The limestones of Scotland — Figures and plates

[Volume 1]

Figures

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(Plate 5A) Carleith Quarry, Galston, Ayrshire. Quarry in cornstone of Upper Old Red Sandstone age, illustrating the concretionary nature of the rock.

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(Table 2) Synonymy and distribution of the principal Scottish Carboniferous limestones.

[Volume 2] Figures and plates

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Plate 1 Photomicrographs of metamorphic limestones

(Plate 1 Fig. 1) Photomicrographs of metamorphic limestones. (S34577) [NR 354 485]. (SL 129), p. 81. Dalradian, Islay Limestone; Leorin Quarry, Islay. A limestone recrystallized under stress and showing foliation by alternation of bands of coarser and finer grain-grain-foliated structure-which are parallel to a schistosity produced by elongation of calcite grains and trains of dark mineral matter. Polarized light. x 20.

(Plate 1 Fig. 2) Photomicrographs of metamorphic limestones. (S34430) [NN 776 541]. (SL 4), p. 85. Dalradian, Blair Atholl Limestone; near White Bridge, Perthshire. A limestone recrystallized under stress. The calcite grains are elongated parallel to the plane of schistosity and the rock is granoschistose in structure. Small lenses of granular quartz define a foliation parallel to the schistosity produced by elongation of the calcite. Polarized light. x 15.

(Plate 1 Fig. 3) Photomicrographs of metamorphic limestones. (S34573) [NR 8336 9685]. (SL 125), p. 82. Dalradian, Tayvallich Limestone; Baluachraig, Kilmartin, Argyllshire. A limestone in which original oolitic structure is preserved in small regions within fully recrystallized rock. Polarized light. x 23.

(Plate 1 Fig. 4) Photomicrographs of metamorphic limestones. (S34575) [NM 8523 0085]. (SL 127), p. 82. Dalradian, Tayvallich Limestone; Eurach, Ford, Argyllshire. An oophasmic limestone, *cf* Fig. 3. Polarized light. x 23.

(Plate 1 Fig. 5) Photomicrographs of metamorphic limestones. (S35262) [NG 952 719]. (SL 258), p. 75. Lewisian, Loch Maree Series; Allt Folais, Letterewe, Ross-shire. A sheared and recrystallized limestone composed of calcite and aragonite. The aragonite has been darkened by boiling in cobalt nitrate solution and the photograph shows the irregular spatial relations of the two crystalline forms of calcium carbonate occurring in this rock. Polarized light. x 7.

(Plate 1 Fig. 6) Photomicrographs of metamorphic limestones. (S35262) [NG 952 719]. (SL 258), p. 75. Lewisian, Loch Maree Series; Allt Folais, Letterewe, Ross-shire. Under high magnification the crystal form and the characteristic re-entrant angles produced by twinning distinguish the aragonite from calcite. Polarized light. x 100.

(Plate 1 Fig. 7) Photomicrographs of metamorphic limestones. (S34947) [HU 437 324]. (SL 184), p. 78. Shetland Metamorphic Series; Fladdabister, Shetland. Recrystallized, sheared limestone showing large twinned crystals of calcite between laminae of triturated calcite. Polarized light. x 30.

(Plate 1 Fig. 8) Photomicrographs of metamorphic limestones. (S35264) [NG 951 720]. (SL 259), p. 76. Lewisian, Loch Maree Series; Allt Folais, Letterewe, Ross-shire. A spheroidal growth of calcite encloses a flake of phlogopite (mica) and is set in a mortar-like base of gritty and pulverized calcite. The significance of the spheroidal growth is not known. Polarized light. x 83.

Plate 2. Photomicrographs of structures of limestones

(Plate 2 Fig. 1) Photomicrographs of structures of limestones. (S34849) [ND 004 127]. (SL 162), p. 133. Jurassic, limestone in Kimmeridgian boulder beds; Portgower, Sutherland. Poikilocrystallic structure; calcite forms large shapeless crystals enclosing angular grains of quartz and feldspar and shell fragments. Polarized light. x 10.

(Plate 2 Fig. 2) Photomicrographs of structures of limestones. (S40167) [NC 381 704]. M 2921, p. 94. Cambro-Ordovocian, Durness Limestone; Balnakiel Bay, Durness, Sutherland. Homoiolithic structure; slivers and irregular pieces of white limestone with small thin shells are enclosed in darker argillaceous limestone without shells. The two components are of penecontemporaneous formation. Polarized light. x 13.

(Plate 2 Fig. 3) Photomicrographs of structures of limestones. (S34658) [NS 313 017]. (SL 156), p. 98. Upper Old Red Sandstone, cornstone; Lannie-lane Limeworks, Straiton, Ayrshire. Clotted structure; original pelitomorphic calcite forms dark clots in a base of grey, recrystallized calcite of less fine grain. More coarsely crystalline calcite occurs in a network of veins which produces a breccioid structure. Polarized light. x 15.

(Plate 2 Fig. 4) Photomicrographs of structures of limestones. (S34854) [NS 6945 3006]. (SL 170), p. 98. Upper Old Red Sandstone, cornstone; Middlefield Quarry, Muirkirk, Ayrshire. Pellet structure; small ovoid bodies, thought to be faecal pellets, form groups in a matrix of granular, recrystallized calcite. The outer coat of the pellet seems to be more resistant to recrystallization than the interior. Polarized light. x 20.

(Plate 2 Fig. 5) Photomicrographs of structures of limestones. (S34851) [ND 222 333]. (SL 167), p. 97. Middle Old Red Sandstone; Robbery Head, Caithness. A dolomitic limestone showing micronodular structure. The small, clear nodules and lenses are of dolomite, the matrix of fine-grained calcite, bituminous clay, small rhombs of dolomite and clastic quartz. Polarized light. x 12.

(Plate 2 Fig. 6) Photomicrographs of structures of limestones. (S34525) [NT 2787 6727]. (SL 17), p. 106. Calciferous Sandstone Series, Burdiehouse Limestone; Clippens Lime Works, Midlothian. Unsorted pieces of pure limestone composed of clear, granular calcite, small fragments of collophane and incomplete ostracod shells, are enclosed in a matrix of pelitomorphic calcite darkened by bituminous matter; homoiolithic structure. Polarized light. x 13.

(Plate 2 Fig. 7) Photomicrographs of structures of limestones. (S35904) [NT 252 939]. (SL 214), p. 120. Carboniferous Limestone Series, Charlestown Main Limestone; Chapel Quarry, Kirkcaldy, Fife. Zoophasmic structure in a thermally altered limestone. The carbonate has been completely recrystallized to coarse grains, and tiny garnets (small dark dots and aggregates) have been produced by the action of heat. The outlines of fossils are partially preserved. Polarized light. x 19.

(Plate 2 Fig. 8) Photomicrographs of structures of limestones. (S34656) [NX 23 94]. (SL 154), p. 96. Ordovician, Stinchar Limestone; Tormitchell Quarry, Pinmore, Ayrshire. Oolitic and pseudo-oolitic structures. Oval ooliths have radial and concentric internal structure pseudo-ooliths are less regularly rounded and do not possess regular internal structure. Polarized light. x 20.

Plate 3. Photomicrographs of clastizoic limestones and calcilutites

(Plate 3 Fig. 1) Photomicrographs of clastizoic limestones and calcilutites. (S34622) [NS 3380 4855]. (SL 136), p. 108. Calciferous Sandstone Series, Broadstone Limestone; Auchenmade Quarry, Dairy, Ayrshire. A clastizoic limestone composed of unsorted fragments and debris of fossils in an unevenly bedded matrix of fine-grained calcite mixed with clay and darkened by bituminous and carbonaceous matter. Polarized light. x 14.

(Plate 3 Fig. 2) Photomicrographs of clastizoic limestones and calcilutites. (S35799) [NT 0648 8424]. (SL 276), p. 121. Carboniferous Limestone Series, Charlestown Main Limestone. Charlestown Quarries, Fife. A clastizoic limestone or spergenite, unsorted and unbedded. The larger constituents are mainly fragments of crinoids and polyzoa. The matrix is dolomitized and recrystallized. Polarized light. x 19.

(Plate 3 Fig. 3) Photomicrographs of clastizoic limestones and calcilutites. (S34447) [NS 9874 7078]. (SL 52), p. 125. Carboniferous Limestone Series, Petershill Limestone; 1000 yd N. by E. of Petershill Reservoir, West Lothian. A microclastizoic limestone, of small fossil debris and entire foraminifera in a matrix of finely granular, recrystallized calcite. Polarized light. x 15.

(Plate 3 Fig. 4) Photomicrographs of clastizoic limestones and calcilutites. (S34541) [NT 3761 6865]. (SL 59), p. 124. Carboniferous Limestone Series, North Greens Limestone; Cousland Lime Workings, Dalkeith, Midlothian. A microclastizoic limestone composed of well-sorted small fragments of fossils and entire microfossils of comparable size embedded in a bedded matrix of pelitomorphic calcite admixed with clay and bituminous matter. Polarized light. x 13.

(Plate 3 Fig. 5) Photomicrographs of clastizoic limestones and calcilutites. (S34848) [NC 915 041]. (SL 161), p. 133. Jurassic, Brora Arenaceous Series; Ardassie Point, Brora, Sutherland. Impure limestone or microcalcarenite, composed of pelitomorphic calcite admixed with silt of quartz, mica, coaly matter and pyrite, and containing microdebris of fossils together with numerous 'round bodies', possibly algal, composed of radially arranged calcite. Polarized light. x 23.

(Plate 3 Fig. 6) Photomicrographs of clastizoic limestones and calcilutites. (S35505) [NX 251 929]. (SL 267), p. 96. Ordovician, Stinchar Limestone; Kirkdominae Hill, Barr, Ayrshire. A calcilutite, composed of slightly recrystallized pelitomorphic calcite, scarce microdebris of fossils and numerous algal growths. Polarized light. x 25.

(Plate 3 Fig. 7) Photomicrographs of clastizoic limestones and calcilutites. (S40472) [NT 172 542]. (SL 183), p 115. Carboniferous Limestone Series, Gilmerton Limestone; Whitfield Limeworks, Peebles-shire. A calcilutite composed of granules of clear calcite in a pelitomorphic matrix of calcite and clay. The granular calcite is in part recognizable as fossil debris and includes tiny algal growths. Polarized light. x 24.

(Plate 3 Fig. 8) Photomicrographs of clastizoic limestones and calcilutites. (S35897) [NT 2155 8637]. (SL 217), p. 106. Calciferous Sandstone Series, Burdiehouse Limestone; Newbigging Mine, Fife. A calcilutite composed of pelitomorphic calcite enclosing pyritized ostracod shells, small grains and cleavage fragments of calcite and chips of shell. Polarized light. x 20.

Plate 4. Photomicrographs of dolomites

(Plate 4 Fig. 1) Photomicrographs of dolomites. (S34489) [NO 2371 0524]. (SL 97), p. 118. Carboniferous Limestone Series, Charlestown Main Limestone; Easter Glasslie, Fife. Dolomite grains of varying size form an uneven mosaic. Contiguous grains interpenetrate so that in section detailed portions of one grain appear isolated within another-diacrystallic structure. Polarized light. x 30.

(Plate 4 Fig. 2) Photomicrographs of dolomites. (S34839) [NC 372 626]. (SL 176), p. 93. Cambro-Ordovician, Durness Limestone; Sarsgrum, Sutherland. Breccioid structure in dolomite. Recrystallization to coarse grain has taken place along sharp-walled channels separating portions in which recrystallization to smaller grain has occurred. Polarized light. x 20.

(Plate 4 Fig. 3) Photomicrographs of dolomites. (S40621) [NT 000 976]. (SL 158), p. 102. Calciferous Sandstone Series, cementstone; Devonshaw Old Quarry, Kinross. Porphyrocrystallic structure in dolomite. One large and two smaller

euhedral crystals of dolomite appear within a matrix of fine-grained, granular dolomite. These crystals occur at the intersection of bituminous films which may have guided and concentrated the action of the recrystallizing solutions. Polarized light. x 38.

(Plate 4 Fig. 4) Photomicrographs of dolomites. (S34843) [NC 384 649]. (SL 175), p. 92. Cambro-Ordovician, Durness Limestone; Keol-dale, Sutherland. A luteous, taxichnic dolomite in which the original sedimentary structure of alternating fine and finer grain of the carbonate and silt particles has been preserved. Polarized light. x 11.

(Plate 4 Fig. 5) Photomicrographs of dolomites. (S34593) [NS 9722 8572]. (SL 120), p. 130. Carboniferous Limestone Series, Castlecary Limestone, Culross, Fife. Stylolitic film in a zoophasmic dolomite. The original fossiliferous limestone has been dolomitized to a mosaic of uniform grain. The ghost of a shell fragment, one margin of which is followed by the straight part of the styloitic film, can be seen. Polarized light. x 20.

(Plate 4 Fig. 6) Photomicrographs of dolomites. (S34450) [NO 6113 1133]. (SL 28), p. 101. Calciferous Sandstone Series, 'Kirkby's Ina Limestone'; Randerston, Fife. A ferriferous dolomite in which the grain varying from microcrystalline to pelitomorphic probably reflects the variation of grain in the original limestone. Shells of ostracods are delineated by more and less dense concentrations of pyrite powder through which the more coarsely crystalline dolomite within the shells grows. Polarized light. x 14.

(Plate 4 Fig. 7) Photomicrographs of dolomites. (S34588) [NS 9985 9405]. (SL 115), p. 130. Carboniferous Limestone Series, Castlecary Limestone; R. Black Devon, Fife. Arenaceous dolomite in which the original elastic and clastizoic structures are preserved, though the internal structure of the fossils has been destroyed; the dolomite is clastizoichnic. Polarized light. x 11.

(Plate 4 Fig. 8) Photomicrographs of dolomites. (S35799A). (SL 276), p. 121. Carboniferous Limestone Series, Charlestown Main Limestone, Charlestown, Fife. A partially dolomitized limestone in which fossil framework is preserved in calcite (black) while the matrix and the infillings of the chambers within the fossils have been converted to dolomite. The calcite has been stained dark by treatment in silver nitrate and potassium chromate. Polarized light. x 20.

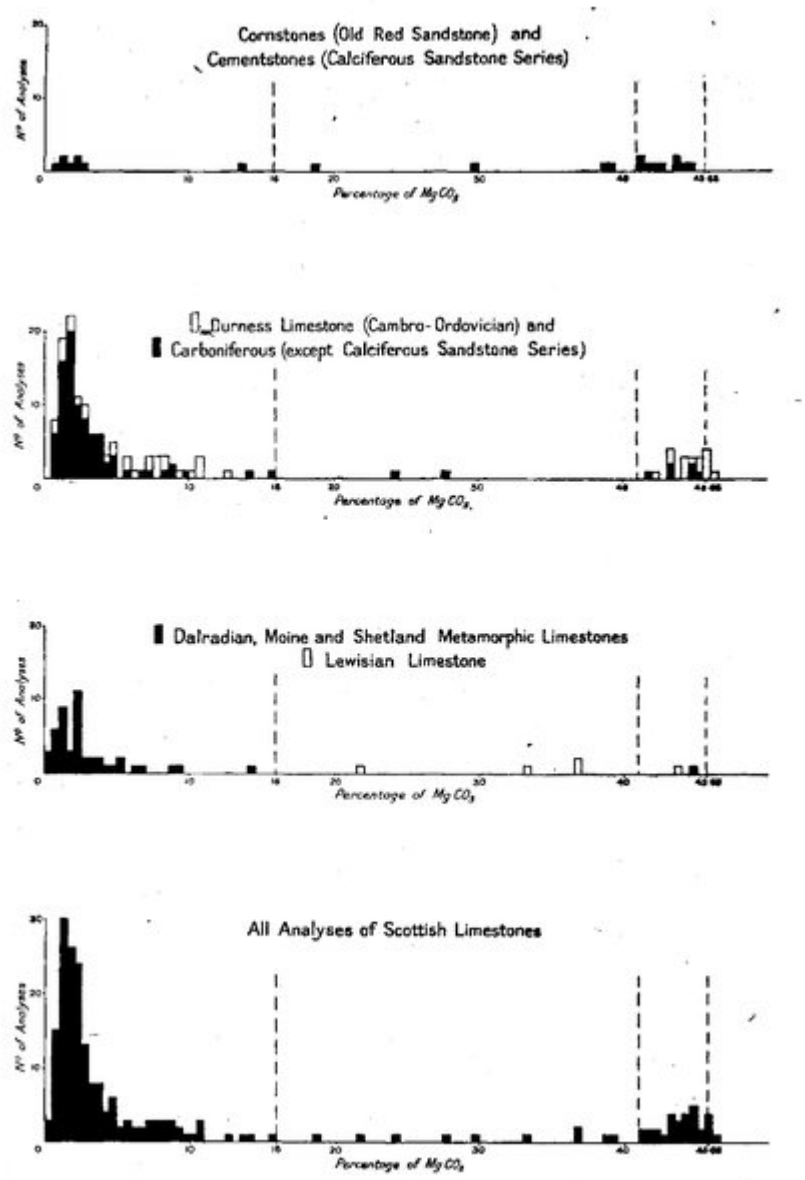


Figure 1 Histograms showing percentages of magnesium carbonate in analysed Scottish limestones.

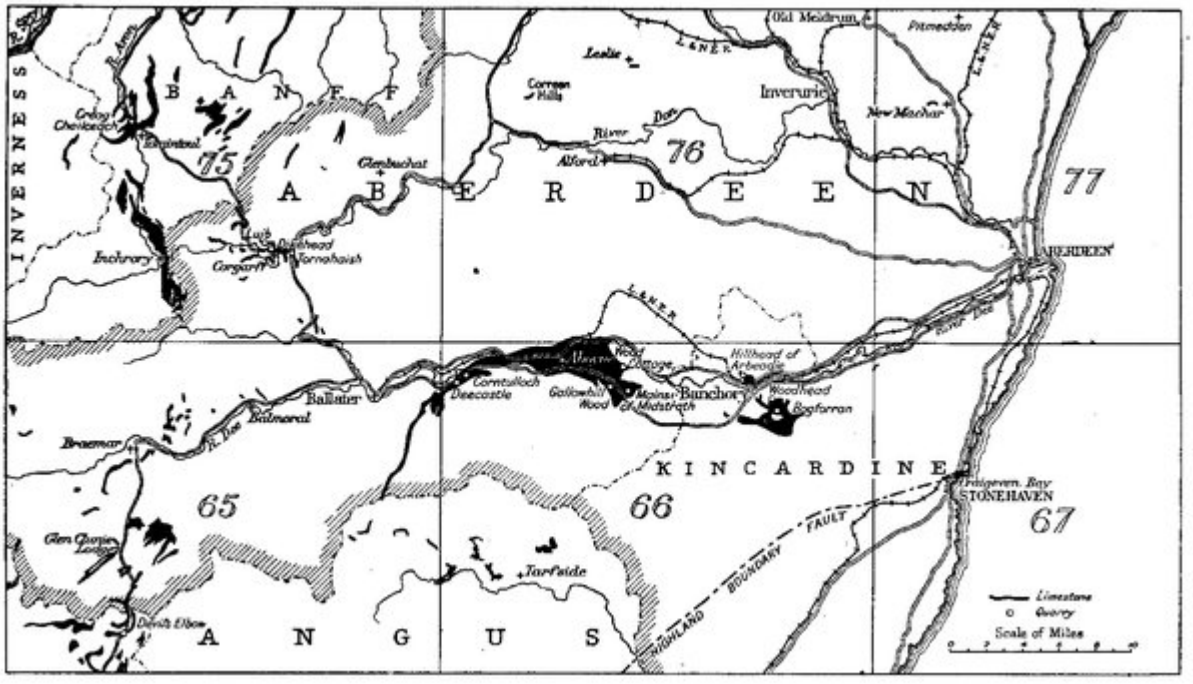


Figure 2 Sketch map showing distribution of limestone in the counties of Aberdeen and Kincardine.

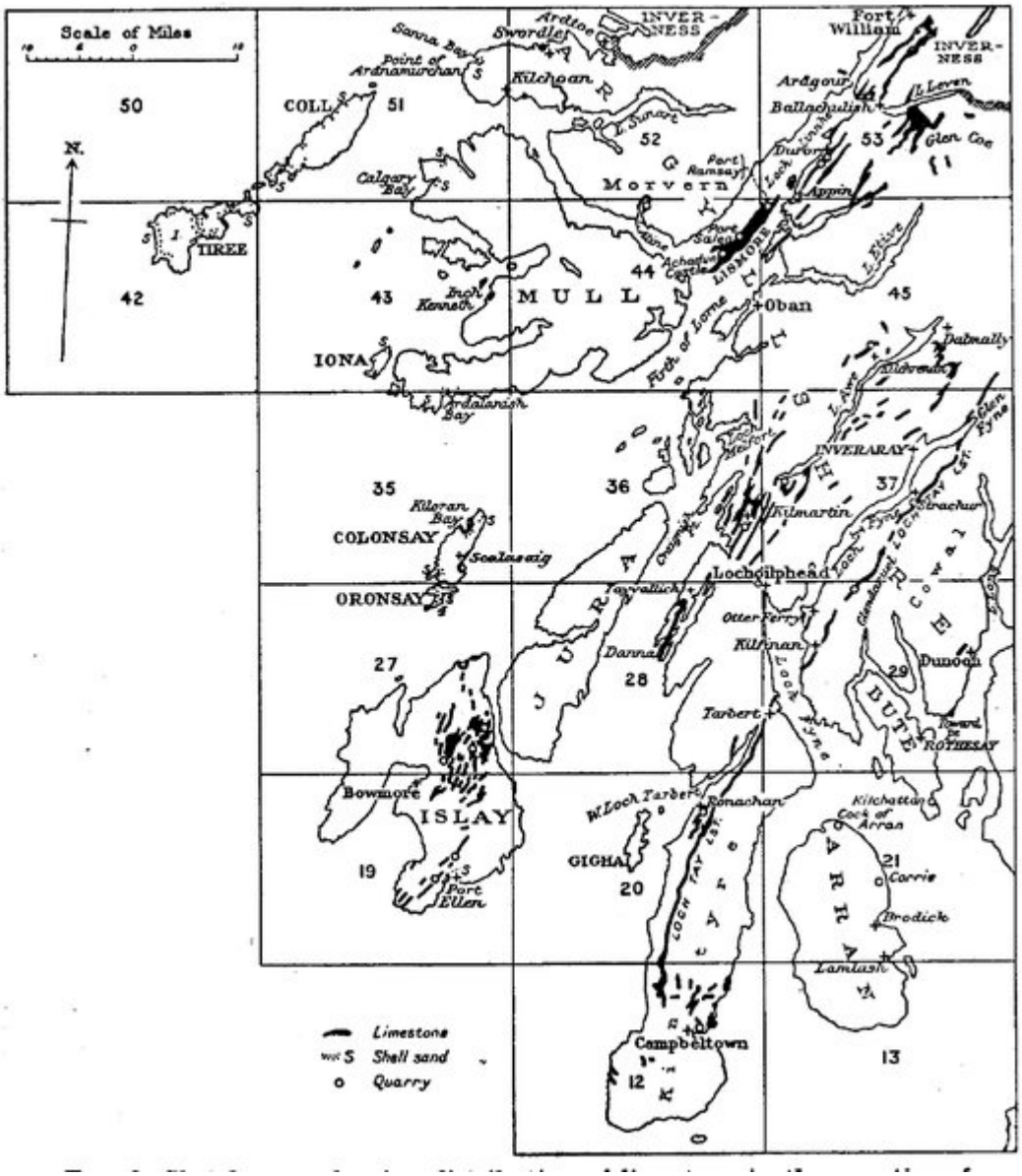


Figure 3 Sketch map showing distribution of limestone in the counties of Argyll and Bute.

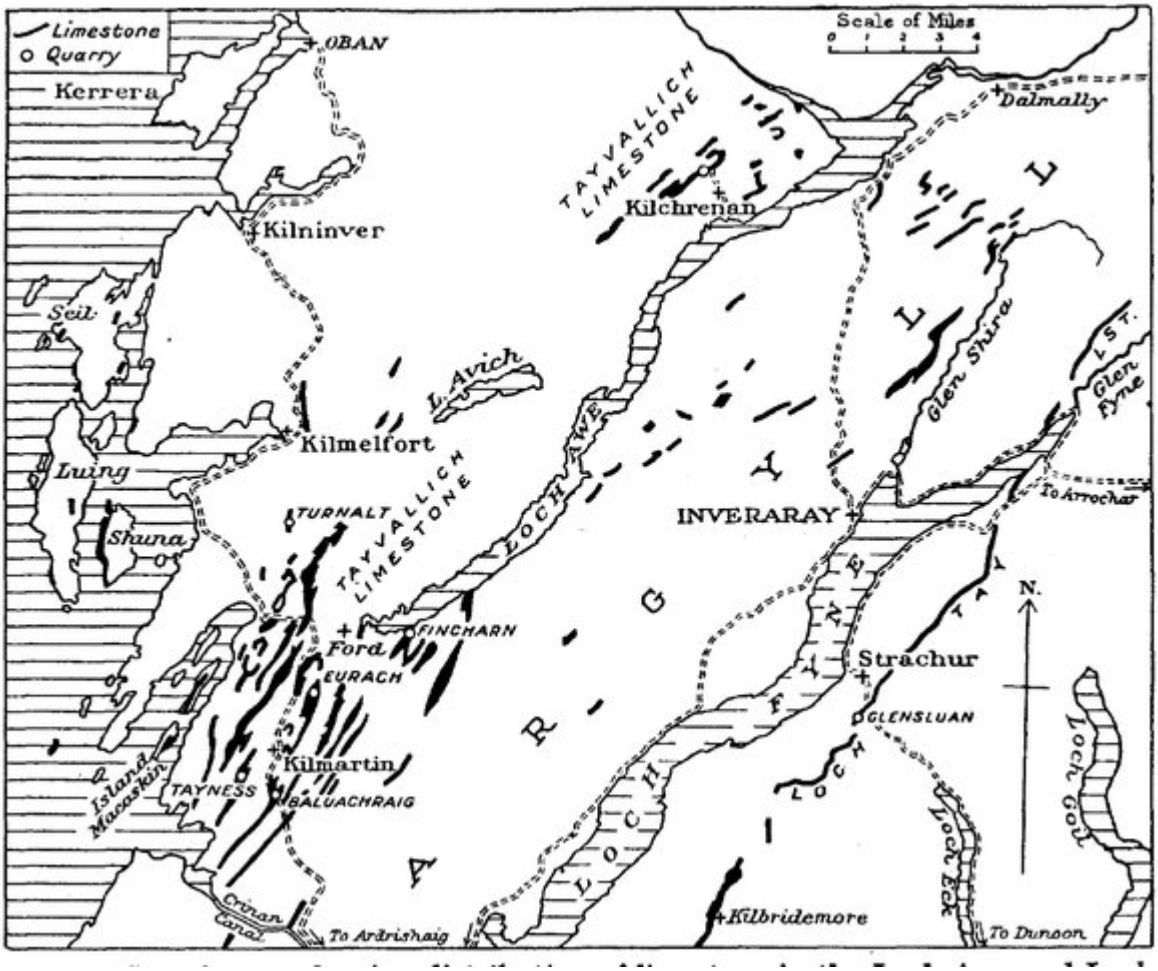


Figure 4 Sketch map showing distribution of limestone in the Loch Awe and Loch Fyne districts of Argyll.

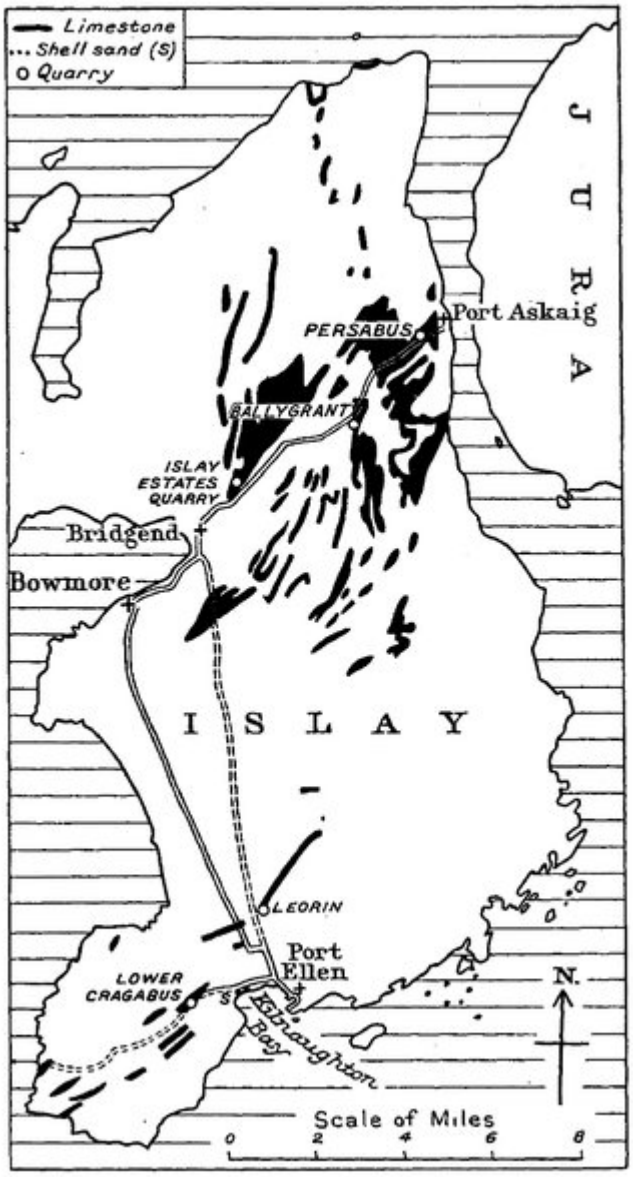


Figure 5 Sketch map showing distribution of the Islay Limestone.

