

The Amateur Diatomist

Volume 5 Part III.

Editorial
New Download - The Diatom
Flora of Nuneaton and some
Outlying Districts
Dr. LeGear's Worm Powder
Cleaning Diatoms
Oamaru - Section A. Locations
Diatoms in Colour
Field Microscopes X – The
Diagnostic
Extracts from a Diatomist's
Notebook (II)
Diatom Locomotion explained?



*Eric Grenville Drake Collection - Sample ACS - Stagnant
ditch near Old Mill, Salisbury (Wednesday 18th September
1968) ©Steve Edgar 2013*

Editorial

The editors have been rather busy of late with various projects and hence the issue of a new number has been delayed considerably.

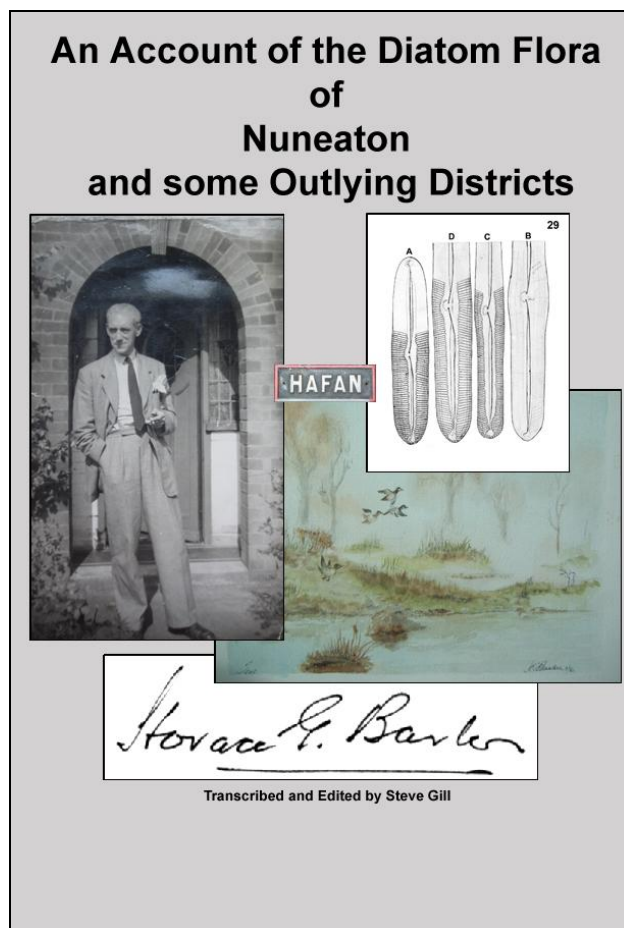
Material for publication is hard to come by so anyone wishing to add their 'two-penneth' is more than welcome to submit something.

One of the projects that has occupied one of the editors for a considerable time is Horace Barber's 'Account of the Diatom Flora of Nuneaton and some Outlying Districts'. This project is now complete and a brief summary of the end product appears below.

The account of Diatom Locomotion is a revelation and we can't understand why this approach hasn't been mooted previously.

We continue to get complimentary emails in regard to our efforts and these we appreciate greatly (modesty forbids the publishing of these). However, if you don't like something or want to point out the error of our ways then please do so. We would also particularly like to hear from anyone experimenting with 'staining' of diatom frustules to increase contrast and, perhaps, thereby eliminating the need for high R.I. mountants. This is a call to all you chemists out there - there must be something that will bond to/stain silica!

New Download



This volume is a transcription of the work and plates of Horace Barber in relation to collections made around his home town. It includes numerous plates and additional sketches as well as notes by himself and additions by John Carter.

It is not a taxonomic guide to diatoms but amply illustrates the mechanisms and thought processes of this enthusiastic and capable amateur diatomist.

The volume above is now available in the Downloads section of this site.

Review.

British diatomists may well be familiar with the work of Horace Barber, since his excellent drawings are the mainstay of two important publications for those wanting to identify diatoms here in the UK. One is the short but very useful 'A guide to the morphology of the diatom frustule' first published by FBA in 1981 which includes a key. The other is the very comprehensive 'An Atlas of British Diatoms' published by Biopress in 1996. The simplicity but excellence of the illustrations is evidence of the artistry of Barber, but very few of us have much of an insight into the life of the man. The publication under review does just that. Principally, it is a transcription of a document that Barber wrote over a period of time, detailing the diatom flora of the Nuneaton area where he lived.

The original text of Barber has been transcribed, and the plates scanned and included in the A4 size pdf document at a very generous size. I have the advantage over most readers in having had a view of the originals, and it is quite evident that the scanning process and associated software has been used to good effect to enhance the plates, often improving the contrast and overall clarity.

Another enhancement is the inclusion of full details of the locations mentioned, with Northings and Eastings given in addition to site photographs. For those able, it means that these sites can be visited and sampled, which is a bonus, albeit that some are now garden centres or parts of the M42!. This up to date information is added as editor's notes. A useful map shows each site in relation to the others.

Each plate is accompanied by the transcribed text of Barber, with additional notes as needed. This includes size ranges and locations. Their usefulness is increased by the indexing of this and the ability to easily search for particular species. The plates themselves are very good, which many will know as the hallmark of Barber. He certainly had great skill in depicting what are quite complicated features, giving a sense with many that less is more. Birdwatchers use the term 'jizz' to encapsulate the essence of a bird, and in a similar way the plates of Barber do this for diatoms.

The appendices contain much useful content. The first is a set of species lists for each locality, with plate numbers that depict them. Similarly, the next appendix is an alphabetical list of diatom species. There is also some additional information about the life of the man, with some further examples of his artistry, including watercolours, oils and pottery. A full bibliography and a glossary of terms complete the work.

All in all, this is a fine production of the work of a great expert, and we are lucky that it has been made available by those left behind, and certainly by the efforts of the editor in putting it in our hands so easily. Heartily recommended.

Mike Samworth

Dr. LeGear's Worm Powders

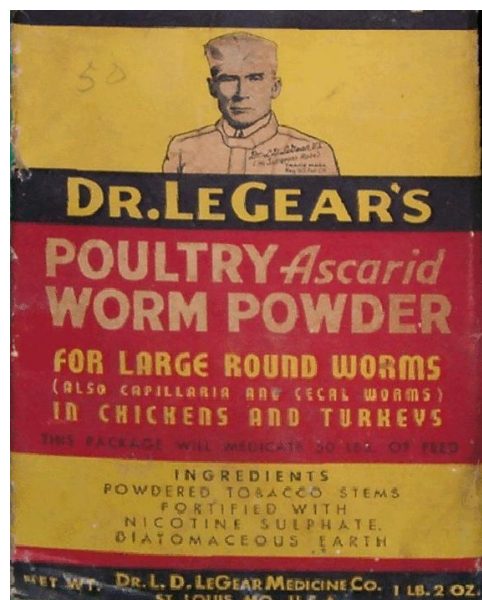
Uses of Diatomite

The subject in this issue is Dr. LeGear's Poultry Powders.

The Dr. L. D. LeGear Medicine Co. produced a range of Veterinary medicines in the early years of the last century, and indeed continued in one guise or another up until the present day.



The powders of interest to diatomists are the worm (and lice) powders that contain diatomaceous earth. The earth in these case was undoubtedly calcined and milled, but to what degree in the early samples is unknown.



Louis D. LeGear was born circa 1869 in Canada and graduated from Ontario Veterinary College in 1892. His brother Newton G. LeGear graduated from the same institution in 1896. Many advertisements for the products of the company appeared in the press in the period after the First World War.

Make your hens moult quickly



Get more winter eggs

The moult is a severe test of a hens strength. It calls on her to supply all her surplus energy and flesh to make feathers. Hens must have a tonic during this critical period, to supply them with more energy, and help them to digest and use every ounce of the feed. Make your hens moult properly this year, by giving them

Dr. LeGear's Poultry Prescription
(Powder)

in their feed. This prescription, compounded from my 27 years veterinary and poultry raising practice, absolutely cuts down the time and strain required for moulting, keeps hens in strong, vigorous condition and insures your getting more winter eggs from your hens. Don't lose profits from high winter egg prices by neglecting your hens during the moult. Try this famous remedy, recommended by thousands. I guarantee that it will help make your hens lay more eggs.

Dr. LeGear's Stock
Powders,
produce perfect diges-
tion, drive out worms,
increase growth and
production.

Dr. LeGear's Antiseptic
Healing Powder,
cleanses, dries and heals
sores and cuts quickly,
easy to use, in either wet
form.

Dr. LeGear's
Lice Killer
(powder) kills your
flock quickly of
lice, protects
chicks, etc.

Money Refunded
Through my dealer, if any remedy bearing my
name fails to do what I claim for it. Ask your
dealer for a package refund. Sold by all good
dealers—order by post.

Dr. L. D. LeGear Medicine Co.
767 Howard Street, St. Louis, Mo.

Get Valuable New Book.
Just completed, "The Care and Treatment of Stock and Poultry," by Dr. L. D. LeGear, graduate Veterinary Surgeon, of 27 years practice. A wonderful help to all stock and poultry raisers. It is a 120-page book, full of valuable up-to-the-minute information. Used as a reference book by veterinary surgeons and schools. It will save you many, many times its cost. Send 5c to us today and we will mail it to you, postage prepaid.

Care and Treatment of Stock and Poultry

Dr. LeGear's Poultry Prescription



Pacific Rural Press, Volume XCVIII, Number 12, 20 September 1919

Flyers listed many of their products...

DR. LEGEAR'S STOCK AND POULTRY REMEDIES

Are the best and most complete line of medicines made for the curing of diseases of all Live Stock and Poultry. Try them. None better made.

Below is a list of Dr. LeGear's Remedies which are sold by all Druggists and dealers in patent medicine everywhere

- | | |
|--------------|-----------------------------|
| Dr. LeGear's | Liniment |
| " | " Gall Cure |
| " | " Colic Cure |
| " | " Hoof Oil |
| " | " Spavin Cure |
| " | " Eye Water |
| " | " Stock Powders |
| " | " Poultry Powder |
| " | " Worm Remedy |
| " | " Screw Worm Killer |
| " | " Powdered Lice Killer |
| " | " Dip and Disinfectant |
| " | " Antiseptic Healing Powder |

MANUFACTURED ONLY BY

DR. L. D. LEGEAR MEDICINE CO.
ST. LOUIS, MO.

...and a slightly risqué card exists but it is thought that this was produced by a third party intermediary wholesaler. (You have to guess at what's behind the masking paper!)



Worm powders containing 'food grade' diatomaceous earth are still widely on sale.

Old Papers Revisited - Cleaning Diatoms

Extracted from Transactions of the American Microscopical Society Vol. 32, No. 1, Jan., 1913

AMERICAN MICROSCOPICAL SOCIETY

73

CLEANING DIATOMS

Blake (Am. Jour. Sci. Jan. 1913) calls attention to the interest in cleaning, mounting, and study of diatoms. After recounting the difficulties attendant on the usual methods he describes a method originated by himself some twenty years ago.

Instead of the older method of treating with acid, diluting with water, and repeated decanting, the author devises an organic sieve made by cementing a thin cross-section of some coniferous wood to a small glass vial whose bottom has been cut off for the purpose. The wood is cut about one-quarter millimeter in thickness, from a suitable piece of wood kept until the operation in boiling water. This is done by means of a sharp, thin-edged chisel.

The operation of cleaning the diatoms consists of placing the digested diatom material, moderately diluted, in the vial, and by means of a suitable rubber compression bulb, alternately pressed and released, of forcing the acids and salts thru the sieve, and the clay and fine sand thru or into its pores. These diatoms which are longer than the diameter of the pores will remain behind with larger grains of sand which must be removed in some other way.

74

NOTES, REVIEWS, ETC.

It is necessary to see that the strainer does not become choked. This may be prevented by shaking. The strainer should, of course, be kept in water between uses. When it finally becomes clogged with sand, a new one must be put on.

By using wood with different sized conducting vessels, a sorting of the diatoms may be affected. By using pine, spruce, white wood of the red cedar, a graded series of strainers can be had, the last being much finer than the first.

This is an interesting 'take' on sieving diatoms. It is not a procedure that any of the editors have experimented with as we have a set of wire-mesh and nylon-mesh sieves.

Oamaru (Section A - Locations)

A collection of notes from Steve Gill

Oamaru, Otago Province, New Zealand

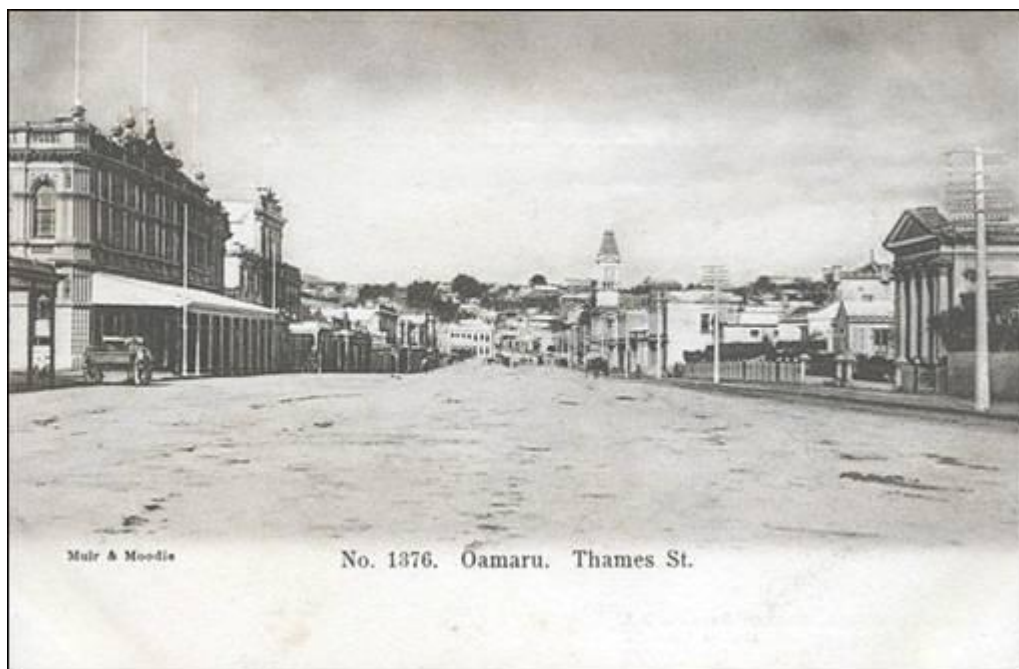
Def: Oamaru:

O=food (especially sacred); *a*=of; *Maru*, a war-deity of the Maoris. Sacred food set apart as an offering to the god Maru. Should not be pronounced Ommaroo, as is the common way, but each vowel should be given its full value. (def: 1936). Also The place of Maru (def: 1966). Also O - the, and Amaru - the tree.

Def: Otago:

Otago is generally accepted as being a corruption of the Maori O-Takou, which means the red earth (ochre) referring to the red clay used by the Maoris to paint their houses and canoes.

To diatomists the name Oamaru conjures up visions of a series of farmsteads and hills, riven by gullies and creeks with the odd farm dwelling in a landscape otherwise devoid of human influence. Oamaru is, and was, during the years of diatomite (diatomaceous earth [DE is the abbreviation used in industry]) discovery, a township and no diatomite is actually known from there. The diatomite outcroppings all occur in the hinterland, where the above description is appropriate, but they are now closer to smaller conurbations than to Oamaru itself. However, in the early days of the collectors the only major settlement in the vicinity was Oamaru.



The entire document comprises three sections:

- A.** Sites/Locations
- B.** Landowners/Source Names
- C.** Diatomists and Diatomite Collectors

Each deals (or attempts to deal) with the specific categories. However, there is substantial crossover between sections where references to sites and locations include names of individuals (landowners, diatomists and collectors), references to landowners by virtue of the site name being named for them has links to the sites section and lastly diatomists and collectors may be linked with any elements of the other sections.

This is a working document reflecting the current state of my research notes.

Section A: LOCATIONS.

The "Oamaru" startled the world long ago because of the writings of Grove and Sturt. Having had some correspondence, I thought later notes might be of value since the names and localities written then might have varied or been lost. Mr. L.D.Coombs, A.R.I.B.A., most kindly came to our aid. He is an experienced and fine worker in this group. "In the eighties of the last century when the deposits were discovered, some enthusiasm was shown and a few pioneers made a very careful search of the country and found practically all the outcrops. The names they gave to these were generally those of the farmers on whose land the deposits were found. Well, that was over fifty years ago and in the meantime two things happened. First: The first wave of enthusiasm passed, nobody else took up the hobby. Second: The farmers died or moved away. Hence, although a few people would know about the deposits in a general way, though names of places lost their application the actual places became unknown except to diatomists who might read the names in books. In early days many samples must have been sent to England elsewhere. Later, when more samples were asked for, nobody at Oamaru - or very few - knew what was really meant; and I am told all sorts of material was sent, very little of which contained diatoms.

*From The Diatoms of New Zealand by Vida Annette Latham (c1944)
published as Diatom Notes No. 9. by The State Microscopical Society of Illinois.
Topographical details of some of these are given by Doig (1962, 1967)
Stratigraphical details in The Oamaru Diatomite by Edwards (1991)*

The year in braces { } are the records noticed for the location. (excluding later 20th /21st Century references)

It is probable that the locations described as synonymous with are, in reality, discreet collecting points within a specific area, or in some cases the same collection location whose description is based on land ownership where such ownership has changed over time.

1. Allan's Farm, Oamaru {1888 Lautour, 1915 - Diatomees du Monde Entier - Tempere et Peragallo, Meakin Collection - Sample 1202}

Now in the possession of Bob and Nancy Allan

Deposit located in the middle of a sheep field approximately 3 minutes walk from the house.

In 1888 in the possession of H. Allan.

450 5' 57.99" S 1700 53' 58.82" E

1a. Allen's Farm (Synonymous with Allan's Farm) {1888 - Latour}

Alternative spelling

1b. Allan's Rock {Meakin Collection - Sample 1363}

Name found on sample tubes (469, 471, 472, 476) in the Schulze Collection

A number of distinct beds of diatomaceous earth have been identified in the stratigraphic column (Doig, 1967).

The bed has been allocated a zone based on the predominant genus found in the bed.

The table below (from Doig, 1967) enumerates the beds, as known at that juncture. (see notes on Arthur John Doig in Section C).

