston-super-Mare	£15
M43.	Rev. William Smith	List of the Diatomaceae in the British Museum 1859	£5
M44.	William Gregory	On New forms of Marine Diatomaceae found in the Firth of Clyde and in Loch Fine 1857	£4
M45.	Otto Muller	Kammern und Poren in der Zellwand der Bacillariaceen 1899-1901	£5
M47.	Kain and Schultze	On a Fossil Marine Diatomaceous Deposit from Atlantic City, N.J. 1889	£5
M48.	Dr. József Pantocsek	A FERTŐ TÓ KOVAMOSZAT VIRÁNYA (Bacillariae Lacus Peisonini) 1912	£5
M49.	Dr. Josef Pantocsek	BESCHREIBUNG und ABBILDUNG der FOSSILEN BACILLARIEN des ANDESITTUFFES von SZLIÁCS in UNGARN 1903	£5
M50.	E. G. Grahn M.D.	Diatomaceae found in the neighborhood of Brookville, Indiana. 1885	£4
M69.	Little Imp	A Checklist of British Diatoms	£4
M71.	Little Imp	Diatomaceae on Magic Lantern Slides V.1.0.	£3
M72.	Alfredo Truan y Luard	Diatomeas de Asturias 1844	£5
M73.	Little Imp	A Checklist of Diatoms of the Central U.S.A.	£3
M74.	Little Imp	DiatCode - List of Diatom Species with Int. codes	£3
M76.	Various Authors	Practical Direction for collecting, Preserving, Transporting, Preparing and Mounting Diatoms	£4
M78.	Rev. Eugene O'Meara	Report on the Irish Diatomaceae	£6
M80.	William Smith	A Synopsis of the British Diatomaceae	£10
M81.	J. D. Moller	Diatomaceen Typen-Platte 335	£4

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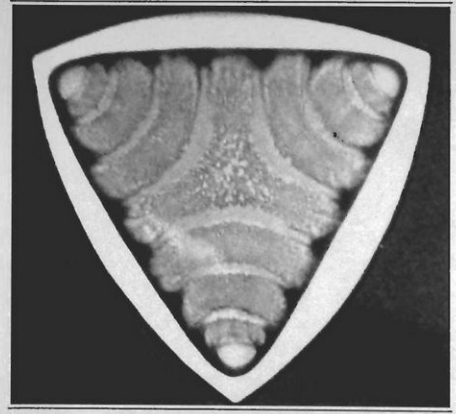
Little Imp Publications



Front cover picture: *Triceratium lineatum* - a photograph by Thomas Castle (circa 1900)

Nikon Coolpix
900/900s/910/950/995/4500
Accessories

It is possible (not to say easy) to get various accessories confused and go for an accessory that doesn't fit one of the above models. For that reason I have included these models but note where they are unsuitable.

AN-CP19	Strap for 4500
AN-E990	Strap for 990
AS-10	TTL Multiflash Adapter
AS-E900	Flash Adapter Bracket
CS-990	Camera Case for 990
CS-CP10	Camera Case
EC-8CF	8mb CompactFlash Card
EC-AD1	PCMCIA CompactFlash Card Reader
EG-900	Video Cable for 900 series
EG-E5000	Audio/Video Cable

EH-21	AC Adapter and EN-EL1 Charger combined

EH-30	Mains Adapter
EH-31	Mains Adapter
EH-53	Mains Adapter

EN-EL1	Battery for 995/4500

ES-E28	Slide Copier
FC-E8	Fisheye Lens – 0.21x
FC-E9	Fisheye Lens – 0.20x (Not suitable for 900 series or 4500)
HL-CP10	LCD Hood
HL-E5000	LCD Monitor Shade
LC-E900	Nikon 28mm Lens Cap
LC-ER1	Rear Lens Cap for Telephto, Wide Angle and Fisheye lenses
LC-ER2	Rear Lens Cap for WC-E68
MC-EU1	USB Remote Control
MH-53	Battery Charger for EL-1
MH-53C	Car Battery Charger for EN-EL1
MSV-01	Portable 30gb Hard drive for storing images from camera. (Unclear whether this is suitable for connection to 4500, definitely not suitable for 900 series)
SB-22	Speedlight Flash
SB-22S	Speedlight Flash
SB-24	Speedlight Flash
SB-25	Speedlight Flash
SB-26	Speedlight Flash
SB-28	Speedlight Flash
SB-28DX	Speedlight Flash
SB-30	Speedlight Flash
SB-50DX	Speedlight Flash
SB-80DX	Speedlight Flash
SC-18	Multiflash Sync Cord
SC-19	Multiflash Sync Cord

SC-EM3	Serial Cable for Mac (990)
SC-EW	Serial Cable for 950
SC-EW2	Serial Cable for 950
SC-EW3	Serial Cable for 990
SD-8A	External Powerpack for SB-80DX
SK-E900	Multi Flash Adapter
SL-1	Macro Coolight
TC-E15ED	1.5x Magnification (Not suitable for 900 series or 4500)
TC-E17ED	1.7x Magnification (Not suitable for 900 series or 4500)
TC-E2	2x Telephoto Lens
TC-E3ED(TC-E3)	3x Telephoto Lens
TC-E3PF	Lightweight 3x Tele Converter lens.
UC-E1	USB Cable

The following lens adapters may be needed for accessory lenses. These are noted against the accessory. The remainder are to allow the lenses to be fitted to other Coolpix series cameras.

UR-E1	24-28mm step-up ring (for Coolpix 700)
UR-E2	Lens Thread Adapter (Coolpix 880)
UR-E3	Lens Thread Adapter
UR-E4	Lens Thread Adapter

UR-E5 Lens Thread Adapter
UR-E6 Lens Thread Adapter
UR-E7 Lens Thread Adapter (see also **WC-E68**)
UR-E8 Lens Thread Adapter (Coolpix 5400 & 5700 fit)
UR-E9 Lens Thread Adapter (Coolpix 6400 fit)
UR-E10 Lens Thread Adapter (Coolpix 5400 fit)
UR-E11 Lens Thread Adapter (Coolpix 5400 fit)
UR-E12 Lens Thread Adapter
UR-E13 Lens Thread Adapter
UR-E14 Lens Thread Adapter
UR-E15 Lens Thread Adapter
UR-E16 Lens Thread Adapter
UR-E17 Lens Thread Adapter
UR-E18 Lens Thread Adapter
UR-E19 Lens Thread Adapter
WC-E24 0.66x Wide Angle Lens

WC-E63 0.63x Wide Angle Lens

WC-E68 0.68x Wide Angle Lens
(requires UE-E7 adapter)

WC-E75 0.75x Wideangle Lens (Not suitable for 900 series or 4500)
WC-E80 0.80x Wideangle Lens (Not suitable for 900 series or 4500)
WM-E50 Wide Converter Attachment (Not suitable for 900 series or 4500)

The above list should make it a bit easier to find that sought after attachment.
There are hundreds of third-party adapters, certainly too many to enumerate. However, some of the more microscope and macro specific ones are:-
Raynox PFR-028 Lens Protection Filter
Raynox MSN-200 MacroScan Close-up Lens
Raynox MSN-500 Super MacroScan Close-up Lens
Leitz Wetzlar Periplan 18x/18 Eyepiece (This has a 28mm thread to take an eyecup.)
LNS-2330D Zarf's Microscope Lens Adapter for Nikon CoolPix (www.zarfenterprises.com)
UNI-2042D Zarf's Microscope UniAdapter© for Nikon CoolPix
BXBH2-D Zarf's Olympus BX and/or BH2 Trinoc Microscope Adapter for Nikon CoolPix 800, 900, 950, 995, or 4500 Digital Camera. Will thread directly onto your Nikon CoolPix Digital Camera.

MaxView Plus Digital Camera to Microscope Adapter (http://microscope-depot.com)
CDC Series Couplers (http://www.diginc.com/coupler/)
Unilink Adapter by Brunel (requires 37 to 28mm ring)
MaxView Wide Angle Eyepieces for 28mm Nikon cameras from http://www.seopetronics.com/digitalcam.htm
Simple Digital Camera Adapter from I.W. Scientific (http://www.microscopesusa.com/digital_camera_adapters.html)

These are but a few. The web is full of companies willing to provide a connector for the Coolpix 900 series and the Coolpix 4500.

Some interesting possibilities are provided with a range of adapter rings. Many of these are to be found on eBay. The example below might give you some ideas.

28mm male to 58mm male reversing ring.
This adapter is used to mount a standard lens onto a Coolpix 900 series or 4500 back to front.

This then utilises the attached lens as a super macro lens. If nothing else it will provide a use for all those 35mm SLR lenses that you've collected over the years and can't bear to part with.
A few words at one of the microscope meetings will soon put you on to other suppliers. Indeed many of the exhibitors at the meetings have made their own accessories.
A number of microscopists have recently been extolling the virtues of the Sony DSC-W5 and W7. The advantages noted include a 2.5inch LCD. This camera depicted on the next page is fitted with a threaded ring 'around' the teleseoping lens. Into this can be screwed an adapter made by Sony but also made and supplied by a number of other manufacturers. This adapter presents a 37mm thread to which you may attach an eyepiece. If you have been using a Coolpix 900 series or Coolpix 4500 then you will need to change the 37mm thread to one of 28mm.

Sony DSC-W5

Sony Adapter and Kenko UV Filter

Adapter_28 from PhotoSolve

37mm to 28mm Adapter from eBay

There are many other cameras with threaded lens adapters. The Nikon Coolpix range, however, appears to have the most comprehensive range of accessories.

Flatters and Garnett Diatom Slides

Further to two previous published lists we have decided to produce a further extract from their 1933 catalogue (8th edition). The reasoning behind this is really to do with our misconception of the numbering used on their slides. We were of the opinion that the X numbers associated with each species was the same throughout their history. It was only when we were sent the following extracted pages that we realised that the serial numbers associated with a species would also allow the diatomist to effectively date their slides.

Catalogue A. (1933)

(EIGHTH EDITION)

Microscopical Preparations

Zoology
Botany
Textile Fibres
Petrology

Zoological and Botanical Specimens
Wall Diagrams

FLATTERS & GARNETT Ltd.

Telephone ARDWICK 3533
Telegrams "SLIDES, Manchester

Registered Office
309 OXFORD ROAD
(Opposite the University)
MANCHESTER, 13

DIATOMS.

Named Diatoms.

Mounted in specially prepared Styrax, generally in groups of 3 to 6 specimens.
The species are accurately determined, and the girdle as well as valve view is shown where desirable.
The specimens are mounted on the cover of this Cover Glass, so as to allow of the use of Immersion Lenses.
In addition to the species listed, many others can be supplied.
We shall be glad to hear of special requirements, so that we may look out for the desired species and send when found.

		s. d.		£ s. d.
	Price per Slide	1 0	Per dozen	0 11 0
X3999	Collection of 72 Typical Slides (our selection) in pine cabinet			3 7 6
X4000	Collection of 24 Showy Varieties, in pine cabinet			1 5 0

Diatoms mounted specially to order in any desired manner.
In this series those usually mounted as "tests" are not included. For "Test Slides" see page 72.

X4001 Achnanthes brevipes
X4002 ,, inflata
X4003 ,, longipes
X4004 ,, subsessilis
X4005 Achnanthidium flexellum
X4006 Actinella Brasiliensis
X4007 Actinocyclus Peckeleyi
X4008 ,, crassus
X4009 ,, Ehrenbergii
X4010 ,, nebulosus
X4011 ,, oliveranus
X4012 ,, peplum
X4013 ,, pruinosus
X4014 ,, Ralfsii
X4015 ,, Roperi
X4016 ,, notula
X4017 ,, subtilis
X4018 Actinoptychus adriaticus v. balearicus
X4019 ,, africanus
X4020 ,, amblyoceros
X4021 ,, campanulifer
X4022 ,, excellens
X4023 ,, glabratus
X4024 ,, heliopeltus
X4025 ,, heterostrophus
X4026 ,, hexagonus
X4027 ,, ,, v. tenellus
X4028 ,, maculatus
X4029 ,, Paynei
X4030 ,, ,, v. Moorii
X4031 Actinophychus spinulosus
X4032 ,, splendens
X4033 ,, ,, v. halionyx.
X4034 ,, stella.
X4035 ,, Szontaghii
X4036 ,, Thumii
X4037 ,, trilingulatus
X4038 ,, undulatus
X4039 ,, vulgaris
X4040 Alloioneis antillarum
X4043 Amphiprora alata
X4044 ,, lepidoptera
X4045 ,, maxima
X4046 ,, pulchra
X4047 ,, ,, v. pulchella
X4048* Amphitetras antediluviana
X4049 ,, nobilis
X4050 ,, radiata
X4051 Amphora caudatica
X4052 ,, cymbifera
X4053 ,, Grevillei
X4054 ,, obtusa
X4055 ,, ovalis
X4056 ,, proteus
X4057 ,, robusta.
X4058 Anorthoneis excentrica
X4059 Arachnoidiscus Ehrenbergii
X4060 ,, ,, c. Californica
X4061 ,, hungaricus
X4062 ,, indicus
X4063 ,, Oamaruensis
X4064* ,, ornatus
X4065 ,, ,, v. Montereyana
X4066 ,, Sendaicus
X4067 Asterolampra acutiloba
X4068 ,, Marylandica
X4069 Asteromphalus arachnoidiscus
X4070 ,, Darwinii
X4071 ,, hungaricus
X4072 ,, variabilis
X4073 Aulacodiscus apicarius
X4074 ,, amoenus
X4075 ,, argus
X4076 ,, excavatus
X4077 ,, Grunowii
X4078 ,, Johnsonii
X4079 ,, Kittonii
X4080 ,, margaritaceus
X4081 ,, ,, v. Debyi
X4082 ,, Mölleri
X4083 ,, Nova Zealandicus
X4084 ,, oregonus
X4085 ,, orientalis
X4086 ,, Petersii
X4087 ,, ,, v. notabilis
X4088 ,, probabilis
X4089 ,, quadrans
X4090 ,, Rogersii
X4091 ,, Sollittianus
X4092 Auliscus caelatus
X4093 ,, Hardmanianus
X4094 ,, Hauckii
X4095 ,, Moronensis v.
X4096 ,, Oamaruensis
X4097 ,, pruinosus
X4098 ,, sculptus
X4099 Biddulphia aurita
X4100 ,, Baileyi
X4101 ,, balaena
X1401a ,, Edwardsii
X4102 ,, elegantula
X4103 ,, heteroceros
X4104 ,, longicruris
X4105 ,, pulchella
X4106 ,, reticulata
X4107 ,, rhombus
X4108 ,, rigida
X4109 ,, Roperiana
X4110 ,, rotunda
X4111 ,, Tuomeyi
X4112 ,, ,, v. elongata
X4113 ,, ,, v. hungarica
X4114 ,, Zanzibarica
X4115 Campylodiscus adornatus
X4116* ,, adriaticus
X4117 ,, v. Massiliensis
X4118 ,, ambiguus
X4119 ,, triangulatus
X4120 ,, clypeus
X4121 ,, Daemelianus
X4122 ,, decorus
X4123 ,, ecclesianus
X4124 ,, echeneis
X4125 ,, eximius
X4126 ,, hibernicus
X4127 ,, horologium
X4128 ,, limbatus
X4129 ,, ,, v. chilensis
X4130 ,, noricus
X4131 ,, Thuretii
X4132 Campyloneis Grevillei