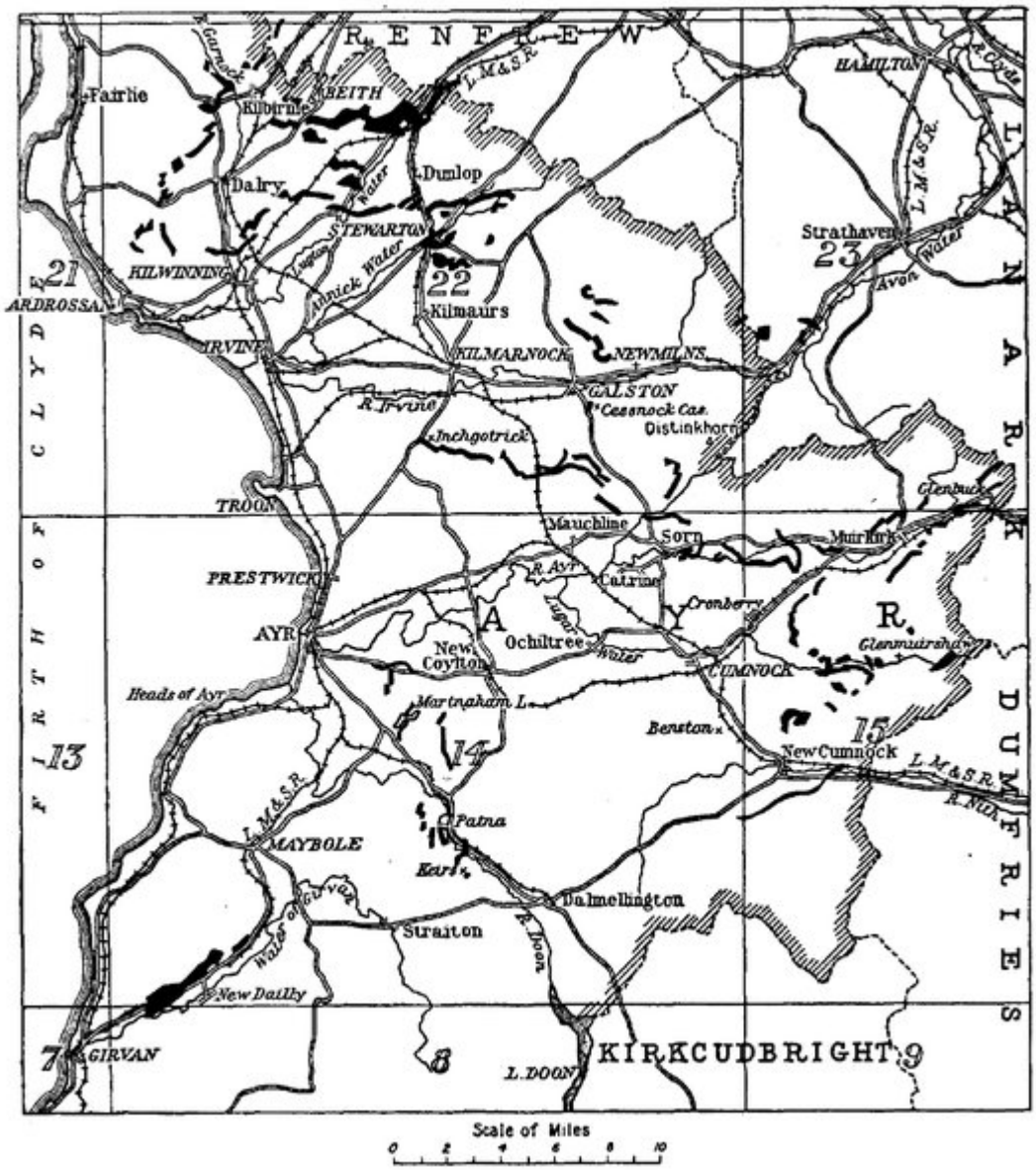


Figure 6 Sketch map showing main areas black of the Carboniferous Limestone deposits of Ayrshire.

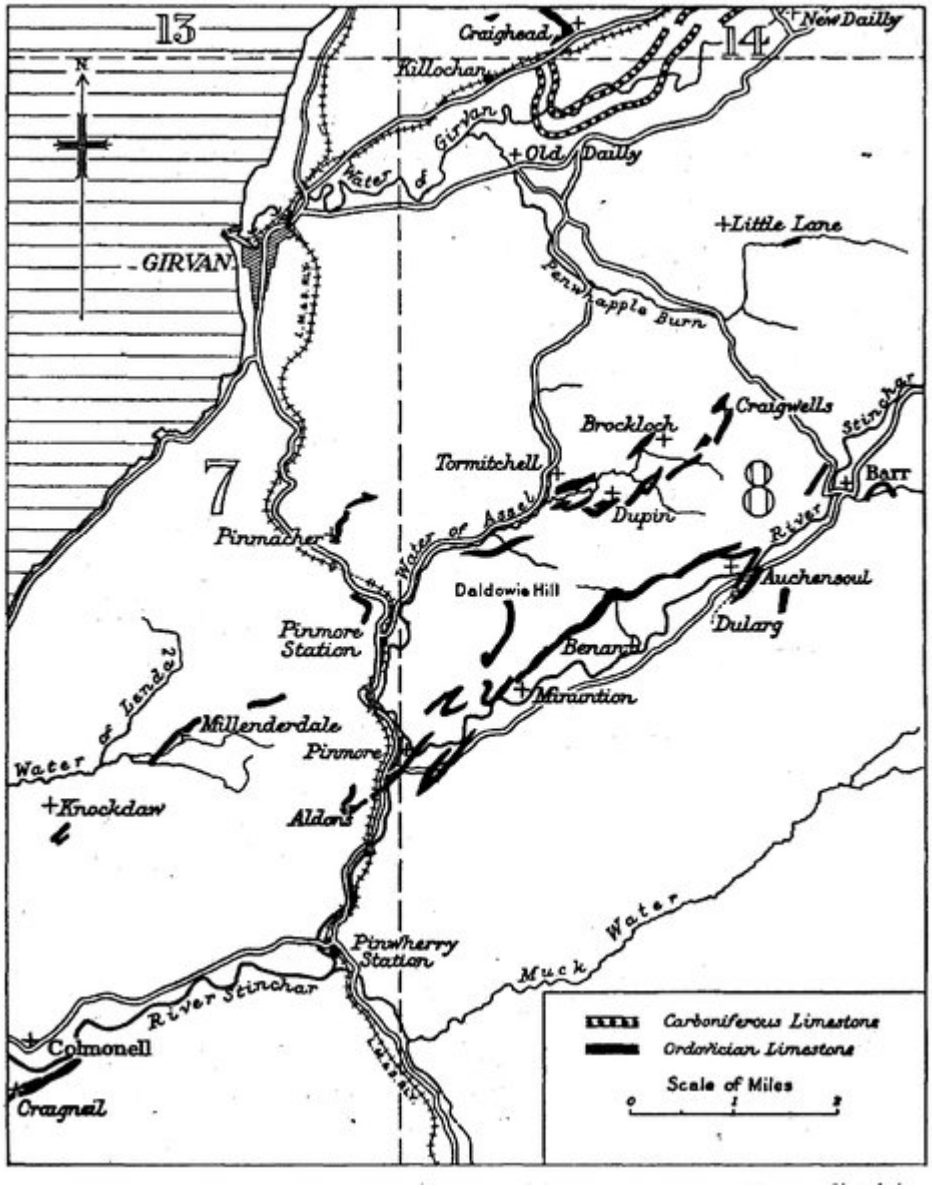


Figure 7 Sketch map showing distribution of limestone in the Girvan district of Ayrshire.

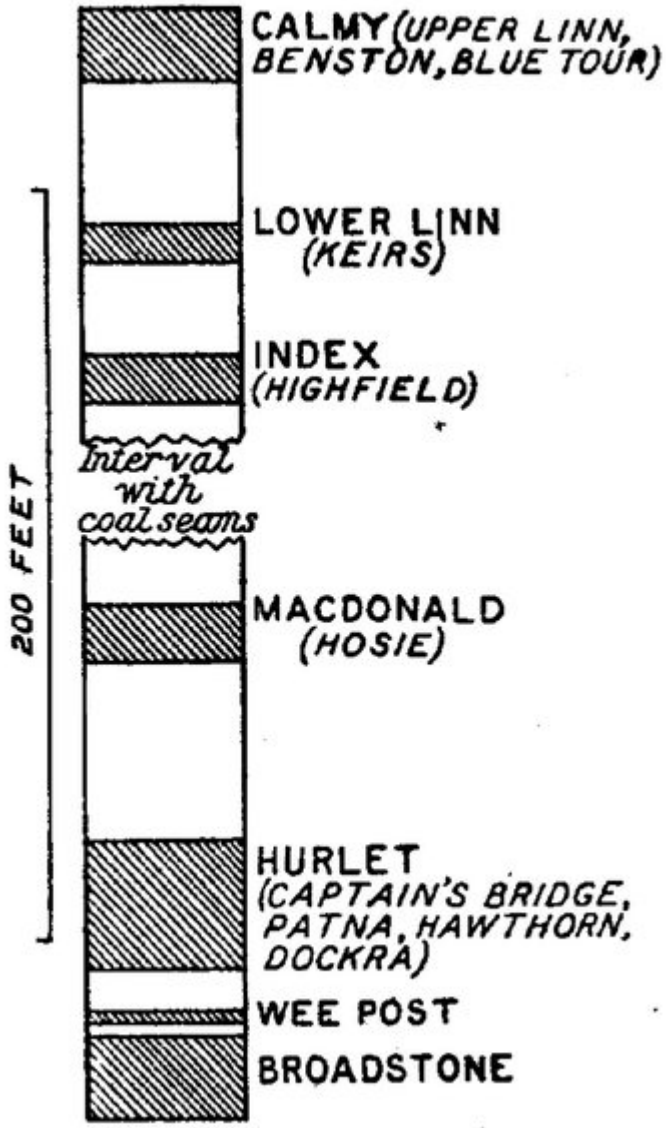


Figure 8 Vertical Section of the worked limestones in the Carboniferous of Ayrshire.

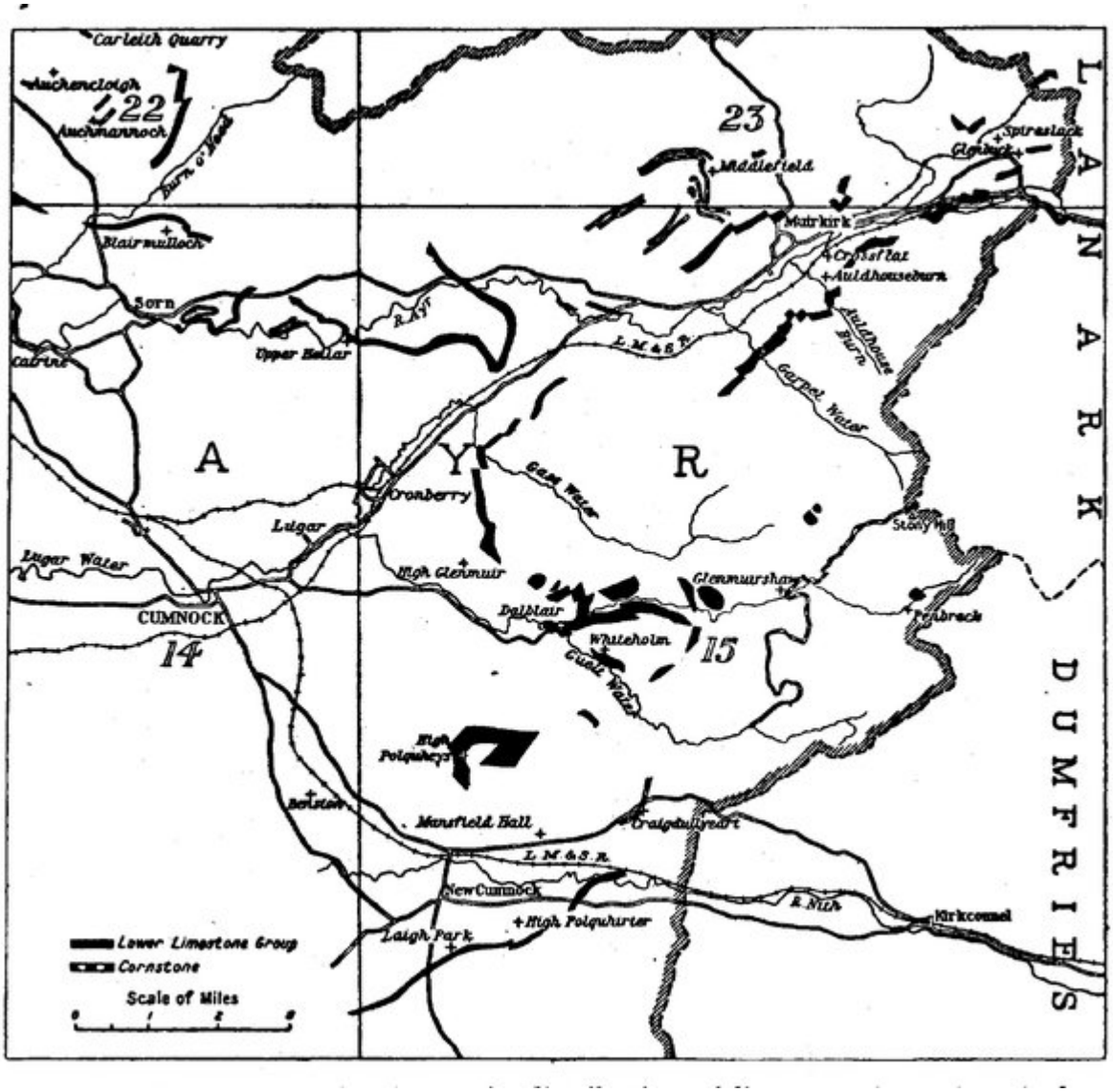


Figure 9 Sketch map showing main distribution of limestone in east-central Ayrshire.

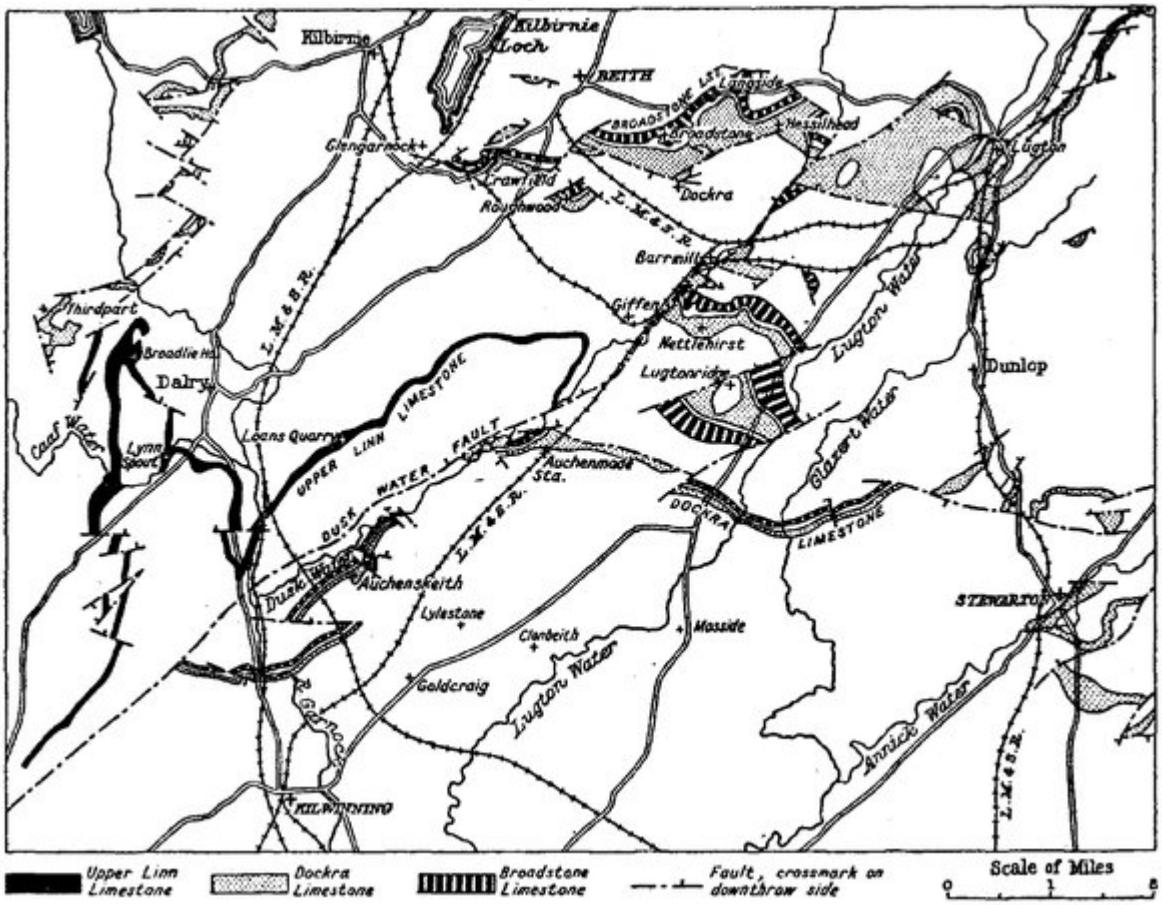


Figure 10 Sketch map showing main distribution of limestone in the Dalry, Beith and Stewarton districts of Ayrshire.

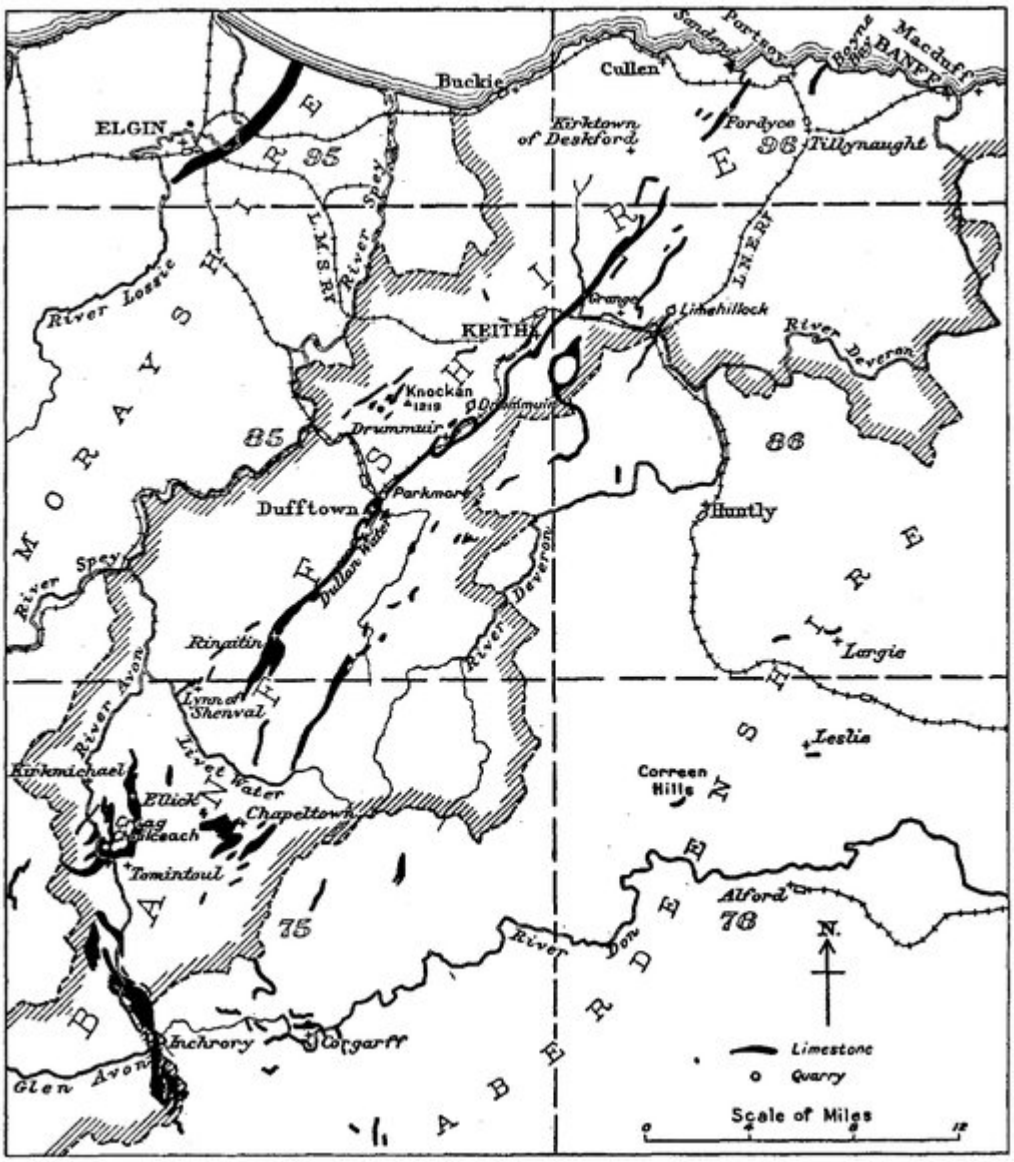


Figure 11 Sketch map showing distribution of limestone in Banffshire.

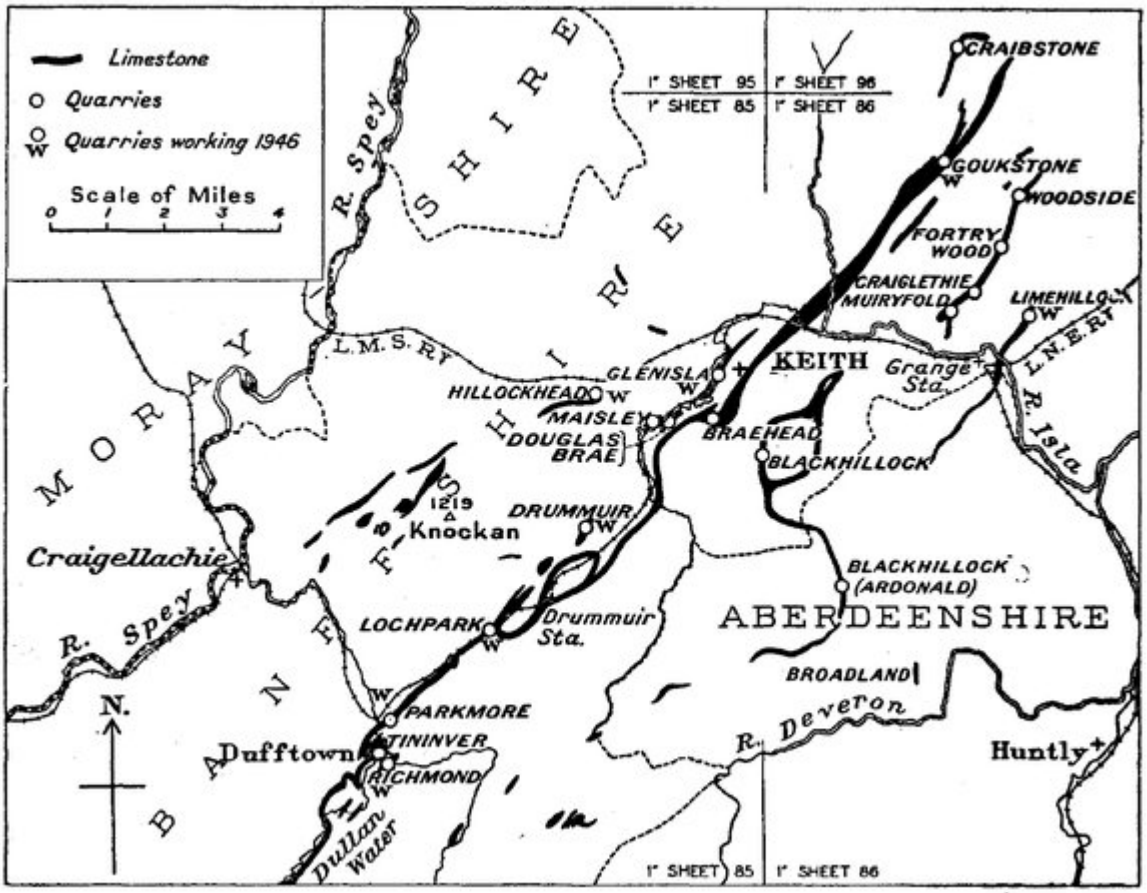


Figure 12 Sketch map showing distribution of limestone in the Keith-Dufftown district of Banffshire.

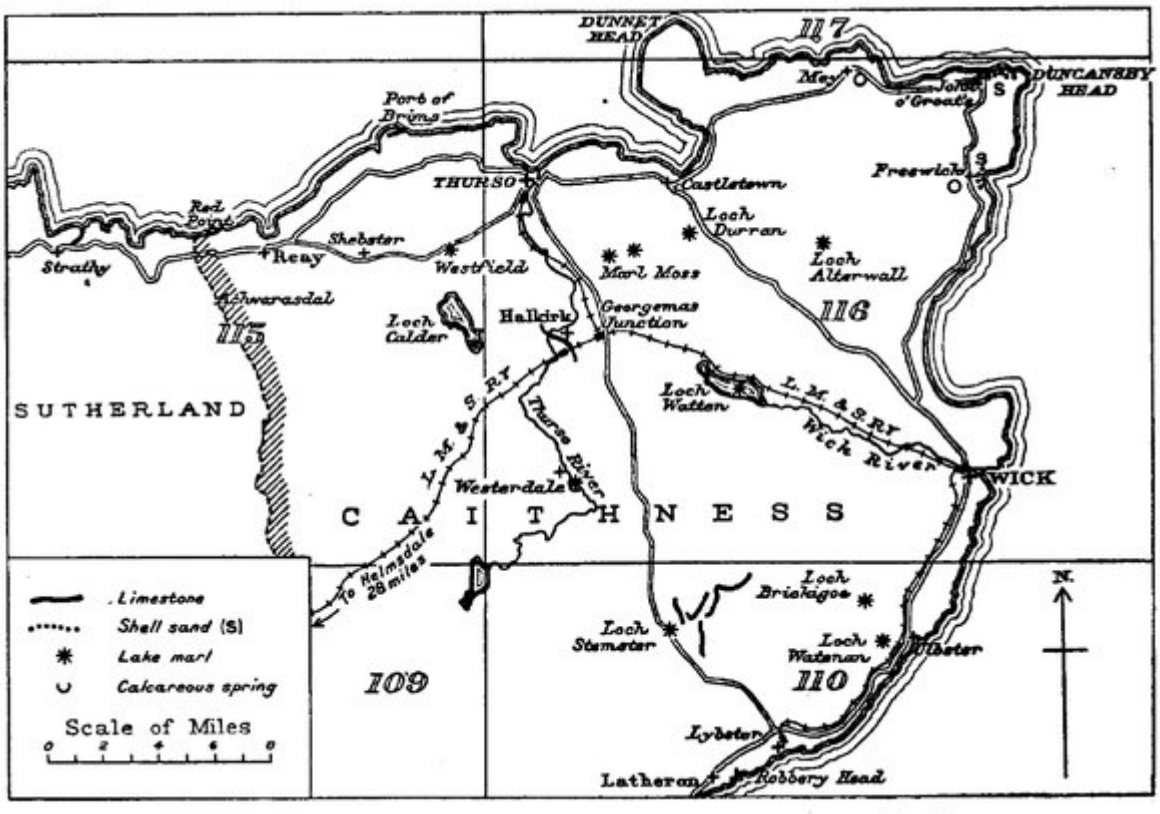


Figure 13 Sketch map showing calcareous deposits of Caithness.

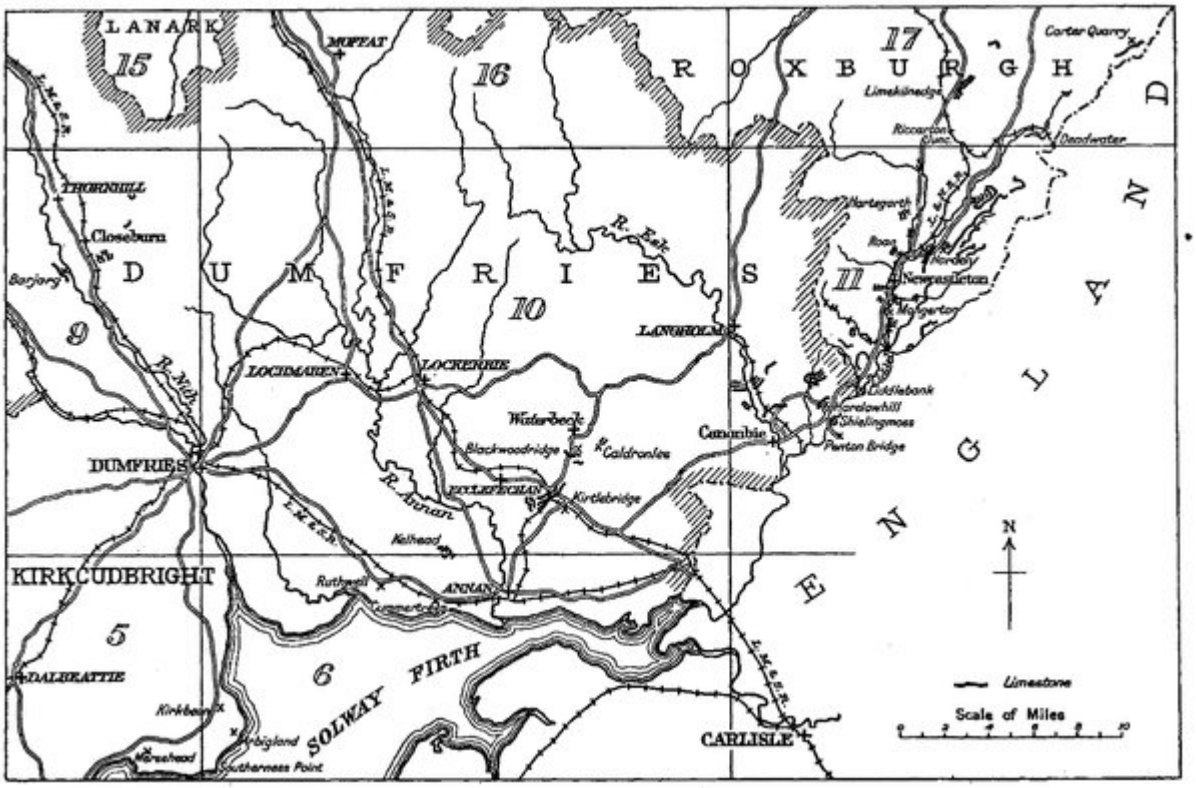


Figure 14 Sketch map showing distribution of limestone in the counties of Dumfries, Kirkcudbright and Roxburgh.