Location Name: Allan's Farm			
Acronym/Bed	Old Name	Zone	Notes
AF/1	-	Stephanopyxis	
AF/3	Allan's	Stephanopyxis	

2. Atkinson's (Farm) {1888 - Lautour}

Possibly the same as Cave Valley - Atkinson's Road ran along this feature (now renamed Cormacks Road)

De Lautour's map (1888) shows Atkinsons as being on the opposite side of the road from Cormacks and at approximately the same distance west of Weston. The location may not have been Cave Valley as such but a northern continuation of the exposure at Allan's.

3. Bain's (Farm) {1887 - Hutton, 1888 - Lautour, 1889 - Tempere et Peragallo, Edwards 1960}

Records also exist relating to Bain's Top (is this synonymous with Bain's Upper?)

3a. Bain's Upper

Described by Lautour (1888) as Calcareous Diatomaceous ooze. Similar to Jackson's.

3b. Bain's Middle

Described by Lautour (1888) as Non-calcareous Diatomaceous ooze. Similar to Cormack's.

3c. Bain's Lower {L. D. Coombs, Meakin Collection - Sample 447, 1365}

Described by Lautour (1888) as Non-calcareous Diatomaceous ooze. Similar to Cormack's.

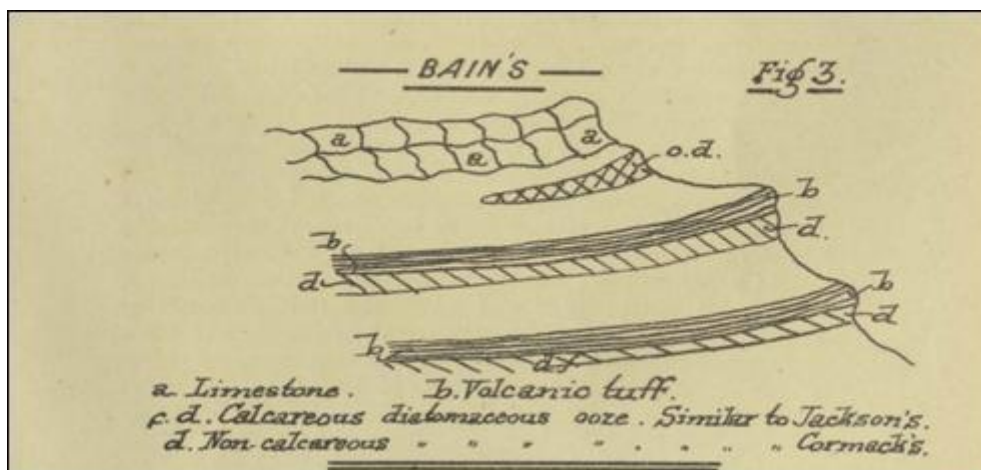
Records also exist referring to Bain's Totara.

Arthur J. Doig also collected from somewhere called Bain's Totara - 450 07' S, 1700 56' E which is south-west of Oamaru and not near Bain's at all!

Totara sample collected by W.F. Reeve circa 1950 - 450 07' S, 1700 56' E which is the same location as Arthur J. Doig's Bain's Totara sample!

Are these co-ordinates simply rounded figures as there are no seconds recorded.

As there are so many Totara locations Bain's Totara is believed to be a way of confirming the site location.



Lautour (1888)

450 6' 4.56" S 1700 53' 15.06" E This location appears to be a thick band.

A number of distinct beds of diatomaceous earth have been identified in the stratigraphic column (Doig, 1967).

The bed has been allocated a zone based on the predominant genus found in the bed.

The table below (from Doig, 1967) enumerates the beds, as known at that juncture. (see notes on Arthur John Doig in Section C).

Location Name: Bain's and Totatra

Locality No.	Old Name	Beds Exposed (1967)	Notes
1	-	BN/1-BN/7	Middle part of northern step (Grid Ref. 474:660)
2	-	BN/6-BN/7	North end of Western step (Grid Ref. 472:659)
3	Bain's	BN/6-BN/9	Middle part of Western step (Grid Ref. 472:657)
4	Totara	BN/4-BN/5	Southern end of flat area between the three steps (Grid Ref. 475:656)
Acronym/Bed(Locality)	Old Name	Zone	Notes
BN/3(1)	-	Stephanopyxis	
BN/5(4)	Totara	Stephanopyxis	
BN/7(1)	-	Stephanopyxis	
BN/7(3)	Bain's Upper Deposits	Stephanopyxis	
BN/9(3)	Bain's Lower Deposit	Stephanopyxis	

4. Big Flume Creek (Synonymous with Borrie's [Farm], Flume Creek, Flume Gully, Frew's [Gully], Hurst's [Farm], Papakaio)

5. Bill's Bluff (Synonymous with William's Bluff) { Arthur J. Doig }

6. Borries (Synonymous with Big Flume Creek, Borrie's [Farm], Flume Creek, Flume Gully, Frew's [Gully], Hurst's [Farm], Papakaio) { 1889 - Tempere et Peragallo, Meakin Collection - Sample 462 (ex-Tempere), 463 (ex-Tempere) }

The following evidence was given at the hearing of the Ardgowan case on Tuesday :

Donald Borrie deposed that he lived at Papakaio, where he had been farming for over 30 years. He farmed about 2200 acres there, and was interested in another 950 acres in South Canterbury. The 2200 acres included 950 acres of freehold and 1260 acres of leasehold. He carried on general farming. He cultivated from 500 to 800 acres a year. The bulk of the farm was on the Waitaki Plains, but he had 200 or 300 acres on the hill. His place was two and a half miles as the crow flies from Ardgowan, Mr Gilchrist's property coming in between. He had land which was very much poorer than any on Ardgowan, but he had land also which was superior to any on Ardgowan.

North Otago Times, Volume XXXVII, Issue 8278, 5 September 1895

7. Breen's (Farm) (Synonymous with Old Stone Quarry and Capsize Stone Quarry)

100 yds south of Old Stone Quarry

Doig (1967) includes this location in the Capsize Stone Quarry deposit.

8. Capsize Stone Quarry (Synonymous with Breen's Farm and Old Stone Quarry) {1918 - Park}

8a. Capsize Quarry

8b. Cape Size {CAS Diatom Collection Acc. No. 612443 - York T. Mandra}

Should be Capsize Quarry

A number of distinct beds of diatomaceous earth have been identified in the stratigraphic column (Doig, 1967).

The bed has been allocated a zone based on the predominant genus found in the bed.

The table below (from Doig, 1967) enumerates the beds, as known at that juncture. (see notes on Arthur John Doig in Section C).

Location Name: Capsize Stone Quarry			
Acronym/Bed	Old Name	Zone	Notes
CQ/2	Old Stone Quarry	Coscinodiscus	
CQ/4	Breen's	Coscinodiscus	

9. Cave Valley (possibly the same as Cormack's) {1874 - H. R. Webb, 1886, 1888 - Lautour}

Possibly referring to THE WAIAREKA VALLEY

I have been intrigued at the use of the word Te Ana raki by members of the Preservation Society since the commencement of the initial hearings process. From my research, the words Te Ana raki pertains to no more than a large piece of limestone rock broken from the cliff at the top of the hill at the western end near Enfield. The rock itself was situated at the bottom of the hill at the junction with Coal Pit Road and contained a dry cave in which early travellers sheltered. Thus Te Ana raki means dry cave . Eventually it was sawn into limestone blocks and used for the construction of the Windsor Park Homestead and so now no longer exists.

Cave Valley is referenced many times as the site of numerous houses and also of Anderson's Quarry.

The North Otago Times states that the discovery of an interesting deposit of diatomaceous earth in the Cave Valley district has given quite an impetus to microscopical study in Oamaru. Diatoms are the most interesting subjects, we believe, that come under the microscope, the forms being of the most perfect and beautiful character. With the naked eye nothing can be noticed but a substance resembling dust, but under the microscopic eye there are brought into view a number of objects of all conceivable shapes and forms of beauty. Dr de Latour has taken a good deal of interest in the collection of diatoms, and has in his possession, mounted on glass, a great variety of all the most interesting specimens. We may mention that the earth at Cave Valley contains a greater variety of specimens of diatoms than does the earth of any of the Old World countries, and on this account there is a great demand for it even in Europe, to which place a quantity of it has been sent.

North Otago Times, Volume XXIII, Issue 6630, 1 May 1888

Otago Daily Times, Issue 8184, 16 May 1888



*1861 Topographical Sketch of Oamaru District (LINZ, Dunedin) [Part of S.O. 1302]
Showing the Cave Valley (Waiareka Valley).*

10. Cormack's (Cormacks) {Meakin Collection - Sample 735 S.W. Corner, 1153, 1154}

From - Wises Index to Every Place in NZ, 1912

CORMACK'S, Otago. A railway siding five miles from Oamaru, one mile from Weston. On the Oamaru-Tokarahi line. Weston is the nearest post office. Named after a paymaster on the railway. Farming district.

This is possibly one John Cormack who was in the employ of Messrs. M. D. Morrison and Co. who were railway line contractors - circa 1876.

10a. Cormack's Crossing {Arthur J. Doig}

WANTED, TENDERS FOR
CARRING WHEAT to Cormack's
 Crossing, within a few hundred yards of the
 Whitstone Property. Also Tenders for Cart-
 ing into Oamaru. Apply
J. MACLENNAN,
 Whitstone.
 ap24

North Otago Times, Volume XXVI, Issue 1871, 25 April 1878

THURSDAY, 10TH JULY.

On the Premises, Cave Valley.

At 12 o'clock.

A. H. M A U D E
has received instructions from Messrs Grainger and Sons, to sell by public auction, at above time and place—The Goodwill of

LEASE OF EDUCATIONAL RESERVE,
being part of 2 of Section 23, Block 3,
Oamaru District, situated near
Cormack's Crossing, on Ngapara
Railway, containing 38 acres 2 roods,
with about 9 years to run, at a
very low rent.

This Property has a five-roomed dwelling-house, dairy, store-room, pigsties, and other improvements thereon. There is a live fence round the farm, which is sub-divided into 4 paddocks. 14 acres are in English grass, and the balance is ready for a crop.

Also,

H I S S T O C K,

As under :

2 Thoroughbred Geldings

1 do Filly

2 Farm Geldings

Chaff-cutter and Horse-power complete

Corn Crusher

2 Drays

1 Reaper

1 Double-furrow Plough

Spring Cart and Harness

1 Stone Truck

1 Churn

600 Bags Oaten Chaff; about 3 Bushels

Garden Peas

1 Yearling Bull; about 100 Fowls,

&c., &c.

A. H. MAUDE,

Auctioneer.

4j

10b. Cormack's Extension {1877 - McKay}

10c. Cormack's Farm

See advertisements below for Cormack's Siding

10d. Cormack's Siding(s) {1874 - H. R. Webb, 1877 - McKay, 1888 - Forrester, Meakin Collection - Sample 478 (ex-H.R.S.Williams, 852, 1368)}

BRUCE CHRISTIE AND CO.
PRELIMINARY NOTICE
THURSDAY, 10TH SEPTEMBER.
At the Farm House, Cormack's Siding,
CLEARING SALE
OF
IMPLEMENTS,
HORSES, CATTLE,
Etc., Etc.
BRUCE CHRISTIE & CO.
have received instructions from
Mr James Carson (who has sold his farm) to
sell by public auction at the above time and
place—

North Otago Times, Volume XXXV, Issue 7230, 2 September 1891

**THE NEW ZEALAND LOAN AND
MERCANTILE AGENCY COM-
PANY (LIMITED), have been favored with
instructions from Mr Thomas Meek to offer
for sale by public auction as above—**

**That well-known Farm at Waiareka
(near **Cormack's Siding**) consisting
of 80 acres, and at present in the
occupation of Mr J. J. Young.**

**There is a Good Four-roomed House on
the Farm as well as a good Stable and all
necessary Outbuildings.**

**The Farm is divided into Five Paddocks,
and has a Permanent Water Supply.**

**The auctioneers have pleasure in calling
special attention to this Farm, it being
within easy distance of Oamaru and close
to Railway and Dairy Factory.**

North Otago Times, Volume XXVI, Issue 9753, 4 May 1900

A rail line - now removed and all evidence of diatomite outcroppings obliterated.

The Weston operations were formerly operated by Taylor's Limeworks, a subsidiary of Holcim. Taylor's Limeworks consolidated their operations at Makareao (Dunback) in 1990 with the opening of a new plant there. The limeworks at Weston were then sold to Parkside Quarries Ltd, who continue to mine lime and Oamaru stone at two sites. If the Weston Cement Works development goes ahead, new lime/tuff quarries will be established at the western edge of Parkside's operations. The cement works will be on land immediately west of the old Taylor's works at Cormacks.

See also Taylor's Quarry below.

From southward-facing points at Waiareka Junction (placed thus to eliminate an impossibly sharp and steep curve had they faced Oamaru-wards) the line proceeds for barely two miles on a climb of 1 in 111 to Weston. Weston, known for its Oamaru stone quarry, could be called a 'dormitory area' with respect to Oamaru. The present terminus of the line (since 1959) is at Cormacks the site of Taylors' Lime Works. The original Cormacks loop was situated 300 yards on the Weston side of the present station. This loop was removed in 1944. Taylors' works have recently been taken over by Milburn Lime and Cement and so the future of the business seems secure. This opinion is based on a recent statement by Milburn Lime and Cement (1961) that they intend to eventually base most of their plant and operations at Cormacks where there are unlimited reserves of high-grade limestone.

Cormack's Siding diatom type locality

Cormack's Siding was a low cutting and earth platform used for loading stock onto a now-disused railway line in North Otago. The locality was right next to a main road and the

cutting provided a readily accessible source of fresh late Eocene Oamaru Diatomite Edwards, 1991. In the heydays of amateur diatomists in the late 19th century many samples of diatomite from this locality were sent around the world as exchange samples. As a result Cormack's Siding became the type locality for over 13 species of archaeomonads and 108 species of diatom (Edwards, 1991), and was therefore a site of international importance. The site was not regularly visited by geologists, and unfortunately before it could be added to the local District Scheme schedule it was bulldozed away and completely destroyed during road widening in 2000."

(Note: Rumour has it that the line will be re-opened sometime in the near future)

New Zealand Place Names Database:

Place Name Detail: Cormacks

District: Otago

Description: LOCALITY: Defined area of low or nil population

Lat: -45.0797

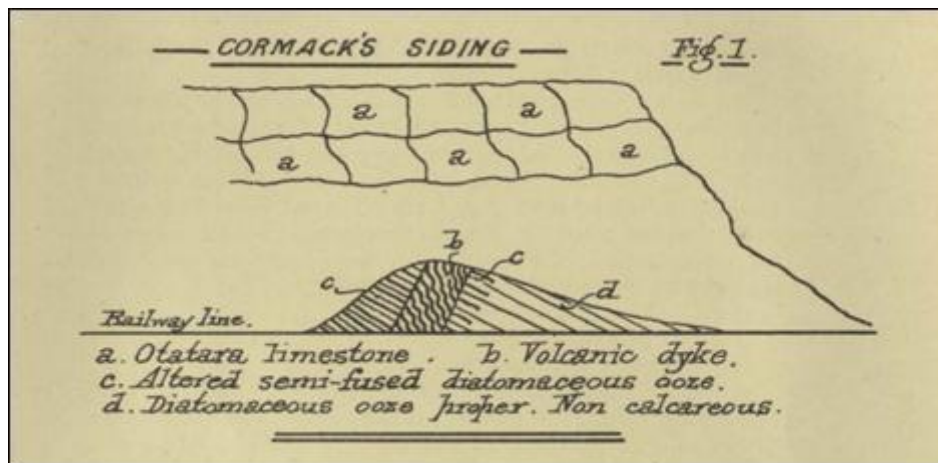
Long: 170.8952

NZMG Easting: 2344235.1

NZMG Northing: 5567847

NZMS 260 sheet: J41

Referred to as Cormacks Siding, Cave Valley by Harry de Lautour in 1888 (On the Fossil Marine Diatomaceous Deposit near Oamaru - Read before the Otago Institute 12th June 1888)



Lautour (1888)

10e. Cormack's Top {1877 McKay, 1915 - Diatomees du Monde Entier - Tempere et Peragallo}

11. Daniel's.? (Cormack's?)

12. Devil's Bridge (Synonymous with Mavor's)

On Mavor's farm

1. Devil's Bridge. (Fig. 2.)

Fig. 2 represents a section from the Devil's Bridge in a west-north-west direction to a point about a mile beyond the area mapped, so as to include the Waiarekan beds.

The tuffs (a) are very fine and tachylytic, and are interbedded with bands of diatomaceous earth. Dykes and sills intersect the tuffs and the diatomaceous earth, and the latter is altered in places to a hard flinty rock. There are inclusions of quartz in the dolerite, this being a noticeable feature of the earlier intrusive rocks associated with the Waiareka tuffs. The quartz has probably been incorporated during the passage of the molten rock through the quartz grits that lie at the base of the Tertiary series. The limestone is poor in fossils, and is similar to the building-stone, but in parts it becomes chalky. A peculiar nodular surface marks the junction of this rock with the overlying greensand, although it is not so conspicuous in this locality as in other parts of the district. The greensand (c) overlying is glauconitic, casts of Foraminifera being plentiful. Some distance above the base *Pachymagas parki* (Hutt.) occurs in abundance, other fossils being scarce. The brown sands (d) are also glauconitic

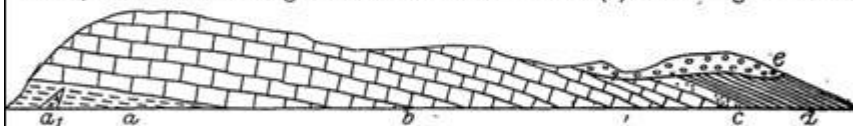


FIG. 2.—Section (diagrammatic) W.N.W.—E.S.E. through the Devil's Bridge. (a) Tuffs and diatomaceous earth, intruded by dolerite (a₁); (b) limestone; (c) greensand; (d) Awamoan beds; (e) gravels.

and very fossiliferous. The nodular band contained *Terebratula* sp., *Aetheia gualteri* (Morris), *Hemithyris* sp., and stems of *Isis*. The greensand (c), in addition to *Pachymagas parki* (Hutt.), contained *Pecten huttoni* Park. The fossils from the brown sands (d) have been recorded by Marshall and Uttley (1913, p. 303) and clearly indicate that the beds are Awamoan.

Park (1905, p. 518), in describing the beds here, placed the limestone above the Hutchinsonian and Awamoan; but the greensands lie hard upon the surface of the limestone, which is undoubtedly the Ototara stone. The rocks are conformable throughout, and dip towards the coast at an angle of from 10° to 16°.