Named Diatoms—*continued.*

X4133 Cerataulus laevis
X4134 ,, orbicularis
X4135 ,, Smithii
X4136 ,, turgidus
X4137 Cestodiscus superbus
X4138 ,, trisitatis
X4139 Climacosira mirifica
X4140 Climacosphenia australis
X4141 ,, elongata
X4142 ,, moniligera
X4143 Cocconeis heteroidea
X4144 ,, Imperatrix
X4145 ,, pellucida
X4146 ,, regalis
X4147 ,, scutellum
X4148 Corinna elegans
X4149 Coscinodiscus apiculatus
X4150 ,, biangulatus
X4151 ,, centralis
X4152 ,, diorama
X4153 ,, elegans
X4154 ,, excavatus
X4155 ,, Kochii
X4156 ,, Kutzingii
X4157 ,, lineatus
X4158 ,, lunaris
X4159 ,, marginatus
X4160 ,, nodulifer
X4161 ,, radiatus
X4162 ,, robustus
X4163 ,, Simbirskianus
X4164 ,, Woodwardii
X4165 Craspedodiscus coscinodiscus
X4166 ,, elegans
X4167 Cyclotella comta
X4168 Cymbella aspera
X4169 ,, cuspidata
X4170 ,, cymbiformis
X4171 ,, Ehrenbergii
X4430 ,, gastroides
X4172 ,, lanceolata
X4173 ,, mexicana
X4431 Diatoma anceps
X4174 Diatoma hiemale
X4432 ,, vulgare
X4175 Dictiadia capreolus
X4176 Encyonema prostratum
X4177 ,, turgidum
X4178 ,, ventricosum
X4179 Endyctia oceanica
X4180 Entopyla australis
X4181 Epithemia argus
X4182 ,, ,, v. alpestris
X4183 ,, Hyndmannii
X4184 ,, ,, v. capitata
X4185 ,, musculus
X4186 ,, sorex
X4187 ,, turgidus
X4188 ,, zebra
X4189 Eunotia arcus
X4190 ,, diadema
X4191 ,, formica
X4192 ,, gracilis
X4193 ,, major
X4193a ,, parallela
X4194 ,, pectinalis
X4195 ,, praerupta
X4196 ,, robusta var.
X4197 ,, serpentina
X4198 ,, Soleirolei
X4199 ,, tetraodon
X4427 ,, triodon
X4428 Eunotogramma producta
X4429 ,, Weissii
X4430 Eupodiscus radiatus
X4200 Fragilaria antarctica
X4202 ,, mutabilis
X4203 ,, undata
X4204 ,, virescens
X4205 Gephyria media
X4206 Gomphoneis elegans
X4207 ,, herculaneum
X4208 ,, mamilla
X4209 Gomphonema acuminatum
X4210 ,, capitatum
X4211 ,, coronatum
X4212 ,, geminatum
X4213 Goniothecium danica
X4214 ,, odontella
X4215 Grammatophora robusta
X4216 Hantzschia vivax v. granulata
X4217 Hemiaulus ornithocephalus
X4218 ,, polycystinorum
X4219 ,, polymorphus
X4220 Hemidiscus cuneiformis
X4221 Homoeocladia Vidovichii
X4222 Hyalodiscus maximus
X4223 ,, radiatus
X4225 Hydrosera triquetra
X4226* ,, whampoensis
X4227 Isthmia enervis
X4228 ,, nervosa
X4229 Jaenschia antiqua
X4230 Lauderia Janischii
X4231 Licmophora Ehrenbergii
X4232 Lithodesmium californicum
X4233 Mastogloia var. sp.
X4234 Mastogonia crux.
X4235 Melosira clavigera
X4236 ,, crenulata
X4237 ,, granulata
X4238 ,, nummuloides
X4239 ,, Oamaruensis
X4240 ,, ornata
X4242 ,, sol
X4243 ,, sulcata
X4244 ,, truncata
X4245 ,, varians
X4246 Navicula acrospheria (Diploneis) alpina
X4247 Navicula Americana
X4248 ,, Beyrichiana
X4249 ,, bohemica
X4250 ,, bomboides
X4251 ,, clavata
X4252 ,, crabro
X4253 ,, cuspidata
X4253 ,, Dariana
X4254 ,, didyma
X4255 ,, elegans
X4256 ,, follis
X4257* ,, formosa
X4258 ,, hebes
X4259 ,, Hennedyi
X4260 ,, humerosa
X4261 ,, interrupta
X4262 ,, maculata
X4263 ,, multicostata
X4264 ,, nitescens
X4265 ,, oblonga
X4266 ,, pandura
X4267 ,, permagna
X4268 ,, protexta
X4269 ,, Sandriana
X4270 ,, serians
X4271 ,, splendida
X4272 ,, Yarrensis
X4273 Neidium affinis
X4274 ,, amphigomphus
X4275 ,, columnaris
X4276 ,, firma
X4277 ,, iridis
X4278 ,, tumescens
X4279 Nitzschia Graffii
X4280 ,, maxima
X4281 ,, obesa
X4282 ,, rigida
X4283 Odontotropis carinata
X4284 ,, cristata
X4285 Orthoneis cribrosa
X4286 ,, fimbriata
X4287 ,, splendida
X4288 Pantocsekia clivosa

Named Diatoms—*continued.*

X4290	Pinnularia alpina	
X4290a	" cardinalis	
X4291	" dactylus	
X4292	" divergens	
X4293	" lata	
X4294*	" major	
X4295	" mesolepta	
X4296	" nobilis	
X4297	" viridis	
X4298	Plagiotropis vitrea	
X4299	Pleurodesmium Brebissonii	
X4300	Pleurosigma delicatulum	
X4301	" Kochii	
X4302	" Wansbeckii, etc., etc.	
X4303	Podocystis adriatica	
X4304	Podosira argus	
X4305	" corolla	
X4306	" dubia	
X4307	" maculata	
X4308	" maxima v. californica	
X4310	Polymyxus coronalis	
X4311	Pseudauliscus angulatus	
X4312	Pyxidicula cruciata	
X4313	Raphoneis amphiceros	
X4314	" " v. elongata	
X4315	" belgica	
X4316	Rattrayella Oamaruensis	
X4317	Rhabdonema adriaticum	
X4318	" " v. fossilis	
X4319	" arcuatum	
X4320	" crozieri	
X4321	" minutum	
X4322	Rhizosolenia styliformis	
X4323	Rhoicosigma compactum	
X4324	" oceanicum	
X4325	Rhoicosphenia curvata	
X4326	Rhopalodia clavata	
X4327	" gibba	
X4328	Scoliopleura latestriata	
X4329	" tumida	
X4330	Sollium exsculptum	
X4331	Stauroneis acuta v. Terryana	
X4332	Stenopterobia intermedia	
X4333	Stephanodiscus astraea	
X4334	" Mariensii	
X4335	" Niagarae	
X4336	Stephanogonia danica	
X4337	" Nova Zealandica	
X4338	Stephanopyxis corona	
X4339	" coronata	
X4340	" diadema	
X4341	" ferox	
X4342	" grosse-cellulata	
X4343	" Grunowii	
X4344	" permarginata	
X4345	" Raeana	
X4346	" spinosissima	
X4347	" turris	
X4348*	Stictodiscus Californicus	
X4349	" Hardmanianus	
X4350	" Johnsonianus	
X4351	" parallelus	
X4352	" " v. gibbosa	
X4353	Surirella Americana	
X4353a	" arcta	
X4354	" Baldjickii	
X4355	" bifrons	
X4356	" biseriata v. acuminata	
X4357	" Capronii	
X4358	" elegans	
X4359	" " v. elongata	
X4360	Surirella fastuosa	
X4361	" " v. fossilis	
X4362	" Febigerii	
X4363	" Fulleborni	
X4364	" lata	
X4365	" Molleri	
X4366	" nobilis	
X4367	" robusta	
X4368	" spiralis	
X4369	" splendida	
X4370	" tenera	
X4371	" Terryi	
X4372	" turgida	
X4373	Symbolophora trinitatis	
X4374	Synedra baculus	
X4375	" capensis	
X4376	" crystallina	
X4377*	" formosa	
X4378	" Gaillonii v. elongata	
X4379a	" superba	
X4380	" ulna v. danica	
X4381	" ulna v. elongata	
X4382	Systephania sp.	
X4383	Terpsinoe intermedia	
X4384	" musica	
X4385	Tetracyclus emarginatus	
X4386	" Japonicus	
X4387	" lacustris	
X4388	Triceratium archangelskianum	
X4389	" antarcticum	
X4390	" arcticum (3, 4, and 5 angles)	
X4391	" atlanticum	
X4392	" Brookei	
X4393	" castellatum	
X4394	" castelliferum	
X4395	" crenulatum	
X4396*	" favus (recent and fossil)	
X4397*	" " v. maxima	
X4398	" " v. quadrata	
X4399	" formosum (3 and 4 angles)	
X4400	" fractum	
X4401	" glandiferum	
X4402	" grande	
X4403	" Kinkerianum	
X4404	" majus	
X4405	" Montereyi	
X4406	" Nova Zealandicus	
X4407	" pentacrinus	
X4408	" pseudo-nervatum	
X4409	" rugosum	
X4410	" scitulum	
X4411	" " v. quadrata	
X4412	" sculptum	
X4413	" Sendaiense	
X4414	" Stokesianum v. Moravica	
X4415	" trisulcum	
X4416	" Weissii	
X4417	" zonulatum (3 and 4 angles)	
X4418	Trinacria excavata	
X4419	" Heibergii	
X4420	" insipiens	
X4421	" regina	
X4422	" simulacrum	
X4423	" ventricosa	
X4424	Willemoesia sp.	
X4426	Xanthiopyxis umbonatus	

See also Test Slides.

Diatom Type Slides.

Mounted in Styrax unless otherwise instructed. Selected typical forms mounted in rows, each with list of names. A few additional forms are often included where desirable without extra charge. Interesting forms from different localities.

	X3861	X3862	X3863	X3864	X3865
No. of forms	12	20	40	60	100
Price	2 6	5	7 6	11 6	18/-

		s. d.
X3866	Velvet-lined case to carry one type slide ... each	2 6

N.B.—We can supply as many as 8 or more 100-form type slides, all different. Price, each 18/-. Customers desiring additional type slides are requested to forward lists for those they already have, to avoid duplication of species as far as possible.

		£ s. d.
X3874	Collection of 1,000 Diatoms on 10 or 20 slides, with list of names in Case (mounted to order) (Sets on 20 slides sent unless otherwise instructed).	12 12 0
X3875	Collection of 500 Diatoms, arranged after Van Heurck's Classification on 20 slides, with list of names, in case (mounted to order)	5 5 0
X3876	Type Slide of 400 Diatoms on 4 slides, with name photographed under each specimen, in case	8 10 0
X3877	Type Slide of 100 diatoms with name photographed under each specimen on 1 slide	2 2 6
X3878	" " 40 " " " " " " "	1 8 6
X3879	" " 20 " " " " " " "	0 17 6

Genus Type Slides (in Styrax).

Each containing several species of one genus with list of names. Mounted on selected slides ·9 to 1·0 m.m. and covers ·16 to ·18 m.m. in thickness.

Price per slide, 2/-.

		No. of Species			No. of Species
X4801	Actinocyclus	[illegible]	X4815	Grammatophora	6
X4802	Actinoptychus	[illegible]	X4816	Melosira	8
X4803	Amphora	[illegible]	X4817	Navicula	10
X4804	Arachnoidiscus	[illegible]	X4818	Nitzschia	6
X4805	Aulacodiscus	[illegible]	X4819	Pinnularia	8
X4806	Auliscus	[illegible]	X4820	Pleurosigma	8
X4807	Biddulphia	[illegible]	X4821	Rhabdonema	6
X4808	Campylodiscus	[illegible]	X4822	Stauroneis	5
X4809	Cerataulus	[illegible]	X4823	Stephanopyxis	6
X4810	Coscinodiscus	[illegible]	X4824	Surirella	8
X4811	Cymatopleura	[illegible]	X4825	Synedra	6
X4812	Cymbella	[illegible]	X4826	Triceratium	8
X4813	Epithemia	[illegible]	X4827	Trinacria	5
X4814	Eunotia	[illegible]			

Locality Type Slides.

Type Slides from many localities can be supplied. See pages 73 and 74.

Diatom Test Plates

Selected typical specimens mounted on slides, ·9 to 1·0 mm. and covers ·16 to ·18 mm. thick. Each with list of names.

X3849	X3850	X3852	X3853	X3854	X3855
8	8 fine	15	20	30	50 forms.
2 6	2 6	4 6	6 6	10/-	15/-

List for Test Plate X3849. 8 forms.

Triceratium favus.
Navicula nobilis.
" lyra.
Pleurosigma attenuatum.
Stauroneis phoenicenteron.
Grammatophora marina.
Pleurosigma angulatum.
Surirella gemma.

List for Test Plate X3850. 8 fine forms.

Amphipleura Lindheimeri, Grun.
Cymatopleura solea Ehr.
Grammatophora subtilissima.
Navicula cuspidata Kutz.
" rhomboides Ehr.
Nitzschia obtusa.
" sigma. W. Sm.
Pleurosigma angulatum. W. Sm.

		s. d.
X3858	Test Plate of 5 Diatoms. Photographed under each specimen is name, N.A. and magnification at which each is resolved (in Styrax only)	5 6
X3860	Velvet-lined Case for 1 test slide	2 6

Mounted in Styrax R.I. 1·820 or in other media to order.

Diatom Test Slides.

Mounted in Hyrax on slides ·9 to 1 mm., and covers ·16 to ·18 mm. thick (R.I. of Hyrax 1·820).
Price, each 1/3; per dozen, 14/-.

		s.	d.
X3881	Collection of 24 slides in pine cabinet	28	0

If required, slides can be had mounted specially in the following media:— Styrax R.I., 1·58. Monobromnaphthalin R.I., 1·655. Piperine R.I., 1·650. Dry.

N.B.—Only a few species are available "dry."

X3890	Amphipleura Lindheimerii
X3891	" pellucida
X3892	Brebissonia Boeckii
X3893	Coscinodiscus asteromphalus
X3894	" oculus-iridis
X3895	Cymatopleura apiculata
X3896	" elliptica
X3897	" " v. subconstricta
X3898	" Hibernica
X3899	" Mannii
X3900	" solea
X3901	" " v. elongata
X3902	Diatoma anceps
X3903	" vulgare
X3904	Cymbella gastroides
X3905	Frustulia Saxonica
X3906	Grammatophora hibarensis
X3907	" macilenta
X3908	" marina
X3909	" serpentina
X3910	" subtilissima
X3911	Hantzschia amphioxys
X3912	" marina
X3913	" elongata
X3914	Hyalodiscus laevis
X3915	" stelliger subtilis
X3916	Melosira arenaria
X3917	" Borreri
X3918	Navicula amphigomphus
X3919	" amphisbaena
X3920	" aspera
X3921	" cuspidata
X3922	" elliptica
X3923	" firma
X3924	" iridis
X3925	" lyra
X3926	" major
X3927	" nobilis
X3928	" rhomboides
X3929	" Smithii
X3930	" sculpta
X3931	" sphaerophora
X3932	" tumescens
X3933	Nitzschia acuminata
X3934	" circumsuta
X3935	" dubia
X3935a	" granulata
X3936	Nitzschia obtusa
X3937	" " v. scalpelliformis
X3938	" pandariformis
X3939	" plana
X3939a	" punctata
X3940	" scalaris
X3941	" sigma
X3942	" " v. Habershamii
X3943	" " v. sigmatella
X3944	" sigmoidea
X3945	" tryblionella
X3946	Plagiodiscus nervatus
X3947	Pleurosigma acuminatum
X3948	" affine
X3949	" " v. Normannii
X3950	" " v. Virginica
X3951	" aestuarii
X3952	" angulatum
X3953	" attenuatum
X3954	" balticum
X3955	" decorum
X3956	" elongatum
X3957	" fasciola
X3958	" formosum
X3958a	" " v. longissima
X3959	" hippocampus
X3960	" longum
X3961	" obscurum
X3962	" Olympianum
X3963	" quadratum
X3964	" rigidum
X3965	" Ryderii
X3966	" strigosum
X3967	" Terryanum
X3968	Stauroneis acuta
X3969	" anceps
X3970	" phoenicenteron
X3971	" Heidenii
X3972	Surirella gemma
X3973	" striatula
X3974	" biseriata
X3975	" cardinalis
X3976	Synedra capitata
X3977	" fulgens
X3978	" Gallionii robusta
X3979	" ulna
X3980	" undulata
X3981	Triceratium favus (recent or fossil)

Test Slides other than Diatoms.

		s.	d.
Z3990	Meadow Brown Scales (Hipparchia janira), dry	1	3
Z1034	Lepisma Scales (Lepisma), dry	1	3
Z1040	Podura Scales (Lithocyrtis curvicollis), dry	2	6
Z1560	Proboscis of Blowfly—Selected	4	6

Apertometers—Zeiss, Beck, etc., to order.

Exhibition Slides

"Circle" Slides.

Selected specimens mounted within a circle.

I. From various localities.

	X3565	X3566	X3567	X3568	X3569	
About	25	50	100	150	200	forms.
Price	2/6	3/6	6/-	8/6	10/6	

II. From specified localities see pages 67 and 68.

Rosettes and Stars.