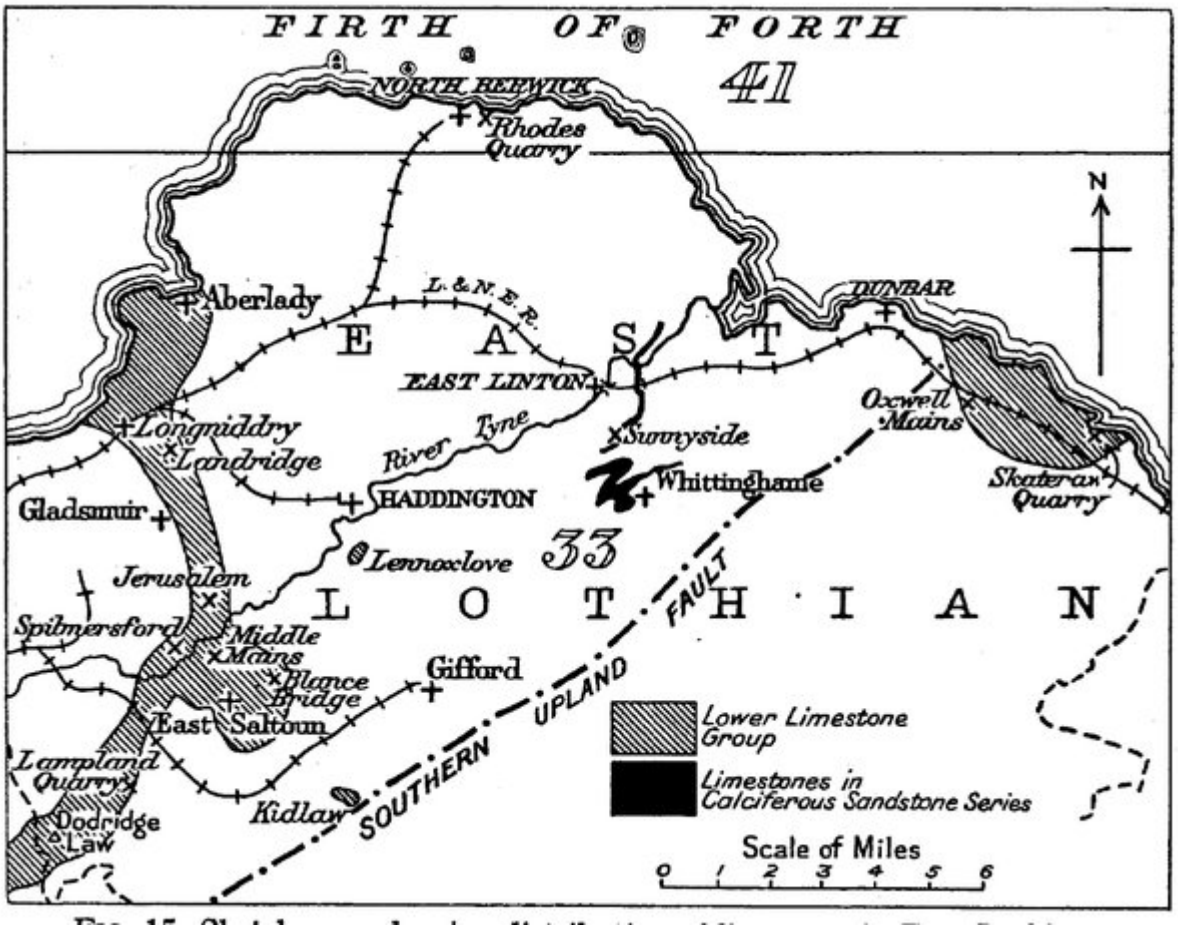


Figure 15 Sketch map showing distribution of limestone in East Lothian.

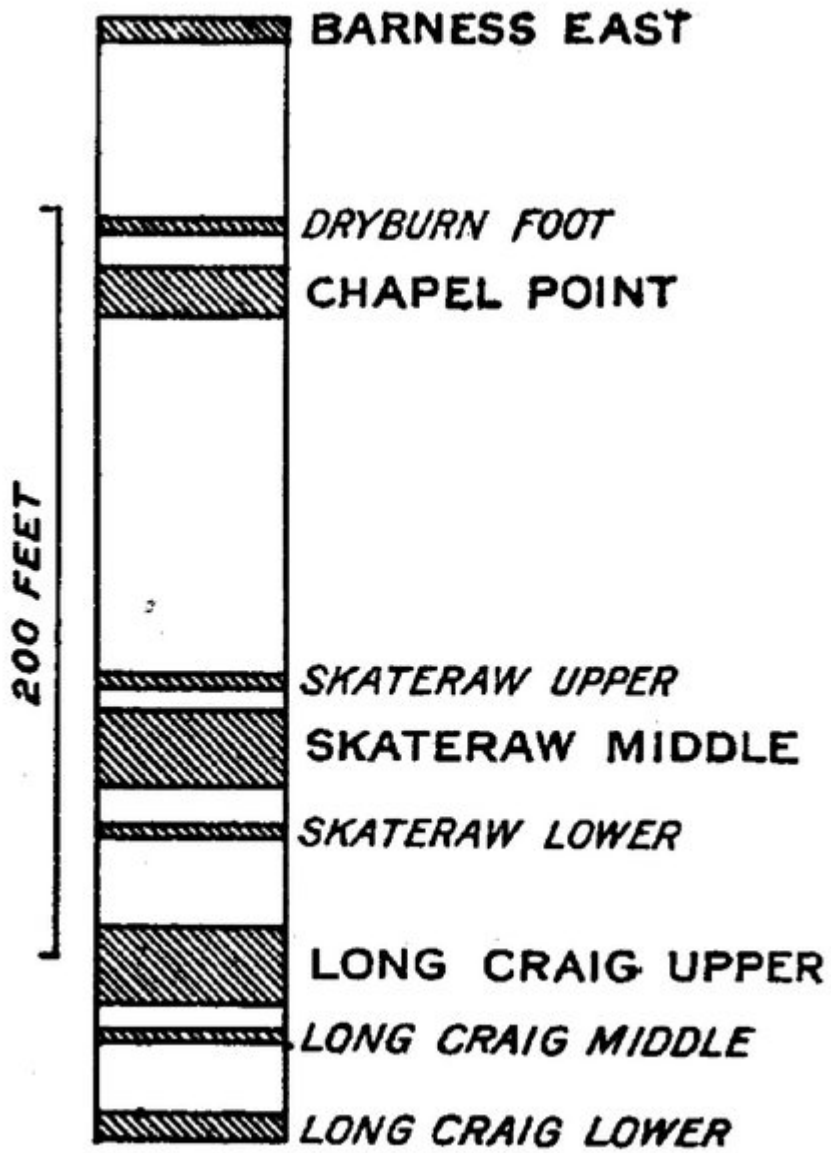


Figure 16 Vertical Section of the limestones of the Lower Limestone Group of East Lothian.

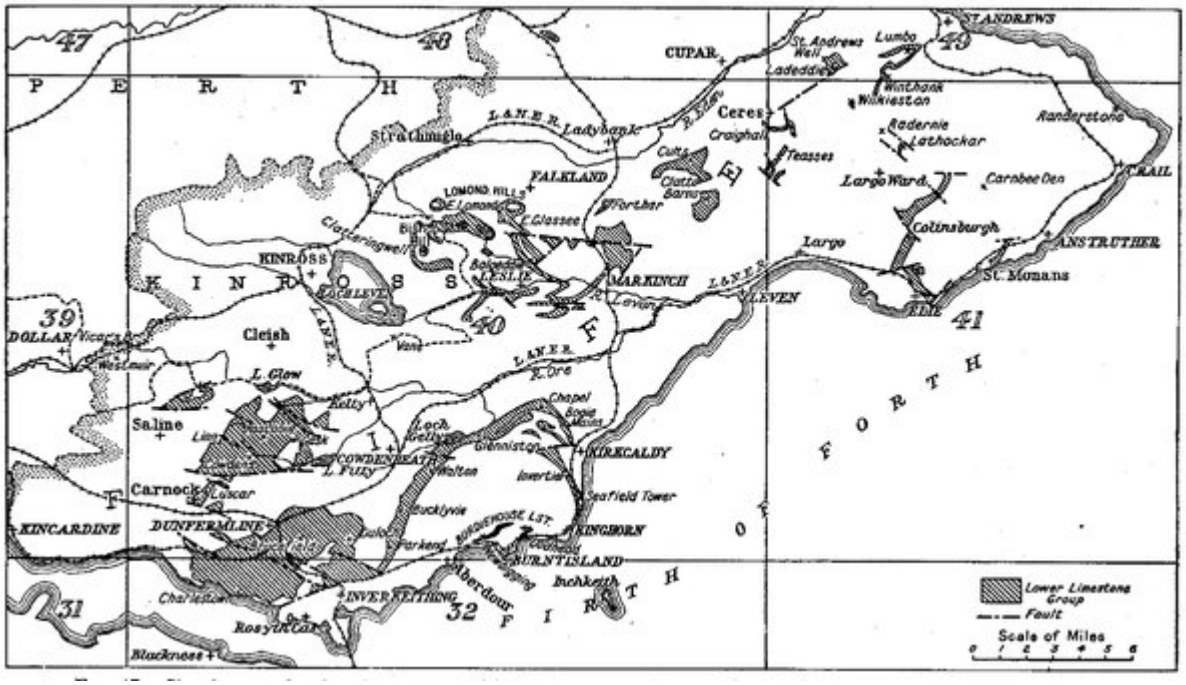


Figure 17 Sketch map showing distribution of limestone in the Carboniferous of the counties of Fife and Kinross.

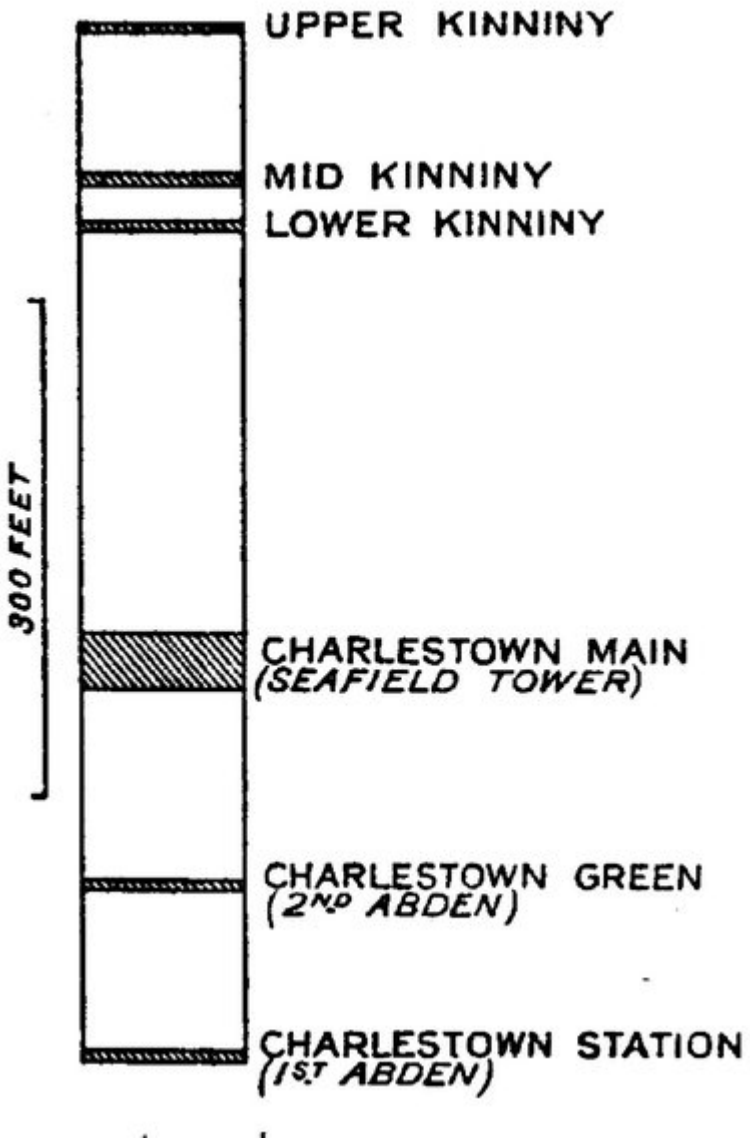


Figure 18 Vertical Section of the limestones of the Lower Limestone Group of Fife.

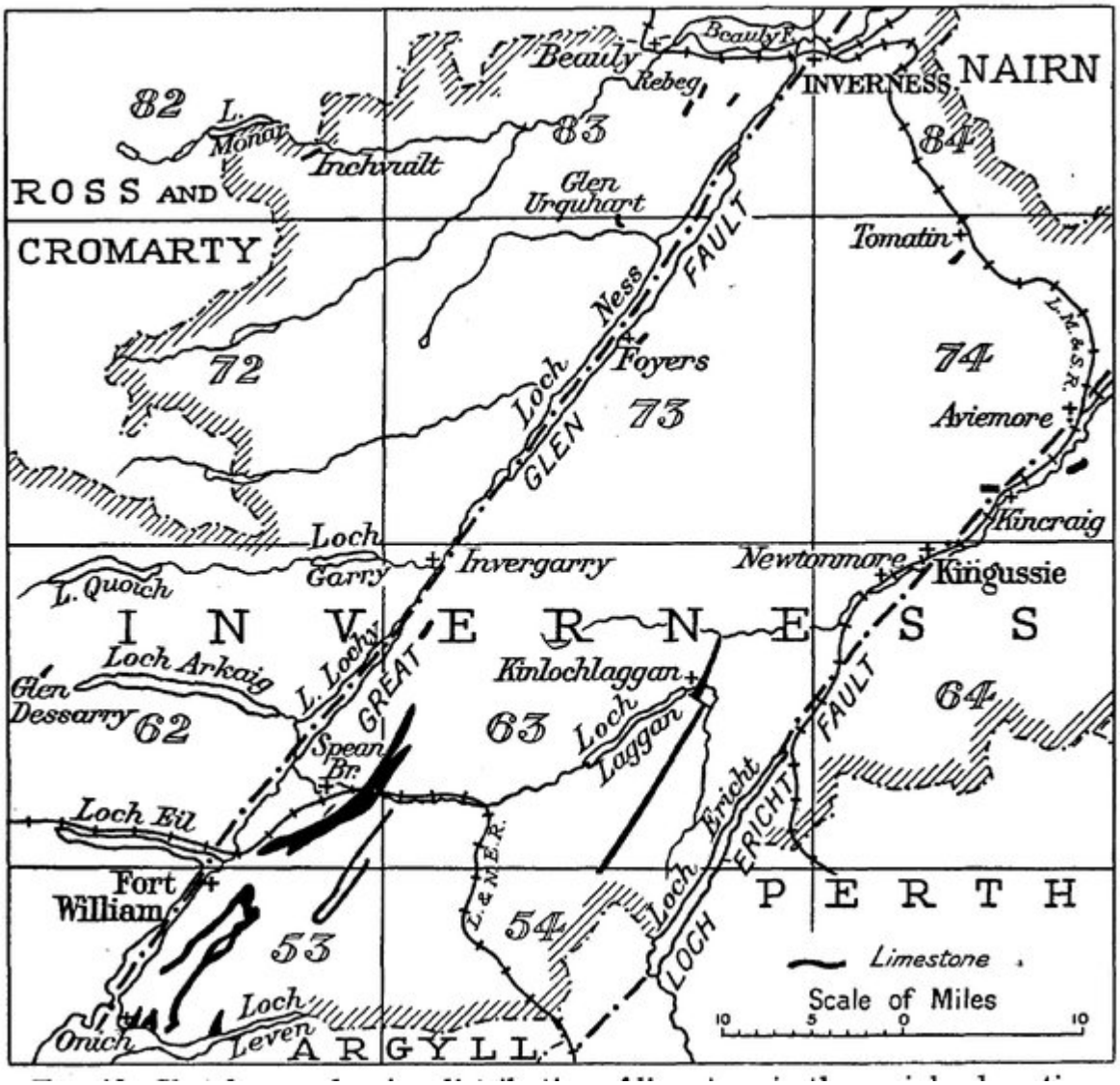


Figure 19 Sketch map showing distribution of limestone in the mainland portion of Inverness-shire.

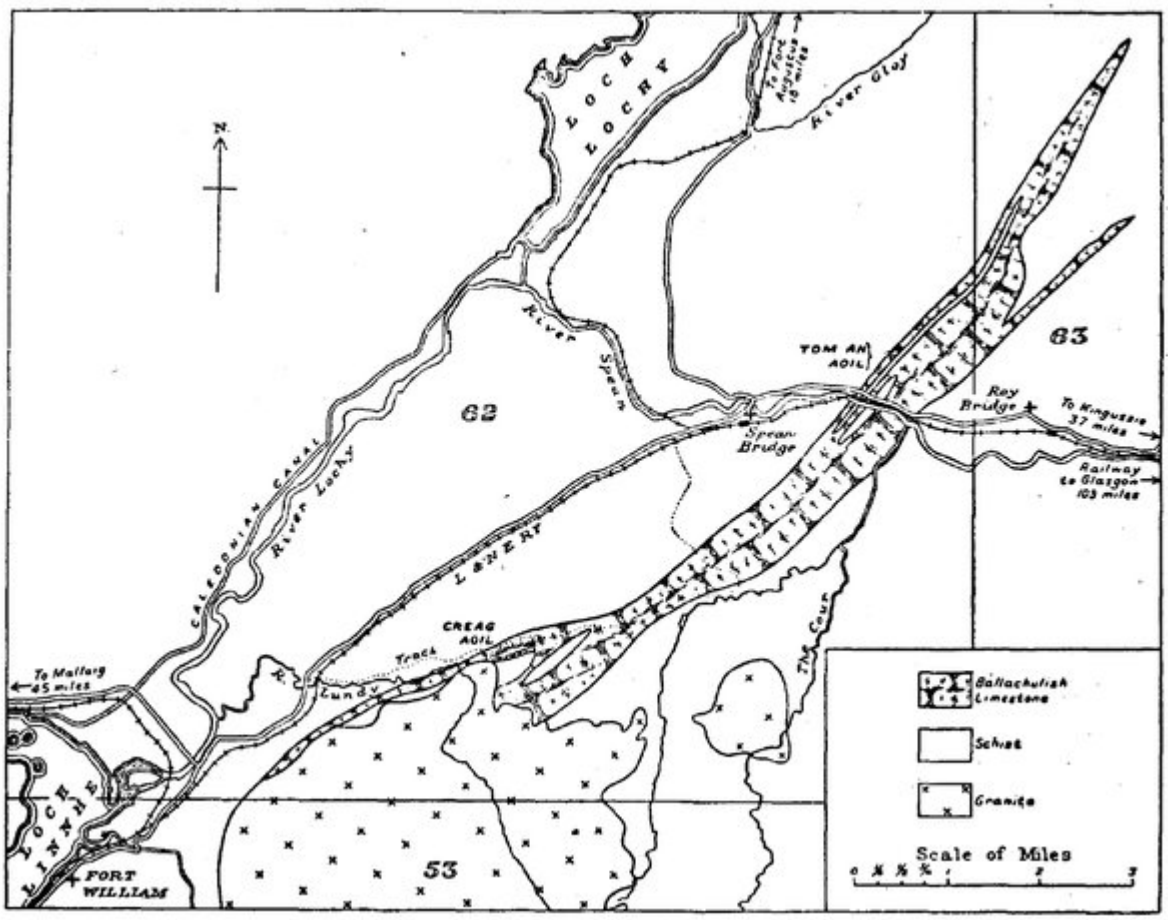


Figure 20 Sketch map of the Ballachulish Limestone in the Fort William–Spean Bridge district of Inverness-shire.

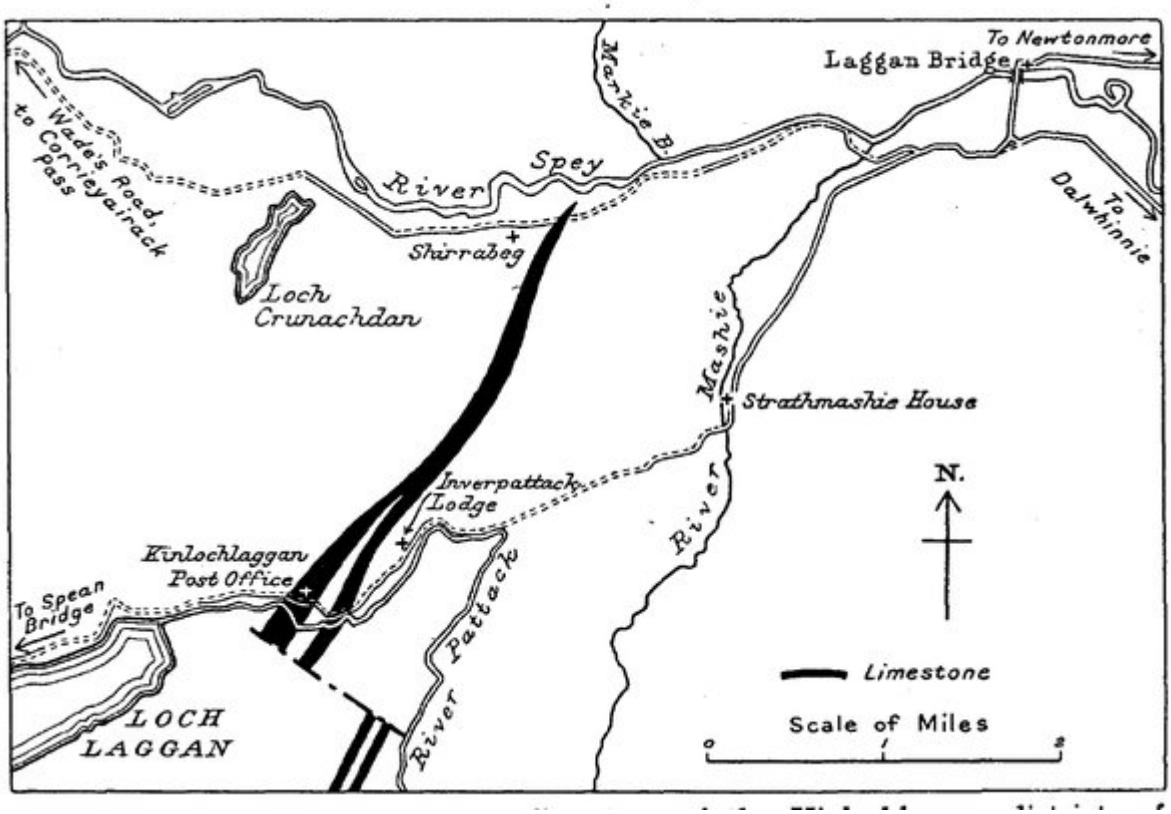


Figure 21 Sketch map showing the limestone of the Kinlochlaggan district of Inverness-shire.

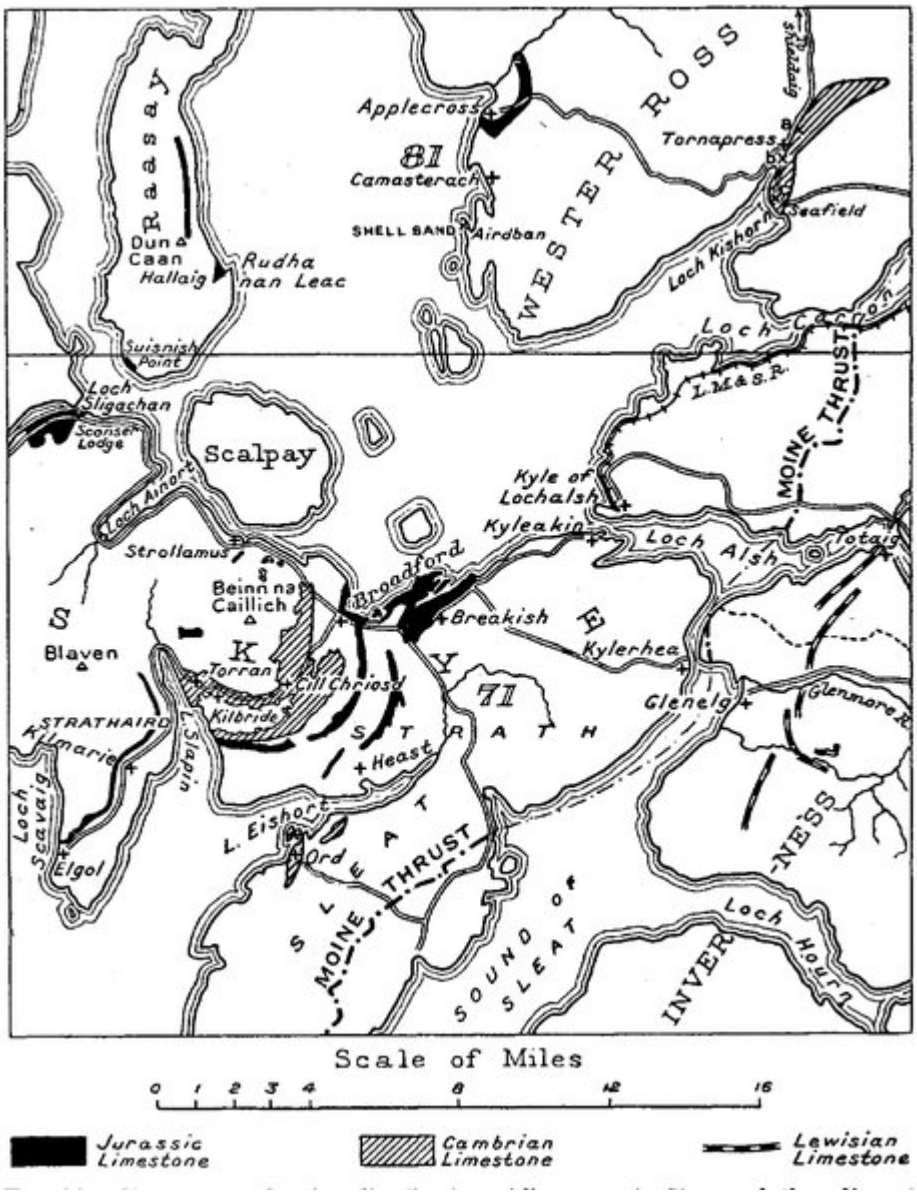


Figure 22 Sketch map showing distribution of limestone in Skye and the adjacent mainland.

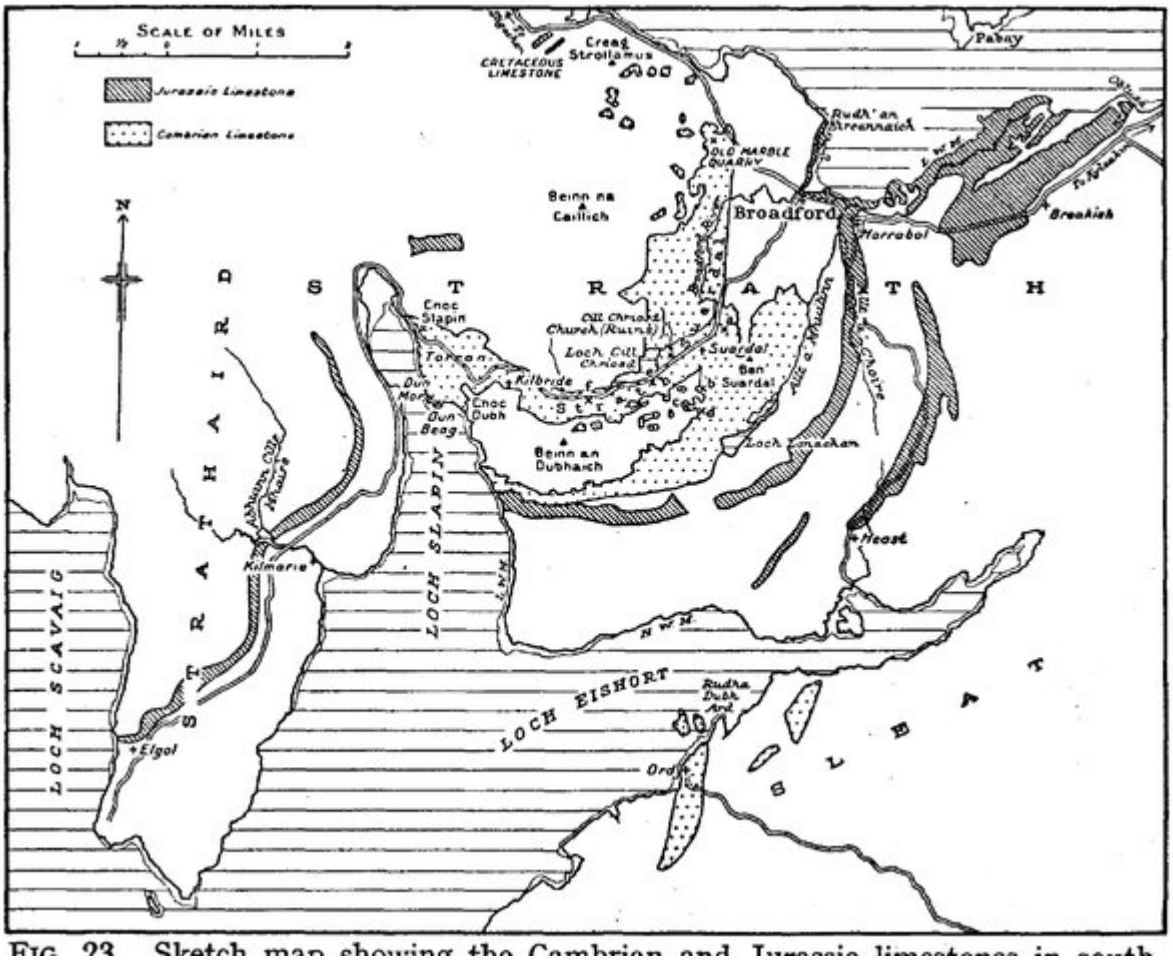


FIG. 23 Sketch map showing the Cambrian and Jurassic limestones in south-eastern Skye.