Transactions and Proceedings of the Royal Society of New Zealand
Art. VIII. *Geology of the Oamara-Papakaio District.*

By G. H. Uttley, M.A., M.Sc., F.G.S., Principal, Scots College, Wellington.

[Read before the Wellington Philosophical Society, 19th September, 1917, received by Editors, 31st December, 1917; issued separately, 24th May, 1918.]

Prior to ownership by Mavor was it in the hands of James Garrow as per the cutting below.

James Garrow, farmer, of Oamaru, deposed that he and his sons had bought land from time to time from the company. He bought 182 acres at L8 an acre in May, 1883. For a bit of the Devils' Bridge paddock, which he had since bought, he was paying 10s 6d per acre for nine or ten years. He paid L8 an acre for his land. The first purchase was the roughest piece of land on the estate. He had been on the estate for 12 years, and had good opportunities of judging of its value.

13. Dick's Farm

14. Division Hill

New Zealand Place Names Database:

Place Name Detail: Division Hill

District: Otago

Description: HILL: A natural elevation of the Earth's surface

Lat: -45.0316

Long: 170.9304

NZMG Easting: 2346874.1

NZMG Northing: 5573256

NZMS 260 sheet: J41

450 1' 36.36" S 1700 55' 15.30" E

A number of distinct beds of diatomaceous earth have been identified in the stratigraphic column (Doig, 1967).

The bed has been allocated a zone based on the predominant genus found in the bed.

The table below (from Doig, 1967) enumerates the beds, as known at that juncture. (see notes on Arthur John Doig in Section C).

Location Name: Division Hill			
Acronym/Bed	Old Name	Zone	Notes
DH/1	-	Coscinodiscus	
DH/3	-	Coscinodiscus	
DH/5	-	Coscinodiscus	

15. Flaws Creek (East Oamaru)

I haven't been able to locate this site. Could this be a misspelling of Frew's?

16. Flume Creek (Synonymous with Big Flume Creek, Borrie's [Farm], Flume Gully, Frew's [Gully], Hurst's [Farm], Papakaio) { 1889 - Tempere et Peragallo }

5. *Flume Creek, Papakaio District.* (Fig. 6.)

This section is exposed near the township of Papakaio in a small gully, spanned by the flume of the water-race. The section is not continuous, and the dip of the rocks in the lower part of the creek varies somewhat. There are distinct signs of faulting in the neighbourhood. At the head of the gully a bed of diatomaceous earth crops out, and lower down a small exposure on the left shows the same bed lying beneath a fine calcareous tachylytic tuff, dipping N. 70° E. at 20°. Greenish-brown laminated tuffs (c)

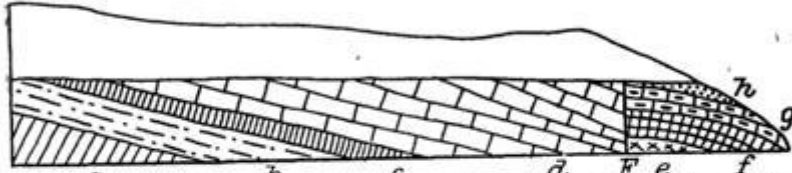


FIG. 6.—(a) Diatomaceous earth; (b) tachylytic tuff; (c) fine laminated tuffs; (d) limestone; (e) tuffs; (f) glauconitic limestone; (g) hardened limestone; (h) greensand; (F) fault.

overlie, and then follows a flaggy limestone (d). There is a break in the section at this point, but tuffs containing minerals occur *in situ* at the bottom of the bank. Then follows a coarser and more glauconitic limestone, which has a steeper dip than the lower flaggy limestone. A hard band of limestone (g) about 15 ft. thick caps the more glauconitic stone. Greensand (h) lies hard upon (g), and the junction is marked by the great

The greensand yielded *Epitonium lyratum* (Zitt.), *Terebratulina suessi* (Hutt.), *Pachymagas parki* (Hutt.), *Aetheia gualteri* (Morris), and *Hemithyris* sp.

In this locality also we have the nodular band occurring at the base of the greensand, and notable for the abundance of alcyonarian stems. Dr. Thomson informs me that a nodule collected by him from this locality was analysed by Mr. B. C. Aston and showed 1·8 per cent. P_2O_5 , equivalent to 2·9 per cent. $Ca_3P_2O_8$.

Transactions and Proceedings of the Royal Society of New Zealand

Art. VIII.—*Geology of the Oamara-Papakaio District.*

By G. H. Uttley, M.A., M.Sc., F.G.S., Principal, Scots College, Wellington.

[Read before the Wellington Philosophical Society, 19th September, 1917, received by Editors, 31st December, 1917; issued separately, 24th May, 1918.]

17. Flume Gully (Synonymous with Big Flume Creek, Borrie's [Farm], Flume Creek, Frew's [Gully],

Hurst's [Farm], Papakaio)

Named after the wooden flume that once carried the Oamaru water supply (now replaced)

Entrance lies close to main highway almost a mile SE of Papakaio township according to Y.

T. Mandra.

N O T I C E .

TUAPEKA AND WAITAHUNA
DEPASTURING DISTRICTS.

IN accordance with a recommendation of the Board of Wardens, His Honour the Superintendent has sanctioned the re-adjustment of the Boundary between Great and Small Cattle, which will in future be as under :—

Starting from Dewes' farm in a straight line north to a gully known as Flume Gully, thence along the watershed of Blyth's Gully in a north-west direction, and terminating at the Waitahuna River.

By Order.

JAS. R. GASCOIGNE,
Hon. Secretary to Board of Wardens.
Lawrence, Tuapeka, June 1st, 1870.

DURING the late heavy hailstorm and squall at Waitahuna, a large portion of the fluming which carries the Long Race Company's water across Flume Gully was blown down. After due consideration, the Company (Messrs Ferris and party) decided upon using wrought iron pipes, instead of re-erecting the flume. This has been done, and is found to suit the purpose admirably. The pipes are seven inches in diameter, excepting the receiving one, which is fifteen inches.

Tuapeka Times, Volume XII, Issue 600, 24 January 1880

A number of distinct beds of diatomaceous earth have been identified in the stratigraphic column (Doig, 1967).

The bed has been allocated a zone based on the predominant genus found in the bed.

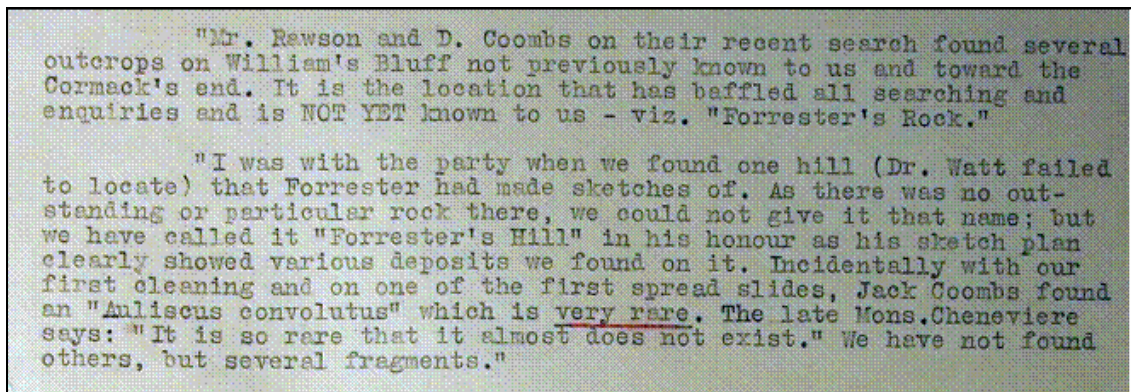
The table below (from Doig, 1967) enumerates the beds, as known at that juncture. (see notes on Arthur John Doig in Section C). The Old Name in this table doesn't help with samples labelled Big Flume Creek, Borrie's [Farm], Flume Creek, Frew's [Gully], Hurst's [Farm], Papakaio.

Location Name: Flume Gully			
Acronym/Bed (Bank)	Old Name	Zone	Notes
PP/3 (N)	-	a. cosmopolitan b. Stephanopyxis	Bed split by narrow band of tuff. Might be regarded as two bands a. b.
PP/6 (N)	-	t. Melosira b. Coscinodiscus	Single band but with different populations top and bottom t. b.
PP/8 (N)	Upper Papakaio	Coscinodiscus	
PP/10 (N)	-	Stephanopyxis	Possibly previously labelled Lower Papakaio but in fact a different bed.
PP/12 (N)	Lower Papakaio	Stephanopyxis	
PP/12 (S)	South Bank Upper Deposit	Stephanopyxis	
PP/15 (S)	-	Stephanopyxis	Possibly previously labelled South Bank Lower Deposit but is in fact not conjoined.
PP/17 (S)	South Bank Lower Deposit	Stephanopyxis	

18. Forrester's

Forrester's Hill often abbreviated to Forrester's.

18a. Forrester's Hill, Oamaru {Meakin Collection - Sample 1190, 1191, 1193, 1194, 1195}
2 or 3 bands of diatomite running across the hill.



"Thomas Forrester (1838 - 1907)

Before emigrating with his family to New Zealand in 1861, Forrester had attended the Glasgow Government School of Design in Scotland. There his studies ranged from map drawing to draughting skills which set this humble man on a lifetime of achievement.

Following his employment by the Dunedin architect, R A Lawson in 1869 he was sent to Oamaru to supervise the building of the Bank of Otago, which today houses the town's public art gallery- The Forrester.

Thus began a long and fruitful association with the town. Within a few short years of his arrival Forrester was directing his considerable design and engineering talents towards the Oamaru Harbour. Beginning as inspector of works he was appointed secretary of the Harbour Board and later engineer. From samples he had taken of the harbour floor he saw the seabed could be dredged. This led to the creation of a deepwater anchorage allowing large ships loaded with North Otago's bounty to come and go in safety.

While still in full time employment with the Harbour Board, for almost three decades from 1872 and in partnership with John Lemon, Forrester designed an impressive portfolio of ornately decorated buildings and family homes, contributing more than any other person to the distinctive architecture of Oamaru. Thomas Forrester brought the architectural and design skills to the partnership and John Lemon supervised construction and saw to the day to day running of the practice.

In 1882 Forrester was appointed first curator of the newly established Oamaru Museum (now the North Otago Museum). The museum was located in the Athenaeum, a building he had designed. There he pursued his other interests in geology and photography."

Also

"Thomas Forrester was born in Glasgow, Scotland, probably on 16 May 1838, the son of Janet Watt and her husband, George Forrester, a modelling and decorative plasterer. Thomas attended the Glasgow Government School of Art, where his studies ranged from map drawing to the draughting of plans. Meanwhile, he learned from his father how to ornament the interiors of buildings, and like him became a plasterer. On 5 July 1860 at Glasgow, Thomas Forrester married Elizabeth Megget, a dressmaker. The following year Thomas and Elizabeth and the first of their four children travelled to New Zealand as assisted emigrants, arriving in Port Chalmers, Otago, on the *Pladda* on 8 September 1861. Thomas Forrester's parents accompanied them to New Zealand.

During his first years in the colony, Forrester was called on to use the full range of his artistic talents. Initially he is said to have worked as a plastering contractor in Dunedin. In 1865 he drew for James Hector the first geological survey map of New Zealand. The same year the

architect William Mason designed the structure for the Dunedin-based New Zealand Exhibition. Forrester, who had worked as a draughtsman to Mason and his partner W. H. Clayton, was superintendent of the building where displays were shown.

After working for Mason and Clayton, Forrester was employed by the architect R. A. Lawson. In early years Oamaru limestone was much favoured as a building material, large blocks being available 'of the same tint and consistency' so that 'whole cities might be built in which one stone could not be distinguished from another'. Mason had used the easily worked material for the magnificent, ill-fated Dunedin post office, completed in 1868; a more secure edifice was Lawson's limestone-veneered First Church of Otago, begun the same year. Thus in 1869, when Forrester was sent to Oamaru as supervising architect for Lawson's Bank of Otago building (later the National Bank of New Zealand offices), he well knew the material with which he was working.

His assignment completed, Forrester settled with his family at Oamaru. He soon began a lifelong connection with the local harbour authority as inspector of works, secretary and, later, engineer. He established that the seafloor could be dredged, and that a notoriously uncertain open roadstead could be transformed into an enclosed deep-water harbour. About 1872 he and John Lemon formed an architectural partnership: Forrester was part-time designer of buildings, while Lemon, with his well-established contacts among the local elite, was full-time business manager.

Occasionally the practice took on contracts outside North Otago. After the abolition of the provincial system and establishment of a multitude of counties in 1876, the Waimate County Council commissioned Forrester to design council chambers and a hospital. The brick and stucco chambers, among the first in New Zealand, had spacious and comfortable debating facilities. The hospital plans were considered more suited to 'a place of affluence than charity', and the completed brick building was later criticised as a memento of a time when local bodies had more money than they could usefully spend.

In Oamaru, by contrast, it was thought that structures should be imposing and that a utilitarian function should be concealed behind an ornamental facade. Forrester, deferring to local expectation, created on Harbour Street an uninterrupted sequence of grand buildings constructed in Oamaru stone in which grain was stored before being moved to the nearby port. In neighbouring Tyne Street, the town's original business heart, there arose richly ornamented hotels, the squat Custom House, and J. & T. Meek's Elevator, a five-storey grain store. For Thames Street, which became Oamaru's main artery, Forrester planned a court house which, with its classical design, emphatic temple-front portico and restrained facade, was the pride of the district when completed in 1883. Also in Thames Street was the large, decorated post office finished in 1884; it was for years a favourite with postcard, calendar and crockery illustrators. The freezing works, which took sheep from the nearby Totara estate, was completed in 1886. Beyond municipal boundaries, the partners designed the original Waitaki Boys' High School building with its picturesque silhouette.

When John Lemon died in 1890, Thomas Forrester retired from the business to make way for his only surviving child, John Megget Forrester. Thereafter he pursued his interests in geology and photography. With Dr H. A. de Lautour he did microscopic work of scientific value on the diatomaceous deposits of the Oamaru district. Forrester continued to focus much of his attention on harbour improvements. He designed the Holmes wharf which allowed large ocean-going vessels to call at Oamaru. A festive crowd greeted the 6,237-ton *Waiwera* in June 1907. Sadly, Forrester did not live to witness this occasion, having died in Oamaru on 25 March 1907, survived by his wife and son.

In colonial New Zealand a man who had not been articled to an architect might still break into the profession. Forrester was one such man, progressing from plasterer, to draughtsman in the employ of Dunedin architects, to independent practitioner in Oamaru. Local dignitaries, encouraged by the illusory prosperity of the Vogel years, insisted that the churches, schools, warehouses, factories and private houses of their town be of a high

architectural standard. Forrester obliged. Working with local limestone, he erected handsome buildings, many of which still stand, monuments to his skill and to North Otago pride."

Also

Arrivals September 7 1861. *Pladda*, 982 tons, Dunlop, from Glasgow.

Arrival of the "*Pladda*"

This fine vessel, which has made very good passage from the "bonnie banks o' Clyde," to this port. arrived here on Sunday, the 8th inst., and was towed up to Port Chalmers by the "*Prince Albert*." The "*Pladda*" has brought from the home country an addition to our population of 369 immigrants, who appear to be on the whole a clean and healthy class of people, and have arrived in good time to obtain situations, or, if they prefer it, to try their luck at our newly-discovered gold fields, but we learn that many have considered it more advisable, in meantime, to engage themselves to farm service, or take employment in town, until they see how matters are likely to go.

The "*Pladda*" left the tail of the bank on the 1st June, and had favourable winds and weather until she reached the latitude of Madeira. Was becalmed for a short time at the Line, after which a breeze spring up, which enabled her to proceed on her voyage. Several vessels were spoken at sea - one homeward bound, by which letters were sent out. The *Pladda* arrived here on the 7th inst., having accomplished the passage here on the 7th inst., having accomplished the passage from land to land in 98 days. The weather during the voyage was on the whole very fine, and the passengers all agreeable. Upwards of 10 was collected from passengers on board, on behalf of an infant whose mother died. A bazaar for the benefit of the Seaman's Society, was held, which was well attended.

On the arrival of the "*Pladda*," the following address signed by nearly 150 passengers, was presented to Captain Dunlop - a circumstance highly gratifying, as showing by their testimony how much his kindness and attention has been appreciated....

The following is a list of the passenger by the above vessel:

Forrester, George and wife (Thomas Forrester's parents)

Forrester, Thomas, wife (nee Elizabeth Megget) and infant

In the Journal of the Quekett Microscopical Club May 25th 1888 Ordinary Meeting:

The Secretary said he had a matter of interest to mention for the benefit of those who were interested in the study of the Diatomaceae. Some time ago Mr. Forrester, of the Oamaru Harbour Board, New Zealand, promised to send over some diatomaceous earth for distribution amongst the members. Since then a parcel had arrived from him containing two samples of the deposit, one from Jackson's Paddock and the other from Cormack's Siding.

He had brought with him to the meeting some of each sort, from which Members could supply themselves if desired, and if the quantity brought was found to be insufficient, more could be had if wanted. Mr. Forrester had asked in exchange for any specimens of other deposits which Members might be able to furnish him with. He thought that the thanks of the Club were due to Mr. Forrester for so kindly affording them the opportunity of examining for themselves specimens of the earths which were upon the table before them.

(Per United Press Association.)
 Received March 27, 9.14 a.m.
 OAMARU, March 26.

Mr T. M. Forrester, whose death was announced last night, has been secretary of the Oamaru Harbour Board since its inception in 1869. He had also been Engineer for the Board for 25 years. He came to Oamaru from Dunedin in 1869, and in collaboration with the late Mr John Lemon, was architect for the most substantial buildings in the town. Deceased had only been ailing for four weeks.

Wanganui Herald, Volume XXXXI, Issue 12127, 27 March 1907

NZ-BMD Death 1907/4722 Forrester, Thomas, aged 68

450 1' 43.41" S 1700 54' 22.00" E

A number of distinct beds of diatomaceous earth have been identified in the stratigraphic column (Doig, 1967).

The bed has been allocated a zone based on the predominant genus found in the bed.

The table below (from Doig, 1967) enumerates the beds, as known at that juncture. (see notes on Arthur John Doig in Section C).