Selected specimens symmetrically arranged in Star or Rosette form.

	X3571	X3572	X3573	X3574	
About	60	100	150	200	forms.
Price	10/6	15/6	19/6	22/6	

Slides with intermediate numbers of forms will be charged at corresponding prices.

Locality Diatom Slides.

The following localities are selected from our extensive list of gatherings. The available space does not allow of a full list of these. Those selected show a fair variety of forms, and are therefore suitable for type and circle slides.

They are supplied in three varieties as follows:—

(I.) **"Circle Slides,"** containing about	25	50	100	150	forms
	2/6	3/6	6/-	8/6	each
(II.) **"Type Slides,"** each with list of names, containing about	12	20	40	60	forms
	2/6	5/-	7/6	10/6	each

(III.) **"Strewn Slides,"** 8d. each; per dozen, 7/-.

When ordering Circle or Type Slides add the letter "C" or "T" with the appropriate number of forms—e.g., X4737 C50, or X4667 T40.

In the absence of other particulars strewn slides will be sent.

All are mounted in Styrax.

Abbreviations used—

R.F.—Recent Freshwater. F.F.—Fossil Freshwater.
R.B.—Recent Brackish Water. F.B.—Fossil Brackish Water.
R.M.—Recent Marine. F.M.—Fossil Marine.

British Isles.

X4752	Appleby, Westmorland	R.F.
X4601	Ballater, Scotland	F.F.
X4753	Belfast, Ireland	R.F.
X4754	Black Moor, Scotland	F.F.
X4602	Black Moss, Scotland	F.F.
X4755	Blewbury, Berkshire	R.F.
X4604	Bogangoe, Huntley, Aberdeen	F.F.
X4756	Cawthorne, Yorkshire	R.F.
X4605	Colchester, Essex	R.B.
X4757	Collin Hill, Belfast	R.F.
X4606	Cwm Bychan, Wales	F.F.
X4607	Falmouth, Cornwall	R.F.
X4758	Fyvie, Aberdeen	F.F.
X4759	Glen Feshie, Scotland	F.F.
X4760	Gomersal, Yorks	R.F.
X4761	Heckmondwike, Yorks	R.F.
X4762	Hell Kettles, Darlington	R.F.
X4763	Holywell, Lincs	R.F.
X4764	Holton, Oxford	R.F.
X4765	Isle of Man	R.F.
X4608	Jarland, Aberdeen	F.F.
X4766	King's Norton, Birmingham	R.F.
X4767	L. Arenig Bach, Wales	F.F.
X4768	L. Bearg, Skye	R.F.
X4769	L. Cuithair, Skye	R.F.
X4609	L. Kinnord, Aberdeen	F.F.
X4770	L. Lomond	R.F.
X4771	L. Maree, Scotland	F.F.
X4772	Lewis Is., Scotland	F.F.
X4773	Monkstead, Skye	F.F.
X4774	Maidstone, Kent	R.F.
X4775	Monach, Lewis	R.F.
X4776	Mull, Scotland	F.F.
X4777	Norfolk Broads	R.F.
X4778	Ordie, Aberdeen	F.F.
X4779	Premnay Peat	F.F.
X4780	Sheene, Aberdeen	F.F.
X4611	Sheerness, Kent	R.B.
X4781	Shetland Is.	F.F.
X4782	Shipley Glen, Yorks	R.F.
X4783	Stornoway, Lewis	F.F.
X4613	Tenby, S. Wales	R.M.
X4612	Thames Mud	R.B.
X4784	Toomebridge, Ireland	F.F.

Continent of Europe.

X4785	Ambleteuse, France	R.M.
X4614	Ananino, Russia	F.M.
X4615	Arcachon, France	R.M.
X4616	Adriatic Sea	R.M.
X4617	Baltic Sea	R.M.
X4786	Bergonzano, Italy	F.F.
X4619	Biscarros, Landes, France	R.B.
X4787	Black Sea	R.M.
X4788	Blankenbergh, Belgium	R.M.
X4789	Bodos, Hungary	F.M.
X4620	Bory, Hungary	F.M.
X4618	Bosphorus	R.M.
X4621	Boulogne, France	R.M.
X4790	Caltanisetta, Italy	F.M.
X4622	Cannes, France	R.M.
X4625	Caspian Sea	R.M.
[illegible]	[illegible]	R.M.
X4791	Celle, Hanover	F.F.
X4624	Condro, Messina	F.M.
X4792	Constantinople, Turkey	R.M.
X4623	Cuxhaven, Germany	R.M.
X4628	Dolje, Hungary	F.M.
X4793	Dubravica, Hungary	R.B.
X4627	Dunkirk, France	R.M.
X4794	Emmingen, Hanover	F.F.
X4629	Erdobenye, Hungary	F.B.
X4795	Felso, Estergaly, Hungary	F.M.
X4796	Florence, Italy	F.F.
X4632	Flushing, Holland	R.M.
X4631	Franzensbad, Bohemia	F.B.
X4630	Für, Jutland	F.M.
X4797	Golfe Juan, France	R.M.
X4798	Goschen Alps, Switzerland	R.F.
X4633	Grotte, Girgenti, Sicily	F.M.
X4799	Gyöngyös Pata, Hungary	F.F.
X4800	Hammerfest, Norway	R.F.
X4634	Havre, France	R.M.
X4635	Isopallaya Serges, Hungary	F.M.
X4636	Jaen, Spain	F.M.
X4920	Joursac, France	F.F.
X4638	Kawsa Bremia, Hungary	F.B.
X4637	Kekko, Hungary	F.M.
X4639	Kertsch, Russia	F.B.
X4921	Kieselguhr from Berlin	F.F.
X4922	Kistib, Caucasus	R.F.
X4644	L. Balaton, Hungary	R.F.
X4643	L. Four Cantons, Switzerland	R.F.
X4923	L. Geneva	R.F.
X4924	L. Sarnen, Switzerland	R.F.
X4646	L. de Cazaux, France	R.M.
X4925	Leghorn, Italy	F.F.
X4926	Les Queyrades, France	F.F.
X4927	Luneberg, Hanover	F.F.
X4647	Malta	R.M.
X4928	Marmorito, Italy	F.M.
X4648	Mentone, France	R.M.
X4650	Monaco, France	R.M.
X4929	Magyar Kermany, Hungary	F.M.
X4930	Moissac, France	R.F.
X4931	Moron, Spain	F.M.
X4649	Mors, Jutland	F.M.
X4652	Nagy Curtos, Hungary	F.M.
X4651	Nice, France	F.F.
X4932	Orvieto, Italy	F.F.
X4933	Osuna, Spain	F.M.
X4934	Puy de Dôme, France	F.F.
X4935	Puy de Mur, France	F.F.
X4654	Rochelle, France	
X4936	Sardinia	R.M.
X4937	Sebastopol Harbour, Crimea	R.M.
X4658	Seine Mouth, France	R.M.
X4656	Simbirsk, Russia	F.M.
X4938	Sta Flora, Italy	F.F.
X4939	St Cloud, France	F.F.
X4940	Soos, Bohemia	F.B.
X4657	Szakal, Hungary	F.M.
X4655	Szent Peter, Hungary	F.M.
X4941	Toulouse, France	R.F.
X4659	Var Mouth, France	R.M.
X4660	Villefranche, France	R.M.
[illegible]	[illegible]	F.F.

Locality Diatoms—*continued.*

Asia.

X4662	Abashiri, Japan	F.M.
X4942	Colombo, Ceylon	R.M.
X4828	Hakodate, Japan	F.M.
X4829	Java	R.M.
X4663	Kobe, Japan	R.M.
X4664	Malacca Str.	R.M.
X4666	Mt. Shichiman, Japan	F.F.
X4665	Nagasaki, Japan	R.M.
X4830	Philippine Is.	R.M.
X4667	Sendai, Japan	F.M.
X4668	Sendai Lignites	F.M.

Africa.

X4831	Adele Farm, Transvaal	R.F.
X4832	Arbal, Algeria	F.M.
X4833	Choma, N.W. Rhodesia	R.F.
X4670	Colline de Soddo	F.F.
X4669	Congo R.	R.B.
X4834	Constantine, Algeria	R.F.
X4835	Ephraddl, Algeria	F.M.
X4836	Hatoura, Kenya Col.	R.F.
X4837	L. Elmenteita, Kenya Col.	R.F.
X4671	L. Zuay	F.F.
X4672	Nossi-Be, Madagascar	R.M.
X4673	Oran, Algeria	F.M.
X4674	Tamalambo, W. Africa	R.M.
X4675	Tamatave, Madagascar	R.M.
X4838	Walfisch Bay (Sounding W. of)	R.M.

North America.

X4839	Albany, Maine	F.F.
X4676	Atlantic City, N.J.	F.M.
X4680	Beddington, Maine	F.F.
X4840	Birge's Pond, Bristol, Conn.	R.F.
X4841	Bird's Hill, Maryland	F.M.
X4679	Boxford, Mass.	F.F.
X4682	Calvert Co., Ind.	F.M.
X4040	Carson City, Nevada	F.F.
X4683	Cherryfield, Maine	F.F.
X4842	Chicago, City Water Supply	R.F.
X4846	Crane Pond, U.S.A.	R.F.
X4681	Dolgeville, Cal.	F.M.
X4847	Drakesville, N.J.	F.F.
X4685	Essex, Mass.	F.F.
X4848	Folly Lake, N.J.	R.F.
X4849	Gila R., New Mexico	R.F.
X4851	Golden Gate, Cal.	R.M.
X4686	Haliotis Washings, Cal.	R.M.
X4687	Herkimer, N.Y.	F.F.
X4688	Hudson R.	R.B.
X4852	Ice Pond, New Britain, Conn.	F.F.
X4853	Jack's Ranch, Cal.	F.
X4854	Jonesport, Maine	F.F.
X4855	Keene, N.H.	F.F.
X4689	Leate's Is., Can.	R.M.
X4690	Lily Lake, Nov. Scotia	R.F.
X4856	Los Angeles, Cal.	F.M.
X4857	Lost Spring Ranch, Cal.	F.F.
X4691	Lyon's Creek, Ind.	F.M.
X4859	Lyon's Farm, N.J.	F.F.
X4695	Mackintosh L., Canada	F.F.
X4696	Millbury, Mass.	F.F.
X4694	Mobile, Ala.	R.B.
X4693	Monterey, Cal.	F.M.
X4860	Montgomery, Ala.	F.F.
X4697	New Britain, Conn.	F.F.
X4698	Nottingham, Ind.	F.M.
X4861	Oreas Is., U.S.A.	F.F.
X4862	Owen's Ferry, Savannah, Ga.	R.B.
X4863	Patuxent, Ind.	F.M.
X4704	Pensacola Bay, Florida	R.M.
X4864	Pitt R., Oregon	R.F.
X4865	Pond's Point, Conn.	R.M.
X4867	Poplein, Ind.	F.M.
X4700	Port Hope, Canada	F.F.
X4703	Port Townsend, U.S.A.	R.M.
X4866	Providence, R.I.	F.F.
X4702	Puget Sound	R.M.
X4869	Quinipiac R., Conn.	R.F.
X4705	Redondo Beach, Cal.	F.M.
X4706	Richmond, Va.	F.M.
X4873	Shell Beach, Conn.	R.M.
X4712	Shiloh, N.J.	F.M.
X4874	Sta. Barbara, Cal.	F.M.
X4875	Sta. Cruz, Cal.	F.M.
X4710	Stony Creek, Conn.	R.M.
X4711	Swan Lake, Oregon	F.F.
X4876	Tamarack, Bristol, Conn.	R.F.
X4877	Tide Pond, Bristol, Conn.	R.M.
X4878	Todd Hollow, Bristol, Conn.	R.F.
X4879	Tontin Lake, New Brunswick	R.F.
X4713	Troy, N.H.	F.F.
X4880	Vancouver Is.	R.M.
X4881	Warwick, R.I.	F.F.
X4883	Weequahick L., N.J.	R.F.
X4714	Wilmurt, N.Y.	F.F.
X4884	Worcester, Mass.	F.F.
X4885	Yaquina Bay, Oregon	R.M.

West Indies.

X4886	Bissex Hill, Barbadoes	F.M.
X4887	Chalky Cliff, Barbadoes	F.M.
X4888	College Hill, Barbadoes	F.M.
X4715	Guadeloupe	R.M.
X4716	Kingston, Jamaica	R.M.
X4889	Mt. Hillaby, Barbadoes	F.M.
X4890	Nassau, Bahamas	R.M.
X4717	Newcastle, Barbadoes	F.M.
X4891	Park's Plantation, Barbadoes	F.M.
X4892	Port of Spain, Trinidad	R.M.
X4893	Porto Rico	R.M.
X4894	Springfield, Barbadoes	F.M.

Central and South America.

X4718	Calama, Chile	F.B.
X4895	Chimborazo, Ecuador	R.F.
X4719	Demerara R.	R.M.
X4944	Guatemala	F.F.
X4945	Huecorio Mexico	
X4720	Mexillones, Bolivia	F.M.
X4728	Noumea, Cayenne	R.M.
X4722	Para R., Brazil	R.B.
X4723	Panama	R.M.
X4724	Panama	R.F.
X4725	Peruvian Guano	F.M.
X4896	Pisagua, Peru	F.M.
X4726	Sta. Cruz Canal, Mexico	R.F.
X4897	Vera Cruz, Mexico	R.M.

Australasia.

X4727	Amherst, Vict.	F.F.
X4898	Auckland, N.Z.	R.F.
X4899	Beaumaris, Port Philip	R.M.
X4900	Belfast, Vict.	R.F.
X4901	Cabbage Tree Swamp, N.Z.	F.F.
X4902	Caralulup Creek, Vict.	R.F.
X4903	Corio Bay, Port Philip	
X4904	Eden, Auckland, N.Z.	
X4905	Karawara, N.Z.	F.F.
X4906	Lyle Bay, N.Z.	
X4907	Pakaraka, N.Z.	F.F.
X4908	Penrose, Auckland, N.Z.	
X4909	Pohangina R., N.Z.	
X4911	Tamar R., Tasmania	R.F.
X4730	Yarra R., Vict.	R.M.

Oamaru localities :—

X4731	Allan's Farm	F.M.
X4732	Bain's Farm	F.M.
X4734	Cormack's Top	F.M.
X4736	Forrester's Rock	F.M.
X4729	Harbour	R.M.
X4737	Jackson's Paddock	F.M.
X4738	Otago	F.M.
X4739	Totara	F.M.
X4740	Troublesome Gully	F.M.
X4741	William's Bluff	F.M.

Oceanic.

X4742	Atlantic Ocean (Challenger)	R.M.
X4743	Ambrim, New Hebrides	R.M.
X4913	Bermuda	F.F.
X4914	Campbell Is.	R.M.
X4915	Caroline Is.	R.M.
X4744	Galapagos Is.	R.M.
X4745	Kerguelen Is.	R.M.
X4747	Macdonald Is.	R.M.
X4916	Marquesas Is.	R.M.
X4746	Mauritius	R.M.
X4748	Paama, New Hebrides	R.M.
X4917	Pacific Ocean (South)	R.M.
X4918	Rodriquez Is.	R.M.
X4750	Samoa	R.M.
X4749	Sandwich Is.	R.M.
X4751	Thursday Is.	R.M.

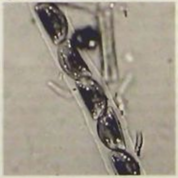
Cymbella prostrata var. *auerswaldii*

This particular diatom is a tube dwelling species and in all cases in our experience has been found in Limestone rich environments.

It may be found in still or running freshwater situations. It might be found as a coating on submerged rocks or adhering to reed stems below the water line or as a free floating mass. This latter appears as a biscuit coloured floating body reminiscent, we think, of a soaked Farleys Rusk. The picture below was taken by Stephen Nagy at Sun River Canyon.

The diatoms themselves are generally arranged in a mucilagenous tube in an alternating arrangement which on the face of it is the most logical way to pack the maximum number of frustules into a given tube length.

The photograph below of the sample collected by the editors from Malham Tarn shows this arrangement.



One question that arises as a consequence of this arrangement is 'What happens when a frustule divides?".