Figure 23 Sketch map showing the Cambrian and Jurassic limestones in south-eastern Skye.

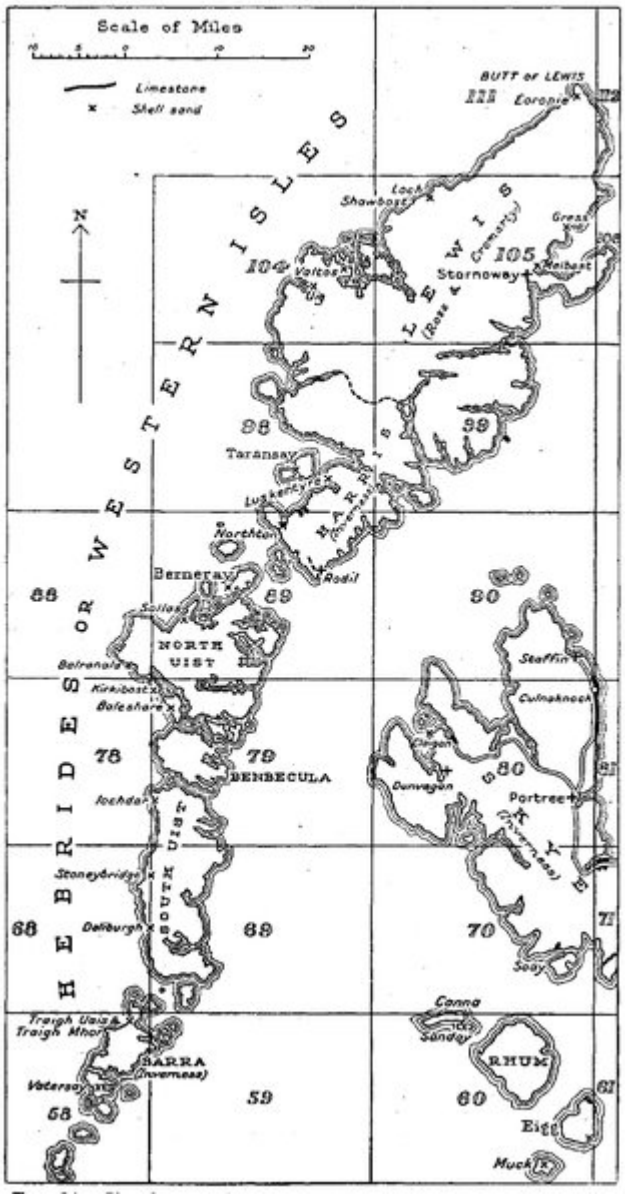


Figure 24 Sketch map showing calcareous deposits in the Hebrides and north-western Skye.

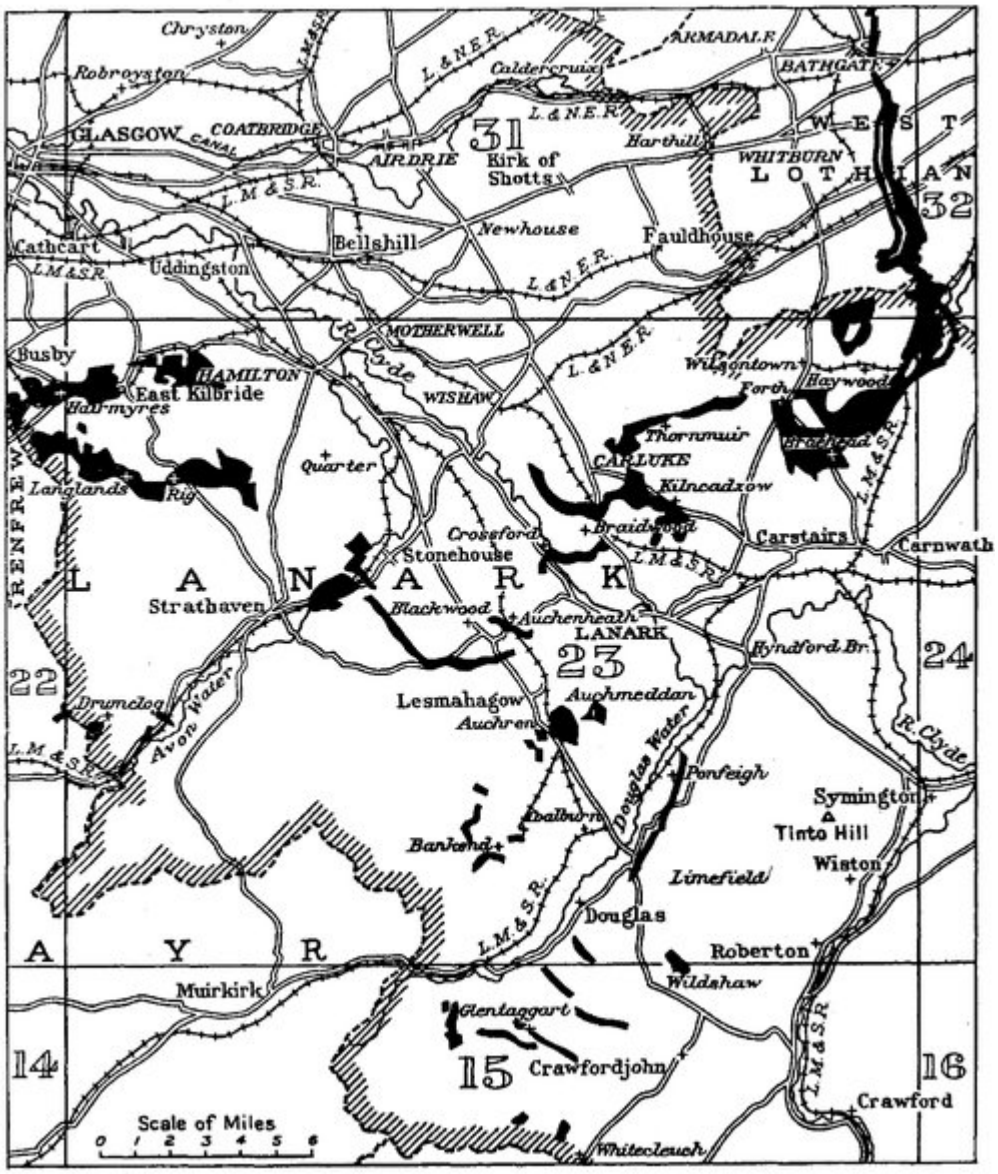


Figure 25 Sketch map showing main areas black of limestone in Lanarkshire.

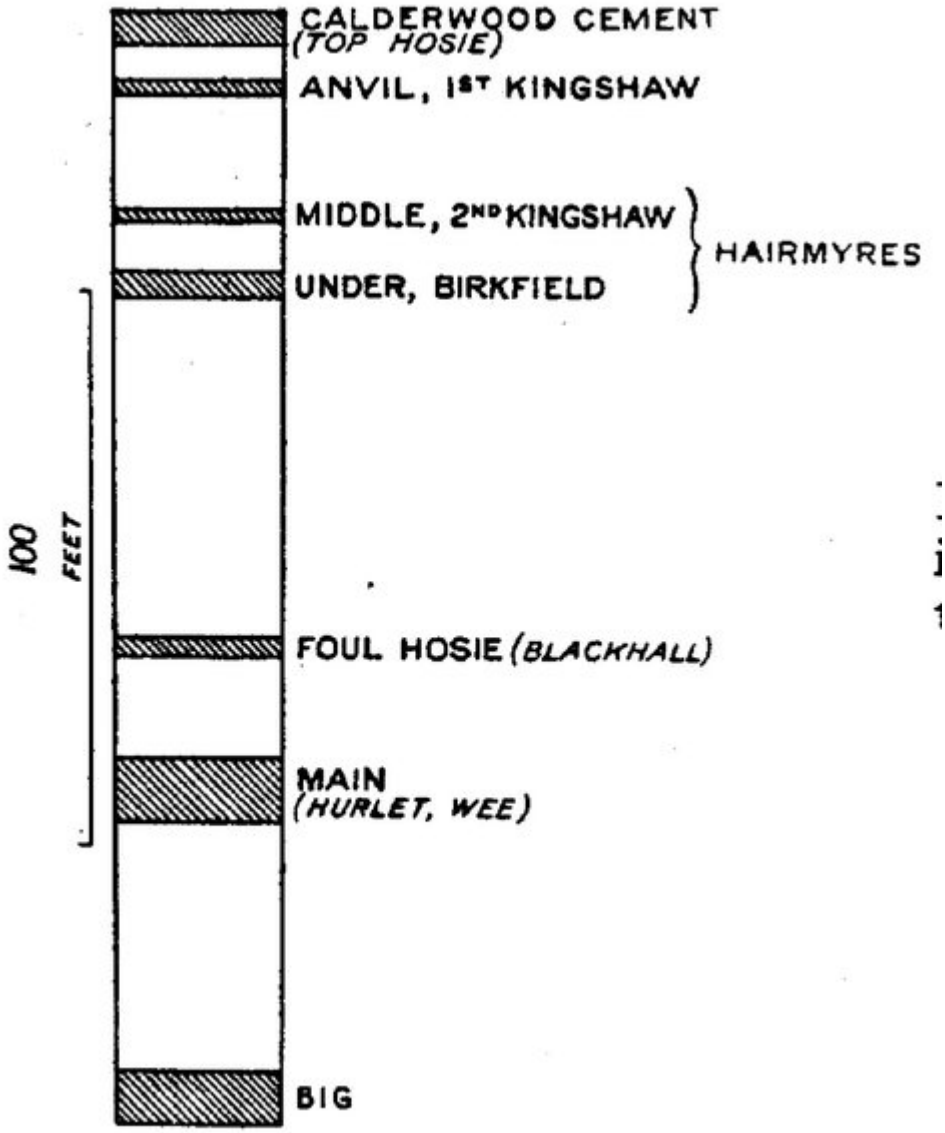


Figure 26 Vertical Section of the limestones in the Lower Limestone Group and at the top of the Calciferous Sandstone Series of Lanarkshire.

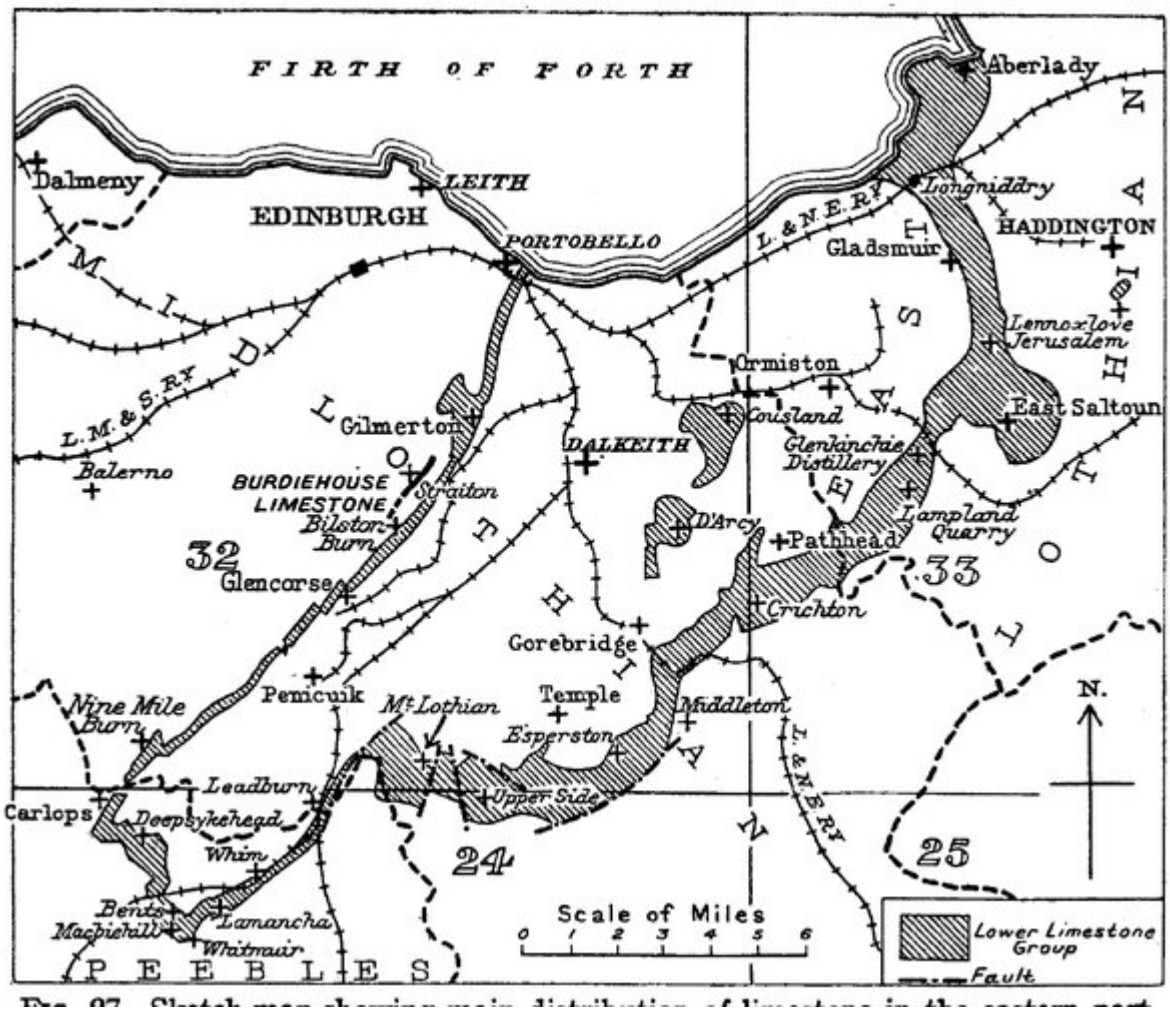


Figure 27 Sketch map showing main distribution of limestone in the eastern part of Midlothian and adjacent parts of Peebleshire and East Lothian.

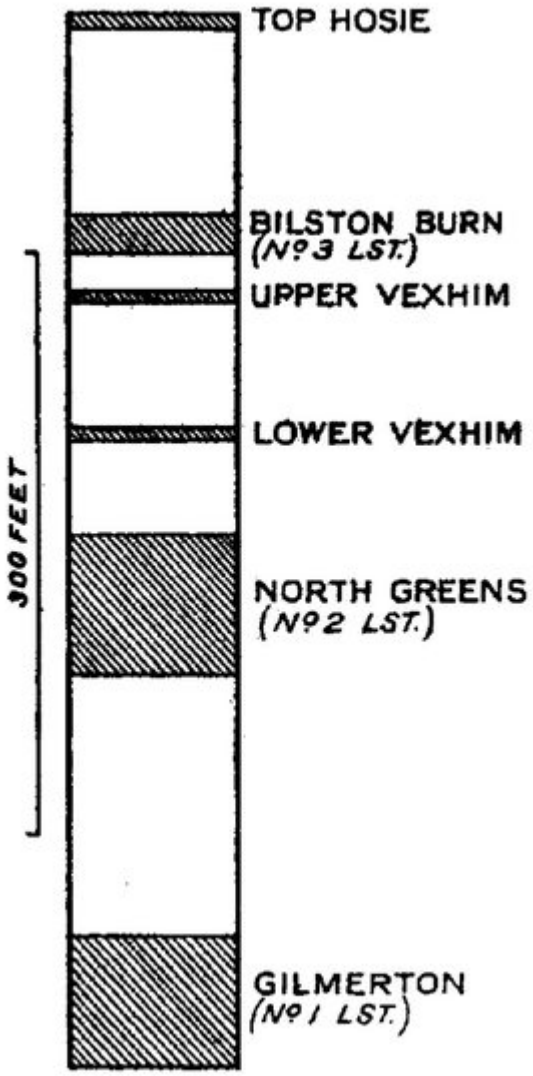


Figure 28 Vertical Section of the limestones of the Lower Limestone Group of Midlothian.

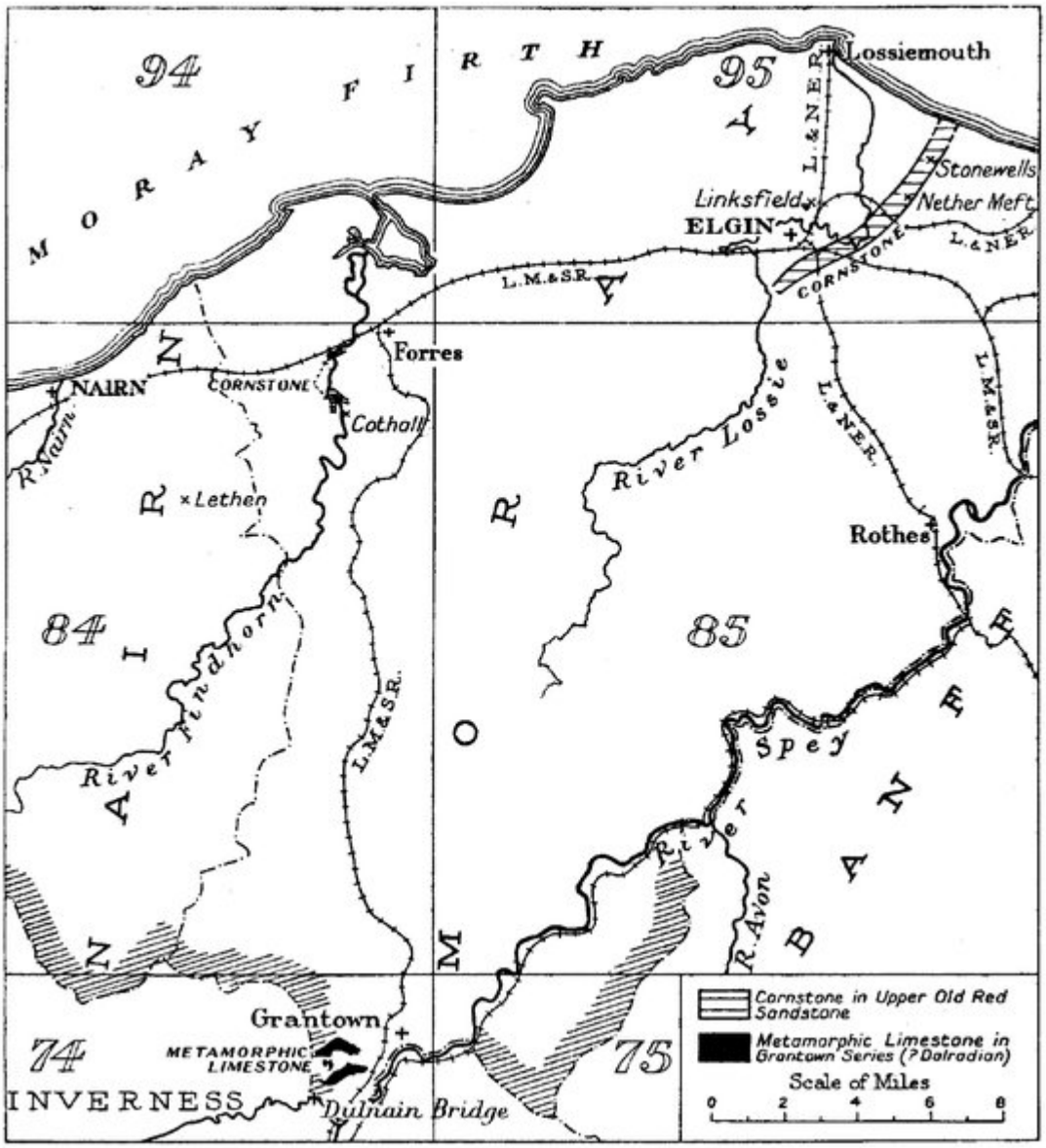


Figure 29 Sketch map showing distribution of limestone in the counties of Moray and Nairn.

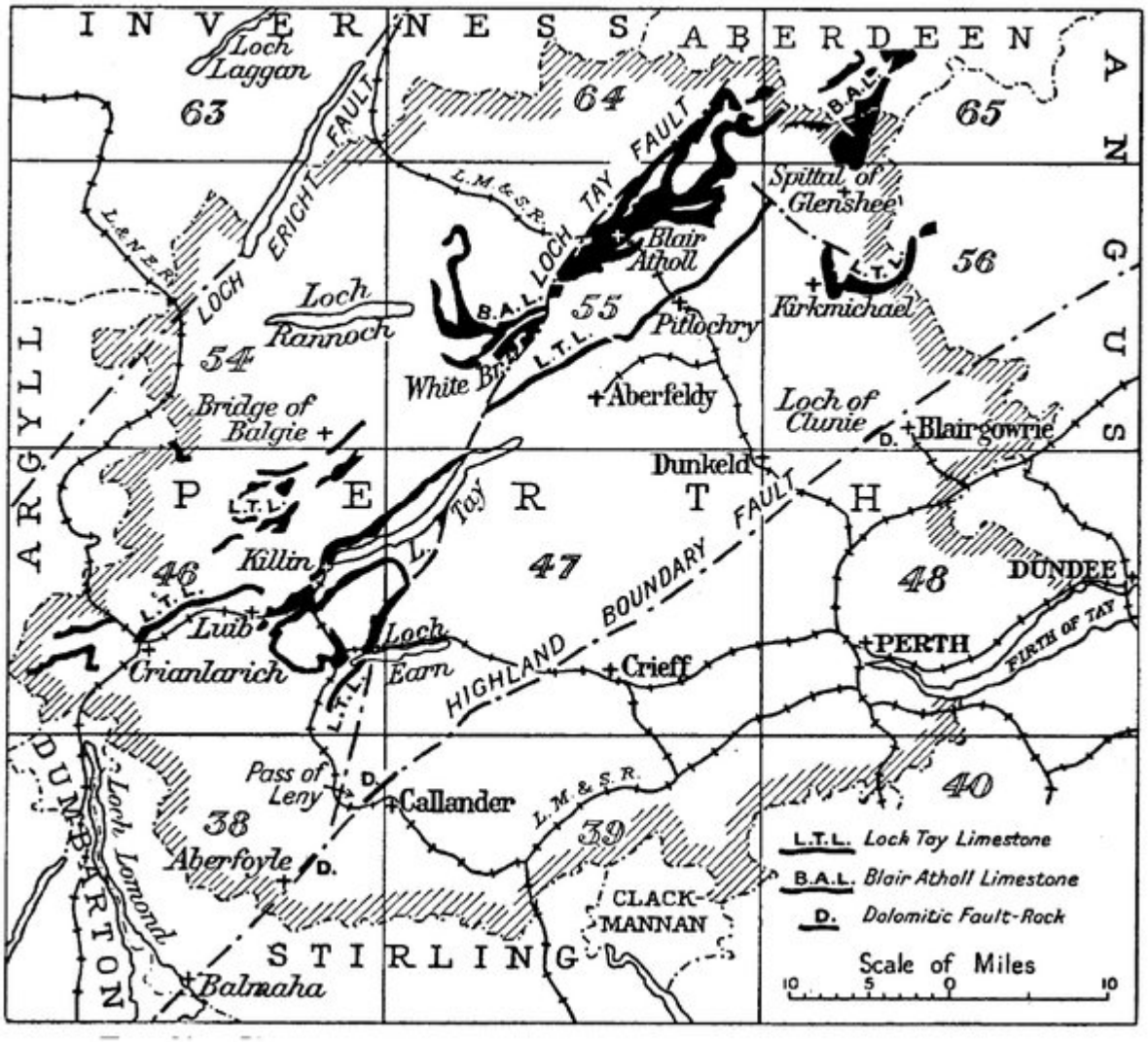


Figure 30 Sketch map showing distribution of limestone in Perthshire.

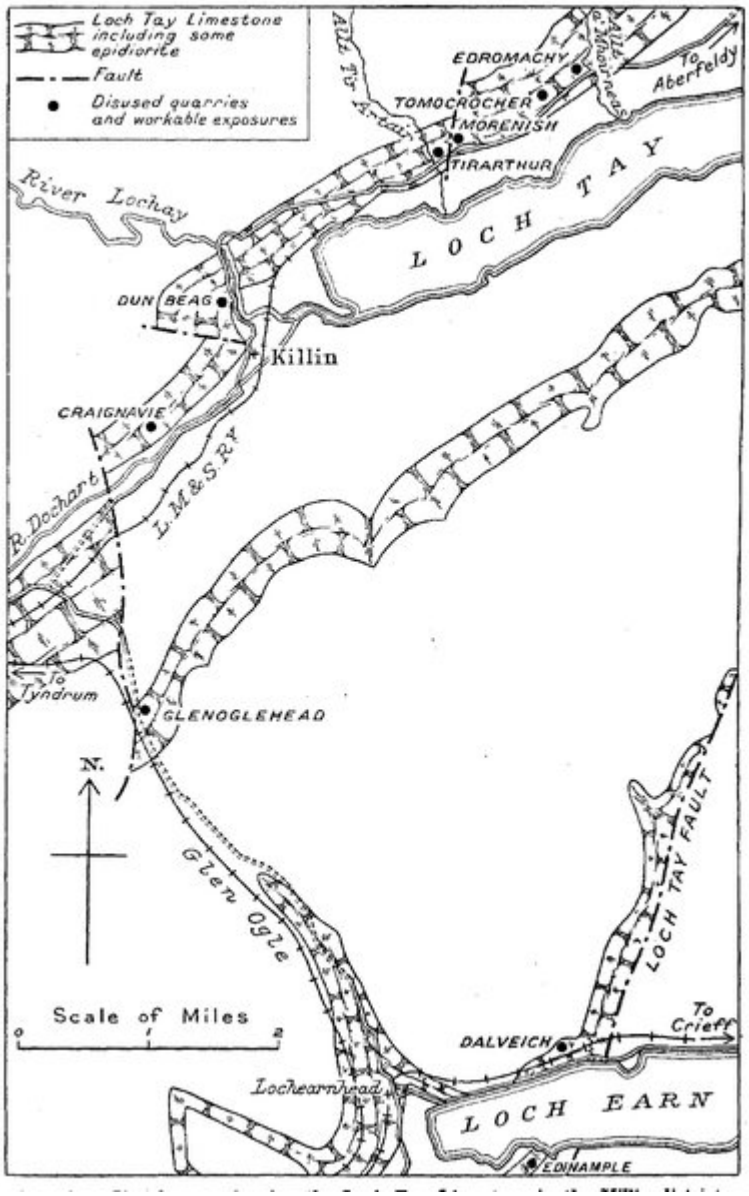


Figure 31 Sketch map showing the Loch Tay Limestone in the Killin district of Perthshire.

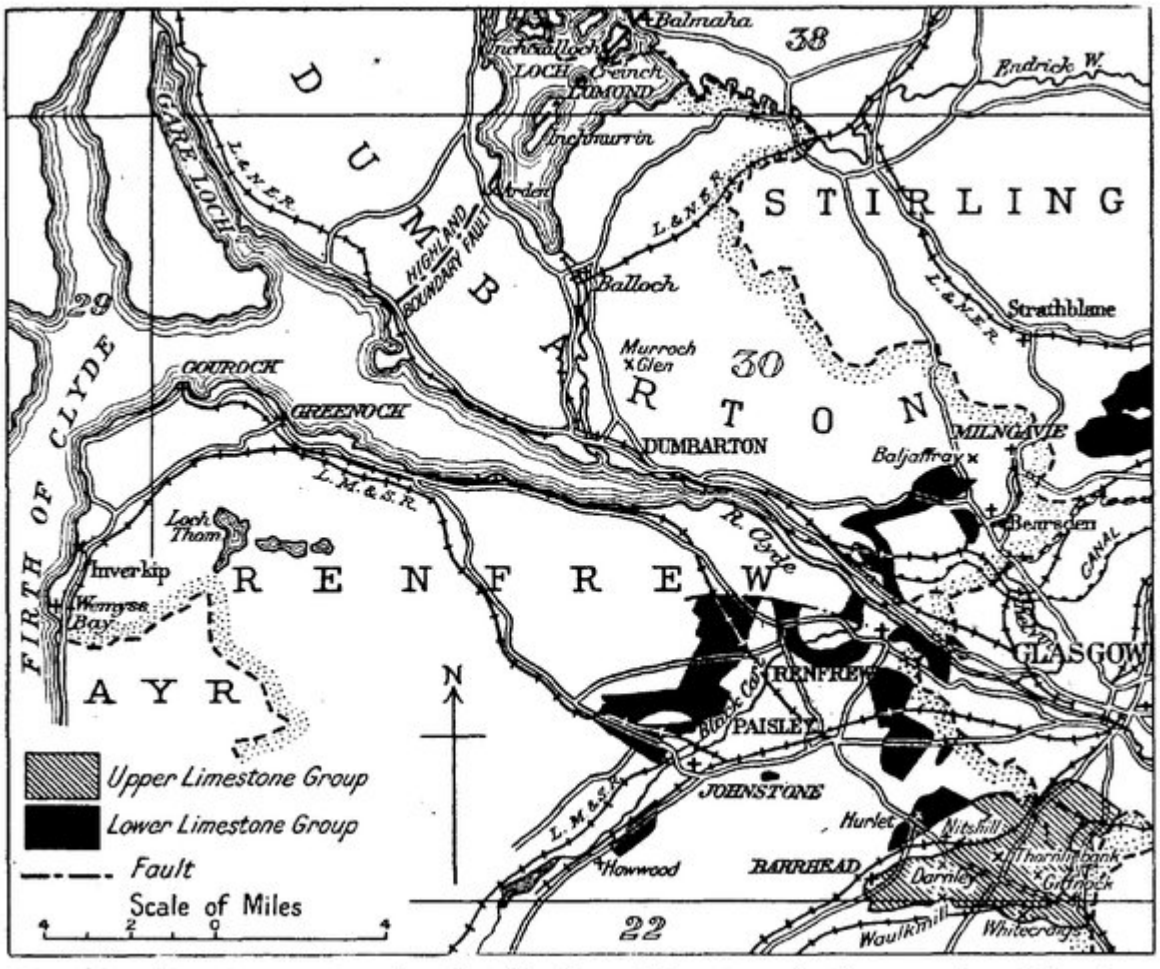


Figure 32 Sketch map showing distribution of limestone in the counties of Renfrew and Dumbarton.