Location Name: Forrester's Hill			
Acronym/Bed	Old Name (Doig 1962)	Zone	Notes
FH/1	Worthless Seam	No diatoms	
FH/2	-	Coscinodiscus	
FH/4	Seam a-a	Coscinodiscus	
FH/5	Seam b-b	Coscinodiscus	

18b. Forrester's Rock (Synonymous with Forrester's Hill) {1915 - Diatomees du Monde Entier - Tempere et Peragallo, Meakin Collection - Sample 490 (ex-Tempere)}

The original sample was named Forrester's Rock. - or since this wasn't found could this be Totara - although it is at the other end of the formation?

19. Fortification Hill - is this a diatomite or limestone formation?

Probably the quarry mentioned in the newspaper cutting below.

There were/are a number of locations called by this name and reference to collecting notes would be need to sort this out.

Possibly in New Zealand Place Names Database (though this seems somewhat off the mark)

Fortification Hill

District: Otago

Description: HILL: A natural elevation of the Earth's surface

Lat: -44.8959

Long: 170.6452

NZMG Easting: 2323985.7

NZMG Northing: 5587736.9

NZMS 260 sheet: I41

From Fortification Hill,
is being got the Oamaru stone
which is being used in the erection
of the Chief Post Office, in Dunedin, which
stone is being shipped at Moeraki, as in
every way the more convenient and safer
place.

Otago Daily Times , Issue 1032, 11 April 1865

Otago Witness , Issue 698, 15 April 1865

Builders and stone masons have been busy in Oamaru during the past ten or twelve months, and the results of their labors are to be seen in the improved appearance of many of the streets. Most noticeable among these recent improvements is the new Queen's Hotel, built in the Italian style of architecture from designs by Messrs Forrester and Lemon. This is a large building situated at the corner of Thames and Wear streets, the principal entrance being in the former. The exterior of the building is handsomely carved, the panel over the front door being particularly fine. Entering at this door one enters a hall with tessellated floor, leading into a large and lofty billiard-room, with bar attached. Passing through which, and through a side passage, the dining-room is reached. On the ground floor are also two parlors, besides bar, offices, etc. A broad flight of stone stairs leads from the ground floor to the upper storey, where is situated, at the north-west corner of the building, a large reading-room. Passages to south and east of this communicate with some 30 bed rooms, three or four of which have private rooms attached. On this floor are also two bath-rooms and a lavatory. The back part of the upper storey, and the servants quarters are reached by a back staircase, also of stone. The whole building is massive and substantial and beautifully finished. The stone of which it is built is from the owner's (Mr Markham's) quarry at Fortification Hill, and the building has been erected at a cost of between L8,000 and L9,000.

At the Stores, Tyne street,
 ———
 At 12.30 o'clock,
 ———
ALLOTMENT AT FORTIFICATION:
 ———
FOR ABSOLUTE SALE.
 ———
F. LEMING AND HEDLEY
 will sell by public auction at the
 above time and place—
 Allotment 2 of **Fortification Hill**
 Paddock, containing 7 acres 1 rood
 and 25 poles.
 In this section is one of the best White
 Stone Quarries in the district,
 ———
 Terms at Sale.
FLEMING AND HEDLEY,
 Auctioneers,

North Otago Times, Volume XXVIII, Issue 3686, 27 June 1884

The following cutting refers either to a Fortification Hill between Oamaru and the Totara Estate to the South West, or Oamaru and the location of the Totara boulder. The location of Sebastopol Hill and Alma Heights here is crucial to this identification. Alma Heights is to the south west of Oamaru.

It may be mentioned that whoever was responsible for the nomenclature of Totara Estate was consistent, for whilst, as has been said, the cairn stands on the summit of Sebastopol Hill, the hill lying between it and Oamaru is called Fortification Hill, whilst the terraced rising ground at the foot of the latter bears the familiar name of Alma Heights.

Otago Witness, Issue 2764, 6 March 1907

20. Foulden Hills, Otago

Foulden Hills Diatomite, not far from Dunedin, New Zealand.

Almost 30 miles south south west of Oamaru

Actually near Middlemarch - so probably freshwater lake deposit - S:45032'1" E:170013'4"

21. Frew's (Gully) (possibly synonymous with Big Flume Creek, Borrie's [Farm], Flume Creek, Flume Gully, Frew's [Gully], Hurst's [Farm], Papakaio){1889 - Tempere et Peragallo}

Named for the owner of the adjacent property.

Not sure that this gully is synonymous with those locations stated above.

TENDERS will be received until
Noon on **SATURDAY**, the 26th, for
the **ERECTION** of a Large **AQUEDUCT**
for the Oamaru Waterworks, at Frew's
Gully.

For further particulars apply to the
Undersigned.

JAMES DUNBAR.

Contractor's Office
Oamaru Waterworks,
January 22, 1878

ja23

North Otago Times, Volume 1794, Issue XXVI, 23 January 1878

In the Papakaio section there are over 60
men engaged in race cutting alone, the work
and progress made being satisfactory. The
Frew's Gully aqueduct is also being built in
a satisfactory manner.

North Otago Times, Volume 2059, Issue XXVII, 6 December 1878

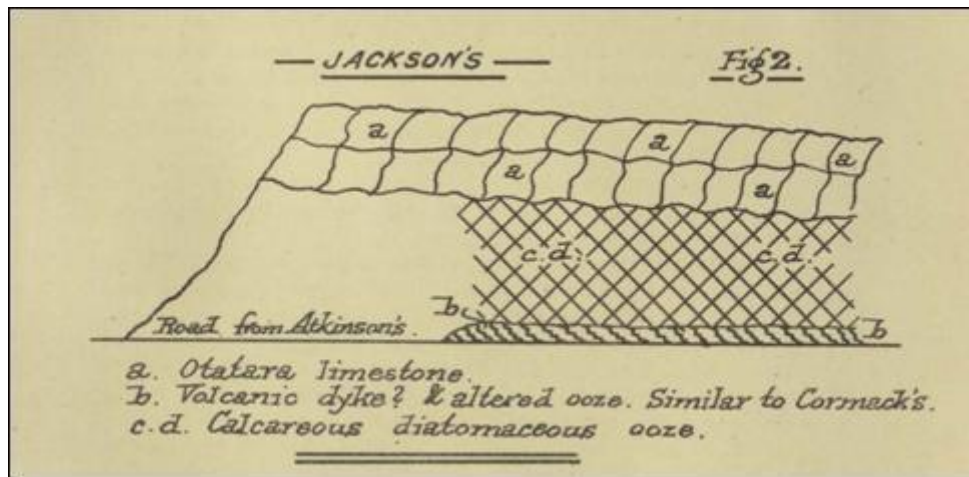
From Henderson's to Frew's Gully, a distance of nine miles, the race is carried around the slope of the hills through good solid ground all the way. On this section there are 16 different parties at work engaged in race cutting by contract, and their labor will be completed in about three months. From here into Oamaru the race cutting is finished with the exception of about 30 chains, in short lengths, which it is not desirable at present to cut. The Frew's Gully aqueduct, which is the largest on the line, consists of eight spans of 60ft each, the trestles ranging from 48ft to 95ft in height, built with a considerable taper from the base. It is very substantial and being situated in an exceedingly charming spot, will, when finished, form an object calculated to give delight to lovers of the beautiful no less than to connoisseurs in bridge architecture. After leaving Frew's Gully, a mile of race cutting leads into the eleven chain tunnel, where the race finally disappears from the plain. The masonry fronts of the tunnel are finished, and give the entrance a very neat appearance.

North Otago Times, Volume XXVIII, Issue 2183, 2 May 1879

22. Hurst's (Farm) (Synonymous with Big Flume Creek, Borrie's [Farm], Flume Creek, Flume Gully, Frew's [Gully], Papakaio and possibly Kent Knole) {1889 - Tempere et Peragallo}

23. Jackson's {1888 - Lautour, Meakin Collection - Sample 1227, 1362, 1379}

This is referred to by Harry de Lautour in 1888 (On the Fossil Marine Diatomaceous Deposit near Oamaru - Read before the Otago Institute 12th June 1888) as if different from Jackson's paddock which is later referred to.)



Lautour (1888)

23a. Jackson's Farm {Dr. Watt - Brigger Collection bottle 650}

23b. Jackson's Paddock {188? - Mr. C. Gifford of Waitaki Boys High School, 1888 - Forrester, 1888 - Lautour, 1915 - Diatomees du Monde Entier - Tempere et Peragallo, Meakin Collection - Sample 508-511 (ex-Tempere), 849, 1117}

A steep hillside located east of Springhill Road. Almost the entire hill is diatomite save for the top 20 feet, which is a limestone cap.

Is Jackson's Farm @ 932-1076 Fortification Road, Cormacks 9495, New Zealand?

A number of distinct beds of diatomaceous earth have been identified in the stratigraphic column (Doig, 1967).

The bed has been allocated a zone based on the predominant genus found in the bed.

The table below (from Doig, 1967) enumerates the beds, as known at that juncture. (see notes on Arthur John Doig in Section C).

Location Name: Jackson's Paddock			
Acronym/Bed	Old Name	Zone	Notes
JP/1	-	Melosira	
JP/3	Jackson's Paddock (Hillside)	Coscinodiscus	
JP/5	Jackson's Paddock (Roadside)	Stephanopyxis	

23c. Jackson's Rock {John A. Schulze Collection - 493}

Name found on a sample tube (493) in the Schulze Collection.

23d. Jackson's Top {Dr. Watt - Brigger Collection bottles 201, 204, and 205}

23e. Jackson's Well {Brigger Collection bottle 32}

24. Kakanui

From - Wises Index to Every Place in NZ, 1912

KAKANUI, Otago. Thirteen miles south from Oamaru and four miles from Maheno railway station. An agricultural settlement on Kakanui River, near coast. Fishing on river, and hare shooting close by. Good roads. One hotel : private board 20s per week. Post and tele-phone office.

The small town of *Kakanui* lies on the coast of Otago, in New Zealand, fourteen kilometres to the south of Oamaru.

A fossil/marine site

450 12' S, 1700 54' E

Is this in the same formation?

25. Kent Knole [Farm?] (Synonymous with Hurst's Farm and probably Papakaio) {1957 Gage, 1965 - Turner}

Kent Knole is a placename situated just off the Georgetown-Pukeiri Road (nr. No.721), about 2000 yards to the north-west of Papakaio.

Doig (1967) notes that this location is on the property of Mr. C. Hurst. This being the case some confusion may arise with early samples labelled Hurst's which samples appear to relate to Flume Gully. Doig (1967) proposes the long names Kent Knole North and Kent Knole South to describe the locations. The North deposit is exposed at the bank of the water race and the South deposit on the hill behind the homestead.

26. Lorne Escarpment (Synonymous with William's Bluff, Whitstone Escarpment)

From - Wises Index to Every Place in NZ, 1912

LORNE, Otago. A railway siding six miles from Oamaru, on the Oamaru-Tokarahi line. The township and post office is Whitstone.

An examination of early maps shows it as a nameless hill devoid of any early or pre European reference. Some distance away on the former Meek property is a limestone cliff referred to on maps as Teaneraki Cliff.

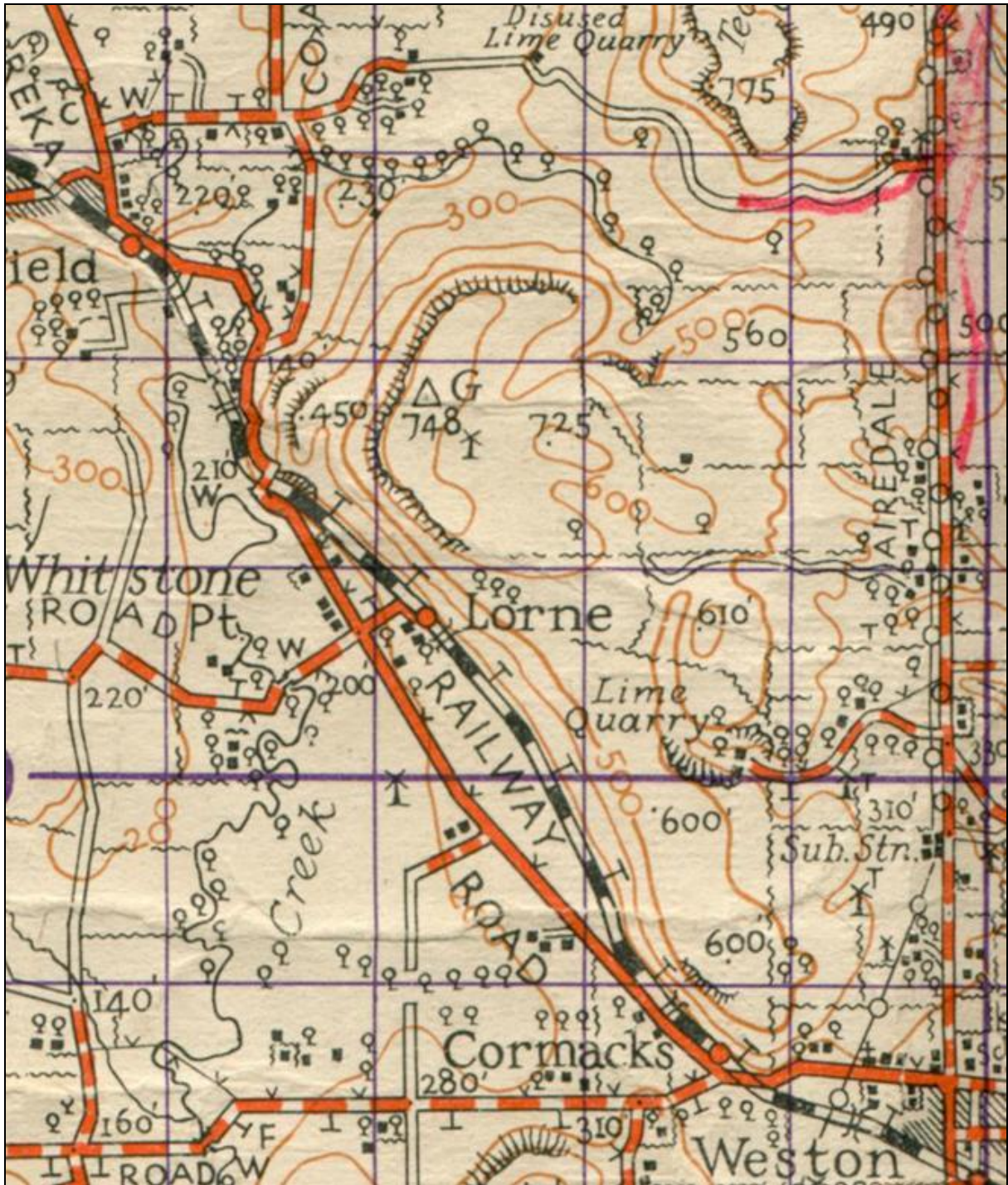
For local Enfield residents it was known as Meek's Hill for three generations because the Meek Farm went to the top. Sometimes it was simply called The Limestone Hill.

For people at Whitstone it was known as Whitstone Hill.

Towards Weston it was known for seventy years as Taylors Hill.

Other long term landowners in the Waiareka valley, farmers and current lessees of the Holcim land refer to the hill as the Lorne Escarpment.

Today there is no one common name for the hill on the Holcim land. It does not have a specific identity. It remains unnamed on maps. For those that need to have a name for it, it is what they want to call it. Attempts to mystify its importance by the creation of a so called common name are intriguing.



Part of NZMS 1 S136 (1943)

Lorn Peak @ S:45020'45" E:168047'31" has this anything to do with the escarpment?
 The Cyclopedia of New Zealand [Otago & Southland Provincial Districts] (1905)
 Lorne is in the electorate of Awarua and in the riding of the same name in the county of Southland. The local post office, which is conducted at a store at the corner where the main north road crosses the roads leading to Dacre and Riverton respectively, is five miles from Invercargill by a good road, four miles of which are traversed by the Invercargill and Suburban Tram Company's line. The cross-roads in question are often spoken of as Wallacetown Crossing. The township of Wallacetown is three miles distant, but the railway station of the same name is quite near, and alongside the railway station are the Wallacetown Junction saleyards, where large stock sales are conducted every alternate Tuesday. There is a hotel alongside the railway station, and the Southland Frozen Meat Company's slaughtering

and manure works also adjoin the railway. On the main road, not far from the cross-roads, stands Lorne farm, one of the most notable charitable institutions in Southland. As a district Lorne is devoted to agriculture and dairy farming. The district is fairly level though somewhat undulating, and contains some good agricultural and pastoral land.

Lorne Farm is one of the institutions managed by the Southland Hospital and Charitable Aid Board. The establishment was opened on the 29th of June, 1899, as an Old Men's Home, but was enlarged in 1902 by the addition of another wing, to provide accommodation for old women and children. The original building, which was of one storey, contained two bedrooms, and a sitting-room for the men, besides a dining-room, three bathrooms, a storeroom, a kitchen, a scullery, a drying-room and washhouse, and four rooms for the master and matron. The accommodation was sufficient for twenty-three inmates, besides officers and assistants. The new addition is a two-storey brick building, and contains, on the first floor, girls' and boys' bedrooms, each with twenty beds; a female dormitory, with six beds; a sick room, with two beds, besides two servants' rooms, and a linen press. On the ground floor there is a nursery, with nine cots, and accommodation for two attendants; separate rooms for the boys and girls; a sewing-room, kitchen and pantry, four bathrooms, the master's office, and the conservatory. There is an asphalt playground with shelter sheds, and other buildings, including an engine-room, pump-house, store-room, chaff-house, carpenter's shop, a loft, and dairy, all in brick. There are also stables, byres, and pigsties. The land, which was originally known as Lorne estate, contains ninety-five acres, five of which are in garden and orchard; the balance is laid down in grass, or is used for cropping as required. In November, 1903, the inmates in the institution numbered sixty-four, including twenty men, three women, twenty-four boys and seventeen girls, the cost of whose maintenance was 4s 10d a head per week. The produce of the farm, besides supplying the requirements of the institution, is a source of revenue to the Board; and the surplus sold during the year which ended in March, 1903, realised #180. The institution is under the care of a master and matron.

Mr. Arthur Cusworth, Master of Lorne Farm, was born near Barnsley, England, in 1852. Mr Cusworth started work at the Barnsley iron works at the age of twelve years, and page 916 was afterwards employed as a gardener. He arrived at Port Chalmers by the ship Waipa, in 1879, accompanied by his wife, and on the 1st of December, of the same year, Mr and Mrs Cusworth became assistant master and matron at the Caversham Industrial School. Mr Cusworth shortly afterwards removed to Cromwell, where he was engaged in gold mining till April, 1883. He then settled in Invercargill, where, after being employed for some years in farming and bacon-curing, he opened a fruit shop in Tay Street, and carried on business for nine years. On the opening of Lorne Farm, Mr. Cusworth was selected out of fifty-three applicants for the position of master of the institution. As an Oddfellow, he has been a member of the Pioneer Lodge, since 1888, was elected trustee in 1893, and has passed all the chairs. He has twice held office as District Deputy, and was representative of the Grand Lodge at Temuka. Mr Cusworth was married, in 1874, to a daughter of the late Mr William Brown, of Invercargill, and has one son, who is a music teacher in Invercargill.