The question itself requires an

expalnation - when a frustule divides it will produce a 'copy' of itself in the same orientation. Thus you will be presented with a column in which numbers of recently divided diatoms ruin the regular symmetry of the normally opposed orienation. However, this is very rarely seen and where it is, only one or two pairs of diatoms in the whole tube appear this way. So what happens to maintain the aspect of the diatoms relative to one another. Do the individuals rotate on their own vertical axis until aligment is achieved? Does the newly formed frustule migrate along the tube length until it encounters a 'slot' where its alignment fits the normal rule? Does neither of these things happen and it's just that we haven't looked hard enough?

Certainly we have witnessed the movement of individuals along the length of the tube, so there is certainly enough room for one frustule to pass another and this can be seen in the photograph below of a tube from the sample collected by Stephen Nagy.

The three diatoms (of which you can see two complete) are in the same orientation. It is, we are told, un-professional to imbue lower organisms with an awareness and intent combined to achieve a particular outcome.

So what is the answer?

The aligment is not likely, we think, to be a result of a chaotic motion (proposed as the mechanism for movement in colonial diatoms like Bacillaria paradoxa), which achieves a result (movement in a particular direction) but which is unpredictable in terms of the colony shape and orientation. These colonies, however, do appear to have a predictable form in relation to each individuals position relative to its neighbour.

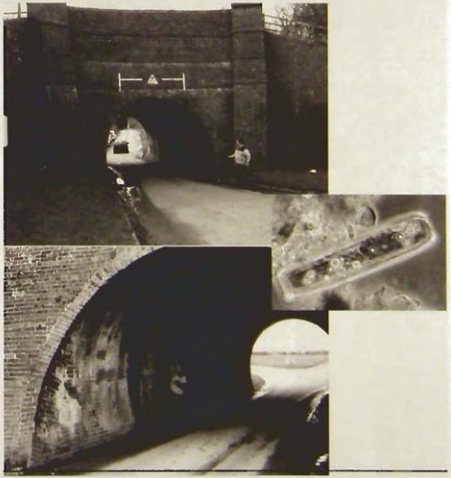
More observation of mobile individuals within the tube is probably required to come up with a notion, or, perhaps, someone already has the answer. If that is you please let us know.

Diatom Collecting Dangers

We have written of the dangers of falling in whilst collecting diatoms. To date, however, we haven't mentioned the danger of getting run-over.

We (and in particular Mike Samworth) have faced such potential on more than one occassion due to our fascination with under-bridge sampling. In the case depicted below diatom collecting can only be performed in twos. One person keeping an eye out for oncoming vehicles, the other taking advantage of an empty road to run in and collect a sample.

The location of this site is Shenton Aquaduct in Leicestershire. The aquaduct carries the Ashby Canal abovethe Shenton to Market Bosworth road. It is of brick construction and seepage is almost constant. At the points where this seepage occurs colonies of diatoms accumulate as brown glutinous masses which glisten invitingly usually just out of reach but some can be gathered.



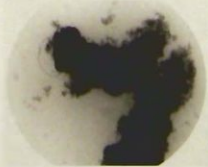
Field Microscopes (V)

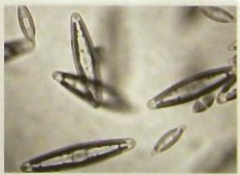
The Carl Zeiss Demonstration Microscope is, without doubt, my favourite field microscope. For me it incorporates all the things I require- portability, robustness, and flexibility of use. This is not a modern microscope but is a pattern that could easily be reproduced using the parts of a cheap unwanted microscope. If any readers have produced such examples we would be very interested in any manufacturing and machining tips.

I use this initially to examine the potential of samples. The objective is a standard 160 tube length RMS thread. I carry a couple of objectives around to change magnification with sample type.

Should I want to record the sample before preserving it is possible to attach my Coolpix using a threaded adapter.

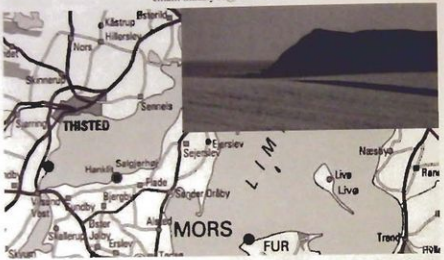
The results can be quite reasonable





Danish Diatomite

Klaus Yde, MD
email: klaus.yde@dadlnet.dk

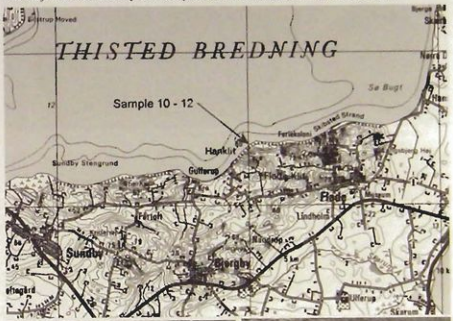


Many diatomists will likely have slides in their collections from Mors, Jutland or Fur, Jutland. It is also likely that many will not know where these places are and even those that have identified the locations will never have visited the sites.

Some while ago I took the opportunity to visit the general area and identified a number of the sites with the help of a map by Marion Honman (see reference) who has studied the deposits. Those in the know will have heard that the diatomaceous earth deposits here are extremely compressed and difficult to clean. In general this is true but some of the layers are easier than others. In all I collected 18 samples from various locations.

Geological data: The material is 55 millions years old and is present as a 60 metre thick formation which can be separated into about 200 layers of which 179 have been numbered from -39 to + 140, each separated by volcanic ash layers. These are best seen at the Skarrehage site.

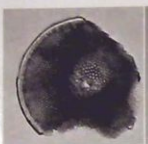
The subject of this small report is Sample No. 11 from the deposit exposed at Hanklit.



Sample 11 has been cleaned and after an initial investigation the following diatoms have been isolated and identified. There is considerably more work to be done to identify further frustules but the initial findings, I believe, are worth recording.

The GPS location of Sample No. 11 - GPS: 56deg53'787N/08deg45'153E

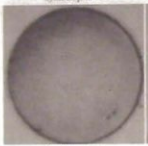
Thanks to Klaus D. Kemp for identification.



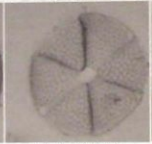
Coscinodiscus stellaris v. *symbelophora*

Stephanopyxis appendiculatus v. *parvispina*

Pterotheca sp



?not identified

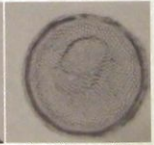


Actinoptychus senarius

Stephanopyxis grunowii

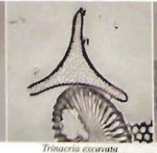
Goniothecium odontella ?

Paralia sulcata

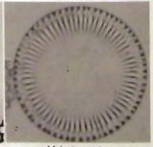


Coscinodiscus curvatulus

Trinacria exsculptum



Trinacria excavata



Melosira major

Thalassiosira nidulus

Hemiaulus dissimile

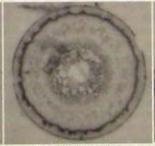
Radiolarian

Silicoflagellate

Kentrodiscus ?

Hemiaulus elegans

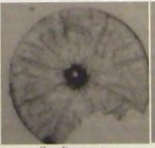
Paralia sulcata



Hyalodiscus valens ?

Coscinodiscus stellaris v. *symbelophora*

Gyrodiscus vortex



Gyrodiscus vortex

Gyrodiscus vortex

Triceratium caudatum

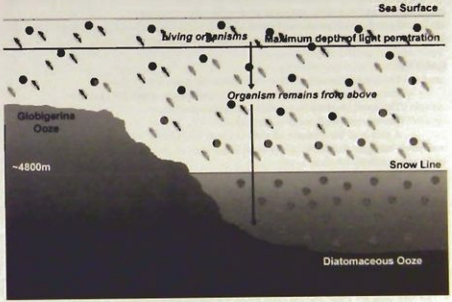
According to Marion Homann there is not a big variance of the species in the different layers, but more difference in the locations

Reference:

Marion Homann: Die Diatomeen der Fur-Formation, Geologishes Jahrbuch, Reihe A Heft 123 (In German)
1990.

CCD

The other day I was posed a question to which I didn't know the answer. Nothing unusual there then, I can hear my friends, family and colleagues say. However, I did remember reading something about the answer to the question when reading accounts of the Challenger expedition. The question was "Why do you rarely find forams in diatom deposits?".
I knew that this was something to do with chemistry and physics but couldn't quite remember how.
This question really only applies to marine deposits and it is in this environment that we need to consider the actual formation of the deposits. This occurs in the oceans as oozes that accumulate on the floors of the oceans. These deposits might be sampled directly using oceanographic techniques or if you can wait long enough the deposits will eventually be raised up out of the oceans and become exposed rocky outcrops. Of course, you might have to wait a couple of million years.The action of producing these deposits is called "Pelagic sedimentation". This means that oceanic organisms that live in the upper layers of the ocean accumulate on the ocean floor when they die. These form deposits generally known as "Biogenic Oozes" or "Pelagic Muds". These accumulations, to be classed as such, must contain greater than 30% of debris from planktonic organisms - e.g. Foraminifera, diatoms and any other creatures with some form of skeletal structure.
And now to the answer to the question.
There is a phenomenon that occurs in sea water where its ability to dissolve Calcium Carbonate changes with depth, pressure and temperature. At a particular depth/pressure/temperature combination the seawater's ability to dissolve all the available Calcium Carbonate defines a logical line. This logical line which varies a little between the world's oceans may generally be taken to be at about 4800 metres. This depth is known by a number of names - Calcite Compensation Depth (CCD), Calcium Carbonate Compensation Depth (CCCD), and Carbonate Compensation Depth (CCD).
At this depth (which can actually vary quite a lot) the calcite detritus falling from the upper layers of the sea where the organisms live is dissolved by the seawater as the seawater at this depth/pressure is undersaturated with Calcium Carbonate. Above this level the seawater is saturated with Calcium Carbonate and thus no more will be taken into solution. If you can visualise all these Calcite tests gradually falling through the layers of seawater you might be able to visualise the common term given to the phenomenon - the Snow Line.



Siliceous detritus - e.g. diatom frustules are unaffected by this and will continue their downward journey to the sea floor where they will accumulate to form Diatomaceous or Siliceous Ooze. Above the Calcite Compensation Depth there will be Calcareous Oozes accumulating upon any seabed also above that depth.

Cleaning Diatoms

by D. T. Richardson

1. Specimen in a heat resistant glass (*note 1*) e.g. Pyrex, 110mm x 15mm (5" x 5/8") or 150 x 25mm (6" x 1") test tube.
2. Cover specimen with an equal volume of 10 per cent aqueous hydrochloric acid or 10 per cent aqueous nitric acid and bring to the boil (spirit lamp or Bunsen burner). Let it stand until cold (*note 2*).
3. Transfer to a glass centrifuge tube (*note 3*), centrifuge, decant off the supernatant liquid.
4. Half fill the tube with water (*note 4*), agitate and centrifuge again, decant off the supernatant liquid.
5. Repeat the wshing a further two times.
6. Add, by means of a glass pipette (*note 5*), approximately 1ml of concentrated sulphuric acid, agitate and pour the mixture into a heat resistant glass test tube. The mixture will turn black.
7. Heat to fuming and carefully add, from a glass pipette, 3 to 4 drops of concentrated nitric acid with gentle agitation (the mixture will emit dark brown fumes). Continue the heating for a further few seconds. The mixture should become colourless.

8. Add a further two drops of nitric acid and heat again.
9. Allow to **cool to room temperature** and very slowly add twice the volume of water (*note 4*) by running the water down the side of the tube. The mixture will emit brown fumes, get hot and may even boil and should be water white very pale straw coloured.
10. Transfer to a centrifuge tube and repeat stages 4 and 5 to remove all traces of acid (*note 6*).
11. If the residue shows any colour repeat the sulphuric/nitric acid treatment.

CAUTION

The test tube must be held in a suitable holder, never the fingers
The mouth of the test tube **must always point away from the operator.**
The operation **must be carried out in the open air.**
The operator **must wear a safety visor.**
A packet of **bicarbonate of soda** (sodium bicarbonate) must be kept close at hand in case of breakages. Sulphuric and Nitric acids are extremely corrosive. Cover spillage immediately with bicarbonate.
The acid residues and washings must be kept in a glass or polythene container and neutralized by adding bicarbonate of soda before being thrown away.

NOTES

1. Soda glass test tubes are prone to cracking especially at the temperature of boiling sulphuric acid (300 degrees Celsius) hence the emphasis on heat resistant glass tubes.
2. This treatment removes calcium salts, which left in will react with the sulphuric acid to form a precipitate of insoluble calcium sulphate. If this should happen the whole specimen will have to be thrown away.
3. The type used are 15ml. conical glass tubes. **Under no circumstances must the mixture be heated in a centrifuge tube**, they are not designed for heating.
4. In soft water areas it is permissible to use tap water, in hard water areas it is safer to use distilled/deionised water to avoid the possibility of deposition of insoluble calcium sulphate.
5. The pipette must have a rubber teat or safety bulb. Do not draw up reagents by means of direct suction by mouth.
6. The supernatant liquid can be tested with methyl orange indicator in cases of doubt. Red indicates the solution is acid, orange/yellow indicates it is acid free.
Methyl orange indicator - 0.04 per cent solution of methyl orange in 20 per cent alcohol or add sufficient methyl orange powder to 20 per cent alcohol to give the solution an orange peel colour. Keeps indefinately.

Supplementary Labels

by D. T. Richardson

The problem with diatom strews are the slide labels!
Their size limits the amount of information which can be attached directly to the slide.
I use thin white card, which I obtain from my local printer, which I cut into 3inch by 1inch (76 x 26mm) on which I write the slide number, locality, National Grid Reference, date, mountant, genus and/or species to be found on the slide. The card is then stored with the slide. This is particularly useful when one wishes to use a slide for demonstration work. All the viwer has to do is match what is listed against illustrations in a reference book. Recording size is not essential but can be of help when identifying some species.

The illustration shows the kind of thing I am writing about. A good quality 80 or 100gsm white paper is equally acceptable, it just happens I prefer to use card.

DIATOMACEAE : 2013 : YEW COGAR BECK,ARNCLIFFE, YORKS.
SD 9081 7003 : 01.10.2002 : D.T.Richardson : Clearax RI. 1.666

Amphora ovalis (Kützing) Kützing	32µm
Cocconeis pediculus Ehrenberg	25µm
Cymbella cistula (Ehrenberg) Kirchner	97µm
Diatoma hymale var quadratum (Kützing) R.Ross	15µm
Diatoma tenue Agardh	144µm

Lealt Valley Diatomite Railway and Diatomite Extraction from Loch Cuithir, Isle of Skye

by John Noorani (photographs by Steve Edgar)

Initial extraction of diatomite was undertaken in the 1850s, by the MacDonald Estates. Loch Cuithir is on the Kilmuir Estate and the MacDonald estates were involved as at that time they were the owners. The diatomite was transported from Loch Cuithir to the pier at Invertote on horseback.
Operations ceased in 1870 by which time MacDonald Estates had sold the Kilmuir Estate, possibly to G.A. Baird of Stichill, (near Kelso).
It was during this period, in 1862 that a woman is reputed to have carried 1.5cwt of diatomite on her back, whilst her horse carried only 1cwt.
Mr. McCleod of Staffin told me that in 1870 the workings were taken over by a firm called Messrs. Barr, their foreman at the time being a Mr. Taylor. They worked the site until about 1912, and it was during this period that the railway was built, along with the drying sheds at Invertote.
Also in 1870 tunnels were constructed at Loch Cuithir to assist with the drying of the diatomite prior to transport, the diatomite was placed on netting to allow water to drain out. (See overleaf)
These tunnels are probably the wooden sheds referred to in the 1898 report (see below). Whilst production during this period may have been virtually continuous, ownership changed hands on several occasions.
The Estate was sent for auction in 1895, the auction being due to take place on Tuesday 12th November 1895 at the Mart, Tokenhouse Yard, Bank of England at 4.00, on behalf of the executors of George Alexander Baird. The auctioneers were Messrs. E. and H. Lumley of London. At that time the rent received from the Skye Diatomite Company was £1 per annum. As even a croft in Lealt brought in excess of £16 this might indicate the deposits were not currently being worked, as no other income from this source is shown. Though the wording of the entry is "Diatomite on Kilmuir Estate" it is just possible that it could refer to the Loch Chaluim Chille deposit near Monkstadt. This is because the Kilmuir estate was made up of several smaller estates - Staffin, Duntulm, and Uig as well as Kilmuir. Loch Chaluim Chille is situated on the latter.
In 1904 the Congested Districts Board obtained the Estate from the trustees of G. A. Baird, it

must be assumed that the auction was not a success.