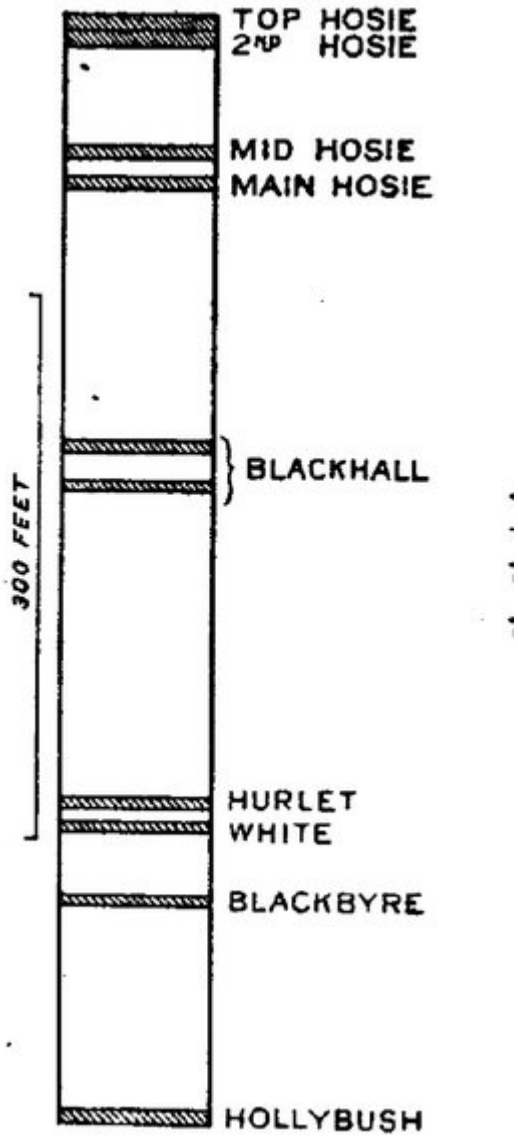


Figure 33 Vertical Section of the limestones in the Lower Limestone Group and at the top of the Calciferous Sandstone Series of Renfrewshire.

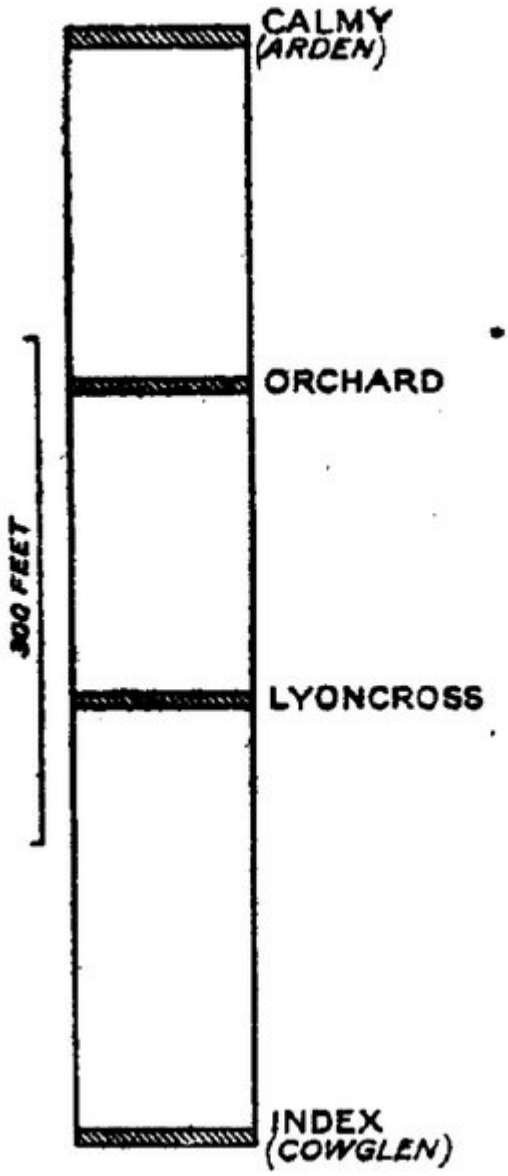


Figure 34 Vertical Section of the limestones in the Upper Limestone Group of Renfrewshire.

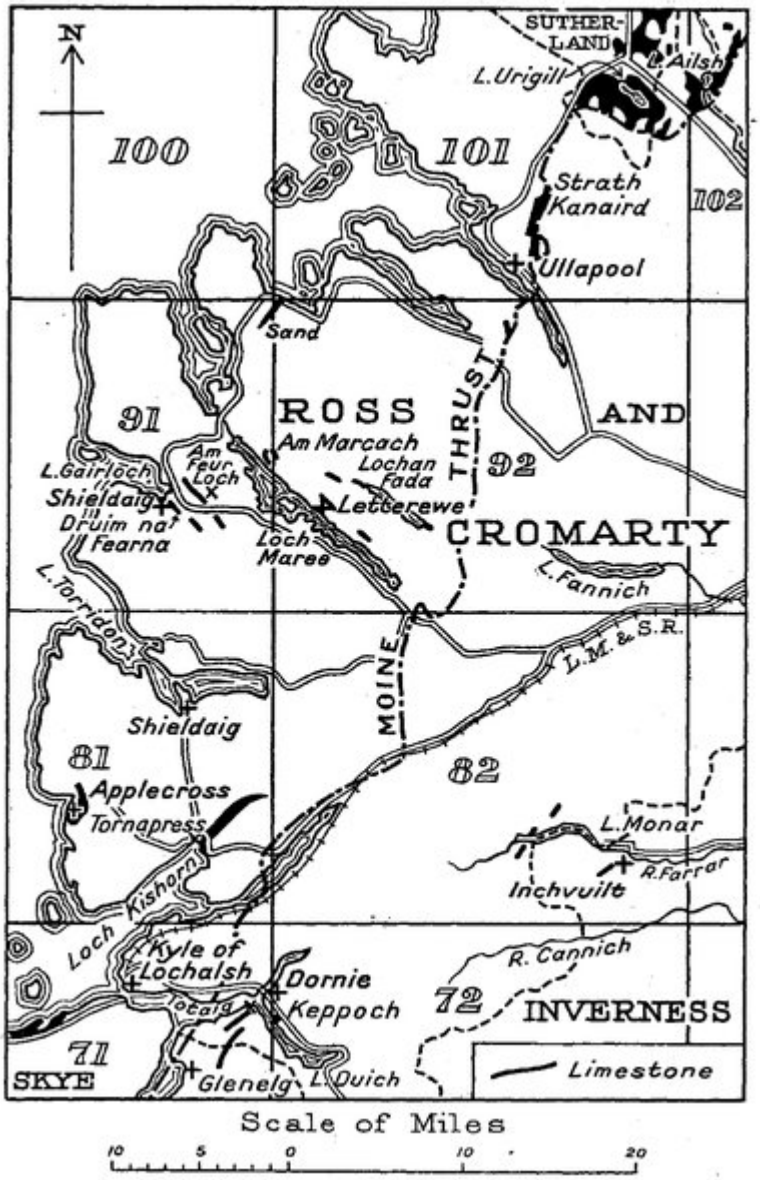


Figure 35 Sketch map showing distribution of limestone in Ross and Cromarty.

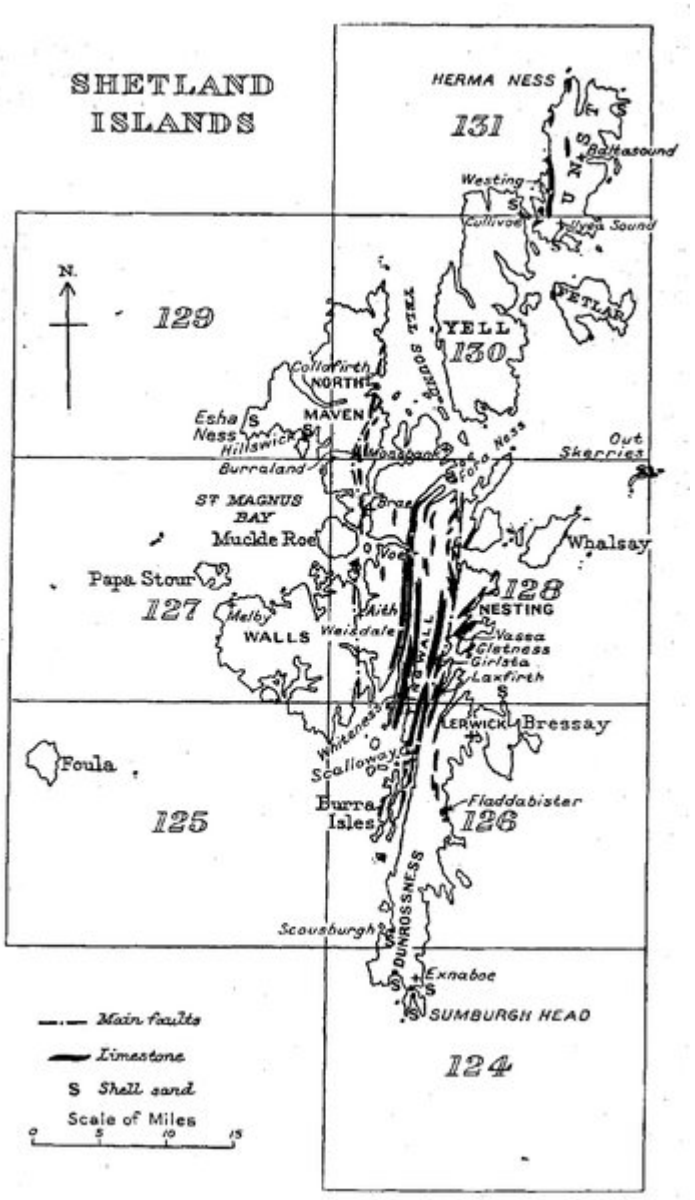


Figure 36 Sketch map showing distribution of limestone and shell sand in Shetland.

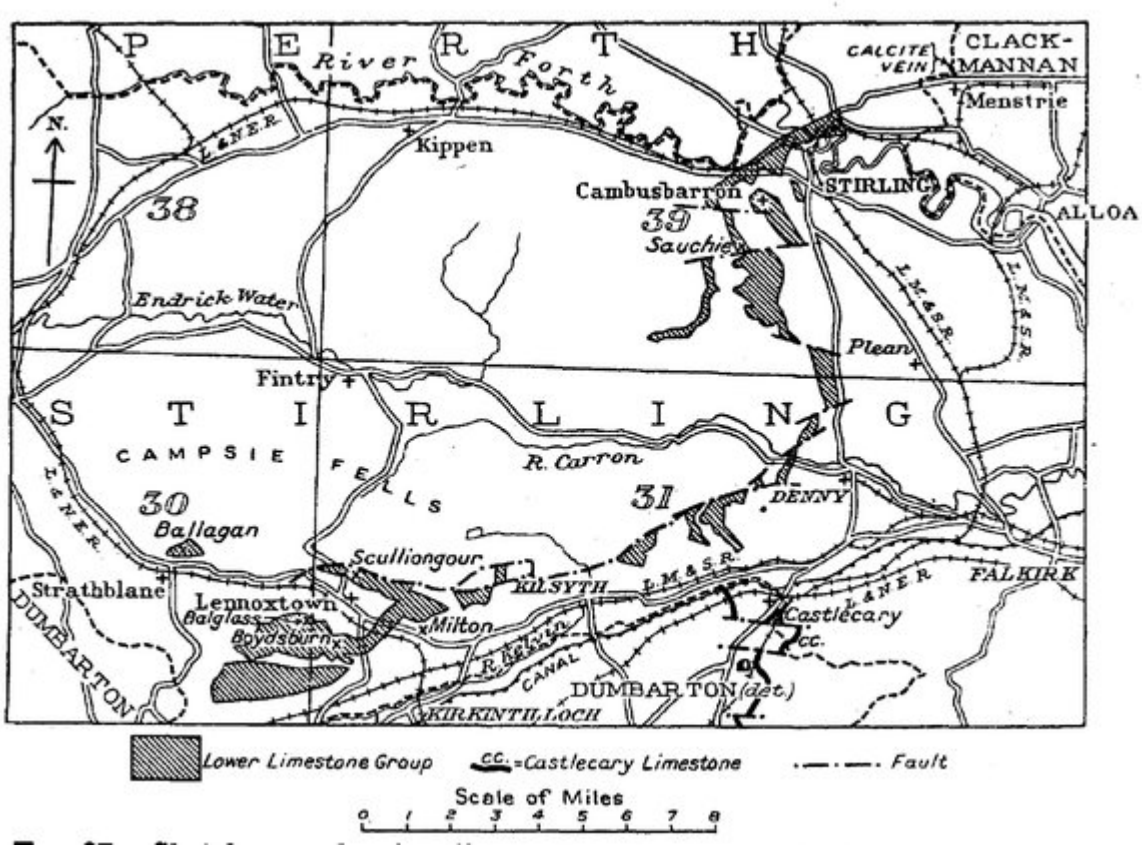


Figure 37 Sketch map showing distribution of limestone in the counties of Stirling and Dumbarton detached.

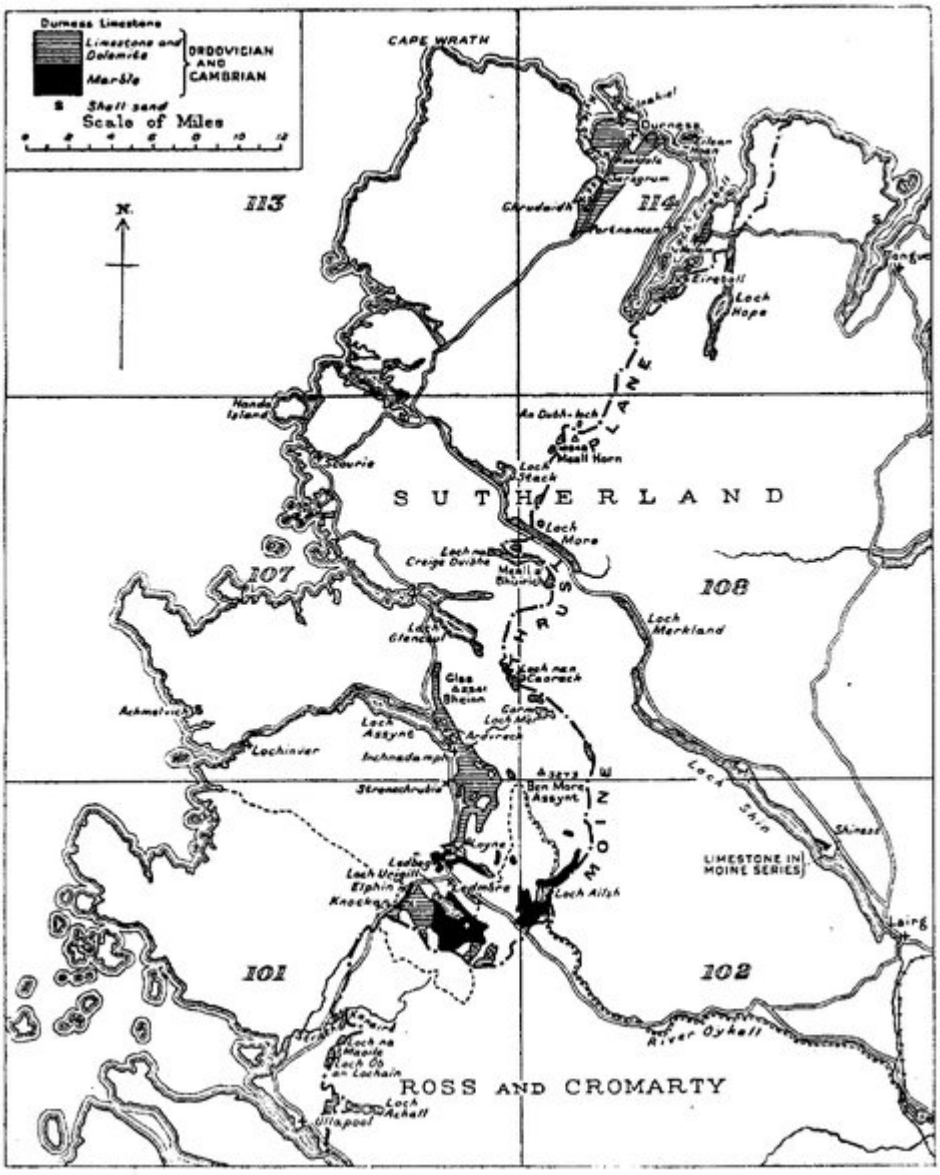


Figure 38 Sketch map showing distribution of limestone in Sutherland.

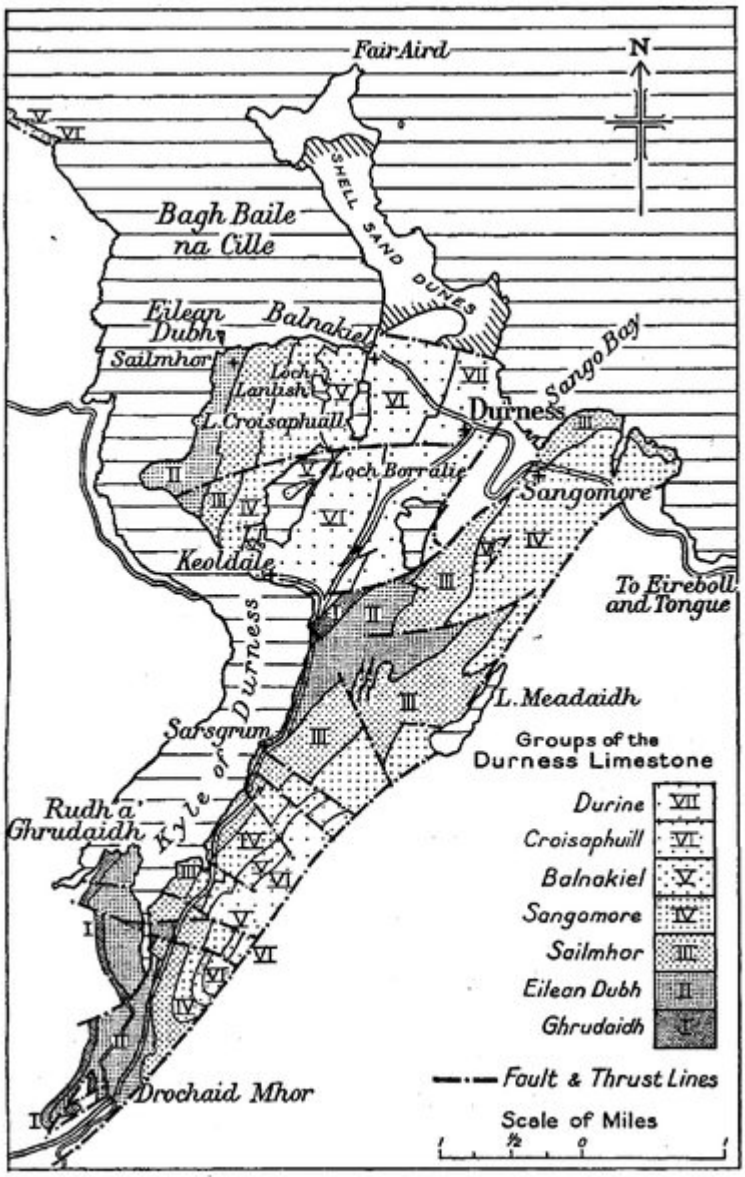


Figure 39 Sketch map showing distribution of limestone in the Durness district of Sutherland.

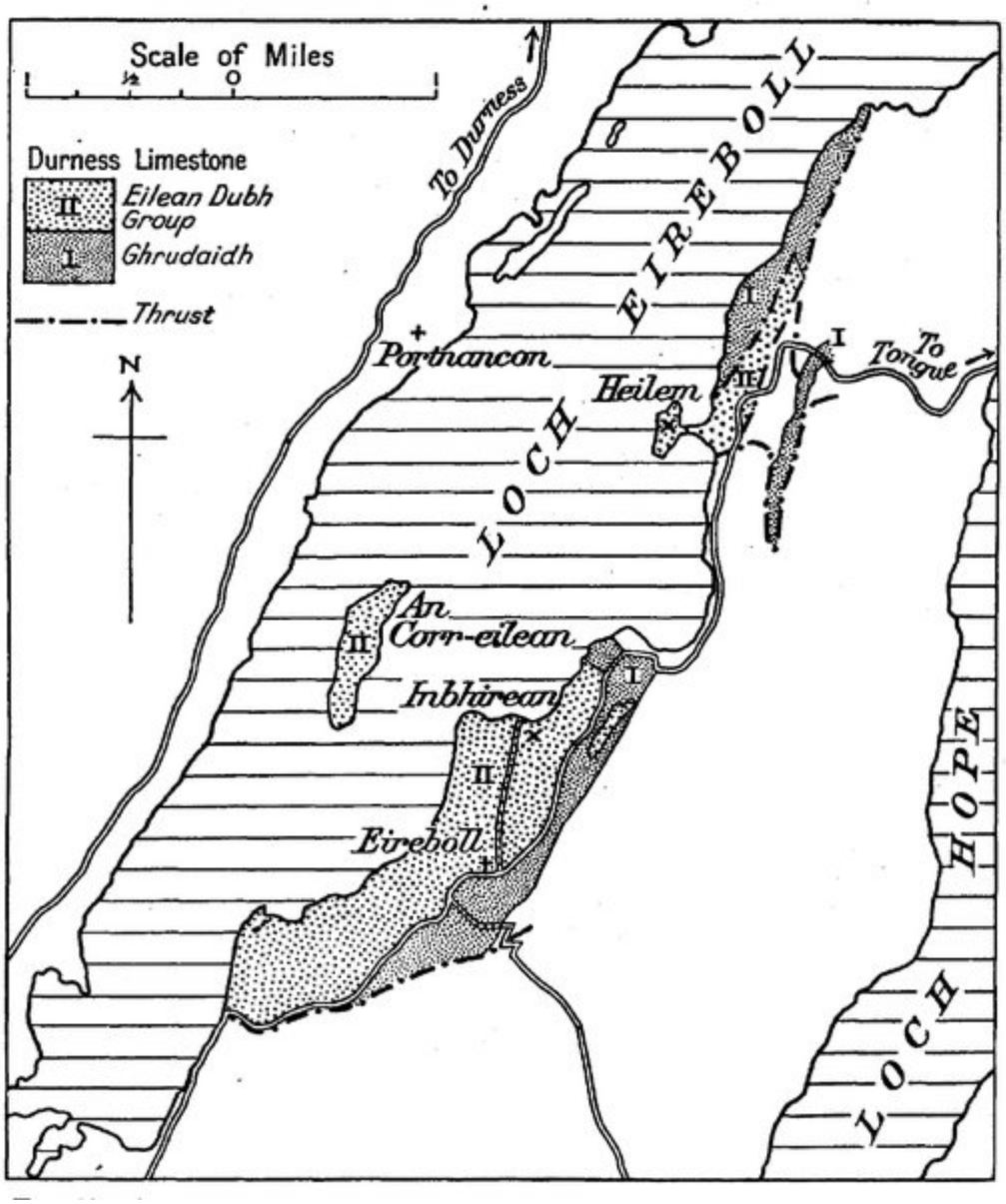


Figure 40 Sketch map showing distribution of limestone in the Loch Eireboll district of Sutherland.

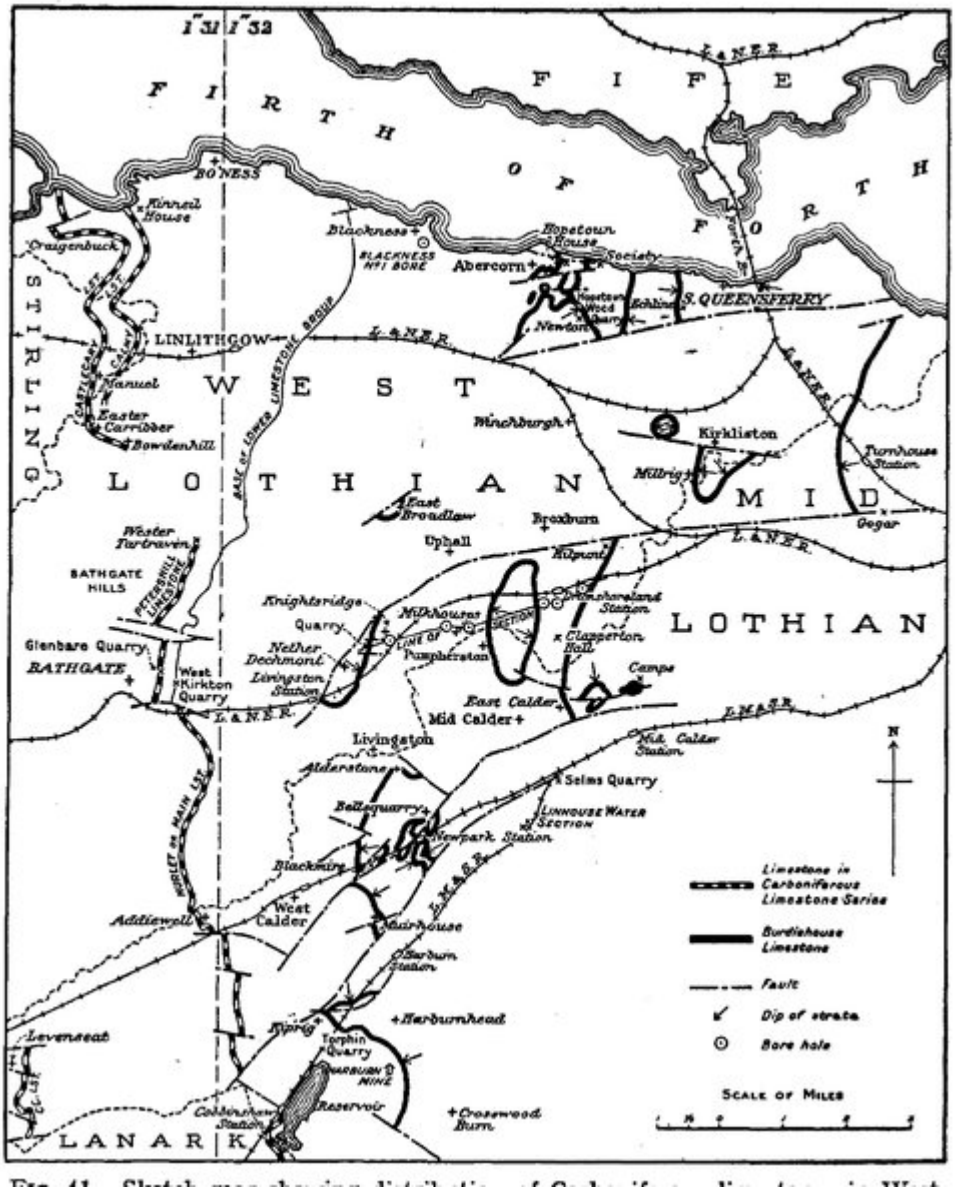


Figure 41 Sketch map showing distribution of Carboniferous limestones in West Lothian and the western part of Midlothian.