Finlayson, Kenneth, Farmer, Auchtertyre, Lorne. Mr Finlayson was born at Shoalhaven, New South Wales, and came to New Zealand at an early age with his father. He was educated at Invercargill and Wallacetown, and has farmed on his own account since 1878. In 1903, Mr Finlayson was chairman of the Makarewa branch of the Farmers' Union. He was married, in 1895, to a daughter of the late Mr. Kenneth McKenzie, of Myross Bush, and has five daughters and one son.

Russell, Robert, Farmer and Stockdealer, Lorne. Mr Russell farms twenty-five acres of freehold on the North Road, also 100 acres leased from the adjoining estate of his late father; and, in addition to these holdings, he has 300 acres of freehold at Makarewa. He engages in mixed farming, and is well known throughout Southland as a large dealer in stock; and he has recently formed a herd of purebred Shorthorns. Mr Russell was born in 1871, in Invercargill, and educated at Fortrose and Waianiwa. His father, the late Mr. John Russell, was considered

the best judge of horses in Southland, and he was himself a noted breeder. The progeny of the horses he imported are well known throughout the Middle Island, and he often acted as a judge at the principal shows, from Invercargill to Christchurch. In 1904, Mr Robert Russell commenced farming on his own account, and four years later bought his land at Makarewa. As a volunteer, Mr Russell served for six years in the Southland Mounted Rifles, and rose, successively, to the ranks of sergeant-major and lieutenant. He is an energetic member of the local Agricultural and Pastoral Association, and has for nine years acted as steward in the roadster classes. Mr Russell has been twice married; in 1893, to Miss Utting, of Waianiwa, who died on the 2nd of October, 1898, leaving two sons and one daughter; and in 1898, to Miss Wilson, of Owaka, who has borne him three daughters.

Mr Kenneth Finlayson , One Of The Pioneer Settlers Of The Lorne District, Built His Homestead And Entered Into Occupation Of His Land In 1860. He Was Born, In 1800, At Auchtertyre, Ross-Shire, Scotland, But Left Home For The Colonies In 1837. He Sailed For New South Wales In A Small Vessel Of Three Hundred Tons, Which, page 917 However, Carried, 360 Passengers. Mr Finlaysen Subsequently Came To New Zealand On Account Of His Health, And Took Up Land At Lorne. He Was Married, in 1836, to a daughter of the late Mr Murdo McRae, of Allta-na-Suth, Ross-shire, Scotland, and at his death left three sons and three daughters.

27. Mavor's {1962 - Doig}

possibly relating to the father and son partnership, Colin and Stefan Mavor, operating Braemorn Farm, Airedale, near Oamaru, as it exists now and possibly in the family for generations.

A number of distinct beds of diatomaceous earth have been identified in the stratigraphic column (Doig, 1967).

The bed has been allocated a zone based on the predominant genus found in the bed.

The table below (from Doig, 1967) enumerates the beds, as known at that juncture. (see notes on Arthur John Doig in Section C).

Location Name: Mavor's Farm			
Acronym/Bed	Old Name	Zone	Notes
MF/1	-	Coscinodiscus	
MF/3	Mavor's Upper	Coscinodiscus	
MF/4	Mavor's Lower	Coscinodiscus	

28. Middlemarch (South west of Oamaru)

From - Wises Index to Every Place in NZ, 1912

MIDDLEMARCH, Otago Central railway. 49 m N.W. by rail from Dunedin. Farming district. Near Taieri River. Hare, pigeon, duck, and rabbit shooting and trout fishing. Very good cycling road. Two hotels, no private board. Post, telegraph, and money order office. Named by Mrs Humphries, wife of surveyor of site, after Geo. Eliot's novel "Middlemarch." then just published. Doctor here. The Salvation Army have a Children's Institute here, and the Rock and Pillar Sanatorium for consumptives is near here.

Freshwater volcanic crater lake bed deposits!

S:45030'35" E:17007'31"

29. Old Stone Quarry (Synonymous with Breen's [Farm] and Capsize Stone Quarry)

30. Papakaio [Papakaiyo] (Synonymous with Big Flume Creek, Borrie's [Farm], Flume Creek, Flume Gully, Frew's [Gully], Hurst's [Farm] and possibly Kent Knole) {1889 - Tempere et Peragallo, Meakin Collection - Samples 920, 921, 995, 1174, 1226}

From - Wises Index to Every Place in NZ, 1912

PAPAKAIO, Otago. 84 miles north by rail from Dunedin and 10 miles from Oamaru ; in Waitaki County. A mining and farming district. Post and teleph; good cycling roads all round. Dr. at Oamaru, 10 m.

Possibly currently being mined as Taylor's Quarry

On the Georgetown-Pukeuri Road

Papakaio (the place where food is sought and eaten) was so called for the spring where large, succulent tuna (eels).were caught and cooked in umu (ovens). This was a camp site for travelling Maori, and the traditional river crossing place.

S:44059'21" E:170058'48"

30a. Lower Papakaio

Tuatara: Volume 26, Issue 1, September 1982

A Method for Cleaning Diatom Samples and the Preparation of Select and Strewn Mounts

By Stuart R. Stidolph

P.O. Box 1021, Levin, New Zealand

Oamaru earths may be divided into two groups, the siliceous and the calcareous. The older siliceous deposits, represented by Cormack, Allan's, Bairns [*sic*] and **Lower Papakaio**, underlie layers of volcanic rock, and contain little or no lime. The slightly more recent calcareous deposits, represented by Jacksons, William's Bluff, Troublesome Gully, Totara and Upper Papakaio, underlie deposits of limestone and contain lime in the form of shell fragments and foramenifera.

30b. Upper Papakaio

Tuatara: Volume 26, Issue 1, September 1982

A Method for Cleaning Diatom Samples and the Preparation of Select and Strewn Mounts

By Stuart R. Stidolph

P.O. Box 1021, Levin, New Zealand

Oamaru earths may be divided into two groups, the siliceous and the calcareous. The older siliceous deposits, represented by Cormack, Allan's, Bairns [*sic*] and Lower Papakaio, underlie layers of volcanic rock, and contain little or no lime. The slightly more recent calcareous deposits, represented by Jacksons, William's Bluff, Troublesome Gully, Totara and **Upper Papakaio**, underlie deposits of limestone and contain lime in the form of shell fragments and foramenifera.

31. Puriri ??? Is this in the North Island (as per below)

From - Wises Index to Every Place in NZ, 1912

PURIRI, Auckland. Nine miles south by rail daily from Thames ; in Thames County; near Kirikiri. Has post and telephone office, and is a mining locality and a sheep district; and is celebrated for its soda springsPuriri water. Place named from the puriri tree. Deer stalking and game shooting. Within 1 m of Thames River Nearest doctor at Thames, 9 m.

Need to check samples FM or FFW

Wanganui Chronicle

Turakina bush gets back original name

Merania Karauria 12th April 2011

A 60ha bush on the Turakina River in the Turakina Valley will once again be known by its original name.

Puriri was the name given to the bush by the tangatawhenua of Kaungaroa at Matatea Pa on the Whangaehu River, but it was renamed Sutherland's Bush.

On Saturday the 60ha bush and the surrounding area on the Turakina River was given back its original name and it is now to be known dually as Sutherland's/Puriri.

It was always known as Puriri by George Matthews and his cousins Stanley and Rangihawinui Hiroti, who were brought up at Kaungaroa, east of Wanganui, and who welcomed a group of Rangitikei Forest and Bird members to the small celebration.

Mr Hiroti blew a conch to Nga Hau e Wha and to Tane before he led the group into the bush to food pits, where once again the sombre resonance of the conch rang out through the ngahere (forest).

Twenty minutes' walk into Puriri Bush, there are five enormous food storage pits high on a hill overlooking the Mangahoe and Turakina Streams.

Mr Mathews described how his ancestors grew kumara and potatoes on the flats in the area, and stored any excess food in the pits.

Alisdair Macleay, who farms just downstream from Sutherland's, said that his grandfather spoke of lots of puriri trees on the flats in the area when they cleared the bush on the property for farming.

He said the puriri trees in the area had all been cleared.

Mr MacLeay's grandfather called the farm Puriri and a carved sign beckons with the name from the gate today.

If the sample is Oamaru then I think this is a mis-reading of Pukeuri

New Zealand Place Names Database

Place Name Detail: Pukeuri

District: Otago

Description: LOCALITY: Defined area of low or nil population

Lat: -45.0340

Long: 171.0218

NZMG Easting: 2354084.6

NZMG Northing: 5573159.2

NZMS 260 sheet: J41

Possibly exposure along the line of the stream.

From - Wises Index to Every Place in NZ, 1912

PUKEURI JUNCTION, Otago. Six miles north by rail from Oamaru; in Waitaki County. Post, telegraph, and money order office. Is a railway junction: has good level roads, and is settled by farmers. The name "Pukeuri " means "Roaring water." Nearest doctor at Oamaru. 6 m.

32. Railway Cutting.? (Probably Cormack's Siding or Cormack's Extension)

33. Rocky Creek (Synonymous with Rocky Stream) {Forrester}

34. Rocky Stream (Synonymous with Rocky Creek) {1967 - Doig}

e.g Samples collected from a southern Exposure, Rocky Stream, Oamaru, New Zealand - A. J. Doig

450 07' S, 1700 58' E

Doig (1967 records exposures:

Rocky Stream North - Grid. Ref. 504:733

Rocky Stream South - Grid Ref. 506:729

And a further exposure recorded by Edwards @ Grid Ref. 503:722

35. Stephenson's Farm (nr. Weston)

36. Table Top Hill {1967 - Doig}

On the Relation of the Oamaru Limestone and Waitaki Stone.

By Professor James Park, F.G.S., F.N.Z.Inst., Dean of the Faculty of Mining at Otago University.

1921/23

Among other places I revisited this year was the high ground overlooking Windsor Junction. From this elevation the Oamaru stone, escarpment behind Cormack's is seen to approach Enfield, whence with its cover of Kakanui limestone it sweeps northward to Teaneraki Cliffs and beyond this to Table-top Hill. The escarpment now trends north-west in the direction of Big Hill, giving the impression as viewed in perspective that the Oamaru stone forms the cap of Big Hill itself and of the scarp-bounded mesas lying between Big Hill and Ngapara.

New Zealand Place Names Database

Place Name Detail: Table Top Hill

District: Otago

Description: HILL: A natural elevation of the Earth's surface

Lat: -45.0162

Long: 170.9544

NZMG Easting: 2348726.1

NZMG Northing: 5575016.9

NZMS 260 sheet: J41

To the North of Brockmans Road.

?Table-top hill on Waitio Station, Makuri-Coonor Road?

On the landholding of Mr. R. Fox in 1967.

36a. Table Top Lower

Stephanopyxis zone {Doig 1967}

36b. Table Top Upper

Coscinodiscus zone {Doig 1967}

37. Taylor's Quarry (Taylor's Lime Works) {1888 - Lautour}

The Oamaru Diatomite is present locally below the limestone at the Taylors Quarry access road, and more extensively to the south.

As a community that suffered badly in the depression of the 1930s there is no better example of the consequences of resource development in the Waiareka Valley than what occurred in the 1950 s. The Taylor family, who began extracting and selling agricultural lime, had their faith justified with the improved prosperity of the times. The demand developed to where there were more than 50 employees required on an ongoing basis. The Taylor family contributed more to the wealth of the Waiareka Valley than they will ever know.

Taylors Quarry - Eo/Oligocene boundary sequence with Oamaru Diatomite and Ototara Limestone

Taylor's Limeworks are about 200 yards west of Cormack's siding, and Cormack's Extension is 200 yards north of the limeworks.

A number of distinct beds of diatomaceous earth have been identified in the stratigraphic column (Doig, 1967).

The bed has been allocated a zone based on the predominant genus found in the bed.

The table below (from Doig, 1967) enumerates the beds, as known at that juncture. (see notes on Arthur John Doig in Section C).

Location Name: Taylor's Quarry			
Acronym	Sequence Name	Beds exposed	Notes
CD	Dragline and Quarry	CD1-CD8	
CE	Cormack's Extension and Watertank	CE1-CE5	
CS	Cormack's Siding	CS1	

Acronym/Bed	Old Name	Zone	Notes
CD/8	Base of Dragline	Melosira	
CE/3	Base of Watertank	Stephanopyxis	
CE/5	Cormack's Extension	Stephanopyxis	
CS/1	Cormack's Siding	Stephanopyxis	

38. Te Aneraki Escarpment {Forrester}

From - Wises Index to Every Place in NZ, 1912

TE ANERAKI. See Enfield

ENFIELD, Otago. 81 miles north by rail from Dunedin and seven from Oamaru; in Waitaki County. Farming settlement. Good roads. Private board. A deposit of dolerite has recently been unearthed here. Post and telephone office with daily mail. Doctor at Oamaru. 8 m. Store and dairy factory.

39. Totara {1889 - Tempere et Peragallo, 1915 - Diatomees du Monde Entier - Tempere et Peragallo, Meakin Collection - Sample 588 (ex-Leonard via Dr.Albert Mann), 851, 1359}

There are many Totara locations that, in all likelihood, do not have anything to do with the diatomite outcrops. This is probably the case with the location Totaratahi below. This is normally shortened to Totara.

An example of this is a Totara in the vicinity of Fortification Hill as per the following newspaper cutting.

THE RECENT FATAL ACCIDENT
AT TOTARA.

THE INQUEST.

An inquest was held yesterday, at the Northern Hotel, before T. W. Parker, Esq., District Coroner, and a jury of thirteen, of whom Mr. Thomas Procter was chosen foreman, on view of the body of Allan Mawhinney, there lying dead. The following evidence was adduced:—

Robert Meek, sworn, deposed: I am a farmer residing at Wamareka. I knew a man by the name of Allan Mawhinney, who was a laborer in my employment. He drove a team of horses. I last saw him alive about 20 minutes to 9 o'clock yesterday morning, the 9th October instant. Up to that time he had been engaged in loading a dray with grain which he was going to drive into Oamaru. He was then perfectly sober. Another dray and team of mine driven by John Bailey, was going to Oamaru in company with Mawhinney. There were three horses in the team driven by Mawhinney, all in a line, and with reins attached. From what I was told by one John McMillan, I went to the Main South Road at the junction with it of the Fortification Road, distant from 4 to 5 miles from my farm, from which the drays had started. I found Mawhinney lying on the side of the road. He was quite dead. The horses had been taken out of the dray, which was standing at the side of the road. The loading on the dray was all right. On examination of the road along which the dray had come I saw there in one place the track of one wheel was obliterated from the road for a length of some inches—perhaps fifteen or about that—and from this spot the body seemed to have been dragged to the place where I found it, which was about a yard and a-half. The dray seemed to have been going along the main road regularly until the horses came to the already mentioned Fortification Road, which they seemed to have turned into. This road leads in the direction of my farm. I should think the deceased was about 30 years of age, and I have been informed that he was a native of Castle Dawson, in the County of Derry, Ireland. He was unmarried. I went to the scene of the accident in my buggy, and drove the body in to Oamaru. There were twenty bags of wheat in the dray, and I think the weight of the load and dray together would be nearly three tons. Deceased was on perfectly friendly terms with his mate John Bailey.

Albert Isaac Garland, sworn, deposed. I am a legally qualified medical practitioner at Oamaru. Yesterday morning I was called to see a man who had been hurt. I immediately rode out to the place, which I was informed was at the crossing of the Main South Road, just under the Fortification Hill. I found there the body of the man lying on the grass by the roadside. The man was quite dead. This morning I have performed a *post mortem* examination. On opening the abdomen I found a large quantity of blood. On removing the intestines I found the last lumbar vertebra separated from the sacrum. The spinal cord was divided. The intestines were much bruised and crushed, and the left kidney was ruptured. On the external surface of the body there was an abrasion which appeared to have been caused by the pressure of some heavy body. On the left leg a few inches above the ankle was a similar mark, and over the right hip bone there was a small abrasion. There were no other external marks of violence. Death appeared to have been caused by the fracture of the spinal column. These injuries might

North Otago Times, Volume XXVII, Issue 2008, 11 October 1878

It is believed that the Totara material is sourced from a location next to Bain's and indeed some references, by way of confirmation, state Bain's Totara. See Bain's.
From - Wisers Index to Every Place in NZ, 1912

TOTARA, Otago. A railway station on Dunedin Oamaru line. Totara is short for Totaratahi.

TOTARATAHI, Otago. Six miles by rail from Oamaru and three miles from the coast. A farming locality. Wild ducks and rabbits. "Totara" means "tree," and "Tahi" "one." Only one tree on the Totara estate. Post and, teleph office. Dr at Oamaru, 6 m.

Def: Totara:

The forest tree *podocarpus*. (def: 1936)

Podocarpus totara (tōtara) is a species of podocarp tree endemic to New Zealand. It grows throughout the North Island and northeastern South Island in lowland, montane and lower subalpine forest at elevations of up to 600 m. Prized for its carving properties it was the primary wood used in Māori carving.

Close to Bain's, in the middle of a field under a large boulder lies a collecting site known as Totara (also Ototara)

New Zealand Historic Places Trust

19 DRD Oamaru 8901

The site of Totara Estate is of national importance as the origin of the frozen meat industry in New Zealand.

The first shipment of frozen meat was organized, killed and dressed in the sheds at Totara, then transported to the nearby railway siding, where it was taken by rail to Dunedin in Ice packed carriages. At Port Chalmers it was loaded into hold of the sailing ship Dunedin of the Albion Shipping Line, where it was then frozen before being shipped to Britain. This took place in February 1882. The success of this initial shipment formed the basis of New Zealand's meat industry and overseas markets.

Today the history of the New Zealand Meat Freezing Industry, which has become one New Zealand's main export earners, can be seen here at Totara. The collection of fascinating antique farming equipment and other relics are housed within the four farm buildings, which are all are built of Oamaru Stone, three date of which from mid-1860s. The carcass shed was built in 1881. The Mens Quarters and Cookhouse, are set up as they would have been, the main building has a comprehensive museum relating to pioneer farming development and the venture into the frozen meat trade.