The Scottish Office, Agriculture and Fisheries Department at Portree have a lease executed in 1899 by the executors of George Alexander Baird as Landlord in favour of Alexander MacDonald, Solicitor, Portree for the extraction of "Diatomite, Kieselguhr or Fossil Meal". The lease covered 267 acres surrounding "Loch Quire" (another spelling for Cuithir), 7.75 acres of foreshore and 2.5 acres between Lealt and Rhudu. This lease was to run from Martinmas (28th November) 1898 to 1929, but could be broken every third year, i.e. 1901, 1904 etc.

A report on the site was compiled by Messrs. McCallum and Stewart following a site visit on 24th September 1898, and this is reproduced below. Whilst it is not known on whose behalf this report was compiled, it seems probable it was in connection with this lease. This conclusion is reinforced by the use of the spelling "Lochguire" in the report. Mr. McCallum was an analytical chemist.

In 1907 a Mr. John Barr, Dinting Lodge, near Manchester asked to assign the lease to the British Diatomite Company Ltd whose head office was at Lealt, with branch offices in London, 11 Queen Victoria St. E.C., and Glagow , 53 Waterloo Street. Asignation finally took place in March 1908. It is not known when Mr. Barr obtained the lease from Mr. MacDonald as detailed records only start in 1906. This may or may not have been the same Mr. Barr referred to earlier. It is also probable that the British Diatomite Company was working the deposits on behalf of Mr. Barr from at least 1906 when there is correspondence bearing their letterhead.

It is interesting to note that in a letter dated 8th March 1910 Mr. Barr was trying to float a company, perhaps with a view to taking over extraction again. He does not appear to have been succdessful.

Meanwhile, in 1907 further diatomite deposits had been discovered at Digg to the north of Staffin, just off the Quirang Road, the location also being known as Sartil. Extraction by the

British Diatomite Company started here in 1909, late the previous year an aerial ropeway some 1400 yards long, worked by water power, had been erected from the workings at Dun Mor to the shore, where a wooden pier and store was built. The store must have been a little distance from the pier as there was a tramway between the two. Permission to erect the ropeway had to be given individually by each crofter over whose land it was to run. I have yet to find any trace of this ropeway.

The railway at Lealt is not shown on the first edition six inch Ordnance Survey map of the area but is shown on the second. From the surveying dates this means it was built after 1875 and prior to 1898, the date of the second survey. The railway was initially worked by a mixture of horse and manpower. On leaving Loch Cuithir the wagons were hauled up a gentle incline and then allowed to run free until approaching Lealt where the gradient again starts to rise. Haulage was again necessary for about half a mile and then it was a free run to the clifftop. At the cliff top the wagons were unloaded and their contents eventually transferred to wagons on an inclined plane for transfer to the cliff bottom. This inclined plane is mentioned in the 1898 survey (75 degrees), and in a Report by Major L. E. Silcox dated 1937 there is mention of an inclined railway 38 degrees to the horizontal worked by a winch. The difference in angle may suggest the inclined plane was rebuilt at some stage. However, there are now no visible traces of any inclined plane. There is the remnant of a wire rope in the cliff side about halfway between the waterfall and the mouth of the Glen, roughly above where the wagon remains are. This could have been connected to the winch which could have been located nearby at the clifftop in a small open structure. However, all contemporary descriptions imply that the diatomite was taken down the cliff near the works. Also, they refer to inclined planes or railways, as opposed to cableways. These cliff-sides are prone to landslip. This may well be the reason for lack of evidence.

Prior to the construction of the inclined plane the diatomite, in sacks, was carried down a very steep cliff path. From the pier adjacent to the sheds the dried diatomite was shipped south by steamer, which may well have been a vessel termed 'a puffer'.

To get empty vehicles back to the loch, it is likely that it was the reverse of the loaded journey. There is no evidence of ropeways, with the exception of the rope previously mentioned, to allow loaded vehicles on a downgrade to pull up empty ones.

At some point, probably under the ownership of British Diatomite, the line was relaid with heavier rail and some reports say an 0-4-0 tank locomotive (builder unknown) was used. Indeed this major improvement may have been as a result of the 1898 report. This locomotive did not come from the Skye Marble Railway as this was not disposed of until 1912/13. In two documents mention is made of stationary steam engines providing traction via cable haulage. Whilst this technology was not unknown in the area (Rassay Iron Mines used cable haulage), there are no remains or evidence of the engine house, which would have been a large building for the area.

After the cessation of extraction by the British Diatomite Company Ltd. around 1912 both the Loch Cuithir site and the railway lay derelict. Meanwhile ownership of the Kilmuir estate had again changed when in 1904 the estate was bought from the Trustees of G.A. Baird by the Congested Districts Board. In 1912 they were succeeded by the Board of Agriculture for Scotland which was renamed in 1960 as the Department of Agriculture and Fisheries for Scotland. Thus the title to Kilmuir Estates (inclusive of minerals) is now held in the name of the Secretary of State for Scotland.

By 1920, the diatomite works had been leased to the United Diatomite Corporation Ltd. who were based in Cardiff, but between 1923 and 1926 this firm disappeared, and by 1926 the estate was attempting to relet the diatomite works. In a letter on the 1st July of that year the Factor stated that, so far as he knew, "there is now no plant in connection with the works except the

remains of a light railway at Cuier (another spelling for Cuithir) and some old drying plant, pipes etc.". From Martinmas 1936 the diatomite workings were let by Messrs. MacCreath Taylor and Co. Ltd. of Glasgow. Following a survey in 1937 by two engineers, Majors Hunt and Silcox, that winter extraction was started again. Mr. McCleod however recalls the names of the operators as Malcolm Nicholson, McClean and Bruce. It is quite probable that these were the local representatives of the aforementioned firm. However, within two years, on the outbreak of the Second World War, work stopped.

The site again lay dormant until 1948 when Scottish Diatomite took over hte lease and started operations, when they built the road to the Loch during 1949 and 1950. This cut the line of the railway in two. Drainage work was also undertaken at the Loch to lower the water level in 1950. Photographic evidence shows this was done in two stages, the second stage being in the mid-fifties. The diatomite was taken by road from the Loch to their new works at Uig, the lorries going both via the Quirang and the north of Skye. These shed at Uig now house Caledonian MacBrayne's ferry terminal at that port. It was from Uig that the diatomite was finally shipped out.

These workings finally finished either at the end of 1959 or early in 1960, no doubt at least in part due to the considerable transport costs.

Summary of Estate Ownership and Extraction Leasing Details

Date	Ownership	Lease Holder
Pre 1850	MacDonald Estates	MacDonald Estates
About 1870	?G.A. Baird	Messrs. Barr ? Owned by G.A.Baird
1895	Estate put up for auction by executors of George Alexander Baird	Skye Diatomite Co. paying rent
1899		Alexander MacDonald takes over lease from executors of George Alexander Baird
1904	Trustess of George Alexander Baird sell to Congested Districts Board	
1906		British Diatomite Co. working deposits
1908		John Barr assigns lease to British Diatomite Co.
1912	Board of Agriculture for Scotland	British Diatomite Co. ceases Extraction
1920		United Diatomite Co.
1936		Messrs. MacCreath Taylor & Co.
1948		Scottish Diatomite

The 1898 Survey

Because it is so complete and gives a very useful snapshot of what was present on 24th September 1898 at the various locations I have included the entire report below:-

Report on Diatomite Field, Lochguire, situated in Glen Lealt, Isle of Skye, by Messrs. McCallum & Stewart.

On 24 September 1898, a visit was paid to the field by Messrs. Macallum and Stewart, who report as follows:-

Upon a narrow plateau on the right hand side of the river at the mouth of Glen Lealt, are placed the drying sheds and stores from which the diatomite is shipped. These comprise two dome roofed iron stores containing the mineral ready for shipment, and a wooden building heated by steam, and containing a water-motor and fan, which at present is also used for storage. Across the river is a two-roomed iron-house used by the present proprietor, when visiting the mine. Here we found three large flat-bottomed boats, capable of carrying sixteen tons each, used in ferrying the bags out to an anchored steamer, and also a small rowing boat. A small stone quay runs from the stores to the river, by which boats are loaded.

A few hundred yards inland the river falls over a cliff about eighty feet high, giving, at all seasons a plentiful supply of water, capable of generating electric energy sufficient to work the railway, pumps or any other machinery required.

Directly above the plateau on which the stores are placed hte cliffs rise to a height of about four hundred feet, up which runs a double track railway at an angle of about 75 degrees, with chain, chain wheels and bogies &c., used in lowering bags of diatomite. On top of the cliff there are three other large store sheds. From these to the field, a distance of about three and a half miles, there runs a two feet six guage light railway, cut and embanked, with siding &c., and midway a wooden house used as a sack store.

At the mine there are one hundred and forty drying sheds, each twenty-four feet long by six feet high, with three trays of inch mesh wire netting. These sheds are open all round. Here there is also a large open sided store shed, with galvanised roof supported on lattice girders and iron columns for the dried diatomite, as well as two large iron huts for the workers, with the necessary bogies (flat and sided), barrows, staging, spades, sacks, &c., and also a four inch syphon pipe one mile long for draining the loch.

The ground whereon the diatomite deposit lies has originally been a loch which has gradually been filled up by the growth and deposit of the diatoms, and now does not exist except during very wet weather, when the burn which originally flowed through it does not suffice to carry off the surface water.

The deposit covers an area of about 30 acres, and varies in depth from six feet at the edge to twenty-five feet at the present working face. Further in it has been found to be thirty-five feet, and still further in no bottom has been found yet, so far as the boring has been carried out, thus showing an almost inexhaustible supply of the finest diatomite. In winning the mineral, about two feet of tirring (*Editors note: Tirring from 'tirr' meaning 'strip'*) only has to be removed, under which is found a foot of superwhite, upon two feet of white, and the remainder grey diatomite.

The present method of winning is as follows:-

To keep down the water which collects in the working-place, a four inch syphon pipe one mile long has been installed, which in ordinary weather is fairly efficient, but in wet weather it cannot keep the water under [control], consequently work is only carried out in dry seasons.

The tirring is first dug off and stacked on one side, and used for embanking &c. The diatomite is then dug with spades as ordinary clay, and placed on hand barrows, which are carried up to the nearest siding and tipped onto a bogie. The bogie, when filled is pushed by four men to the nearest pair of drying sheds which are ranged on each side of the line. Here the men take their stand, two on each side of the bogie - one at the bogie, and one at the shed. The first man takes with his hands a lump of clay, balls it, and passes it to number two, who lays it on the tray, and so on till the bogie is emptied, when they go back for a refill.

Now given dry weather, the diatomite may dry in a week or thereby, according to the amount of sunshine, and wind; but probably, when half dry, rain comes in, and being blown in at the open sides of the sheds, partially wets it again, while possibly some of it is washed away altogether, so that, at best, the drying, as at present managed is slow work, with risk of loss.

When dry the diatomite is bagged and the loaded bogie is pushed by its attendant four men either to the lochside store and discharged there, or direct over the three and a half miles to the stores at the cliff top. Part of the way the bogies run themselves down the incline but part of the way they require a good deal of pushing up hill. When arrived at the stores, the bags are emptied, and bogies and bags are taken back over the three and a half miles again. When a shipment is to be made, the diatomite is again bagged, and lowered down the cliff railway, weighed and ferried out to a steamer at anchor off the coast.

Great saving of working costs may be made as follows:-

1. Large, steam-heated drying sheds, into which the stuff can be shovelled on and off the floors direct, saving much unnecessary handling, and also securing quicker and more reliable drying.
2. The use of sided bogies for carrying the stuff in bulk to the stores when dried, thus saving the preliminary bagging.
3. The substitution of pony-haulage on the railway for manual labour and the institution of trains instead of single bogies. (Railways might evntually be worked by an electrical installation).
4. The clearance of river-bed (which can be done at small cost) to allow a 200 ton steamer being berthed alongside wharf, saving time and men in loading.
5. The drainage of the loch entirely by a cutting at a suitable point, which will carry the burn clear of its present bed, draining the stuff as it lies, so that working will be simplified, and artificial drying minimised.
6. The development of electrical energy at the falls to do all possible mechanical work.
7. The purchase or chartering of a small steamer to carry coals to mines and diatomite to market.
8. A market for surplus coal cargo can be found in Portree and district sufficient to materially reduce the cost of carriage of diatomite to market.

D. A. MacCallum,
R. B. Stewart.

Existing Plant at Mine

Two-roomed iron house, wood-lined and floored	in good order
Two galvanised store sheds at Wharf	do.
Steam-heated drying-shed, with fan and water motor, (useless as drying-shed, but suitable for store)	do.
Double track railway up cliff, two bogies chams &c.	do.

Three galvanised iron store sheds.	do.
Three-and-a-half miles light railway 2'6"gauge with sidings etc.	do.
Sack store	do.
Two galvanised iron huts for workers 24 feet by 16 feet	do.
Galvanised iron shed on girders and columns 75 feet by 25 feet	New
140 small drying sheds each 24 feet by 6 feet by 6 feet	Obsolete
4" flange cast iron syphon pipe, one mile long	in good order
Flat and sided bogies, barrows, wood staging planks, spades, sacks &c. &c.	do.
Three large flat bottomed boats	in good order
Small rowing boat	do.

Further contemporary information is provided by a visit recorded in the book The Misty Isle of Skye, Its Scenery, Its People, Its Story by J.A. MacCulloch, published in 1905. The visit took place in June, but the year is unknown, although as the proprietor is referred to as M., this could be Alexander MacDonald, and would imply the turn of the century.

The party travelled by ship from Portree, which was described as as a coal vessel which was to carry back a cargo of diatomite to the south. The vessel is described thus:- "The whole vessel being used for cargo, there is only standing room in the stern beside the skipper at the wheel, close by the engine house, from which a grimy engineer emerges at intervals to breathe." This is a good description of a "Puffer".

from J.A. MacCulloch's "The Misty Isle of Skye." 1905

"On the cliff above are the remains of Dun Greanan, and rounding a jutting precipice is a little bay, walled round by what seem perpendicular slopes of grass, pierced by a ravine, and guarded on either side by the outlying basaltic cliffs. In this bay, on which the intolerable glory of June sunshine blazed down, the steamer cast her anchor; and with a hamper of provisions, we made for the shore in a coble which had come to meet us. On the shore and on the slopes above the marks of industry were evident. A drying and grinding factory has been erected at the water's edge; great sheds stand on the upper slopes at a precarious angle; while a miniature railway, the continuation of one which runs inland to the diatomite beds, connects the edge of the cliff with the landing stage and factory far below.

When we arrived, the work-people were all at the loch, and there was scarce a sign of life round this lonely bay. But presently a long train of men and women began to zigzag down the path on the face of the slope, and transformed this solitude into humming activity. They must get the cargo embarked while the tide served. Each one carried a bag of diatomite from the grinding-house to the boat slip, till the coble was piled up with sacks. Then it made a slow journey to the steamer, where the sacks were transferred to the hold. Meanwhile a second coble was a-filling, and so all day long, for there were hundreds and hundreds of sacks to be removed, the work went steadily on. Leaving these busy people and feeling a mere idler, I explored the ravine near by. Like most Skye ravines, its sides are formed of steep rocky scaurs, ending in an amphitheatre of rock over which a foaming band of water falls into a deep basin and then rushes noisily down to the sea, over which, out of this rock recess, the blue hills of Applecross are visible. When my observations, geological, botanical, and picturesque, were completed, I rejoined my companions – M. up to the ears in business with his manager. It was now time for lunch, which we ate al fresco, our cheeks fanned by the odorous sea-breeze, our ears greeted by the plangent cries of seabirds, greedy for scraps.