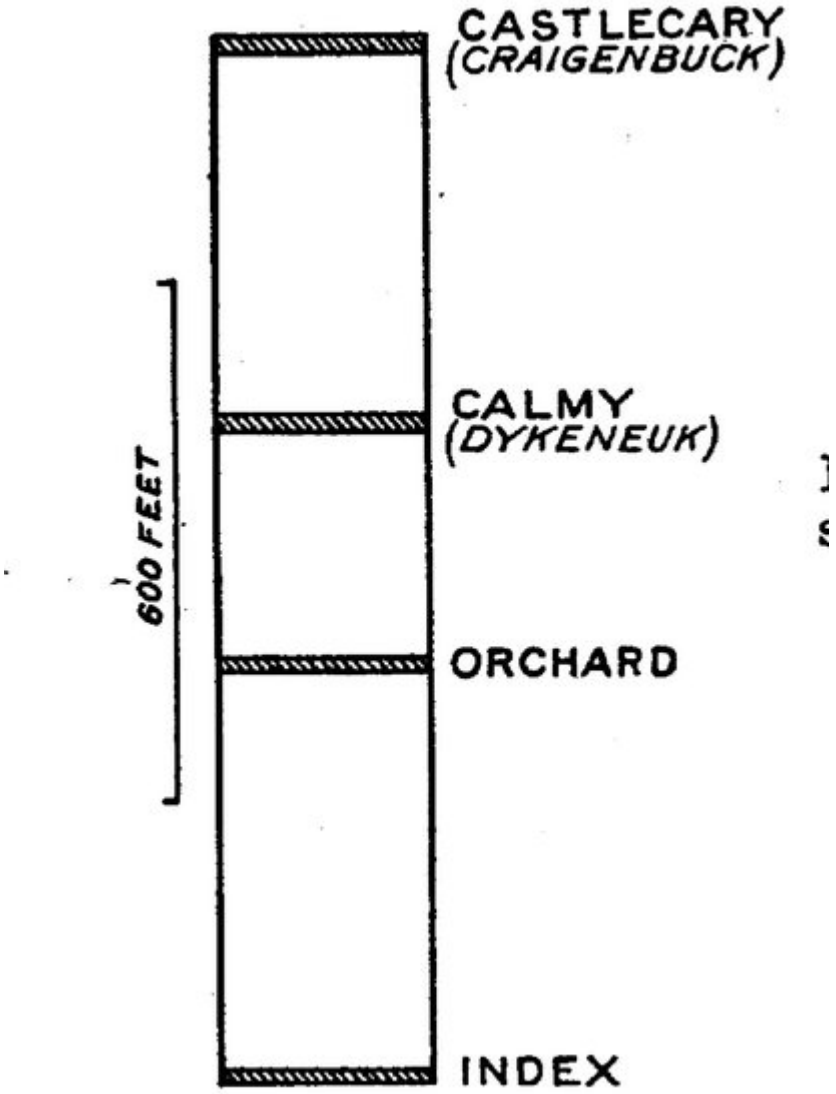


Figure 42 Vertical Section of the limestones in the UpperLimestone Group of West Lothian.

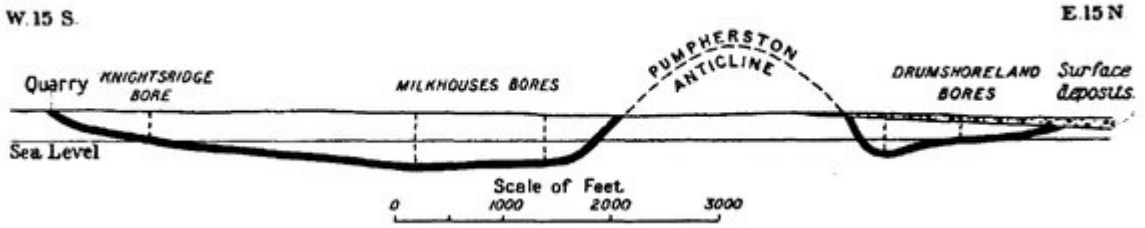
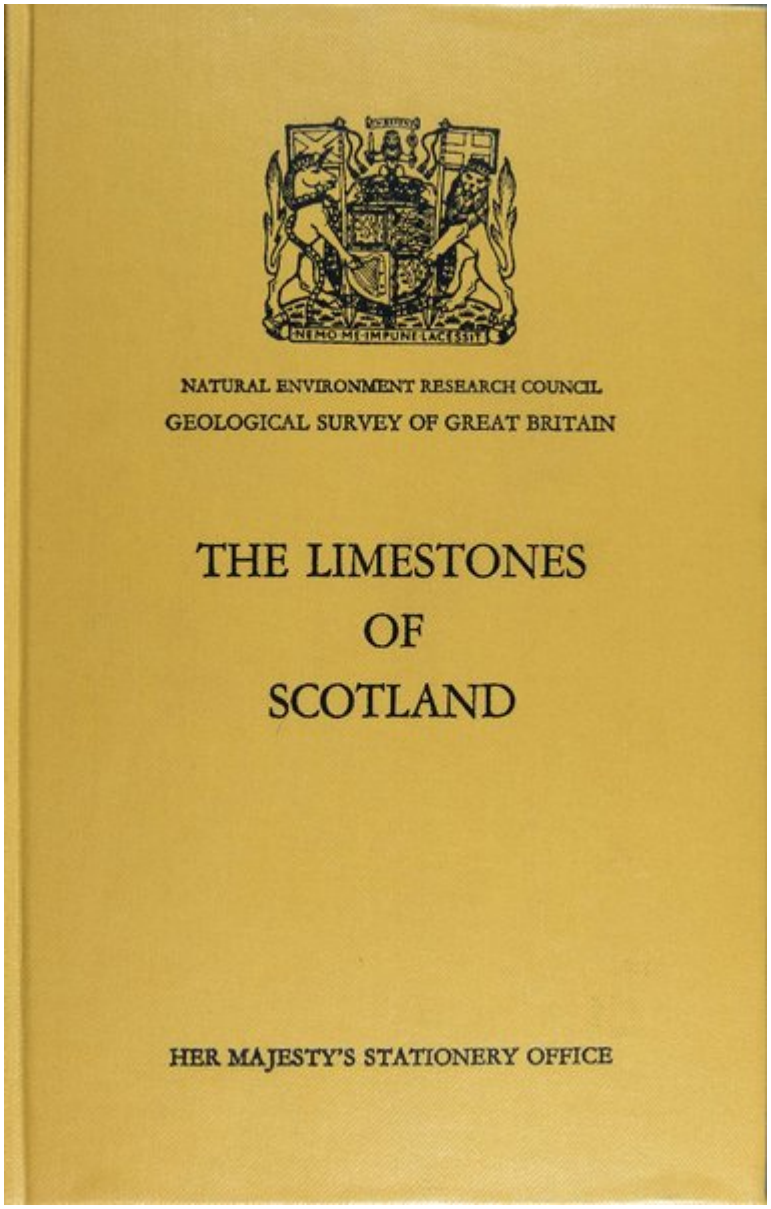
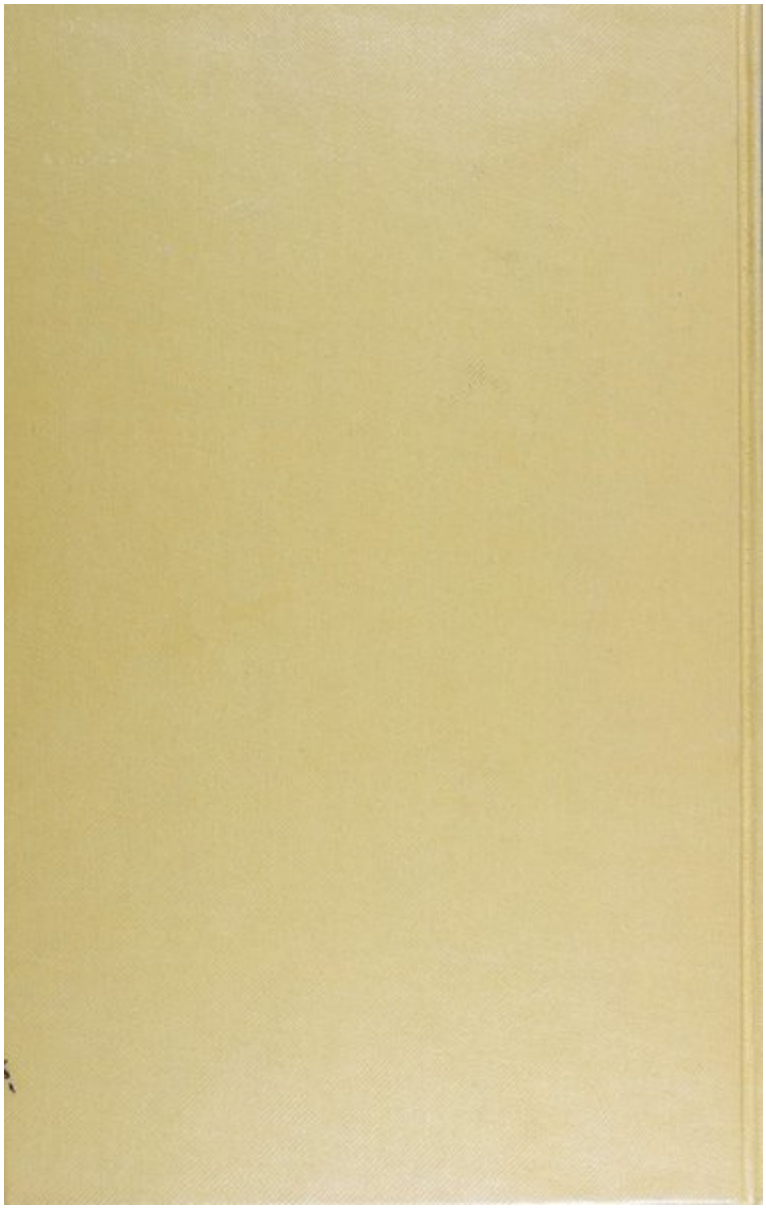


Figure 43 Section of the Burdiehouse Limestone in the Pumpherston area see line of section in Figure 41.



Front cover. Limestones of Scotland.



Rear cover. Limestones of Scotland.

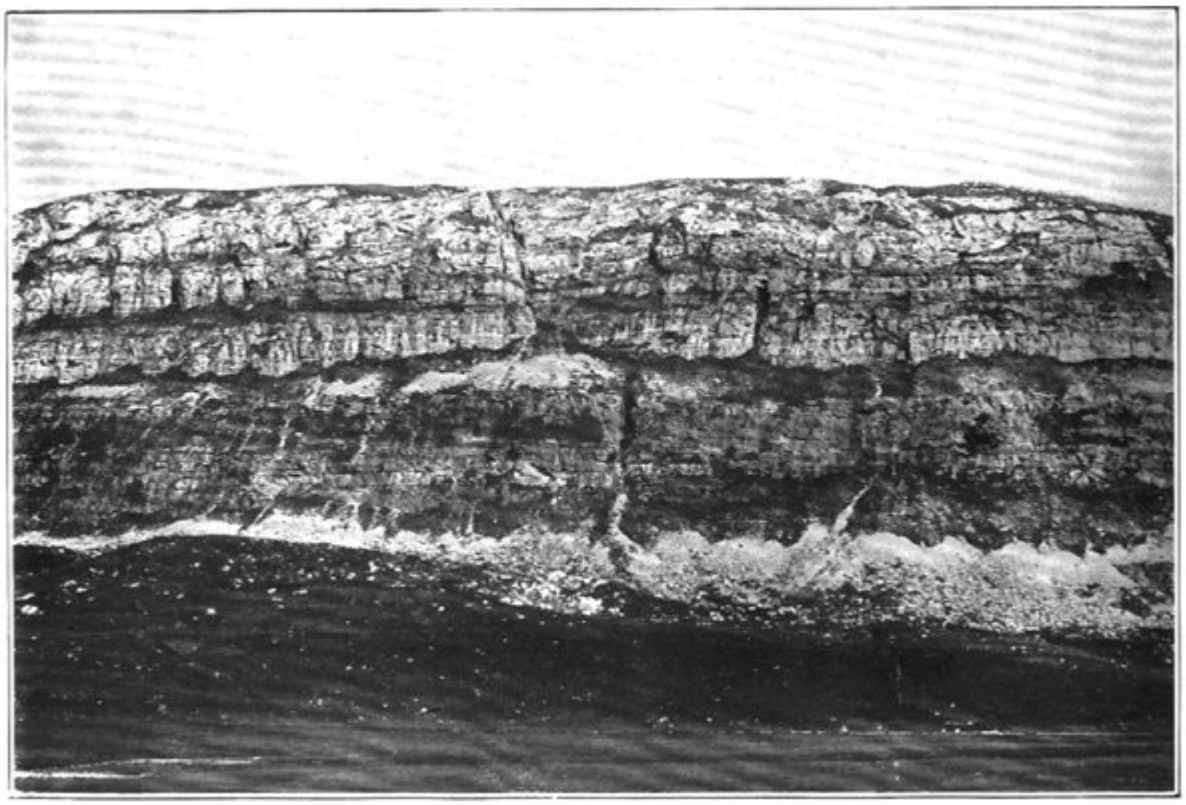


Plate 1 Stronechrubie Cliff, Inchnadamph, Sutherlandshire. Thrust mass of Durness dolomite and limestone. Frontispiece.

Plate 2 Map of the Main Occurrences of Limestone in Scotland.

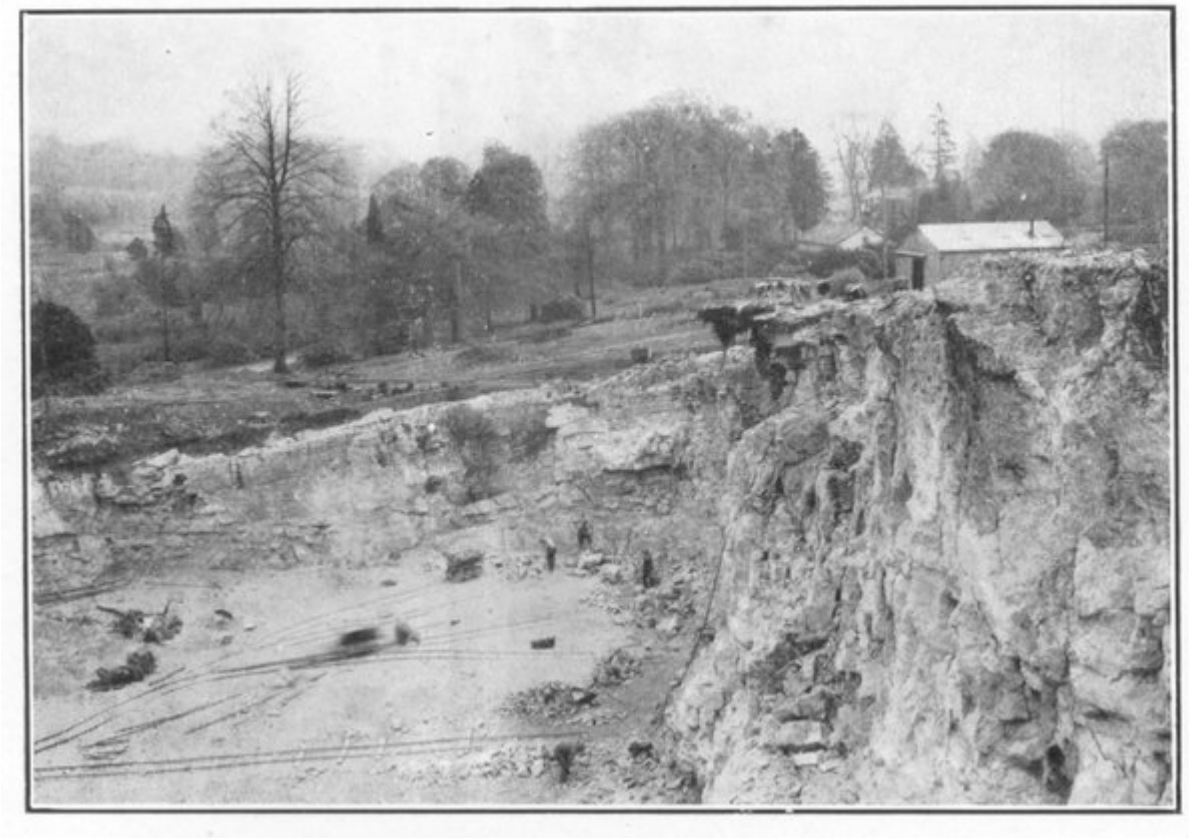


Plate 3A Hessilhead Quarry, Lugton, Ayrshire. General view of quarry in the Dockra Limestone.

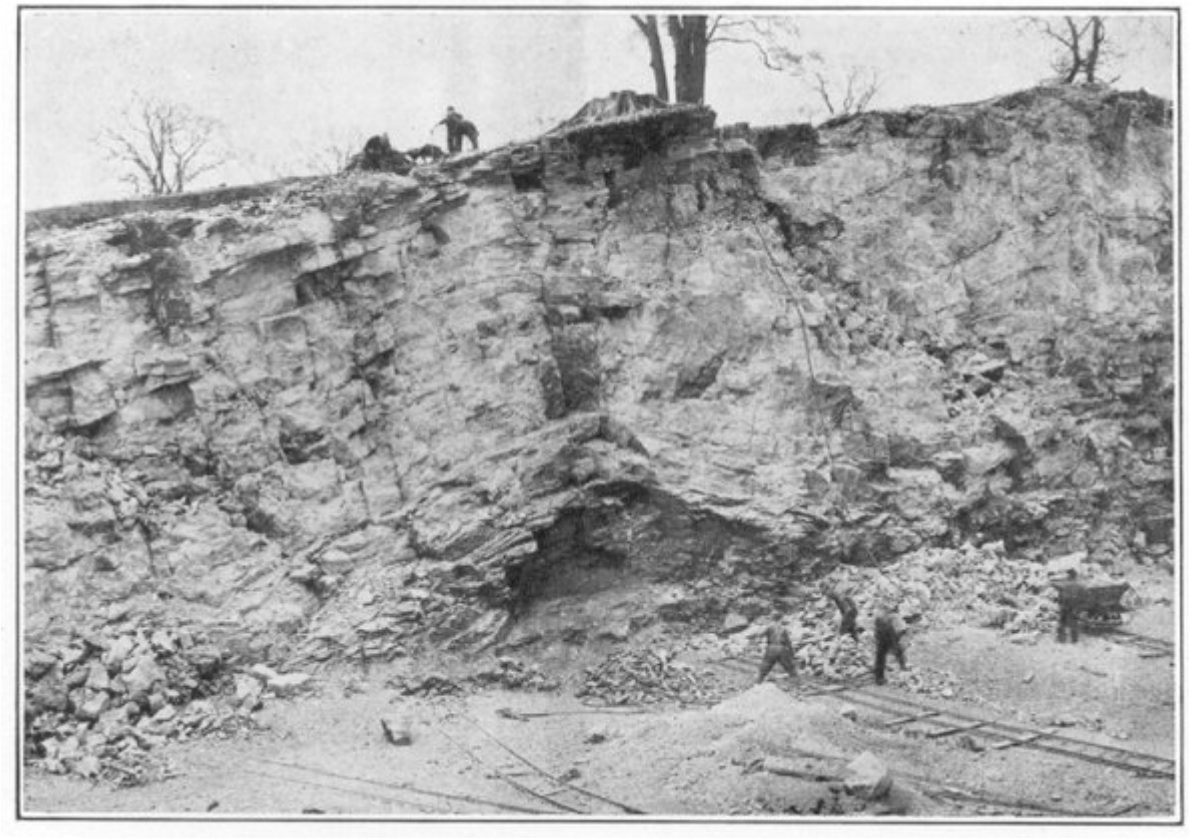


Plate 3B Same quarry, nearer view of face showing arching of strata, bedding and jointing.

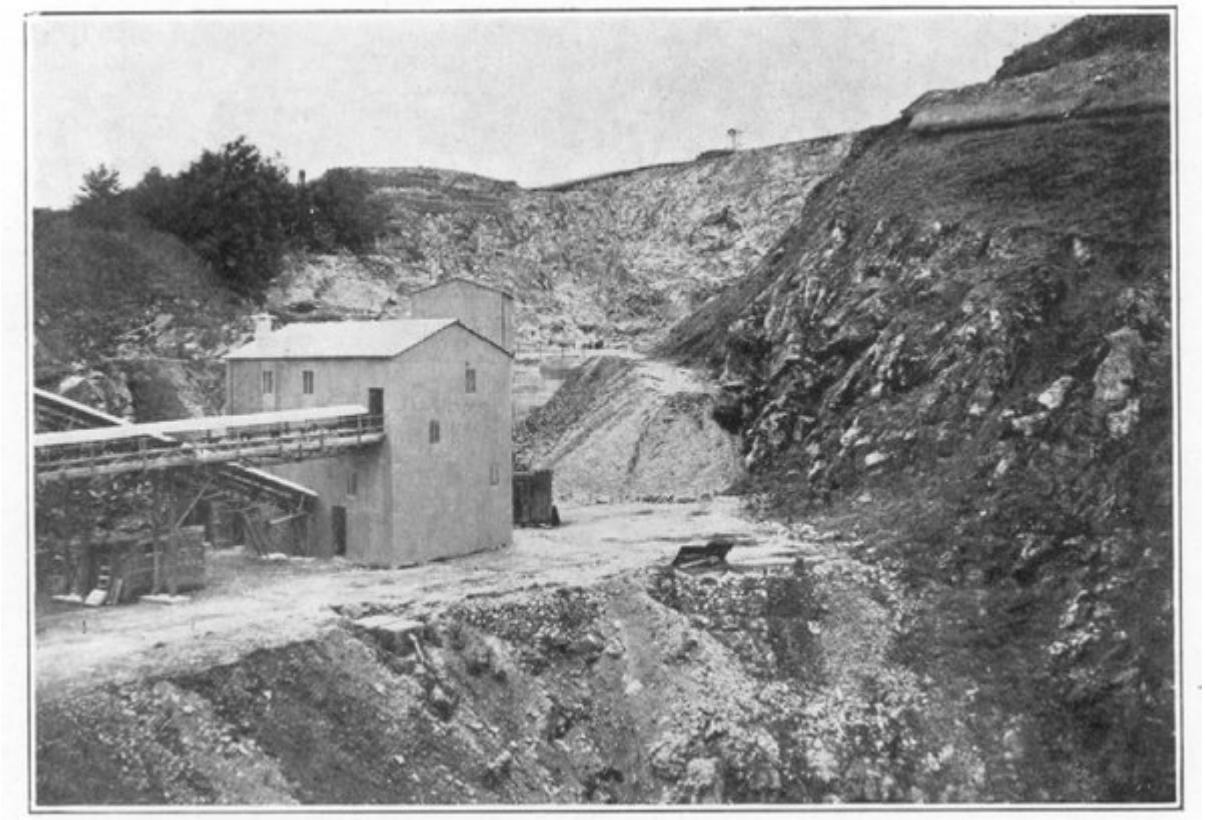


Plate 4A Parkmore Quarry, Dufftown, Banffshire. General view of quarry, showing primary and secondary crushers.

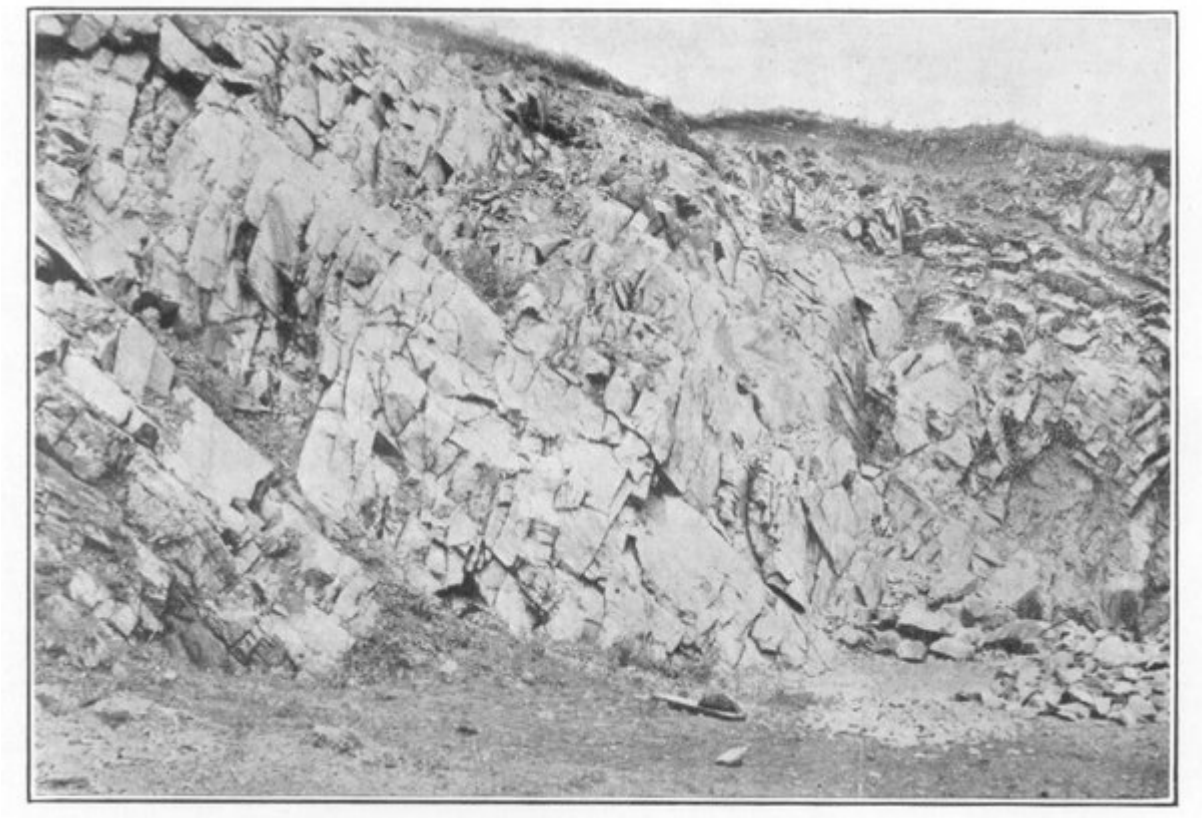


Plate 4B Limehillock Quarry, Grange, Banffshire. View of part of face, showing dip of beds of limestone.

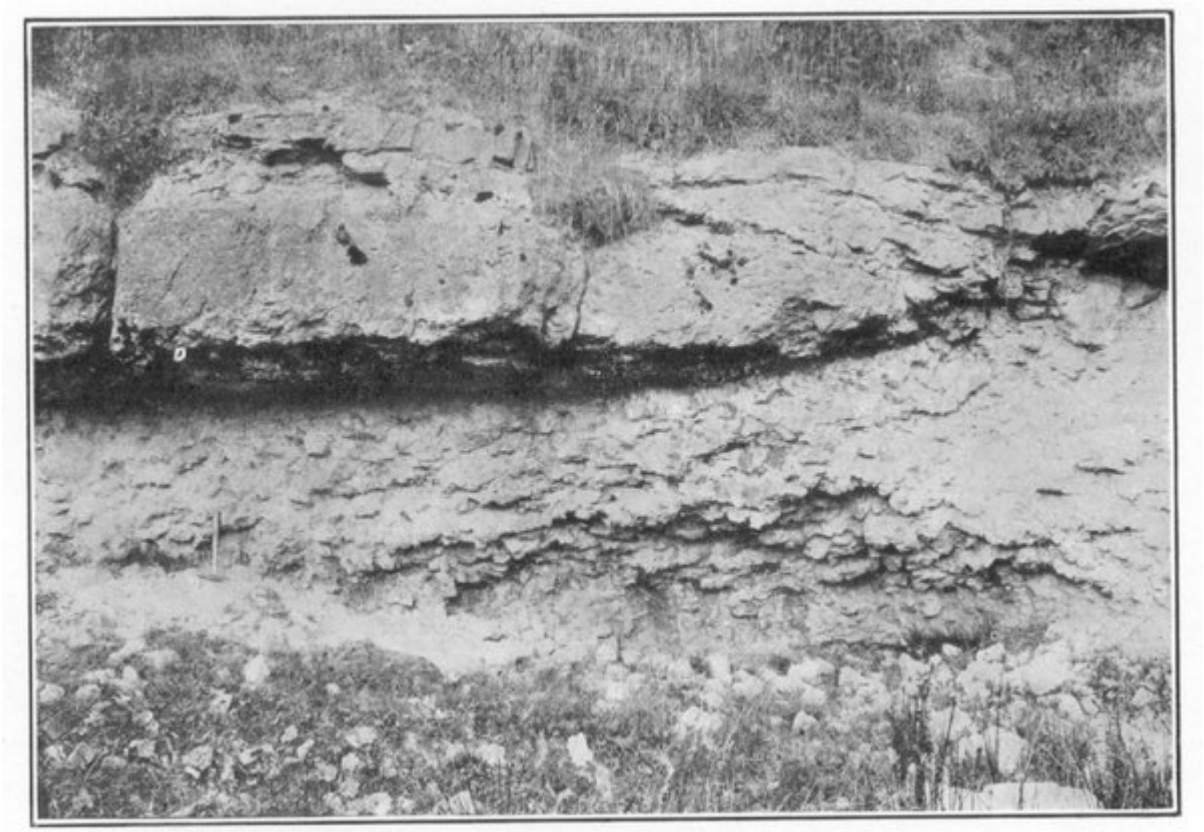


Plate 5A Carleith Quarry, Galston, Ayrshire. Quarry in cornstone of Upper Old Red Sandstone age, illustrating the concretionary nature of the rock.

Plate 5B Shore at Catcraig, east of Dunbar. Surface of the Long Craig Middle Limestone, largely composed of the coral Lithostrotion junceum.