Hours of opening

WEDNESDAYS TO SUNDAYS 10 am to 4pm, plus public holidays (except Christmas Day) and for tours, any time by arrangement. (Dec - Feb open DAILY).

Admission

Tour Prices: Adults \$15 - Children \$5 - Family \$40

Guided Tours available

Postal Address

Lesley Whitteker.

Property Manager,

Totara Estate/Clark's Mill,

N.Z. Historic Places Trust/Pouhere Taonga,

19 D.R.D.,

Oamaru.

Phone/Fax 03 434 7169

EMail: totaraestate@historic.org.nz

New Zealand Place Names Database

Place Name Detail: Totara

District: Otago

Description: LOCALITY: Defined area of low or nil population

Lat: -45.1400

Long: 170.8716

NZMG Easting: 2342553.5

NZMG Northing: 5561097.7

NZMS 260 sheet: J41
 450 6' 7.80" S 1700 53' 20.78" E

40. Troublesome Gully {1889 - Tempere et Peragallo, 1915 - Diatomees du Monde Entier - Tempere et Peragallo, Meakin Collection - Samples 733, 734, 1360}

Troublesome Gully is on the Ross Mitchell property at Weston.

REPORT ON THE INFORMATION PROVIDED TO SUPPORT A PROPOSED CEMENT PLANT AND ASSOCIATED QUARRIES NEAR OAMARU

KAI TAHU KI OTAGO LIMITED (MARCH 2007)

Surveys undertaken October and September 2006. Troublesome Gully contains exotic species. There is a small amount of native vegetation located on the escarpment just above the gully. There is limited native vegetation at Ngapara; however, two small wetland areas were found containing remnant indigenous vegetation. Native vegetation located on the escarpment above Troublesome Gully will be removed; this requires resource consent from the Waitaki District Council. It is proposed that native vegetation along the main escarpment at Weston will be protected. Gullies within Ngapara will be heavily modified. While they contain indigenous species, these are common species and are already modified. There are 3 rock art sites located in Troublesome Gully.

A number of distinct beds of diatomaceous earth have been identified in the stratigraphic column (Doig, 1967).

The bed has been allocated a zone based on the predominant genus found in the bed.

The table below (from Doig, 1967) enumerates the beds, as known at that juncture. (see notes on Arthur John Doig in Section C).

Location Name: Troublesome Gully			
Acronym/Bed	Old Name	Zone	Notes
TG/1	Troublesome Gully	Coscinodiscus	
TG/2	Troublesome Gully	Coscinodiscus	

41. Waiareki Valley (below Jackson's) {1888 - Lautour}

From - Wises Index to Every Place in NZ, 1912

WAIAREKA. See Weston.

WAIAREKA JUNCTION, Otago. Railway siding and junction with post office two miles from Oamaru. Nearest telegraph office Oamaru. A rich discovery in the form of granite has recently been unearthed here. Dr. at Oamaru.

WESTON, Otago. Mixed farming district and township, four miles W. from Oamaru by rail; in Waitaki County. Post and telephone office. Quarries of the noted Oamaru stone are here. Two stores and dairy factory in the township. Is bounded by the Awamoa Creek, and the Waiareka Creek passes near. Dr. at Oamaru, 4 m.

WAITAKI. A railway station on the Waitaki River 13 miles north-east from Oamaru. Duck and hare shooting and trout fishing. Name means "Running water." Post office. Nearest telegraph office is Glenavy, 1 = m distant. One hotel. Dr. at Oamaru.

42. Whitstone Escarpment (Synonymous with Lorne Escarpment, William s Bluff)

From - Wises Index to Every Place in NZ, 1912

WHITSTONE. Six miles from Oamaru; in Waitaki County. Rail to Weston, thence two miles. Farming district. Nearest telegraph office Enfield, one and a-quarter miles. Post office.

S:4503'41" E:170053'7"

43. William's Bluff (Synonymous with Lorne Escarpment, Whitstone Escarpment) {1887 - Hutton, 1915 - Diatomees du Monde Entier - Tempere et Peragallo, Meakin Collection - Samples 593-596 (ex-Tempere)}

Exposures at the cliff top.

A number of distinct beds of diatomaceous earth have been identified in the stratigraphic column (Doig, 1967).

The bed has been allocated a zone based on the predominant genus found in the bed.

The table below (from Doig, 1967) enumerates the beds, as known at that juncture. (see notes on Arthur John Doig in Section C).

Location Name: William's Bluff			
Acronym/Bed	Old Name	Zone	Notes
WB/1	William's Bluff	Coscinodiscus	Diatomaceae more frequent in upper layers.

Summary of Locations:

1. Allan's Farm, Oamaru {1889 - Lautour}

1a. Allen's Farm (Synonymous with Allan's Farm)

1b. Allan's Rock {John A. Schulze Collection - 469, 471, 472, 476}

2. Atkinson's Farm

3. Bain's (Farm) {1887 - Hutton, 1889 - Lautour, 1889 - Tempere et Peragallo}

Records also exist relating to Bain's Top (is this synonymous with Bain's Upper?)

3a. Bain's Upper

3b. Bain's Middle

3c. Bain's Lower

Records also exist relating to Bain's Totara.

4. Big Flume Creek (Synonymous with Borrie's [Farm], Flume Creek, Flume Gully, Frew's [Gully], Hurst's [Farm], Papakaio)

5. Bill's Bluff (Synonymous with William's Bluff) {Arthur J. Doig}

6. Borries (Borrie's Farm) (Synonymous with Big Flume Creek, Borrie's [Farm], Flume Creek, Flume Gully, Frew's [Gully], Hurst's [Farm], Papakaio) {1889 - Tempere et Peragallo}

7. Breen's (Farm)

8. Capsize Stone Quarry (appears to be synonymous with Breen's Farm and Old Stone Quarry) {1918 - Park}

8a. Cape Size {CAS Diatom Collection Acc. No. 612443 - York T. Mandra}

9. Cave Valley (possibly the same as Cormack's) {1874 - H. R. Webb, 1886, 1888 - Lautour}

10. Cormack's (Cormacks) {Meakin Collection - Sample 735 S.W. Corner, 1153, 1154}

10a. Cormack's Crossing {Arthur J. Doig}

10b. Cormack's Extension {1877 - McKay}

10c. Cormack's Farm

10d. Cormack's Siding {1874 - H. R. Webb, 1877 - McKay, 1888 - Forrester}

10e. Cormack's Top {1877 - McKay}

11. Daniels.? (Cormack's?)

12. Devil's Bridge (Synonymous with Mavor's)

13. Dick's Farm

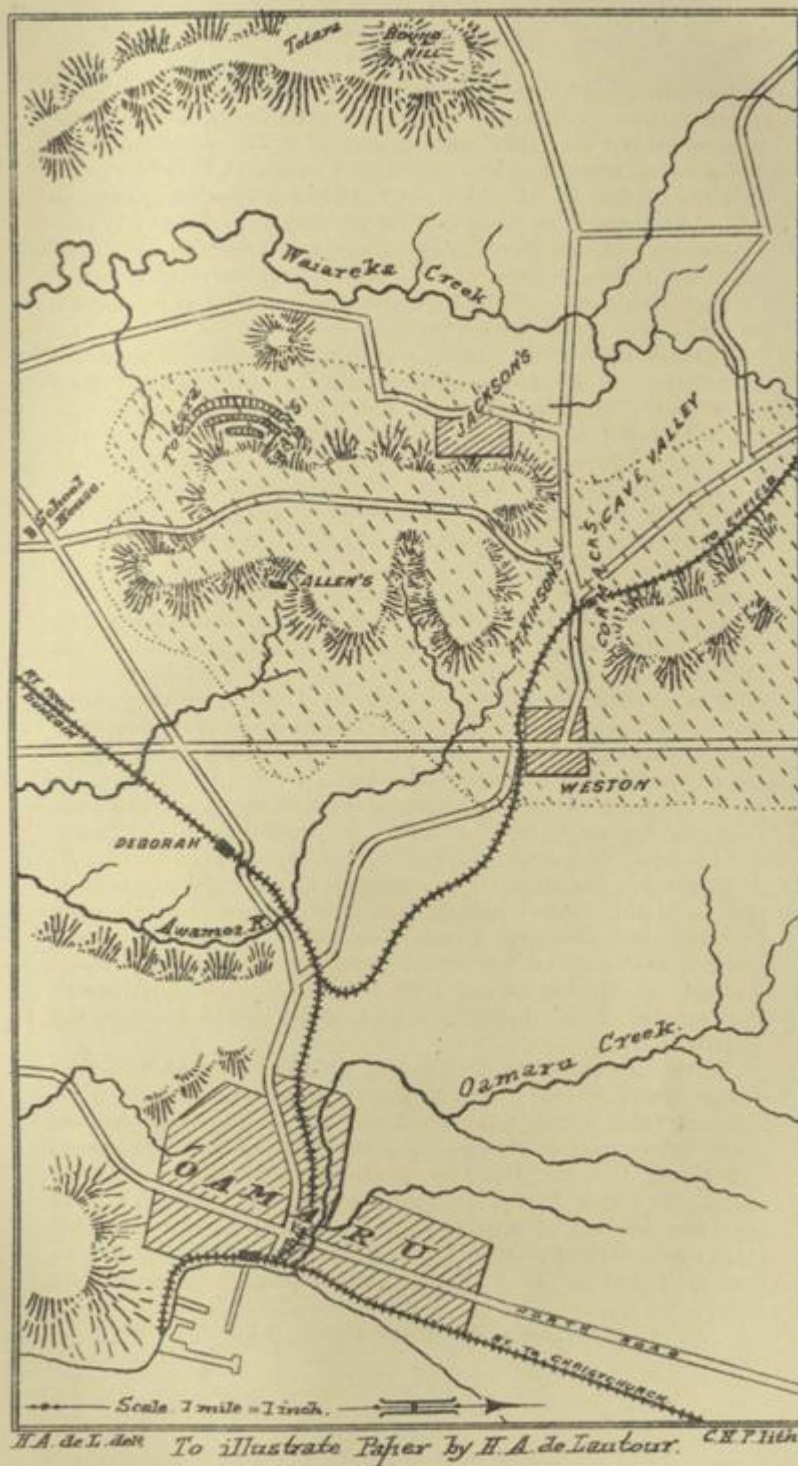
14. Division Hill

15. Flaws Creek (East Oamaru)

16. Flume Creek (Synonymous with Big Flume Creek, Borrie's [Farm], Flume Gully, Frew's [Gully], Hurst's [Farm], Papakaio) {1889 - Tempere et Peragallo}

17. Flume Gully (Synonymous with Big Flume Creek, Borrie's [Farm], Flume Creek, Frew's [Gully], Hurst's [Farm], Papakaio) { 1889 - Tempere et Peragallo }
18. Forrester's
 - 18a. Forrester's Hill, Oamaru {Meakin Collection - Sample 1190, 1191, 1193, 1194, 1195}
 - 18b. Forrester's Rock (Synonymous with Forrester's Hill or is it) { 1915 - Diatomees du Monde Entier - Tempere et Peragallo, Meakin Collection - Sample 490 (ex-Tempere)}
or since this wasn't found could this be the Totara stone?
19. Fortification Hill
20. Foulden Hills, Otago (Foulden Hills Diatomite, not far from Dunedin, New Zealand. - near Middlemarch so probably Freshwater Crater Lake material)
21. Frew's (Gully) (possibly synonymous with Big Flume Creek, Borrie's [Farm], Flume Creek, Flume Gully, Frew's [Gully], Hurst's [Farm], Papakaio){ 1889 - Tempere et Peragallo }
22. Hurst's (Farm) (Synonymous with Big Flume Creek, Borrie's [Farm], Flume Creek, Flume Gully, Frew's [Gully], Papakaio and possibly Kent Knole) { 1889 - Tempere et Peragallo }
23. Jackson's { 1888 - Lautour, Meakin Collection - Sample 1227, 1362, 1379}
 - 23a. Jackson's Farm {Dr. Watt - Brigger Collection bottle 650}
 - 23b. Jackson's Paddock {188? - Mr. C. Gifford of Waitaki Boys High School, 1888 - Forrester, 1888 - Lautour, 1915 - Diatomees du Monde Entier - Tempere et Peragallo, Meakin Collection - Sample 508-511 (ex-Tempere), 849, 1117}
 - 23c. Jackson's Rock {John A. Schulze Collection - 493}
 - 23d. Jackson's Top {Dr. Watt - Brigger Collection bottles 201, 204, and 205}
 - 23e. Jackson's Well {Brigger Collection - bottle 32}
24. Kakanui
25. Kent Knole (Synonymous with Hurst's Farm and probably Papakaio) { 1957 - Gage, 1965 - Turner }
26. Lorne Escarpment (Synonymous with William's Bluff, Whitstone Escarpment, Bill's Bluff)
27. Mavor's (possibly relating to the father and son partnership, Colin and Stefan Mavor, operating Braemorn Farm, Airedale, near Oamaru. i.e. Mavor's) { 1962 - Doig }
28. Middlemarch (South west of Oamaru) (Freshwater Volcanic Crater Lake material)
29. Old Stone Quarry (Synonymous with Breen's Farm and Capsize Stone Quarry)
30. Papakaio [Papakaiyo] (Synonymous with Big Flume Creek, Borrie's [Farm], Flume Creek, Flume Gully, Frew's [Gully], possibly Hurst's [Farm]) { 1889 - Tempere et Peragallo, Meakin Collection - Sample 920, 921, 995, 1174, 1226}
 - 30a. Lower Papakaio
 - 30b. Upper Papakaio
31. Puriri ??? (Puriri is in the north island - if the sample is Oamaru then I think this is a mis-reading of Pukeuri)
32. Railway Cutting.? (probably Cormack's siding)
33. Rocky Creek (Synonymous with Rocky Stream) {Forrester}
34. Rocky Stream (Synonymous with Rocky Creek) { 1967 - Doig }
35. Stephenson's Farm (nr. Weston)
36. Table Top Hill { 1967 - Doig }
 - 36a. Table Top Lower
 - 36b. Table Top Upper
37. Taylor's Quarry (Taylor's Lime Works) { 1888 - Lautour }
38. Te Aneraki Escarpment {Forrester}
39. Totara { 1889 - Tempere et Peragallo, 1915 - Diatomees du Monde Entier - Tempere et Peragallo, Meakin Collection - Sample 588 (ex-Leonard via Dr. Albert Mann), 851, 1359} See Bain's Totara.

40. Troublesome Gully {1889 - Tempere et Peragallo, 1915 - Diatomees du Monde Entier - Tempere et Peragallo, Meakin Collection - Samples 733, 734, 1360}
41. Waiareki Valley (below Jackson's) {1888 - Lautour}
42. Whitstone Escarpment (Synonymous with Lorne Escarpment, William's Bluff, Bill's Bluff)
43. Williams' Bluff (Synonymous with Lorne Escarpment, Whitstone Escarpment, Bill's Bluff) {1887 - Hutton}



Harry de Lautour (On the Fossil Marine Diatomaceous Deposit near Oamaru
Read before the Otago Institute 12th June 1888)

"Map of Oamaru and district, showing the diatom outcrops or faces at Cormack's siding, Jackson's, Bain's, and Allen's farms. The dotted lines show the area of diatomaceous deposit as mapped out by Mr. Isdaile. Diatom earth has also been ploughed up in Cave Valley and on the east side of the Waiareka Creek. None has, however, yet been found on the west side of

the creek, nor on the hills near Totara Round Hill. A small deposit occurs just where the road crosses the railway-bridge to Enfield, but it is of no importance, and is much mixed up with the calcareous *dibris* of the disintegrated limestone."

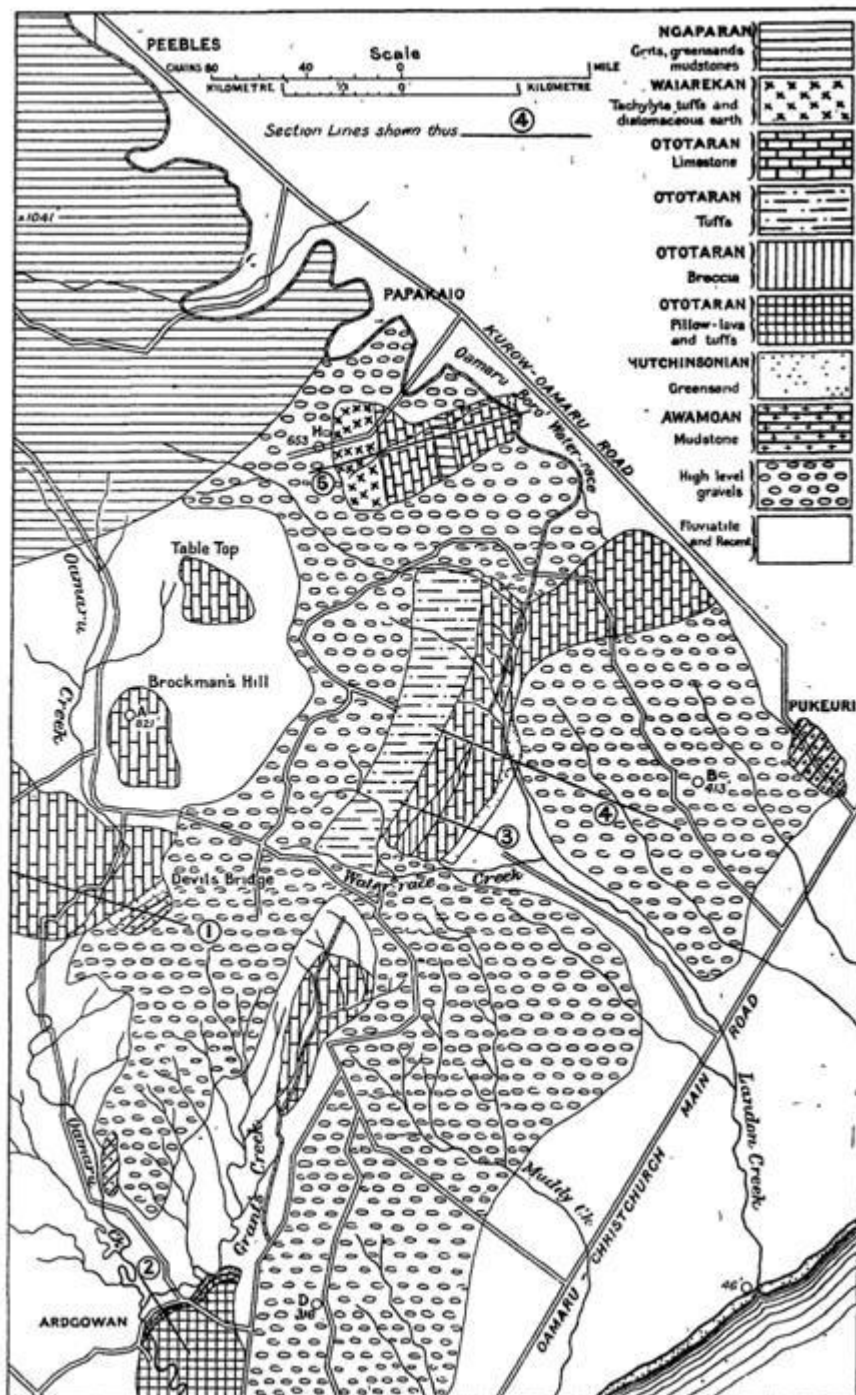


FIG. 1.—Geological map of the Oamaru-Papakaio district. In the legend the order of superposition is inverted.