We ascended the zigzag path leisurely until, at its top, the busy workers far below seemed dwarfed to the size of industrious ants. Inland from the cliff's edge lay miles and miles of undulating moorland backed by the long ridges dipping and rising from Storr to Quiraing, and, just opposite, one bold promontory which overlooks the loch whence the diatomite is taken. This was the landward side. Seawards the water lay like a glassy lake, undisturbed even by a ripple, save where a whale was splashing at the surface far out to sea. Strange to think how at times and with a northerly wind, this coast becomes one of the most inhospitable in all Scotland! In the sound lie the purple Rona and green Raasay. On the mainland are the Ross-shire mountains – Ben Alligin, Leagach, An Teallach, Scour Ouran and its Six Sisters, and the rest of the many peaks, steeped in haze, but with gleams of reflected light on their slopes, or golden red as the day advances and evening comes on.

Leaving behind us this gorgeous vision, we made ourselves as comfortable as possible on one of the open trolleys used for transporting the diatomite from the loch. They are propelled along the level ground or up the slopes by strong and willing lads, who jump on board as soon as the car begins to go downhill. That it does with terrific speed; the motion exhilarates and rouses every jaded feeling; you have all the joys of motoring without breaking the rules of the road. For a brake, the poles with which the lads propel the car, pushed through a hole and pressed against one of the wheels, serve admirably. You are jolted horribly, and have to hold on with your teeth, but not for worlds would you lose the joy of motion or the perfume of the moorland air, heavy with aromatic odours, flung in gusts against your face. The last mile or so is uphill, and we took a short cut over the moor to lessen the labours of our drivers.

Under the shadow of Sgurr a Mhadiadh Ruaidh, the Red Fox's Hill, in a silent hollow, lies Loch Cuithir, now mostly drained, leaving a grey mud bottom of diatomite. Men are employed to dig it out, and it is transferred by girls to open trays of wire netting, set one above another in a staging, so that wind and sun may have free access to dry it. Drying the diatomite is, in fact, the problem of the process, for it is obvious that in a damp climate like that of Skye, the stuff does not lose its moisture in a hurry. M. laughingly offers us a thousand pounds for an expeditious and cheap process. Unfortunately the Germans have been before us, and use a simple and easy method of drying in their diatomite fields. When dry the lumps of clay become light and friable, and turn from dingy grey to white, so that the heather and grass all round the loch is dusty with particles of diatomite. The lumps are then placed in sacks and carried by the trolleys to the cliff where they are ground to a fine powder in the mill.

It is a strangely desolate and remote spot on which such an industry should go on; you are miles from a house, and there is not a sound to break the silence. The eye rests only on the purple moor and the high ridges to the west. But you rejoice to know that this industry gives regular employment to the men and girls of the district, and that since it was begun eighteen years ago, fourteen thousand pounds have been paid in wages and for expenses by the proprietor. Employment is given to about sixty people during the season in preparing the five hundred tons of material annually exported from the loch. Pity that there were not several more such industries for the crofters of Skye to work at, without at the same time taking them away altogether from the work of their crofts. It is too soon yet to say what may be made of the peat beds in Skye, but if ever they are made use of as they are now in Germany and Norway, brighter days may dawn for all classes in the island.

After a leisurely examination of the place and its surroundings we resumed our tramway journey, and were soon flying along at such a pace that in twenty minutes we had covered the distance to the cliff, including time spent in toiling up hills. Once more we came in view of the sea, and islands, and far mountains, with the evening lights beginning to colour them. Far below, the

string of men and girls were still at their work carrying the sacks. Diatomite, they say, is good for the complexion, and certainly these girls have delicate skins, charmingly pink and white. Three very hungry men made their way quickly down the cliff to their camping-ground, and, having induced one of the girls aforesaid to boil a kettle, sat down to tea – a peripatetic meal (like most Skye picnics in autumn), because clouds of midges hung round and stung like fiends till faces and hands ached and itched and were covered with lumps.
By the time the meal was finished and a peaceful pipe smoked, the workers had done their task. The coble was waiting for us, and, bidding the men and girls good-bye, we made for the steamer, with its hold crammed full of sacks of diatomite. In the growing twilight we steamed down the sound. Far behind us, on the remote horizon, were the lonely Shiant Isles, and in front of us stood eleven of the marvellous peaks of the Coolins and the Red Hills – great opaque masses clear cut against first a crimson and then an opalescent sky as the sun sunk behind the unseen outer islands. After such a glorious day in the open air it was an appropriate ending to sail home over the waveless sea, with such a peaceful prospect around us. The long summer twilight kept off the shadows of the night, and though it was nine o'clock when we reached Portree, it was still light. After much ordering and counter-ordering, the skipper got his boat moored to the mail steamer at the quay, and we bade each other good-night, charmed with the success of the day's outing."

Please also refer to Scottish Diatomite deposits – The Amateur Diatomist Vol. 1 No. IV. pp 47-48. and to the list at trhe ned of this article.

Present Day Remains

A genral point is that much that was readily removable was removed and put to other uses whenever work ceased. This was particularly true of any potential building materials, e.g. brick, stone, timber, thus very little of the 1898 inventory is identifieable today. On the basis of the Factor's report in 1926, it would seem most had gone by then. This perhaps suggests that much of todays remains were built after that date.

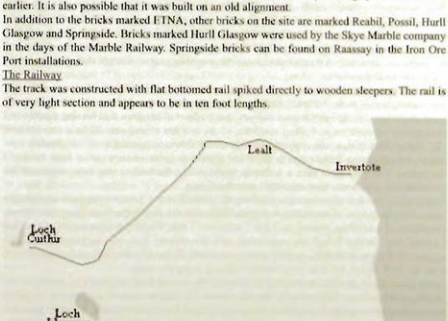
Loch Cuithir

Loch Cuithir now consists of two distinct areas of water, separated by very flat land. Whilst originally the Loch was open water, by the time the extraction started the Loch was little more than a bog. This was drained by a four inch syphon pipe one mile long, of which I have yet to find any trace, and in view of the next paragraph, it may no longer exist as it could now be well above the present day water level. Various drainage ditches wsere also dug.
The final period of operation included work to lower the Loch water level by means of the drain round the edge of the site. This artificial drainage canal eventually discharges into a tributary of the Kilmartin River. It is separated from the lower loch by a road which in due course crosses the channel by a girder bridge, the timbers of which are now badly rotted.
The present open water probably indicates the main work sites in the last phase of extraction.
The east shore was built out considerably with rubble to form a roadway. It is possible that at a slightly higher level there was a rail track for skips to move the extracted diatomite to the lorry loading point by the coast bound road.
There are only limited remains of any buildings, no doubt due to removal of the materials for re-use elsewhere by local residents. There is a building some 13 feet by 19 feet at the point where the road to Lealt joins that round the Loch. Only the base of three of the walls remains, but the fourth (facing the Loch) exists to a height of about four feet. This brick wall, which is on the longer side, has a normal width door in it. The back wall was also of brick as it has fallen over. The side walls were made of a corrugated material. The bricks used are marked ETNA, as are

those of the kiln at Invertote, possibly indicating that they are of the same age. The brick walls appear to have a cment render finish. I would postulate that this building was an office and was probably single storey. Built into the rising ground to the rear of this building are the remains of two walls, the remains being some four courses high. Their purpose is a mystery.
The only other substantial remains is an abutment on the north side of the approach road. The construction of this abutment is interesting in that one side of it is of stone construction, although this has been raised some fifteen inches with brickwork, and it is probable that the back is similarly built, but much of this is hidden by groundworks. The front is mainly of brick, although the bottom two feet are of stone construction. The fourth side appears to be entirely made of brick. The top is of concrete and at one time it supported a superstructure as two of the fixing bolts are still present. The maximum height of the existing structure is about six feet. The bricks used are the same as those used for the office, but because of the mixture of building materials I am of the opinion that the original structure predates the office phase, and was either repaired or added to during that later period. As to use this is not clear. It is unlikely to have been a bridge abutment as there is no high ground or structure which would have supported the other end. It may well have been a loading point of some sort, the supported superstructure being a chute of some description. Nearby, at the higher level there is the remains of some railway track set at about 1 foot 11.75 inch guage, the sleeper spacing being about 2 feet 6 inches. The rail itself is about 2.25 inches high with the foot 2 inches wide and the top 1 inch.
The purpose is unclear as it does not seem to line up with anything, although being at a higher level than the road suggests that it might have been part of the lorry loading system referred to earlier. It is also possible that it was built on an old alignment.
In addition to the bricks marked ETNA, other bricks on the site are marked Reabil, Possil, Hurll Glasgow and Springside. Bricks marked Hurll Glasgow were used by the Skye Marble company in the days of the Marble Railway. Springside bricks can be found on Raassay in the Iron Ore Port installations.

The Railway

The track was constructed with flat bottomed rail spiked directly to wooden sleepers. The rail is of very light section and appears to be in ten foot lengths.



Lealt Valley Diatomite Railway

Starting from the Loch end the course does not become clear until just prior to a bridge over a watercourse into which the drainage channel discharges. Before this the course is totally obscured, no doubt due to disturbed ground caused by the later workings. There is, though, a flat area which could have been used for sidings. It would certainly seem from the 1898 survey that the layout was fairly extensive, which may not be adequately shown on the Ordnance Survey Map. The area now cut through in a cutting by the road may well have originally been level. This would have allowed the railway to have reached the area mentioned above. By this means it could have reached the area of the pier. A wagon turntable here would have allowed wagons to reach the lochside, and possibly the sidings referred to in the McCullum and Stewart report.

On top of the bridge abutment there is what appears to be badly corroded rail attached to wood and fifteen inches away there is a spike. Whilst this suggests a gauge of only fifteen inches, the McCallum Stewart report states the gauge is two feet six inches. Indeed, anything less than two feet is likely to be unstable in use. The width of the various embankments and cutting were about 10 feet, which would have allowed double track. There is, however, no evidence to support this theory.

Following the line to the coast, it immediately enters a cutting on a rising gradient. Interestingly there is a length, about 15 feet, of flat bottom rail in this cutting that is not badly corroded by comparison with other rail lying about the course of the line. This suggests that it is much more recent and I am, therefore, doubtful as to whether this rail belonged to the orignal railway.

On leaving the cutting the track then enters the valley of the river Lealt and runs a gentle falling gradient on a mixture of cuttings and embankments across the valley. Whilst crossing the valley floor on a small embankment the trackbed is intersected by the later road. After crossing a small stream about half a mile prior to the hamlet of Lealt, the line commences a long climbing right hand turn to take it round the back of the houses. This climb is of considerable length and as a result the line gains some 35 feet in height. This is obviously to avoid the settlement of Lealt and its productive farmland. A direct line to Invertote would have gone straight through this area as indeed the road does now.

Whilst the bridge over the stream has long gone, some of the rail has been used to make a bridge. This rail is now so badly corroded that no useful measurements could be made. All the rail still lying about has corroded in the same manner, that is, the web has gone first leaving the foot and head as two separate strips. Further corrosion of the foot has often given rise to a very shallow "V" shape. This bridge was constructed with timber beams supported in a "U" channel steel bearer. An interesting feature here is that there appears to be two levels, one at track level and one below. This may have been a walkway, alternatively, the bearers may have supported the embankment, which was then continued over the stream.

Returning to the line of route, after reaching the summit it is a gentle downgrade towards the coast. About a quarter of a mile before the trackbed meets the road to the Loch there is a concrete foundation of a building, measuring 9 feet 7 inches by 7 feet. Whilst it is adjacent to the trackbed I cannot say whether it had any connection with the railway, however, its location is highly suggestive and was probably a store of some description. It may have been the sack store referred to in the 1898 report, but it is by no means half way along the route.

At the point where the alignment meets the road for the second time, the road now takes over the course of the railway. Furthermore, the area where the line terminated was used as a quarry during the improvements to the A855. By comparison of aerial photographs, it can be seen that from here the road took over the trackbed into the works. At this point the structure of the embankment can be seen and it is built of earth and rock. Such construction would have posed no difficulty locally as many field boundaries were made in the same way.

Right on the edge of the clifftop there is a concrete structure which may well have been an unloading platform. Whilst there are many other concrete structures in the quarry, this is of a different quality, and for this reason it is suggested that this was not part of quarying operations. It may well be that it was put in later when the road from the loch was in use.

In the period 1899-1902 some 900 tons were produced, somewhat less than 100 tons per year. It is probably that most of this would have been produced in the summer months due to the weather.

Initially, certainly the railway was operated by manpower assisted by ponies. In the account of a journey on the line sometime prior to 1905, and probably when the site was leased by MacDonald of Portree, it is stated that wagons were worked by groups of four men who propelled the wagons forward with poles. Where it was possible to freewheel, this was controlled by using the pole as a brake on the wheeltread, through a hole in the wagon floor, the men riding on the wagon. The axle bearings would have undoubtedly have been basic, probably the axle resting on a "U" shaped mounting, and consequently the rolling resistance of the vehicles would have been very high.

A Permanent Way trolley, which has basic axle bearings similar to those that would have been on these trolleys, is easily pushed with a considerable weight on board, and up a 1 in 50 gradient. Rolling resistance os also dependent on track quality, on this railway this is likely to have been poor by comparison. Even so it would seem that this method of propulsion alone may have been used on the initial grade leaving the Loch and the climb round the back of Lealt.

As has already been mentioned, sometime around the turn of the century an 0-4-0 tank locomotive was apparently introduced. It is said that this was done after the line was relaid in heavier rail in 1905, having been regauged to two feet in 1890. The latter date conflicts with the definite statement in the 1898 report that the line was two feet six inch gauge, which I believe to be accurate. The report, though, at item 3 does recommend improvements to the railway, and I would suggest that even if this was not regauged, it was subsequently relaid with heavier rail to permit the operation of locomotives in preference to ponies. On the other hand, there is the pice of two feet gauge track still in existence at the Loch which supports the contention that the line was regauged to two feet, and this piece of track is thus explained as part of the network at the loch. In any case the line would have been regauged to fit a locomotive that was available, rather than have one built for the line.

However, as has already been stated this 2ft gauge section may have been laid during the last phase to move material from the extraction point to the lorry loading point. There is some evidence to support this on the 1960 aerial photograph.

In some documents mention is made of cable haulage. There are no remains to confirm this suggestion, although it was not impossible that the stationary plant was part of the clifftop works at Invertote. It is, thoug, unlikely that both cable haulage and a locomotive would have been used at the same time.

The Invertote Works

Whilst there was eventually a sizeable installation at the clifftop, all present remains are at sea level.

These are situated to the north of the mouth of the River Lealt, the buildings to the south of the river are the remains of a salmon fishing station and were latterly totally unconnected with the diatomite industry. That is not to say, though, that they were not originally part of the installation as the 1898 report refers to a "two roomed iron house across the river". This is probably the house, which presumably than had a metal roof.

For convenience, the buildings will be dealt with in order from the north end of the site. In all

cases there is evidence of stone removal, and there has been considerable slippage of the cliffs which has covered some of the remains.

The most northerly construction is a stone built platform, about ten feet wide, and thirty feet long with a pit almost the full length at the northern end. The surface of the platform is slightly below the top of the side walls. A set of steps lead down into the pit which does not appear to be deeper than the side walls.

The next building is the kiln.

This is of brick with a metal chimney. It is built about twent feet above sea level and is set back into the cliff. The retaining wall surrounding the bake and sides is of rock, as is a wall some fifteen feet to the front which retains the sloping apron in front of the kiln. Coming in at the rear corner and then running along the north side is a stream. It then runs alongside the front for about half the width and then across the apron and through the retaining wall to the sea. It seems to be an original watercourse, judging by the layout of the retaining wall where the stream flows through it. If this is so, it must have served some purpose, because the kiln could easily have been sited to avoid it, or the stream ducted away. It is evident that it never carried enough water to have been capable of producing a great amount of water power, and there is no evidence now of a steam raising capability on site.

The kiln itself consistes of a large lower chamber, with a small upper chamber, that being where the fire was. That being the case, the heat would have been transferred to the lower chamber through the brickwork.

The chimney is of brick surrounded by metal rings. From remains elsewhere on site it is possible that it was finished off with a cone. Whilst it is just possible to stand on the lower chamber, stoking though the firedoor would have been hazardous, if not impossible. Possibly then there was some other surrounding structure, although not built of brick or stone. There is evidence of timber uprights on the brickwork above the lower chamber, and anchor points at a similar level in the hillside. This would have provided staging, both for firing and fuel storage. The bricks are marked ETNA which suggests the kiln was built during the same period as the brick building at the Loch.

Next is what was the main building. Whilst built of stone, it is now very dilapidated. It was a two storey building with a curved roof, this suggesting a roof of corrugated iron. In the middle of the seaward facing wall there is a wide doorway, and opposite that there are the remains of four wooden piles for the pier.