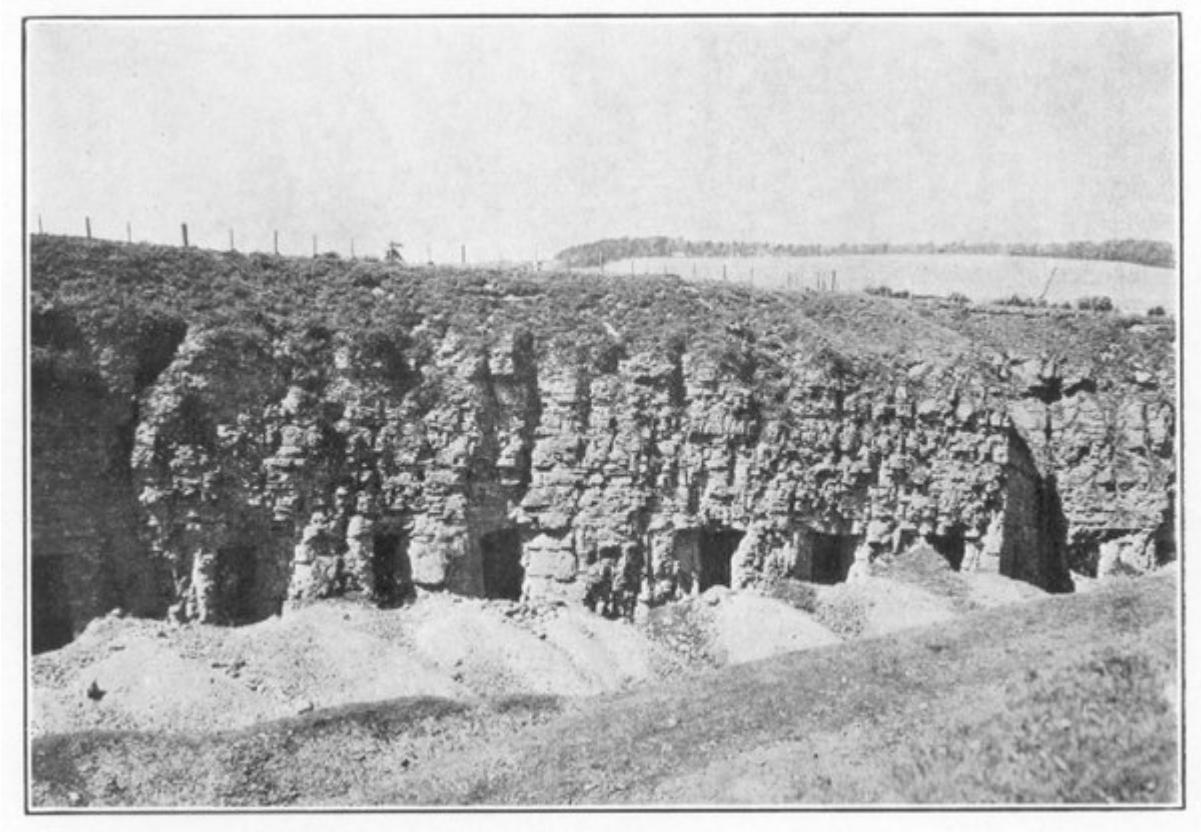


Plate 6A Middleton Quarry and Mine, Gorebridge, Midlothian. The mine is developed in the lower part of the North Greens Limestone.

Plate 6B Interior view of the mine, illustrating the stoop and room pillar and stall method of extraction.

Plate 7A Drummuir Quarry, Banffshire. General view of quarry, showing method of working in two benches and dip of beds of limestone.

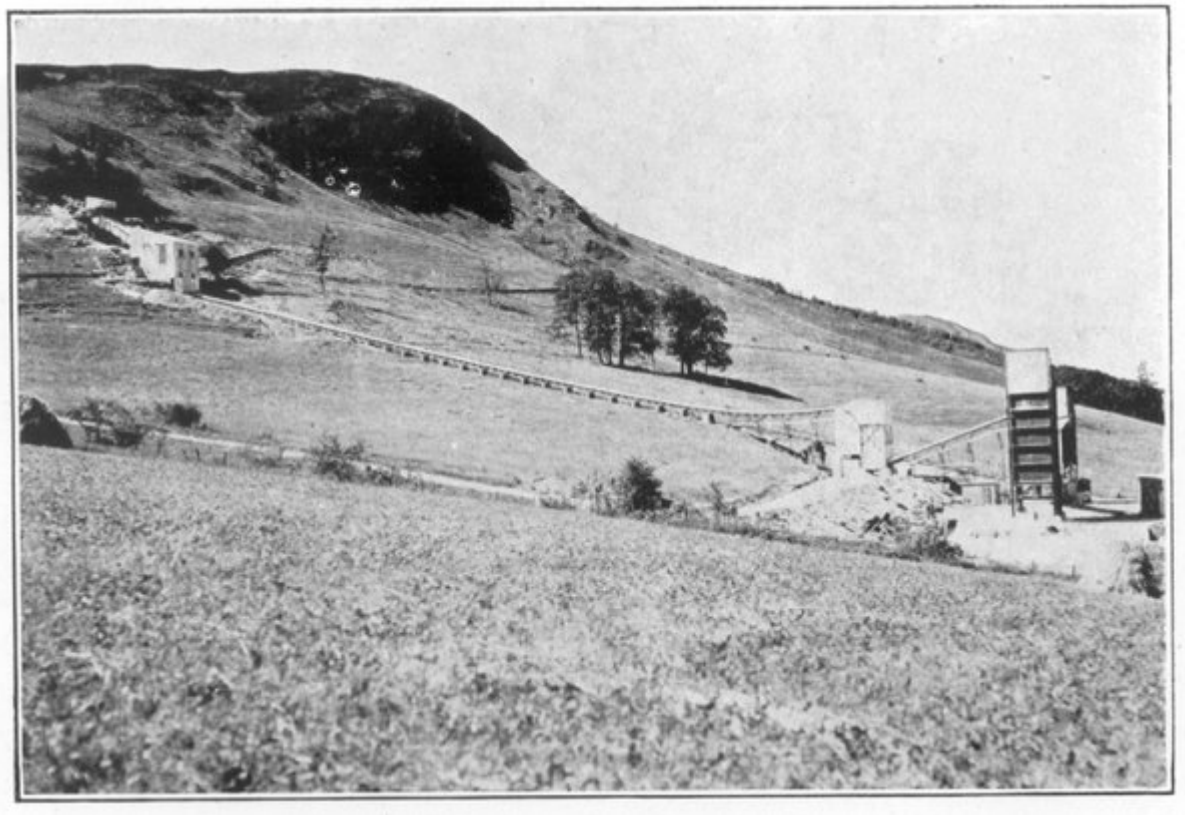


Plate 7B Creag Odhar, Shierglas, Blair Atholl, Perthshire. General view showing hill of limestone to left and crushing plant.

TABLE I

CLASSIFICATION AND DISTRIBUTION OF SCOTTISH LIMESTONE

Main Divisions	Subdivisions	Character of Calcareous Beds	Distribution
RECENT AND PLEISTOCENE		Lake Marl	Caithness (Westfield, etc.), Inverness (Dochfour)
		Calcareous tufa	Wester Ross (Kishorn)
		Shell Sand	Caithness (John o' Groat's), Orkney, Shetland, Outer Hebrides, etc.
CRETACEOUS	Chalk	Limestone (altered chalk)	Skye (Strollamus)
JURASSIC	Kimmeridge and Brora Arenaceous Series	Impure Limestone	Sutherland (E. coast)
	Great Estuarine Series	Limestone, mainly shelly	Eigg, Skye (Strollamus, Strathaird)
	Lias	Shelly Limestone, usually rather sandy	Skye (Broadford), Wester Ross (Applecross), Argyll (Loch Aline, Ardnamurchan)
RHAETIC		Sandy Limestone	Argyll (Mull)
TRIASSIC		Cornstone	Argyll (Mull, Morvern)
CARBONIFEROUS (see Table II for details)	Carboniferous Limestone Series	Numerous Limestones, usually shelly, including the Castlecary and Calmy near the top of the formation and the Bilston Burn, Blackhall (Charlestown Main, North Greens) and Hurlet (Main, Dockra, Glimerton) near the base	Fife, Kinross, the Lothians, Stirling, Peebles, Lanark, Ayr, Renfrew, Dumfries
	Calciferous Sandstone Series	Marine Limestones near the top of the formation, including the Broadstone and Hollybush	N. Ayr, Renfrew, Lanark, Stirling, E. Lothian
		Freshwater Limestones in the Oil Shale Group, including the Burdiehouse	Fife, Midlothian, W. Lothian, E. Lothian
		Cementstones, near the base of the formation	Dumbarton, Stirling, Fife, Roxburgh, Berwick
OLD RED SANDSTONE	Upper Old Red Sandstone	Cornstones, nodular non-fossiliferous fine-grained limestones	Angus (Brechin), Kinross (Vane), Bute (Kilchattan), Ayr, Argyll, Stirling (Gargunnock)
	Middle Old Red Sandstone	Tufaceous and other Limestones, usually impure	Caithness (Achvarasdal)
ORDOVICIAN		Limestone, fossiliferous	Ayr (Girvan)
CAMBRIAN	Durness Limestone :—	Dolomite and Limestone (Upper part probably Ordovician)	
	VII Durine Group	Dolomite and Limestone	Sutherland (Durness)
	VI Croisaphuill Group	Dolomite and Limestone	Sutherland (Durness), Skye (Broadford)
	V Balnakiel Group	Mainly Limestone	Sutherland (Durness), Skye (Broadford)
	IV Sangomore Group	Dolomite and Limestone	Sutherland (Durness)
	III Sailmhor Group	Mainly Dolomite	Sutherland (Durness), Skye (Sleat)
	II Eilean Dubh Group	Mainly Dolomite	Sutherland (Durness, Eireboll, L. Assynt, Elphin), Ross (Ullapool, Kishorn), Skye (Sleat)
	I Ghrudaidh Group	Mainly Dolomite	Sutherland (Durness, Eireboll, L. Assynt) W. Ross (Kishorn)
DALRADIAN (The sequence being uncertain, the limestones are arranged regionally instead of stratigraphically)	Ballachulish Limestone	Crystalline Metamorphic Limestone	Inverness (Spean Bridge, Fort William)
	Appin Limestone	" " "	Argyll (Appin)
	Lismore Limestone	" " "	Argyll (Lismore, ? Shuna)
	Islay Limestone	" " "	Argyll (Islay)
	Tayvallich Limestone	" " "	Argyll (Tayvallich, Loch Awe)
	Shira Limestone	" " "	Argyll (Loch Awe)
	Loch Tay Limestone	" " "	Argyll (Campbeltown, L. Fyne), Perth (Killin, Pitlochry, Kirkmichael)
	Blair Atholl Limestones	" " "	Perth (White Bridge, Blair Atholl, Glen Tilt, Glen Shee), Aberdeen (Braemar)
	Limestones of Eastern Inverness	" " "	Inverness (Kinlochlaggan, Aviemore)
	Limestones of Sandend Group (probably Blair Atholl Limestones)	" " "	Banff (Keith, Dufftown, Tomintoul)
	Limestones of Portsoy Group	" " "	Banff (Keith), Aberdeen (Huntly)
	Boyne Limestone	" " "	Banff (Portsoy)
	Deeside Limestone (probably Loch Tay Limestone)	" " "	Aberdeen (Ballater, Aboyne), Kincardine (Banchory)
TORRIDONIAN		Banded sandy Limestone	Argyll (Colonsay)
MOINE		Lenticular beds of Crystalline Metamorphic Limestone	Sutherland (Skinsess), Inverness (Rebeg, ? Foyers)
SHETLAND METAMORPHIC SERIES		Zones of Crystalline Metamorphic Limestone	Shetland (Voe, Whiteness, Girlsta)
LEWISIAN		Lenticular beds of Crystalline Metamorphic Limestone	W. Ross (L. Maree), Argyll (Coll, Tiree) Inverness (Glen Elg, Glen Dessarry, Glen Urquhart)

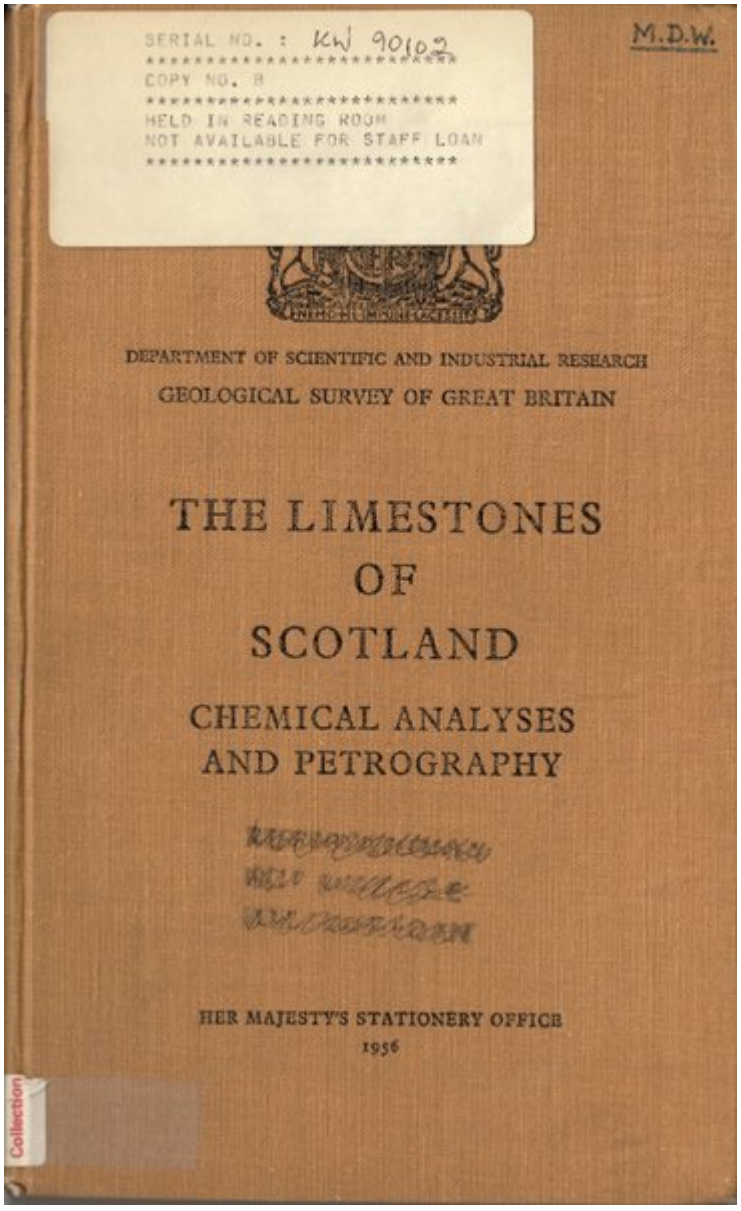
Table 1 Classification and distribution of Scottish limestone.

TABLE II

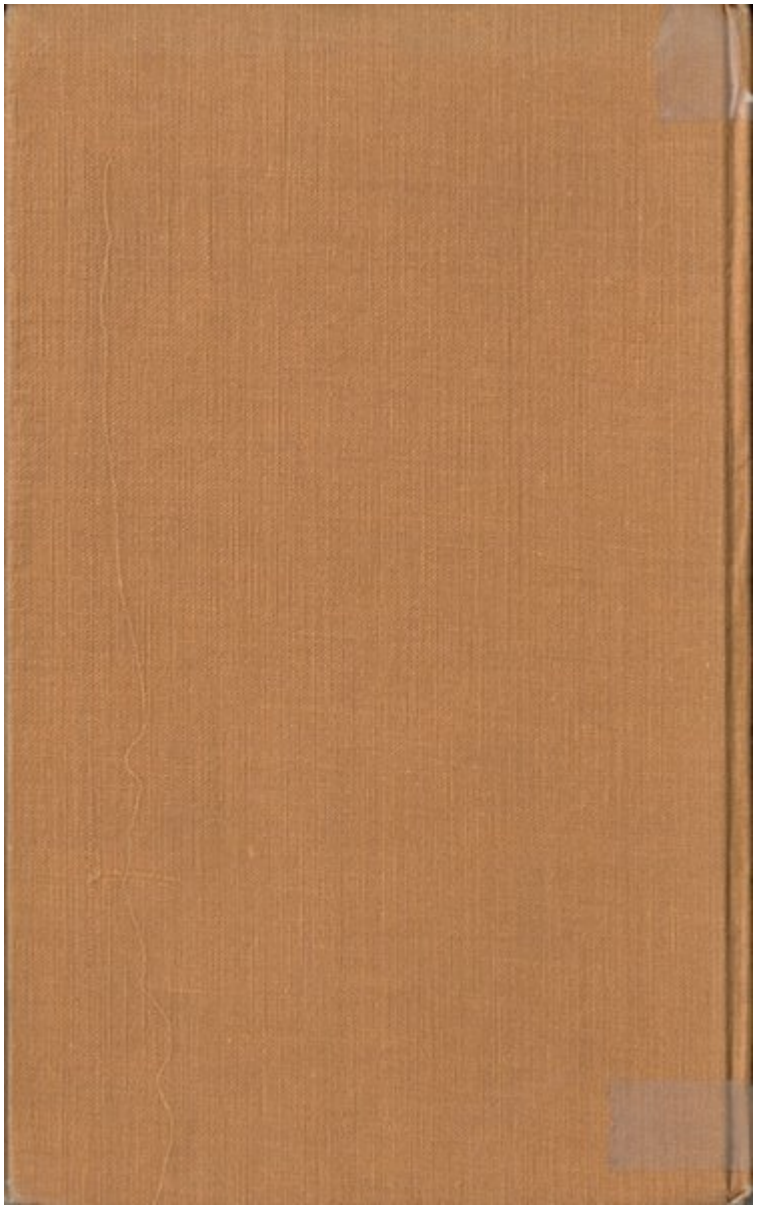
SYNONYMY AND DISTRIBUTION OF THE PRINCIPAL SCOTTISH CARBONIFEROUS LIMESTONES

Geological subdivisions	LIMESTONES Principal names in capitals, synonyms inset	DISTRIBUTION Counties	Localities
UPPER LIMESTONE GROUP	CASTLECARY	Dumbarton	Castlecary, Cumbernauld, Luggiebank
		Fife	Culross
	Craigenbuck	W. Lothian	Kinneil, Carribber
	Levenseat	Midlothian	Bresich
	Vicar's Bridge	Clackmannan	Vicar's Bridge
		Fife	Westmuir
	CALMY	Ayr	New Cumnock
		Lanark	Quarter, Garnkirk, Chryston, Robroyston
		Dumbarton	Cumbernauld
		Fife	Saline, Culross
	Dykeneuk	W. Lothian	Kinneil, Carribber
	Blue Tour	Ayr	Muirkirk
	Beuston	Ayr	New Cumnock
	Upper Linn	Ayr	Dalry
	Gair	Lanark	Larkhall, Carluke, Auchenheath
	Gill	Lanark	Douglas
	Arden	Renfrew	Darnley
	ORCHARD	Renfrew	Giffnock
	Lower Linn	Ayr	Dalry
	LYONCROSS	Renfrew	Waulkmill
	Keirs	Ayr	Waterside
	INDEX	Ayr	Muirkirk, New Cumnock, Sorn
		Lanark	Forth, Coalburn
		Dumbarton	Dullatur
	Highfield	Ayr	Kilwinning
LIMESTONE COAL GROUP	A few Limestones, all thin and impure		
LOWER LIMESTONE GROUP	HOSIE (Limestones of the Hosie Group)	Lanark	Haywood, Carluke
		Renfrew	Johnstone
	Calderwood Cement, Anvil, Middle and Under	Lanark	E. Kilbride
	Hairmyres	Lanark	E. Kilbride
	Macdonald	Ayr	Muirkirk, Dalblair, Penbreck
	Bilston Burn	Midlothian	Esperston
LOWER LIMESTONE GROUP	Mid Kinniny	Fife	Luscar
	BLACKHALL	Renfrew	Hurlet
	Foul Hosie	Lanark	Carluke, Auchenheath
	Petershill	W. Lothian	Bathgate
	North Greens	Peebles	Macbiehill
		Midlothian	Crustland, D'Arcy, Pathhead, Middleton, Mount Lothian
		E. Lothian	Skateraw, Saltoun
	Charlestown Main	Fife	Charlestown, Inverkeithing, Colts, Lomond Hills, Leslie, Roscobie, Chapel etc.
		Kinross	Bishop Hill
	LONG CRAIG UPPER, HURLET or MAIN	E. Lothian	Haraelaw, Oxwell Mains, Gladsmuir, Saltoun
		Ayr	Patna
		Lanark	E. Kilbride, Carluke, Wilsontown, Auchenheath, Strathaven, Lesmahagow, Douglas, etc.
		Dumbarton	Baljaffray
		Renfrew	Paisley, Johnstone, Houston, Hurlet
		Stirling	Lennoxtown, Cambusbarron, Sauchie
	Hawthorn	Ayr	Sorn, Glenbuck, Muirkirk, Glenmuir, Penbreck, New Cumnock
	Dockra	Ayr	Dalry, Beith, Lugton, Ischgotrick
	Corrie	Bute	Cock of Arran, Corrie, Brodick
	Gilmerton	Peebles	Carleps, Macbiehill
		Midlothian	Gilmerton, Middleton, Mount Lothian
		E. Lothian	Saltoun
	Charlestown Station	Fife	Lomond Hills, Little Raith, Kinghorn
	Limestones (uncorrelated) of Lower Limestone and Upper Calciferous Sandstone age	Dumfries	Thorphill, Ecclefechan, Kelhead, Harelawhill
CALCIFEROUS SANDSTONE SERIES	BALDERNOCK	Stirling	Glorat
		Ayr	Dalry
	BROADSTONE	Ayr	Beith, Dalry
		Renfrew	Johnstone
	HOLLYBUSH	Renfrew	Limecraigs, etc., Barrhead
	Big	Lanark	Lesmahagow
	BURDIEHOUSE	W. Lothian	Hopetoun
		Midlothian	Straiton, Harburn, E. Calder
		Fife	Burntisland, Rosyth
	Other limestones in Oil Shale Group	E. Lothian	E. Linton, N. Berwick, Whittinghame
	CEMENTSTONES individual beds not traceable over large areas	Roxburgh	Newcastleton, Carham
		Dumbarton	Dumbarton
		Stirling	Ballagan
		Midlothian	West Calder
		Fife	Devonshaw, Randerstone, Crail, Anstruther

Table 2 Synonymy and distribution of the principal Scottish Carboniferous limestones.



Front cover. Limestones of Scotland. Chemical analyses and petrography.



Rear cover. Limestones of Scotland. Chemical analyses and petrography.

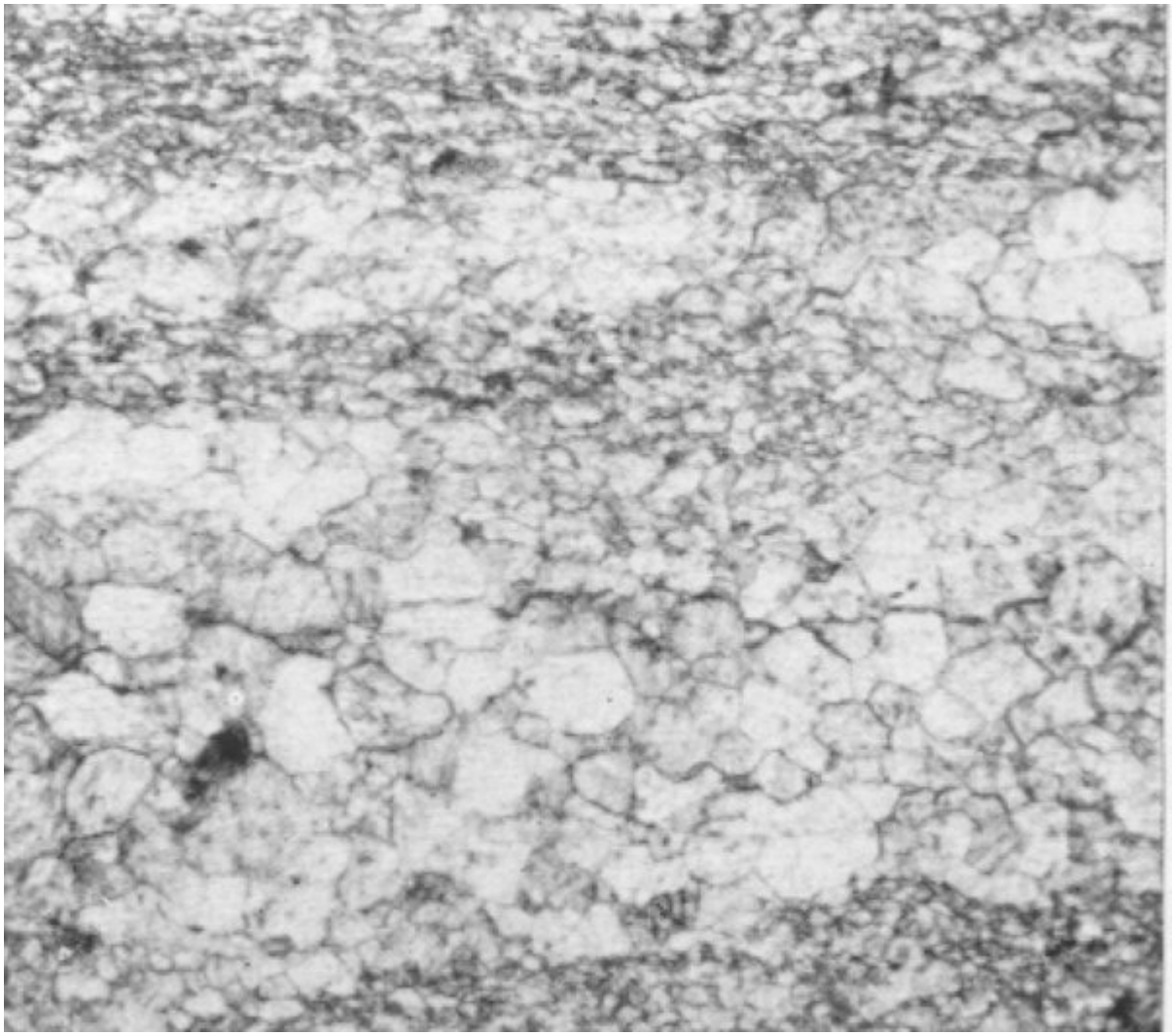


Plate 1 Photomicrographs of metamorphic limestones. FIG. 1. (S34577). SL 129, p. 81. Dalradian, Islay Limestone; Leorin Quarry, Islay. A limestone recrystallized under stress and showing foliation by alternation of bands of coarser and finer grain-grain-foliated structure-which are parallel to a schistosity produced by elongation of calcite grains and trains of dark mineral matter. Polarized light. x 20.

Plate 1 Photomicrographs of metamorphic limestones. FIG. 2. (S34430). SL 4, p. 85. Dalradian, Blair Atholl Limestone; near White Bridge, Perthshire. A limestone recrystallized under stress. The calcite grains are elongated parallel to the plane of schistosity and the rock is granoschistose in structure. Small lenses of granular quartz define a foliation parallel to the schistosity produced by elongation of the calcite. Polarized light. x 15.

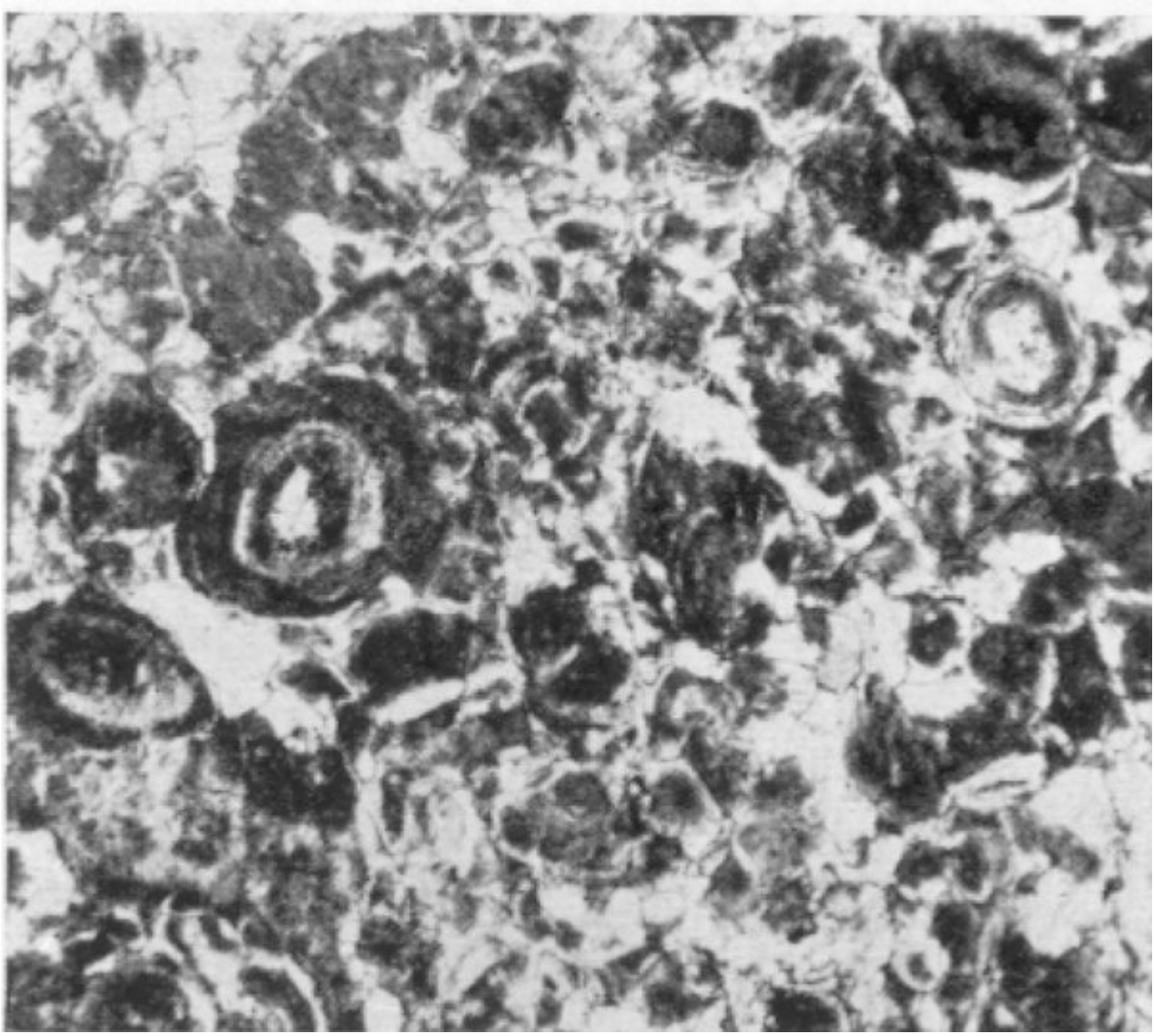


Plate 1 Photomicrographs of metamorphic limestones. FIG. 3. (S34573). SL 125, p. 82. Dalradian, Tayvallich Limestone; Baluachraig, Kilmartin, Argyllshire. A limestone in which original oolitic structure is preserved in small regions within fully recrystallized rock. Polarized light. x 23.