Transactions and Proceedings of the Royal Society of New Zealand
Art. VIII. Geology of the Oamara-Papakaio District.

By G. H. Uttley, M.A., M.Sc., F.G.S., Principal, Scots College, Wellington.

[Read before the Wellington Philosophical Society, 19th September, 1917, received by Editors, 31st December, 1917; issued separately, 24th May, 1918.]

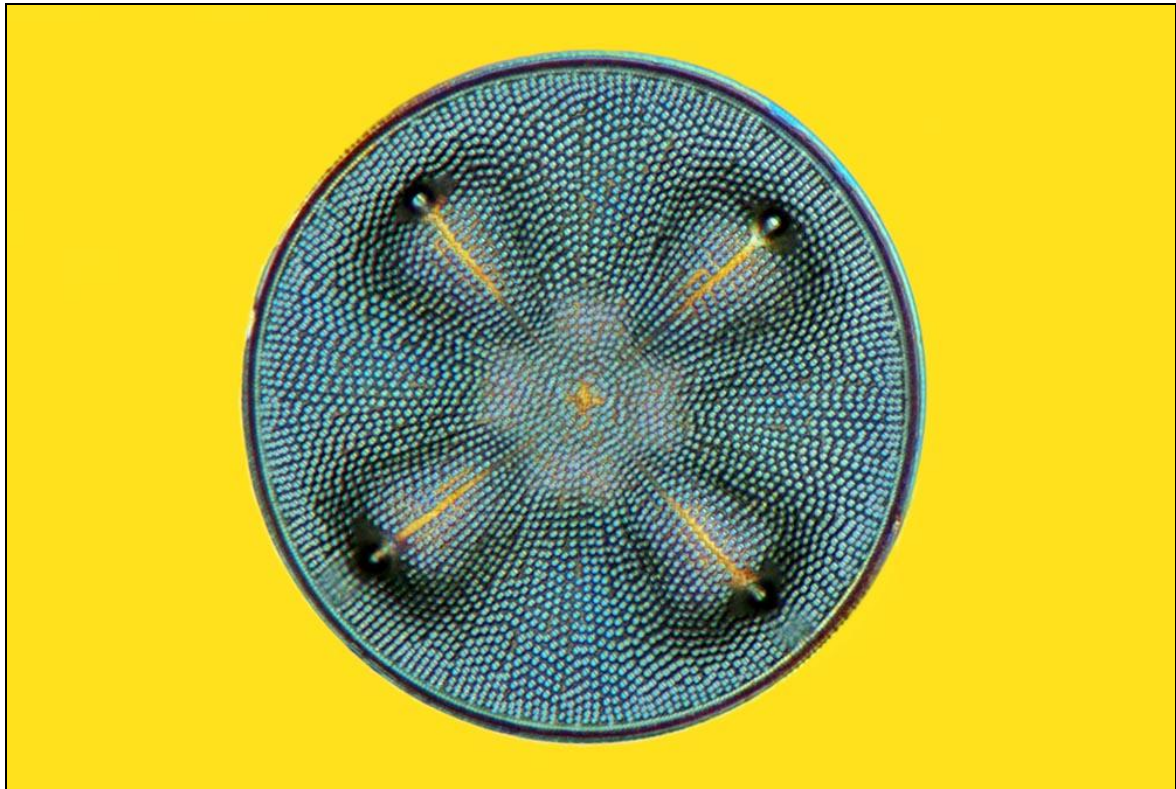
(Note: On this map is Water Race Creek another name for Flume Creek/Gully? Or is Flume Creek where Oamaru Borough Water-race is marked?)

Diatoms in Colour

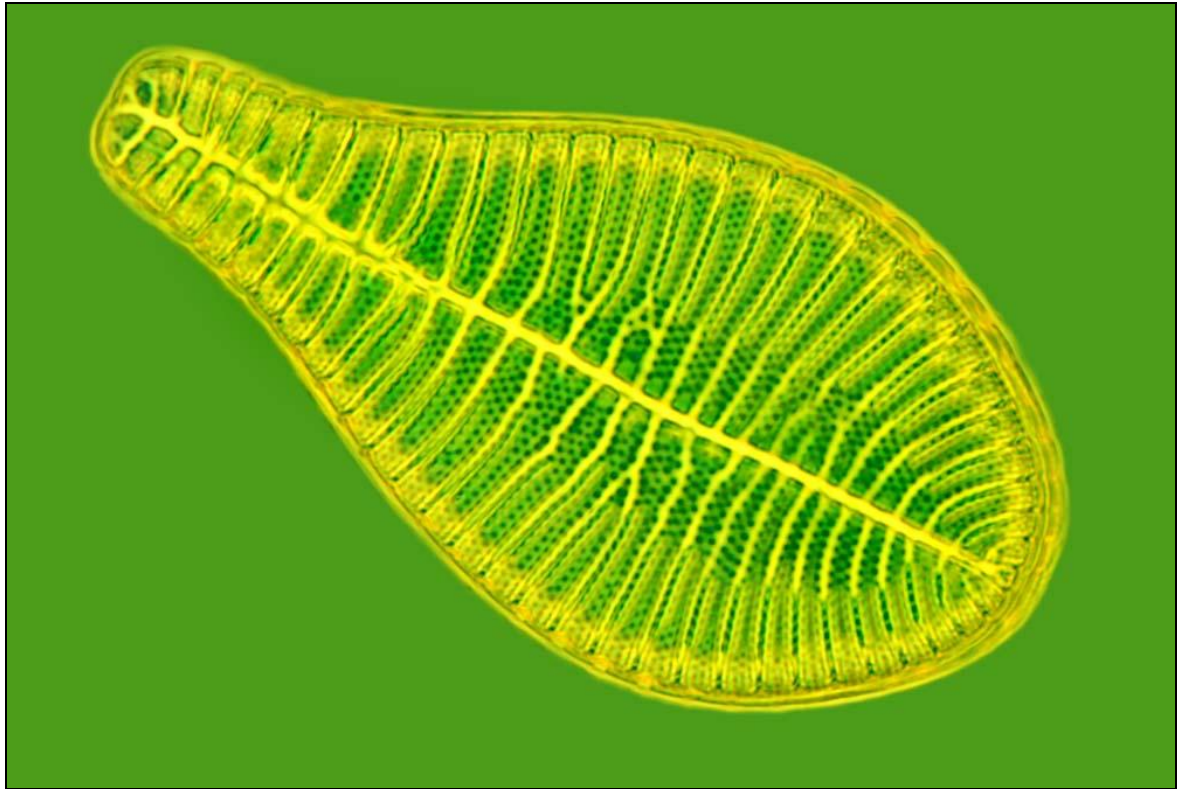
Spike Walker's Diatoms in Colour Gallery
All images © M. I. Walker 2013

Spike Walker has generously given us permission to use even more of his quite exquisite images.

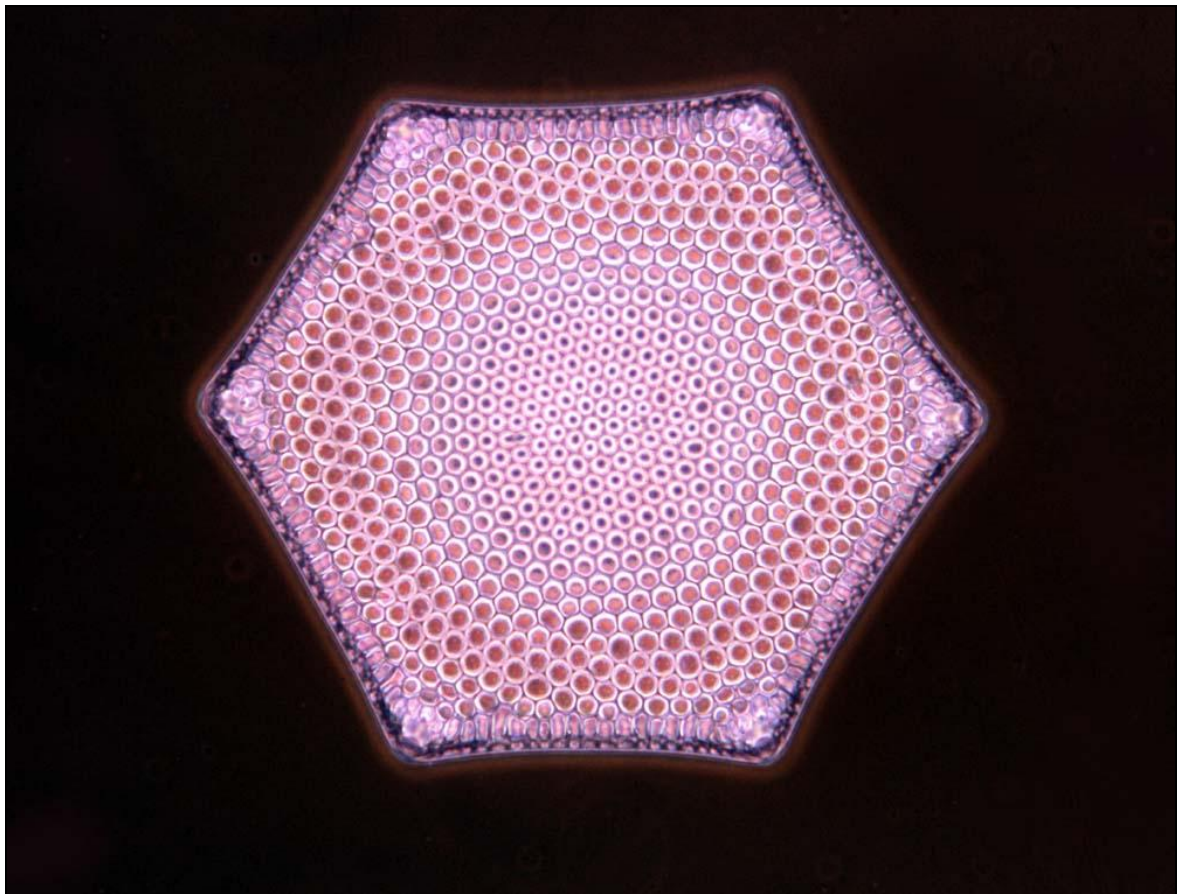
We are careful to ask for such during the euphoria of our occasional 'get togethers'. Spike has always been most accommodating in allowing us the use of his material and once again we thank him wholeheartedly.....again.



Aulacodiscus formosus



Podocystis spathulata



Triceratium favus

Field Microscopes X

The Diagnostic by C. Baker



Inset - from The Illustrated Annual of Microscopy 1900.

This incredibly robust, yet compact, stand utilises standard RMS thread objectives, standard eyepieces and has a tube length range similar to bench top microscopes. As such it is ideally suited to the outwardbound diatomist.

1900/01

C. BAKER,

(ESTABLISHED 1765)

244, HIGH HOLBORN,
LONDON.

Telegrams "Optivorum, London."
Telephone: 1427 Holborn.

Agent for

LEITZ,
REICHERT,
ZEISS,
JUNG,
GRÜBLER.

Contractor to
Various . . .
Departments of
The Home and
Colonial . . .
Governments..
The India . . .
Office, etc.



Also
BECK,
ROSS,
SWIFT,
WATSON.

MICROSCOPES & ACCESSORIES. .

Hours of Business: 9 a.m. to 7 p.m. Saturdays, 9 a.m. to 2 p.m.

TRAVELLING MICROSCOPES.

THE DIAGNOSTIC.

This instrument was designed at the suggestion of Surgeon-Major Ronald Ross, for the special use of officers of the Indian Army Medical Department for the diagnosis of Malaria Fever, but can be fitted with objectives suitable for other purposes.

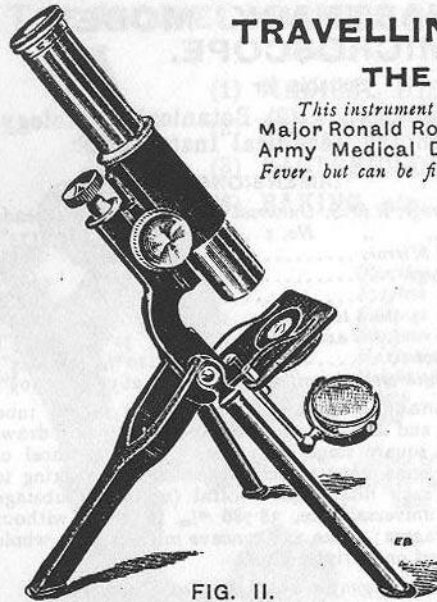


FIG. II.

DIMENSIONS.

Objective gauge R.M.S. universal	0	7967"	36 threads
Eyepiece gauge R.M.S. No. 1	23 ^m / _m	(0.9173")	
Substage gauge	27 ^m / _m	(1.063")	
Diameter of mirrors	30 ^m / _m	(1.181")	
Width of stage	60 ^m / _m	(2.362")	
Depth " " (back to front)	50 ^m / _m	(1.969")	
Spread of feet ..	180 ^m / _m × 180 ^m / _m	(7" × 7")	
Case with three objectives and extra eyepiece ..	270 ^m / _m (10.63") × 90 ^m / _m (3.54") × 75 ^m / _m (2.95")		
Case with three objectives extra eyepiece and mechanical stage ..	270 ^m / _m (10.63") × 100 ^m / _m (3.94") × 75 ^m / _m (2.95")		

Price: £3 17 6

The Diagnostic Microscope has diagonal rack and pinion coarse and micrometer screw fine adjustment, draw-tube extending to 170^m/_m, square stage with clips; substage fitting; plane and concave mirrors; the whole mounted on a folding tripod (see note below).

Stand only in solid brown leather case with either shoulder strap and loops for military belt or handle; with space for three objectives, extra eyepiece, and tubes for stain and immersion oil

£3 17 6

Small Illuminator (modified Abbé) with iris diaphragm

1 2 6

Mechanical Stage for above (fig. 12, page 15) by means of which the whole of a 38^m/_m × 19^m/_m (1.5" × 0.75") cover glass can be examined

2 5 0

(See note below, also on page 15.)

Extra for larger case to carry the mechanical stage

0 5 0

Lock and key to case

£0 3 0

Cycle fittings for case

0 3 0

The Diagnostic Microscope as above, with two eyepieces Nos. 2 and 4, three objectives $\frac{3}{8}$ ", $\frac{1}{8}$ ", $\frac{1}{12}$ " oil immersion, substage condenser with iris diaphragm and double nosepiece (triple nosepiece is not advisable with so small a stand).

	Without mechanical stage.	With mechanical stage.
Baker objectives, $\frac{3}{8}$ ", $\frac{1}{8}$ ", $\frac{1}{12}$ " oil immersion ..	£13 7 6	£15 17 6
Leitz " 3, 6, $\frac{1}{12}$ " " ..	13 10 0	16 0 0
Reichert " 3, 6, $\frac{1}{12}$ " " ..	13 12 0	16 2 0
Zeiss " A. D. $\frac{1}{12}$ " " ..	17 11 0	20 1 0

Approximate magnifications—50, 90, 240, 420, 530, 925.

To set up the Microscope. When in use the tube carrying the objective should be drawn up through the bronzed jacket upon which the rack is mounted as far as is consistent with the focussing of the objectives with the rack and pinion; in this position the movements of the instrument are practically free from that unsteadiness to which all small travelling instruments are more especially liable.

To attach the mechanical stage to the microscope. First slide down the substage condenser until it is well below the stage, see that the screw which gives the back to front movement is unscrewed for the greater part of its length, then push the mechanical stage on to the ordinary stage, first engaging the upper left-hand corner of the ordinary stage with the runner fitted with spring on the under side of the mechanical stage; a slight pressure on this runner will allow the other runner to be slipped over the top right-hand corner; it should now be pushed down until the screw which gives the back to front movement touches the edge of the stage, and the condenser pushed up so that the front lens is just beneath the slip; to effect this the optical part can be raised or lowered in relation to the iris diaphragm, in addition to the sliding movement of the condenser as a whole, being mounted in a separate fitting (see note at the end of next page).

For other objectives and eyepieces suitable for this Stand, see pages 19, 20 and 21.

As can be seen in the catalogue entry above the stand was originally designed to enable workers in the field to diagnose Malaria.

The requirement for such microscopes by medical workers has today been superseded by the advent of chemical based diagnosis kits.

The Surgeon-Major Ronald Ross mentioned in the catalogue entry is, of course, Sir Ronald Ross. The following Biography of Sir Ronald Ross is courtesy of London School of Hygiene & Tropical Medicine ([click the logo below to be directed to their web site where significant other detail is to be found](#)).



Sir Ronald Ross was born in India in 1857 to a Scottish Army Officer and his wife. He was educated in England and entered St Bartholomew's Hospital Medical College in 1874. He took the examinations for the Royal College of Surgeons of England in 1879 and obtained the post of ship's surgeon while studying for the Licentiate of the Society of Apothecaries, which allowed him to enter the Indian Medical Service in 1881. He held temporary appointments in Madras, Burma and Andaman Islands, all the while developing his interests in poetry, literature and mathematics. In 1892 he began his study of malaria and in 1895 began his correspondence with Sir Patrick Manson, then physician to the Seamen's Hospital Society, who became the Medical Advisor to the Colonial Office and the founder of the London School of Tropical Medicine.