At the southern end of the building there are the remains of some large machinery. In the southern end wall there is a large pivot, and in both side walls there are circular holes as if a hute or pipe went through the building. Surrounding this area are bricks. This might suggest later modification.

This is obviously not the steam heated wooden building referred to in the 1898 report. As this

building does not seem to fit with any of the descriptions in the 1898 report, it is probably of later construction, possibly as a result of the recommendations in that report. The 1905 account refers to a drying and grinding factory at hte waters edge. This description would certainly fit this building, both in location and in explaining the remains of machinery.

Lastly there is the remains of a dam built across the river mouth, and an "h" shaped metal support. Possibly this was a footbridge to gain access to what became a salmon fishing station, and was probably the iron house referred to in one of the surveys. It has been suggested that the purpose of this dam was to provide a dock for the ship transporting the finished product. Apart from these supports, there are no other works downriver, and these are not substantial enough to be any part of a dock gate. Outside the works are the clear remains of a pier. One of the most likely

types of vessel to be used was a "Puffer", a vessel designed to sit on the bottom during low tide. I find this expalnation unlikely. The dam was, I believe, built to provide water power for the machinery.

In the account of a journey on the line, mention is made of transferring from the steamer to the shore in a coble. It also goes on to describe the diatomite being transferred in the same way. Such operations were commonplace in the islands, where steamers could not get to piers. The 1898 invemtory also mentions boats used for this purpose.

How the material reached the shore from the top of the cliff poses some problems.

It is known that the diatomite was originally carried by people down to the cliff bottom. I presume these are the steps just visible behind the kiln.

The 1898 and 1905 accounts mention a railway, as does the 1938 report. Indeed two of them go so far as to give the angle of the incline. They differ, which perhaps, suggests rebuilding. The only clue as to location is the 1905 description of "connects the edge of the cliff with the landing stage and factory below.". This suggests that it was in the vicinity of the present day building. The steps are immediately behind the kiln. It may well have been in that area. P. Cole, on the other hand, in his paper - Skye Railways, states that the ropeway went straight up the cliffs in line with the north wall of the works. This suggests the same place.

This wall of the works (the existing building) is in a poor state of repair but it is clear that the drive shaft visible in the south wall did not reach this wall, certainly not in a straight run. On the other hand the ropeway would not need to have been powered, as the loaded carriers could have been used to haul up the empty ones. In either case, though, some form of strong pivot point would have been needed at both ends. The works have, in the north wall at the cliff end, an opening at first floor level. Whilst it may have been a window, if the diatomite arrived here, then this may have been where it was taken into the works.

Finally, on the north of the river on the cliffside there are some steel hawsers. These could be the remains of a ropeway system. There is also a concrete shelter nearby that may have been connected. Given the current shape of the cliffs, it would seem likely that to get a reasonable fall, the ropeway would have had to go from one side of the glen to the other and back. Ropeway technology was in use locally in the transportation of diatomite to Staffin.

On the basis of the contemporary reports which seem definite that it was a railway, not a ropeway, I am inclined to discount the latter two possibilities. However, it has still not been possible to locate any traces of the inclined plane. The 1902 O.S. map shows a straight line down the cliff near the site of the kiln, and the 1946 aerial photograph also shows some object here. this may be the site of the cliff railway.

Rolling Stock

The 1898 survey makes mention of two types of wagon, referred to as bogies, flat and sided. No records of the design have so far come to light, although some of the first wagons are believed to have been built at Stromness in Orkney. In the River Lealt at the bottom of the cliffs are the remains of what may be the chassis of some rail wagons. If that is what they are their form would suggest that they are not dissimilar to some of the wagons used in the Welsh slate industry. I cannot positively link these remains with the railway, or the ropeway funicular railway but the only other likely source would seem to be a contractors railway in connection with the building or rebuilding of the A855. However, the Highway Authority has confirmed that there was no railway involvement when the A855 was rebuilt in the 1970s, and the original road followed closely that of the track from Portree to Staffin and as such the route would probably have been unsuitable for any sort of railway in connection with the original construction. The quarry itself belongs to the Department of Agriculture, who have confirmed that it was opened in 1972 in

connection with the road improvement scheme and the only use the land had prior to that was in the drying of diatomite. The conclusion must be that these remains are indeed of the line's rolling stock, or some other part of the process and pushed over the cliff during clearance operations for the quarry. If these are remains of wagons, measurements suggest that they may just have been suitable for 2ft 6in gauge, they would more lekly be 2ft gauge. I would therefore suggest that they are unlikely to be original and date from the line's rebuilding. They would almost certainly have inside bearings.

It is interesting to note, though, that in the 1905 description of a ride, it is stated that "for a brake, the poles with which the lads propel the car, pushed through a hole and pressed against one of the wheels, served admirably". When the wagons ran freely downhill the author states the lads jumped on board. Presumably the wagons either had special platforms, or more likely, they jumped onto the load.

It is probable that there were no passenger carrying vehicles as such as it ia known that in the 1890s the miners, who came from the local crofting communities, had to walk to Loch Cuithir. Also, had there been passenger vehicles, one would assume the owner would have made sure one was available for his guests, rather than expect them to use an ordinary wagon.

General

Should the weather have been unsuitable for work then the workers received no pay. Given the nature of both the work and the climate, this must have been a fairly frequent occurence. Again, quoting from the 1905 record, it is implied the work, for 60 people, was sesonal, presumably summer.

It is difficult to link the present remains to any particular period, although as a general rule I am inclined to believe that any brick buildings belonged to later periods of activity, as do the brick modifications to stonebuilt structures. The bricks would have been imported into the island. The 1898 survey states there were two domed roof iron stores and a wooden building heated by steam and containing a water motor and fan. Is the stone built platform one of these? The Kiln has evidence of having had a wooden surround. Also there is a wall below the kiln through which runs a stream. Could this be the location of the "wooden building heated by steam and containing a water motor and fan"? The use of the word 'containing' suggests the water motor was insode the building, rather than external and driving the fan through a shaft or belt.

The main building is easier to date, as it is not mentioned in the 1898 survey, but the description of a drying and grinding factory in the 1905 account fits it well. The building must therefore date from the Alexander MacDonald period and probably dates from the turn of the century. It is curious, though, that no mention is made of the kiln in this account. Similarly, the 1898 report, which is very detailed, does not say how the steam was generated.

All heat for drying was probably generated from imported fuel, probably coal, as there is no evidence of the widespread peat cutting which would have been necessary. Again, the visitors in the 1905 record arrived by sea in a 'coal vessel'. From the limited description of hte vessel, it may have been a 'puffer' and had apparently delivered a cargo of coal to Portree and was going empty to Invertote to pick up a cargo of diatomite for the south.

Aerial Photographic Evidence

The earlist photogrpahs are October 1946 and show the site prior to any alterations for the last phase of extraction.

October 1946 Photographs

The works at the bottom of the cliff are in much the same state as today, at the top of hte cliff there are some indistinct shapes, possibly sheds. The kiln is, I think, just visible and rising up behind it is a straight line. This could be the path, or the cliff railway.

Of the railway, the now collapsed culvert to the west of Lealt appears to be intact. Also in the middle of the long straight to the west of Lealt there appears to be a spur, facing to Loch Cuithir and heading towards the river Lealt. Is this the 2.5 acres bewteen Lealt and Rhudu? At the loch there seems to be some buildings on the south shore, long, thin with round roofs. These may be the drying sheds. There are also some small buildings approximately where the current remains are, and something else which is very indistinct. Certainly there are more buildings than there are current remains. On the railway a spur appears to have crossed the Kilmartin River in the vicinity of the loch on a trailing connection into a compound, the mainline stopping in the vicinity of the south shore buildings.

Drainage channels on the main loch are very prominent and form a sort of triangle in the middle. Extraction appears to have taken place round the South and East shores of the main loch.

March 1954 Photographs

The fina lperiod of extraction had started. The road has been built and there is a considerable development at the cliff top. At Loch Cuithir, the new drainage channel to the south of the loch has been cut, although there is no developemnt on the smaller loch, and consequently no bridge is in situ. The small building at the end of the road is present, and at the north east corner of the loch there are some long thin lines. These may be buildings or, more probably, paths or tracks.

At the cliff top there is considerable development. There are 17 low buildings or open beds, together with a tall building and chimney. In July 1953 a newspaper article stated that the diatomite was dried at the loch. Whilst there is no evidence of any large scale developemnts there that could meet this requirement, these buildings at Invertote would certainly be capable of fulfilling this function.

It is very apparent that there was no development at the lower level.

May 1959 Photographs

Because of the height at which this photogrpah was taken, detail is not very clear.

The compound at the cliff top is quite sizeable, and a very noticeable feature is that both it and the road to the loch show up very white, this is not true of other roads, so is probably due to spillage, perhaps water runoff from the wet diatomite transported by lorry.

At the loch there is no open water in the main loch, although the smaller one may have. Extraction appears to have been carried out here and the access road shows up very clearly. The east shore of the main loch has a road alongside it and extraction appears to have taken place here, the road on the south shore seems only to have given access to the smaller loch. There do not appear to be any significant buildings here.

May 1960 Photographs

These photgraphs were taken at about the cessation of extraction.

At the cliff top there is one large building and three smaller round roofed ones. As far as the lower buildings are concerned, they are totally derelict, although the bridge to the fishing station is still intact.

At the loch, the water can be clearly seen, in contrast to the photogrpahs taken the previous year. This may be because by now extraction had ceased allowing the workings to flood. The east shore road has two, possibly three "piers" built out from it. They are situated opposite the road from the coast, half way along and possibly at the end. The first has something on it which could be a dragline excavator. It would, in any case, seem probable that this would have been the method of extraction. The only obviously visible building is the one at the road junction whose foundations still exist.

A few feet above the shore road there is what appears to be another path, which seems to have some rail track on it. This may have been used to trolley the diatomite dredged out from the loch

to the main road where it was loaded into lorries.
Over the course of these photographs, there has been some change to the shape of the main loch, in that the east shore has been straightened, the other significant areas of change have been the artificial channelling of some watercourses to drain the area, and the opening up of the second site of extraction. At no time does there appear to have been any substantial building on the loch site, and thus present remains are indicative of what was present during the whole of the final phase.
At the clifftop it is evident that during the final phase of extraction there was no involvement with the lower buildings. Whilst the clifftop buildings did become extensive, they are all on the site of the present roadstone quarry. Thus all trace has been obliterated.

Diatomite Deposits

Diatomite has been found at the following locations on Skye, although it has not necessarily been exploited commercially at all of them. All are in North Skye on the Trotternish Peninsula.

NG 380690	Loch Chaluim Chille
	Peat thickness 1-2ft
	Diatomite 5ft
NG 412692	Loch Sneosdal
NG 446672	Loch Cleat
	Small dried basin near Sartil, Digg
NG 515690	Loch Mealt
NG 475598	Loch Cuithir
	Covered some 24 acres near the base of the lava.
	Peat thickness 4ft
	Diatomite in excess of 14ft

Studies of the raphe of diatoms

translated by Maurice Moss from the original German by Kolbe.

Because it seemed to me to be of considerable importance in steering my thoughts about the structure of *Semiorbis hemicyclus* (see Moss *et al.*, 1978) I obtained and translated the paper of Kolbe (1956) "On the phylogeny of the raphe of diatoms: *Eunotia (Amphicampa) eruca* Ehr. I present the translation below hoping that it may still be of interest to students of diatoms fifty years later, although a great deal of study has been carried out since.

"Our understanding of the phylogeny of the diatom raphe is still limited. It is necessary to consider: the geologically oldest diatoms had no raphe and, in order to reach the level of development present in some recent groups, the raphe appears in some genera in almost perfect form.

The following problems are relevant to the study of the phylogeny of the raphe:-

1. What was the earliest shape of the raphe and from what structural elements of the frustule did it arise?

2. During which geological period did such a new structure arise? It is reasonable to suppose that the emergence of the raphe was not confined to a single group, but occurred in several taxonomic groups – possibly in different ways – and probably also at different times.

3. What are the stages in the further evolution of the raphe?

Hustedt, as early as 1926, considered that the development of the raphe proceeded from the relatively primitive structure of recent *Eunotia* species. He was concerned, however, only with the further development (Problem 3) and his studies, which particularly concerned the *Eunotia* raphe, did not extend further back.
An explanation of the genesis of the raphe (Problems 1 and 2) can only come from fossil material showing any precursors of the raphe structure. For us the availability of stable fossil material is limited and is not readily studied in relation to these questions. This is understandable if one considers the difficulty of this kind of fine structure; their position – often along the edge in the shadow of a strongly arched structure – is difficult to see even in optimal conditions.
Berg, researching the raphe of *Eunotia* and related genera, found a remarkable variation in the anatomy of the raphe in prequaternary forms. However the species studied by him already had a relatively complex raphe and could not be considered to be related to the earliest type. An important exception was *Licmophora baltica* and this species was believed by Berg to represent the earliest development of a raphe from a pore.
Eunotia (Amphicampa) eruca is a species peculiar to the Mexican tertiary; an old report of Brightwell (see De Toni, 1891 page 812) that it is in the present flora of Melbourne needs confirming because of possible confusion (with *Eunotia serpentina*?). The species was originally described as *Eunotia eruca* by Ehrenberg (1844) and later transferred by him to *Amphicampa*. Even Hustedt placed the species in Amphicampa on account of "the complete absence of terminal nodule and raphe". Although *Amphicampa eruca* is the species which my general knowledge of the literature suggests, Berg gives reasons for establishing homology with *Eunotia* in his most recent monograph of the genus.

Fig. 1—5. *Eunotia eruca* Ehr. Schalenenden.

On the one hand the species has the general characters indicative of *Eunotia* (outline, striae and pseudoraphe: Table 1, Fig. 1) on the other hand the alleged absence of the raphe and the early geological age stimulate further research. The supply of material is a problem; for the samples I used have been given away or disappeared. I finally succeeded in obtaining some material from Regla, Hidalgo, Mexico, embedded in styrax. This was only a last resort because, for the study of fine structure lying close to the periphery of a strongly curved frustule, it is better to use a medium with a low refractive index. For this investigation an Apochromat x90, na 1.40, and Periplan ocular x12 (Leitz) were used with a light source "Moula" lamp (low pressure

incandescent lamp 6V, 5amp), and a "Lucifer" lamp (incandescent 70W/220V) both Leitz.
Eunotia (Amphicampa) eruca Ehr. Was well represented in my material. The mean and limits of the sizes range within the following limits:-

Length 50 – 55 um (24 – 58 um)
Breadth (middle) 11 – 15 um
Striae (very fine punctae) 9 in 10 um (8 – 11)

Pseudoraphe always clearly discernible. In most specimens one can observe a clear short stroke, usually a faint bent raphe slit, at one or both ends of the frustule (see Figs 7 – 11). Very characteristic is the uncertainty of the presence of the raphe, for some individuals show a clear raphe at both ends, many at one end, and a few frustules are without a raphe. In these latter cases it is possible to see on the outer surface of the end of the frustule a number of irregular diffused fine punctae. Although one cannot discern the exact nature of these punctae without the help of the electron microscope, it is possible to describe them as 'terminal poroid field'. The punctae are of the same order of size as those making up the striae (Fig. 1). At the ends of some frustules one may see individual punctae, distinguished from the rest by their size and their clarity giving the impression of pores; usually two or three which are always associated with each other (Fig 2). Their position is such as to lead one to suppose that they represent the location of a future raphe.

In its typical form the raphe appears as a short, about 1.5 – 2 mm long with smooth edges (Fig. 5). The edge is occasionally irregular (Fig. 4) giving the impression that the raphe is made up from pores fusing together.

There is no doubt that the raphe is a genuine slit: by moving the fine adjustment of the microscope it is possible to follow the depth of the slit. First focusing on the surface of the frustule so that the striae are sharply in focus, by moving the fine adjustment down the raphe slit remains in focus after the striae have become unclear. Figs. 7 and 8 show microphotographs of the same specimen at too different levels of focus.

The observations suggest that in *Eunotia eruca* we see the beginning of the raphe in nascent form as it were. In a "terminal pore field" a group of poroids separate out, develop into true pores penetrating the shell and ultimately coalesce to form a short raphe. The fact that all stages of the development were available in the same material indicates that the evolution in *Eunotia eruca* is dynamic and not stabilised.