In August 1897, he made his famous discovery of the transmission of malaria parasites in man by *Anopheles* mosquitoes, after which he continued his research work in India until 1899 when he retired from the Indian Medical Service. He returned to England, taking a post as lecturer at the Liverpool School of Tropical Medicine, later becoming Professor of Tropical Medicine, and accepting a personal chair in Tropical Sanitation at Liverpool University. During World War One he was appointed a consultant physician on tropical diseases to Indian troops and was sent to Alexandria for four months to investigate an outbreak of dysentery which was hampering troops in the Dardanelles. In 1917 he was appointed a consultant physician to the War Office and in 1919 he received an honorary post as consultant to the Ministry of Pensions.

During his life he went on various expeditions, including West Africa, Panama, Greece and Cyprus to advise on and aid the extermination of malaria. He wrote extensively on malaria and other topics including his book *The Prevention of Malaria* in 1910. He was awarded the Nobel Prize for Medicine in 1902 and knighted in 1911. Despite receiving many other awards and honours during his life, he felt embittered that he did not receive monetary reward for his discovery* and petitioned the Government on this subject. This was part of his concern that research workers should receive proper payment and pensions for their work. He was Director-in-Chief of the Ross Institute and Hospital for Tropical Diseases from 1926 until his death in 1932.

*At his death on the 16th September 1932 his estate was valued at only #7,403 4s.

The magnitude of the discovery of the malarial parasite is stated in the following extract.

The letter from DR. RONALD ROSS which we published yesterday, on the subject of the malaria-bearing mosquito, although it merely confirms the previously received report of his success in finding this insect at Sierra Leone, and does not carry the matter much further than was done by the first announcement, nevertheless affords a convenient opportunity for summarizing the results of what promises to take rank among the most valuable scientific discoveries of the century.

Extract from The Times Thursday, September 28th 1899

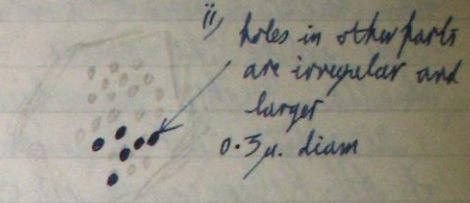
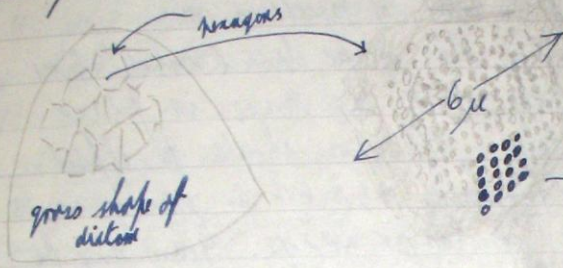
Extracts from a Diatomists' Notebook (I)

Dr. Michael Vaughn Salmon (Laboratory Notebook II)

24 Apr. 78 Object of Expt. To study *Microrotium foveus* on Møller's test slide
N. A. 2. G.

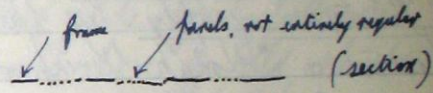
Apparatus:- Zeiss 3mm dry obj: Vi: No other apparatus assoc. with the slide, i.e. black spots etc.

Readings:-



ii) In parts of diatom, 'panel' perforations extend over whole of hexagon frame and are regular and smaller. 0.2 μ diam.

iii) Panels containing perforated membrane are lined with hexagon frame, in fact it is not a real frame, circles of perforations are placed in plain triangular 'dick' giving effect of hexagons as main structure.



Results:- Zeiss 3mm dry gives a very clear picture of the diatom with oblique Vi light, a good dark photographic-type of background. Little more res. appears required. Small colour in picture due to illumination.

Conclusion *Microrotium foveus* are made like *Pidulphia* and *Coscinodiscus*. Size of perforations varies between small limits. These three types are easy to see in Vi. Noted in passing:- this diatom today structure is not resolved in direct light tho' very clear and finer in Vi. can be seen easily in tilted oblique light.

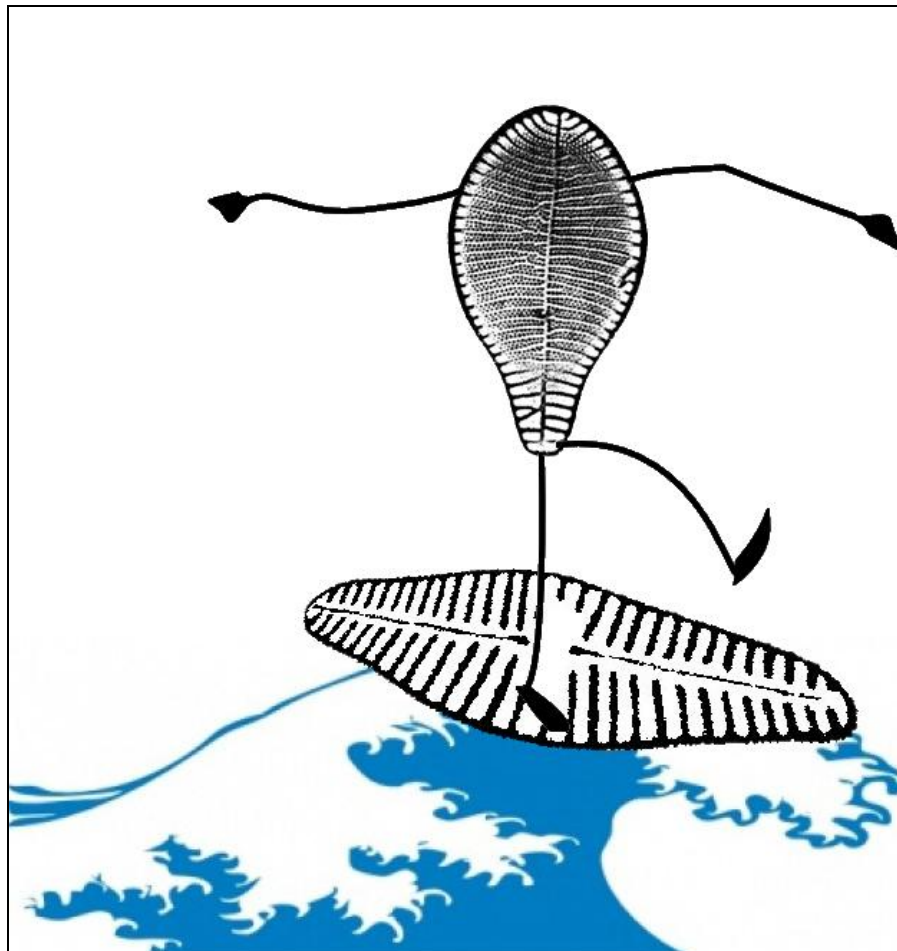
Diatom Locomotion explained?

Over many, many years much has been written (and speculated) concerning the movement of diatoms and their means of locomotion.

On pondering the various modern explanations our resident cartoonist thought there might be alternative explanations.



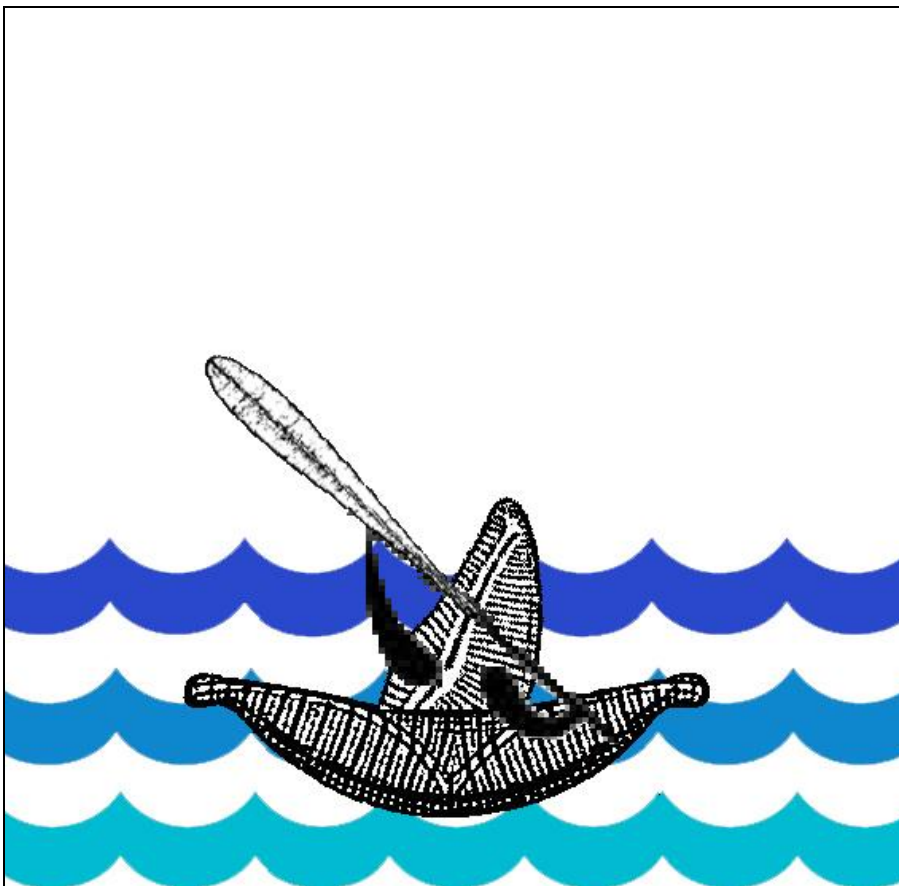
Asteromphalus and Cymatopleura



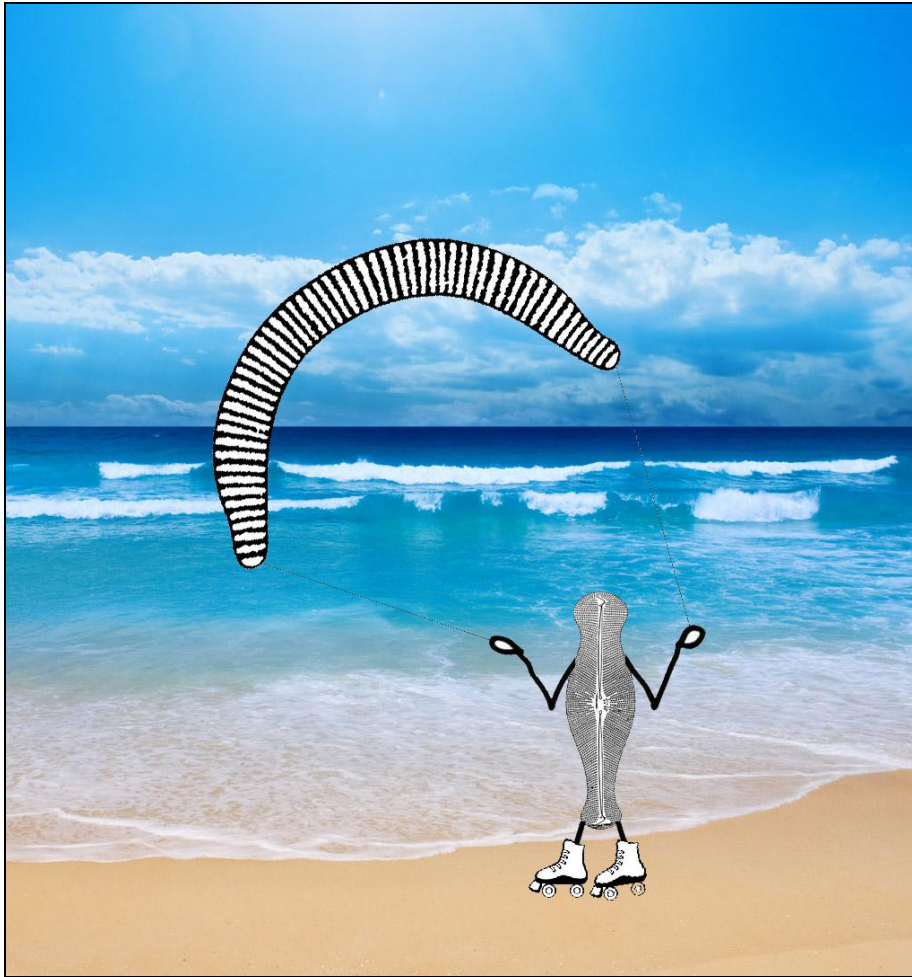
Achnanthes and Podocystis



Campylodiscus and Cocconeis



Cymbella, Epithemia and Licmophora



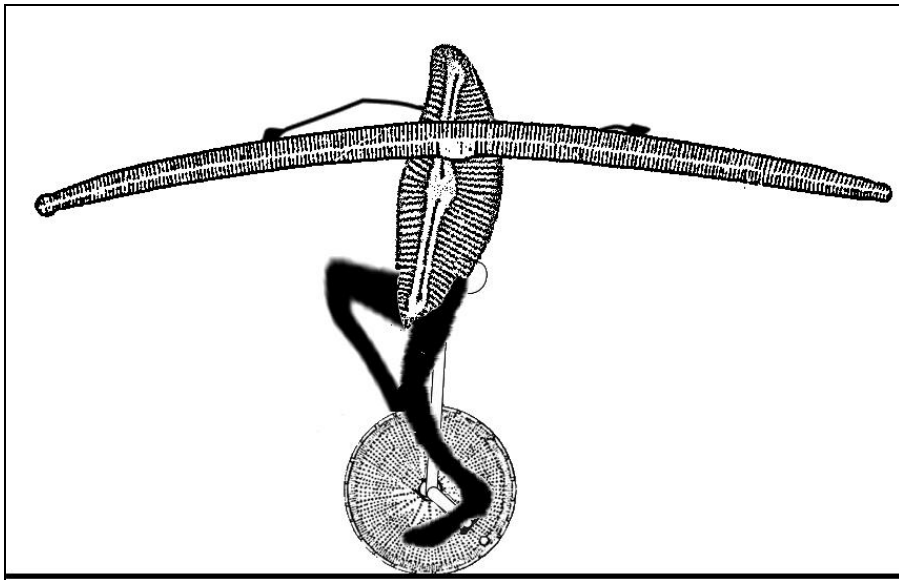
Amphicampa and Didymosphaenia



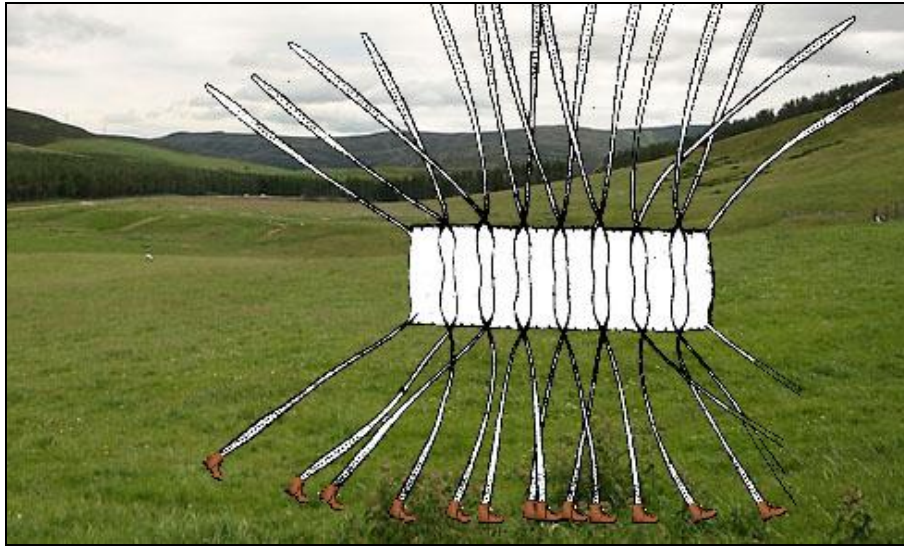
Pleurosigma and Tabellaria



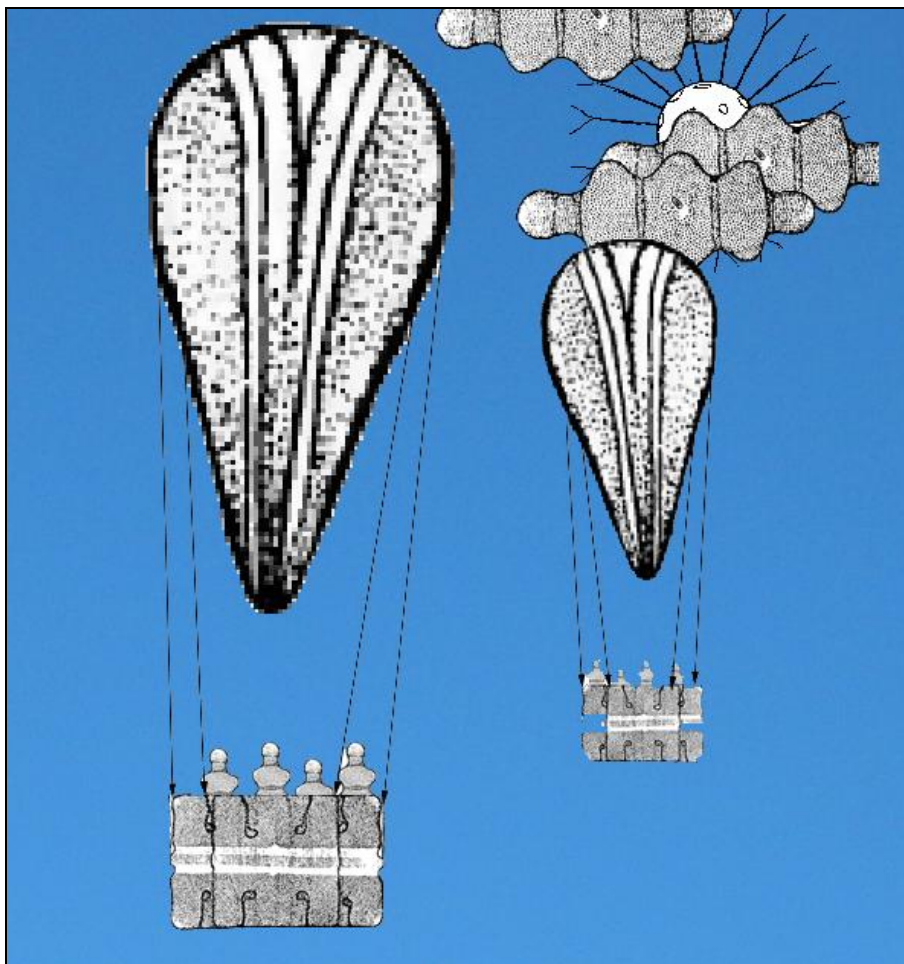
Podocystis and Omphalopsis



Ceratoneis, Actinocyclus and Cymbella



Chaetoceros



Rhipidophora, Terpsinoe and Bacteriastrum