The evolution of the raphe in *Eunotia eruca* occurred in the tertiary; the age of the Mexican strata from which the material was obtained was between late and middle Miocene (see Ross 1951). In no case was a terminal nodule observed. In his work on the *Eunotia* raphe Hustedt writes (1926, page 149) that he considers "the raphe slit as the primary and the terminal nodule as the secondary part of the raphe". The above observations on *Eunotia eruca* support this.

Because of the demonstration of a raphe in *Eunotia eruca* it is established as a genuine *Eunotia* and must be removed from the dubious genus *Amphicampa*. As far as I can judge from the literature the only remaining species in *Amphicampa* is *A. hemicyclus* (Her.) Kast. The presence of a raphe has been detected for this species also by Proschkina-Lawrenko (1953). I have made a reexamination of *Eunotia (Amphicampa) hemicyclus* (Fig. 12) of which I have some good material and confirm the Russian author's findings.

All examples which I examined showed extremely fine curved terminal raphes which are very difficult to see. In Hyrax, because of the high refractive index, the edge of the frustule interferes. Better results were obtained with Clearax ($n_D = 1.66$) or a new medium "Aleurin" ($n_D = 1.677$).

In contrast to *Eunotia eruca* the raphe of *E. hemicyclus* is always fully developed and a stable feature, one never seeing examples with the raphe in different stages of development. There are

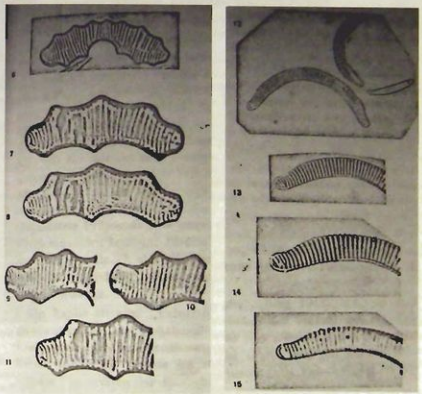


Fig. 6-11. Eunotia eruca Ehr. - 6: Ansicht der Schale, Vergr. 666:1 7: Schalensende, hohe Einstellung. Vergr. ca. 1340:1. - 8: Gleiches Exemplar, wie Fig. 7, tiefe Einstellung. Vergr. ca. 1340:1. - 9, 10, 11: Schalenden bei verschiedenen Exemplaren, Vergr. ca. 1340:1. Fig. 12-15. Eunotia hemicyclus (Ehr.) Ralfs. - 12: Ansicht der Schale. Vergr 666:1. - 13: Schalenende, Vergr. 1000:1. - 14. Gleiches Schalenende, starker vergrossert, hohe Einstellung, Vergr. ca. 1340:1. - 15. Gleiches Schalenende, tiefe Einstellung, Vergr. ca. 1340:1

no grounds for retaining this organism in *Amphicampa* and, according to the earlier suggestions of Proschkina-Lavrenko, should be placed in *Eunotia* in which genus it had already been deposited by Ralfs in 1861. The correct authorisation should thus be: *Eunotia hemicyclus* (Ehr.) Ralfs."

References

Kolbe, R. W. (1956). Zur Phylogenie des Raphe-Organs der Diatomeen: Eunotia (Amphicampa) eruca Ehr. *Botaniska Notiser* **109**, 91 – 97.
Moss, M.O., Gibbs, G., Gray, V. & Ross, R. (1978) The presence of a raphe in *Semiorbis hemicyclus* (Ehrenb.) R. Patr. *Bacillaria* **1**, 137 – 150.

The Amician Mystery Update

(Or the case of the missing Diatoms)

by Ron Green

When I wrote the 'Amician Mystery' I did realise that the article lacked any clear evidence that the 'Amician test' slides ever contained what I referred to as the 'Navicular X' diatoms. This lack of proof was of great concern to me for it could be said the whole article rested on the word of one person who may or may not be giving a true account of his observations. This from a scientific point of view is very unsatisfactory.

The above situation has now changed. Since publication of the article fate has presented me with an opportunity to purchase a slide of the Topping 'Amician test' which, I am now pleased to say, is in my possession. Unfortunately though, my pleasure is tempered by the fact that the cover glass is cracked and as we all know a broken cover glass tends to cause diatoms to disintegrate if they are not embedded in a medium, and the Topping 'Amician test' is certainly not. So I just hoped against hope a few remained in a suitable condition for viewing, identification and possibly even photography.

If you read my previous article you may have wondered how in the name of Sherlock Holmes did I know the Wheeler slide I purchased in 2004 was a 'forgery', and not from Topping's original source material. Well the answer is elementary my dear Watson. The Topping 'Amician test' slide was a strew slide which included a fair amount of debris, in fact the material looked like it had been dredged from the bottom of a local pond and deposited on the slide without being cleaned, and each Topping 'Amician test' slide I have seen has been the same, also the Wheeler slide I saw in the early 1990's was identical in this respect to the Topping slides. Now when I examined my Wheeler purchase of 2004, not only were the 'Navicular X' diatoms missing from the slide (as I stated in the original article) but also the mount contained no debris - it was far too clean. So case proven, I think, Watson, (I wonder if I should have put & Son on the end).

With anticipation and no small amount of trepidation I put the Topping test slide on the stage of my Vikon Microscope (a microscope that has been constructed from standard elements to suit my own purpose and preferences). Selecting a power of 200x I began to scan the slide. My first view was a scene of utter devastation with disintegrated diatoms everywhere but slowly I began to find my way around the slide and then I noticed, where the original debris was thickest, some of the diatoms had survived. Changing the power to 400x I was pleased to have appear before my eyes the 'Navicular X' diatoms, which I had first seen as a boy at the tender age of ten, some sixty years ago. Although requiring positive identification with a higher power, I was in no doubt. What a quandary I dare not use oil or water due to the cracked cover glass so once again, as in the early 1990's, I was restricted to a 60x dry 3 mm apochromatic objective of 0.95 n.a. aperture, but this time a far superior objective by Zeiss.

After adjusting the 3 mm objective's correction collar I was able confirm they were the 'Navicular X' diatoms which every genuine 'Amician' test slide I have ever seen includes. Subsequently finding more and more relatively intact 'Navicular X' diatoms I chose one which offered the best chance of resolving, so after first ensuring the microscope was correctly set up I did achieve black punctae resolution.

With my Topping slide and the other four genuine 'Amician test' slides I have seen in the past, I am now more than ever convinced that my original suggestion is correct that the 'Navicular X' diatom was Topping's 'Amician test', also when Mr. Lobb in 1865/6 was describing how to resolve the 'Amician test' he was in fact referring to the 'Navicular X' diatom not Navicula

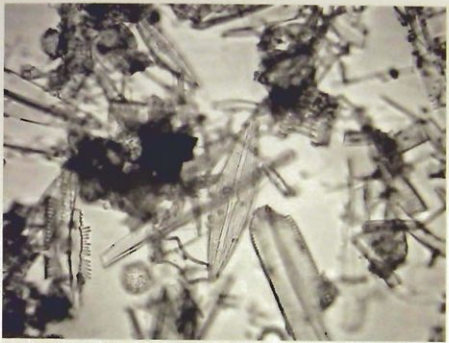


Photo 1 Topping's Amician Slide Showing Navicular X Diatom

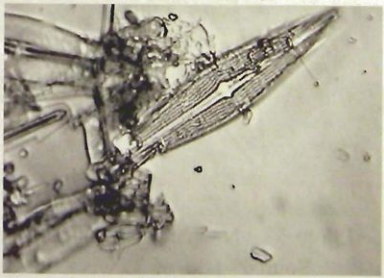


Photo 2 Topping's Amician Slide Showing Navicular X Diatom

rhomboides. Further, as I suggested in my original article, I believe the given name 'Amician test'* was purely for commercial reasons, used to attract dilettanti microscopists thus promoting Topping's business.

Within the said conditions imposed by the broken cover glass I have attempted to photograph a couple of 'Navicular X' diatoms found on the Topping slide (Fig 1 & 2), unfortunately my photographs leave a lot to be desired due to the small camera image size and low pixel count, therefore please forgive their poor quality, For comparison I have also photographed a 'Navicular X' diatom from the Isle of Lewis source, under the same conditions(Fig 3).

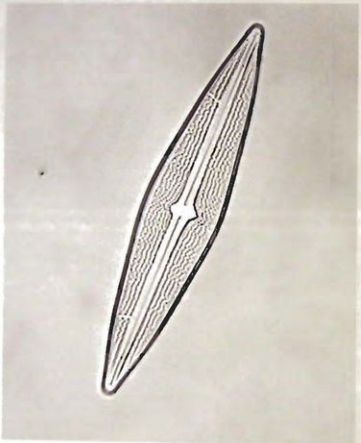


Photo 3 Navicular X Diatom
Source - Isle of Lewis

I am also able to offer interested Microscopists the opportunity to view the Topping slide at some future meeting/venue, also other relevant slides which confirm the truth of my observations. As a matter of interest it has been suggested what I refer to as 'Navicular X' diatoms are in fact *Navicula serians*, but unfortunately, as of yet, no photographic proofs have been supplied.

blue.leader@btinternet.com

Ron Green, Rotherham, England. 4th June 2006

*Not to be confused with the 'Amici test'. I believe Toppings 'Amician test' as said was only loosely related by name to the 'Amici test' in order to claim respectability by association, further as far as I know there are no 'Amici test' slides extant or least none have surfaced to date, therefore at this time no comparative discussion can take place

Some Thoughts on Amici's Test

(and some identification of two diatoms)

by Steve Gill, with photographs by Stephen Nagy, and a slide by Klaus D. Kemp

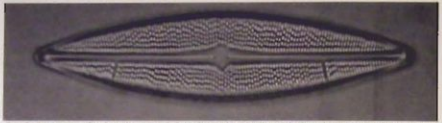
The articles on the Amician Test slide by Ron Green (The Amician Mystery - Amateur Diatomist Vol.III No. III pp. 31-39 & this issue pp 50-53) together with the historical content of the article by Barry Ellam (Amici's Test - Amateur Diatomist Vol. III. No. III pp. 45-49) have motivated a number of us to identify the species Ron Green is looking at and also to consider what Amici's Test might actually have been.

The species Ron has focused on is, we are sure, *Brachysira serians*. The non-taxonomist reader of the previous articles will now, no doubt, throw up their hands in horror. This species used to be known as *Navicula serians*.

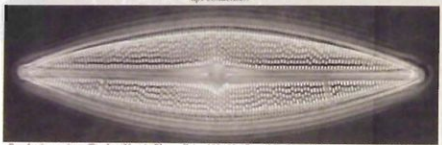
Some trawling through various publications (but mostly via Klaus Kemp's Database) a number of images are available for comparison. A trawl of the web exposes many photographs of this species. Stephen Nagy has provided two photographs for us which you can compare with those of Ron Green. It is, without doubt, the same species.

Arthur Scott Donkin 1871 - Plate 6/Figure 10 Brachysira serians (Ehrenberg) Round & Mann

Patrick & Reimer 1966, France/UK. Plate 33/Figure 1 Brachysira serians (Ehrenberg) Round & Mann



Brachysira serians (Stephen Nagy) Brightfield. Zeiss 100x Neofluar 1.3 phase 3 objective with a 1.4 Achr-apl condenser.

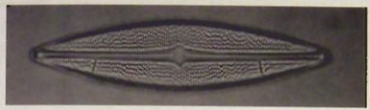


Brachysira serians (Stephen Nagy) Phase. Zeiss 100x Neofluar 1.3 phase 3 objective with a 1.4 Achr-apl condenser.

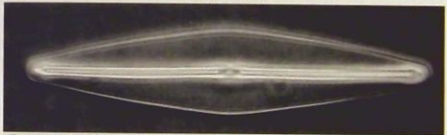
Arthur Scott Donkin 1871 Plate 6/Figure 11 Frustulia rhomboides (Ehr) De Toni

Patrick & Reimer 1966 U.K. Plate 21/Figure 5 Frustulia rhomboides (Ehr) De Toni

Adolf Schmidt - Atlas der Diatomaceenkunde - Finland Tittesee
Plate 396/Figure 1-2 [Recent FreshWater] Frustulia rhomboides (Ehr) De Toni



Frustulia rhomboides (Stephen Nagy) Brightfield. Zeiss 100x Neofluar 1.3 phase 3 objective with a 1.4 Achr-apl condenser.



Frustulia rhomboides (Stephen Nagy) Phase. Zeiss 100x Neofluar 1.3 phase 3 objective with a 1.4 Achr-apl condenser.

Summary of Species

Brachysira serians (Brebisson ex. Kutzing) Round & Mann

Synonyms:

Navicula lineolata Ehrenberg 1843
Navicula serians Brebisson ex. Kutzing 1844
Anomoeoneis serians (Brebisson ex Kutzing) Cleve var *serians* (Brebisson ex Kutzing) Cleve
Anomoeoneis serians (Brebisson ex. Kutzing) Cleve 1895

Morphology:

Length: 50um - 100um
Breadth: 12um - 18um

Description:

Valve is rhombic-lanceolate with convex sides and acute extremities. Striae are slightly radiate, crossed by longitudinal undulating lines (9-12 in 10um), forming puncta. Striae count is 19-21 in 10um. Axial area is narrow and linear-lanceolate. Raphe is straight and filiform. Central area is symmetrical, ovoid to somewhat elliptical.

Description from Donkin 1872 *(Navicula serians)*:

Valve rhomboid-lanceolate, with subacute extremeties; striae transverse, fine, granular, about 60 in .001", shortened opposite the central nodule. Colour of dry valve brown. The "longitudinal striae", as they are termed in this species appear to be produced by plicear or folds on the surface of the valve. Habitat - freshwater in boggy pools in elevated, exposed, or subalpine localities.

Frustulia rhomboides (Ehrenberg) De Toni var. *rhomboides* (Ehrenberg) De Toni
Synonym(s):

Navicula rhomboides Ehrenberg

Morphology:

Length: 40-160 um
Breadth: 12-30 um
Striae density: 20-40 /10um
Shape in valve view: Elliptical or elongated
Transapical symmetry: Isopolar
Apical symmetry: Isobilateral
Raphe, position: Midline of valve face

Description from Donkin 1872:

Valve rhomboid-lanceolate, nearly quadrangular, extremeties slightly obtuse, or rounded; striae fine, indistinct, 85 in .001", transverse, reaching to the median line. Habitat - Freshwater - frequent, especially in boggy pools in subalpine localities.

It is evident from the above descriptions of habitat that the two species are found in the same environments and, indeed, it has been our experience that they are invariably found, one with the other in natural environments.

Bearing this latter observation in mind we come to the question of The Amician Test.

As may be gleaned from Barry Ellam's article many authorities have conjectured on the identity of the diatom purportedly represented as the Amician test. However, Ron Green has observed that "genuine' Amician test' objects are simply strews of a number of species from a particular location type, that contains the Amician test object.

Is it not then conceivable, particularly when two such striking species are inolved, with overlapping striae counts, that the Amician Test is **not a single species but a range of species** found in Freshwater samples from boggy pools in subalpine localities.

This proposal would go some considerable way to solving the puzzle, if puzzle it really was. I use the past tense purposely - in the first instance there was no puzzle.

Nonetheless, there still remains the enigma of *Navicula amicii* from the Jacob Whitman Bailey Collection. Perhaps one day we'll know what it is!

Free Slide

The free slide accompanying this issue was supplied by Klaus Kemp. The strew contains both species mentioned and will facilitate the inspection of both and hopefully the resolution of at least one.

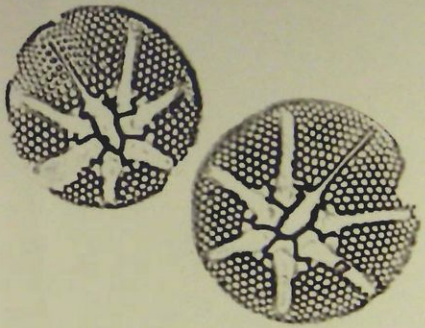
We are very much indebted to Klaus for his generosity and hope that readers will visit his website and order something from him.

Giovanni Battista Amici

Born: **25th March 1786**
Modena, Italy
Died: **10th April 1863**
Florence, Italy

The next issue of

The Amateur Diatomist



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