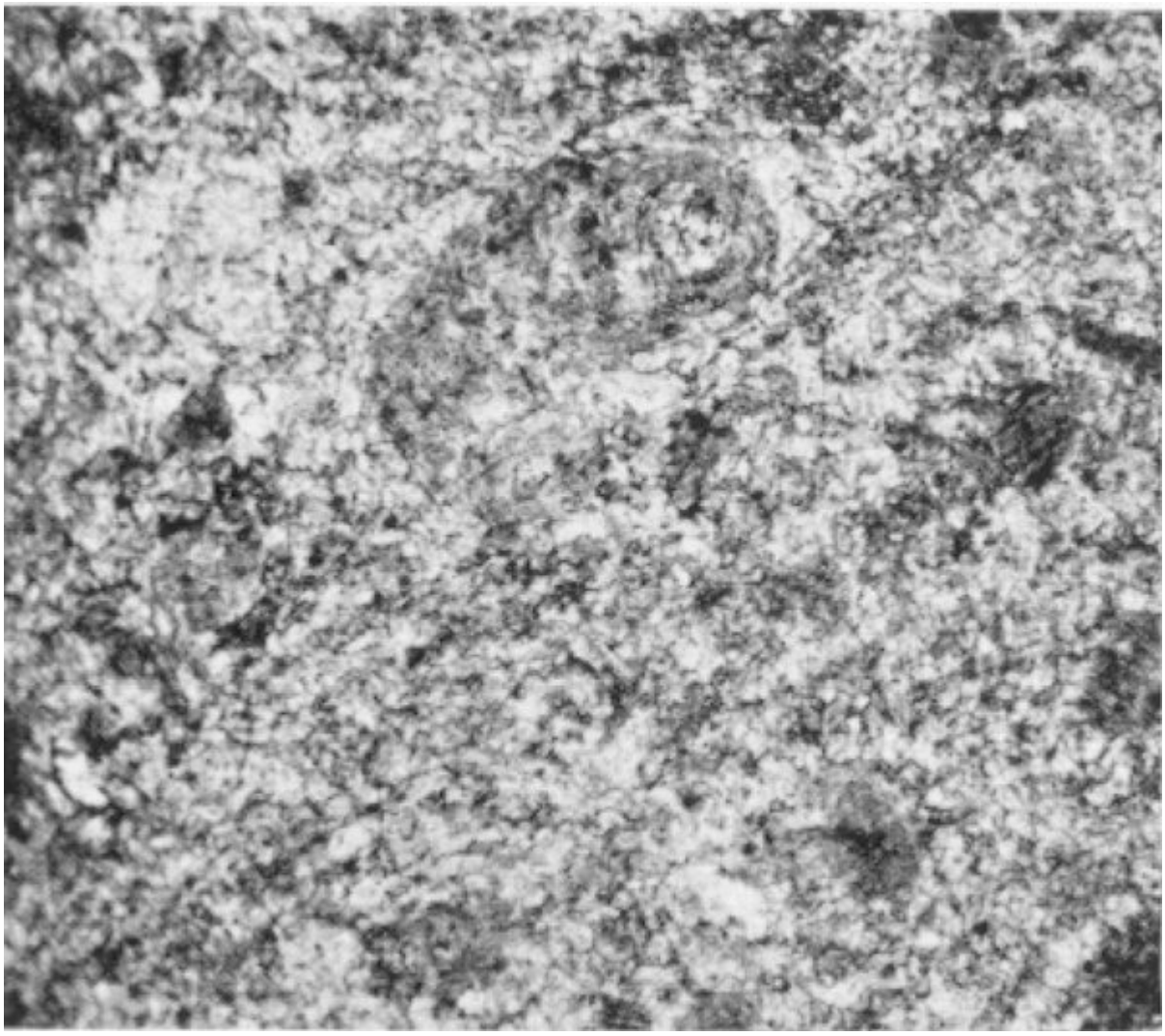


Plate 1 Photomicrographs of metamorphic limestones. FIG. 4. (S34575). SL 127, p. 82. Dalradian, Tayvallich Limestone; Eurach, Ford, Argyllshire. An oophasmic limestone, cf Fig. 3. Polarized light. x 23.

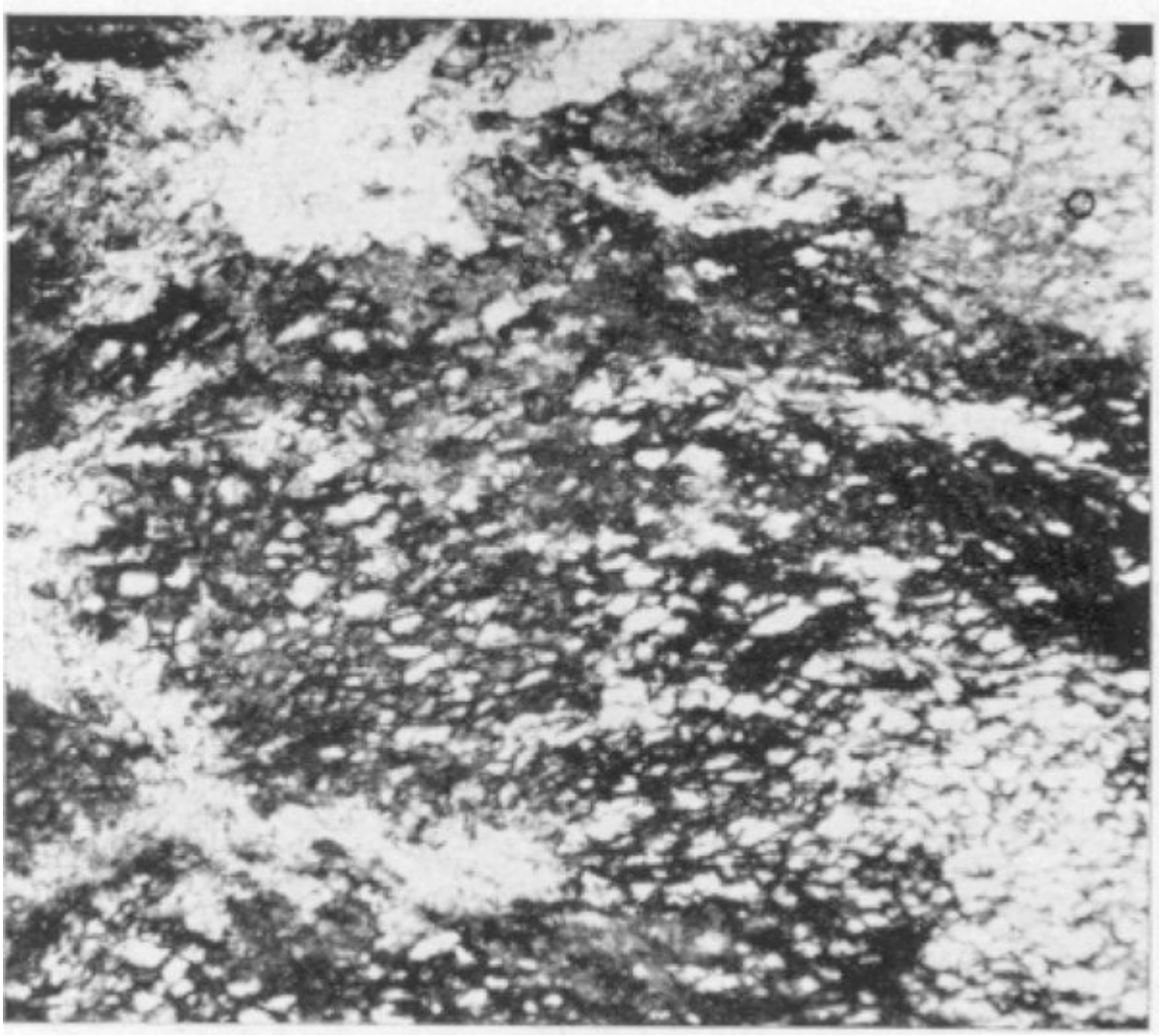


Plate 1 Photomicrographs of metamorphic limestones. FIG. 5. (S35262). SL 258, p. 75. Lewisian, Loch Maree Series; Allt Folais, Letterewe, Ross-shire. A sheared and recrystallized limestone composed of calcite and aragonite. The aragonite has been darkened by boiling in cobalt nitrate solution and the photograph shows the irregular spatial relations of the two crystalline forms of calcium carbonate occurring in this rock. Polarized light. x 7.

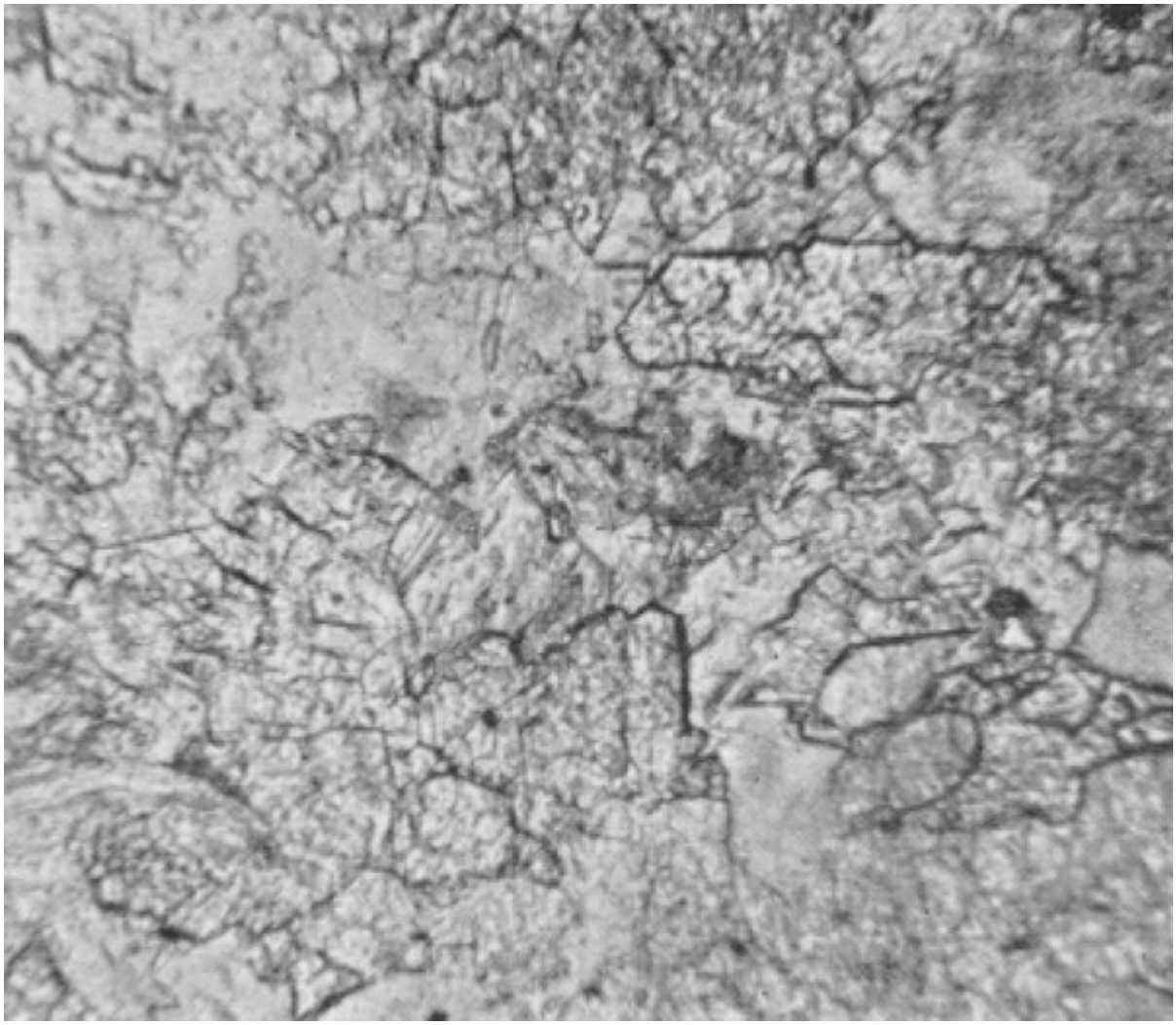


Plate 1 Photomicrographs of metamorphic limestones. FIG. 6. (S35262). SL 258, p. 75. Lewisian, Loch Maree Series; Allt Folais, Letterewe, Ross-shire. Under high magnification the crystal form and the characteristic re-entrant angles produced by twinning distinguish the aragonite from calcite. Polarized light. x 100.

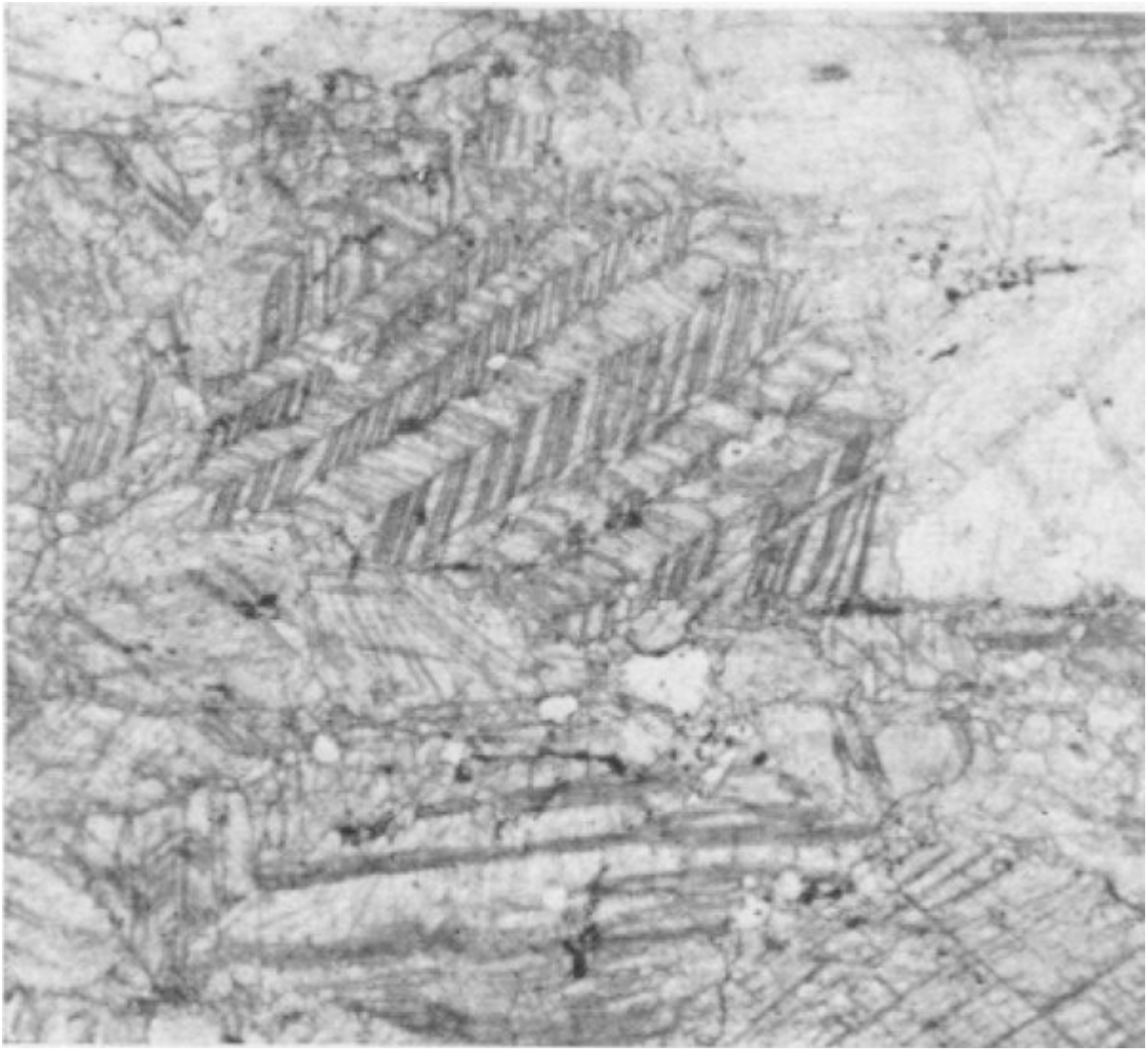


Plate 1 Photomicrographs of metamorphic limestones. FIG. 7. (S34947). SL 184, p. 78. Shetland Metamorphic Series; Fladdabister, Shetland. Recrystallized, sheared limestone showing large twinned crystals of calcite between laminae of triturated calcite. Polarized light. x 30.

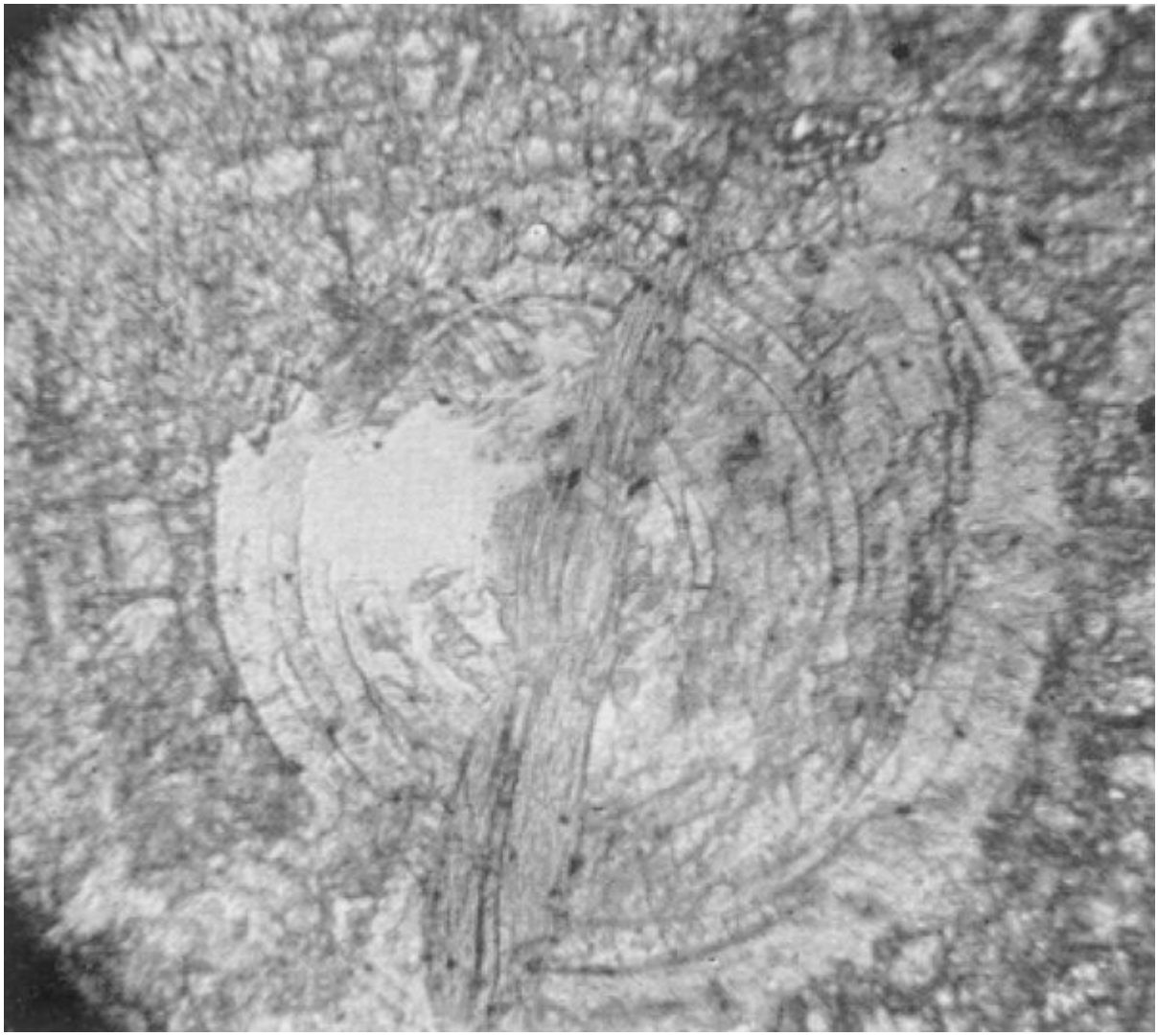


Plate 1 Photomicrographs of metamorphic limestones. FIG. 8. (S35264). SL 259, p. 76. Lewisian, Loch Maree Series; Allt Folais, Letterewe, Ross-shire. A spheroidal growth of calcite encloses a flake of phlogopite (mica) and is set in a mortar-like base of gritty and pulverized calcite. The significance of the spheroidal growth is not known. Polarized light. x 83.

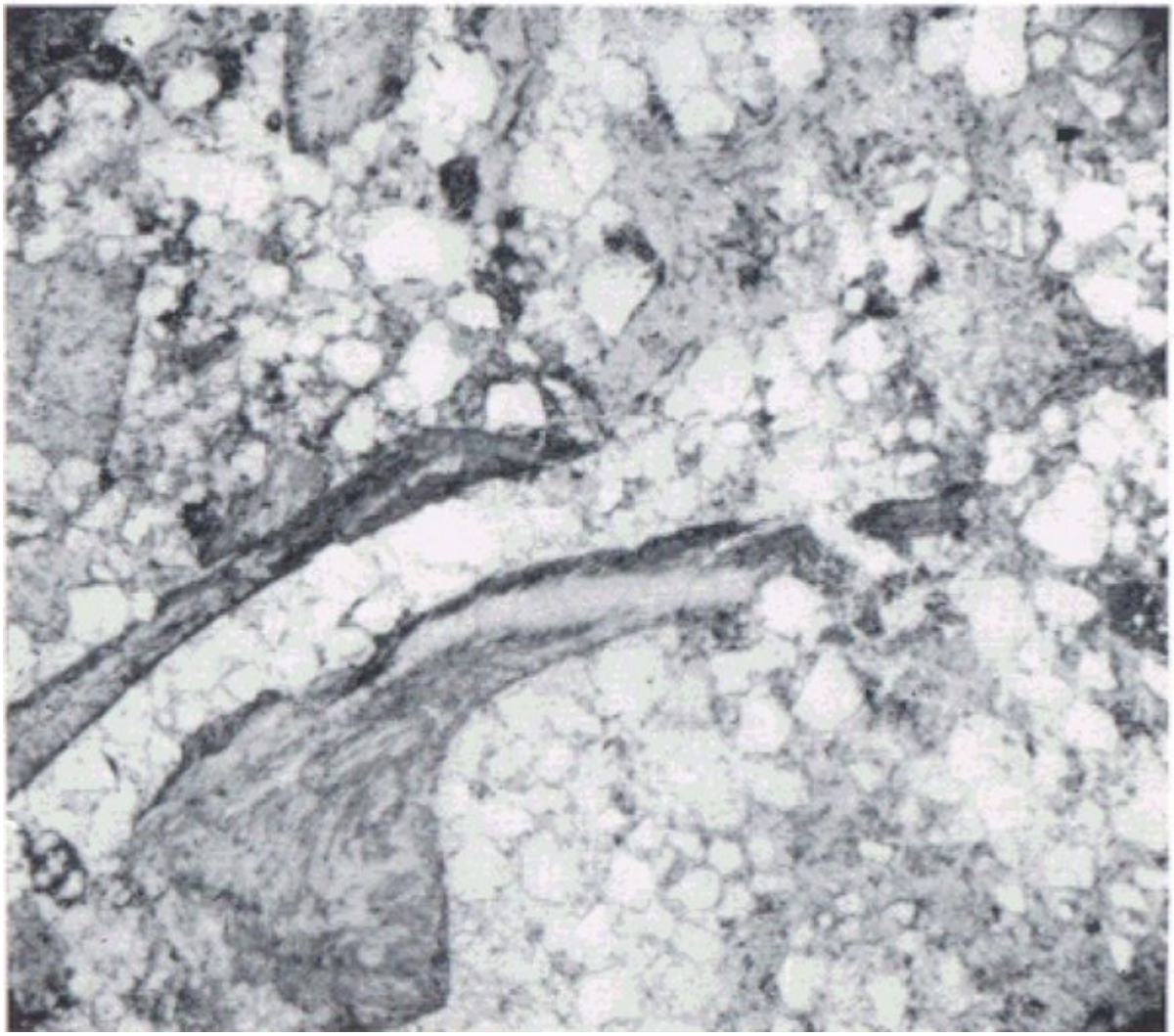


Plate 2. Photomicrographs of structures of limestones. FIG. 1. (S34849). SL 162, p. 133. Jurassic, limestone in Kimmeridgian boulder beds; Portgower, Sutherland. Poikilocrystallic structure; calcite forms large shapeless crystals enclosing angular grains of quartz and feldspar and shell fragments. Polarized light. x 10.

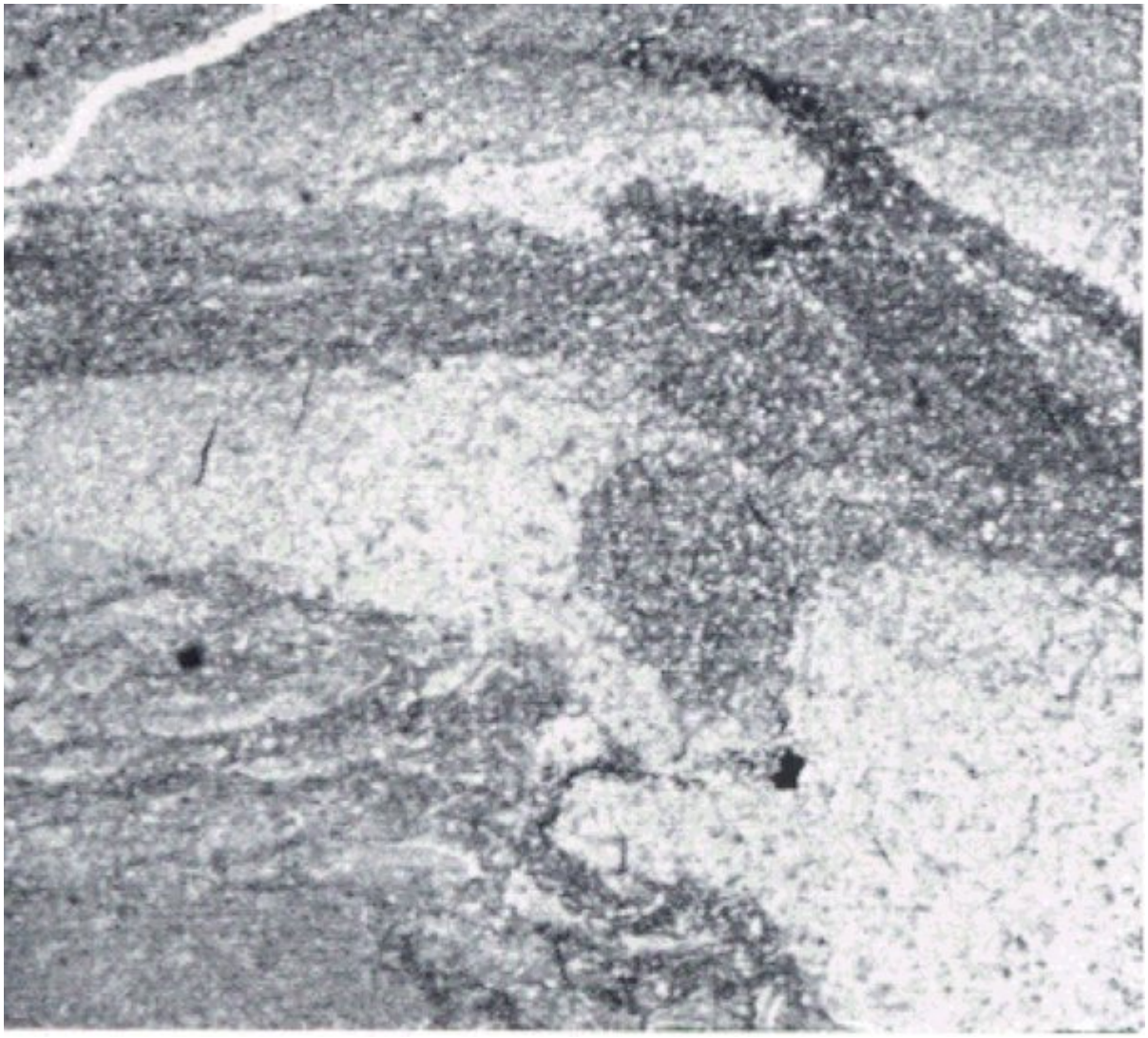


Plate 2. Photomicrographs of structures of limestones. FIG. 2. (S40167). M 2921, p. 94. Cambro-Ordovocian, Durness Limestone; Balnakiel Bay, Durness, Sutherland. Homoiolithic structure; slivers and irregular pieces of white limestone with small thin shells are enclosed in darker argillaceous limestone without shells. The two components are of penecontemporaneous formation. Polarized light. x 13.

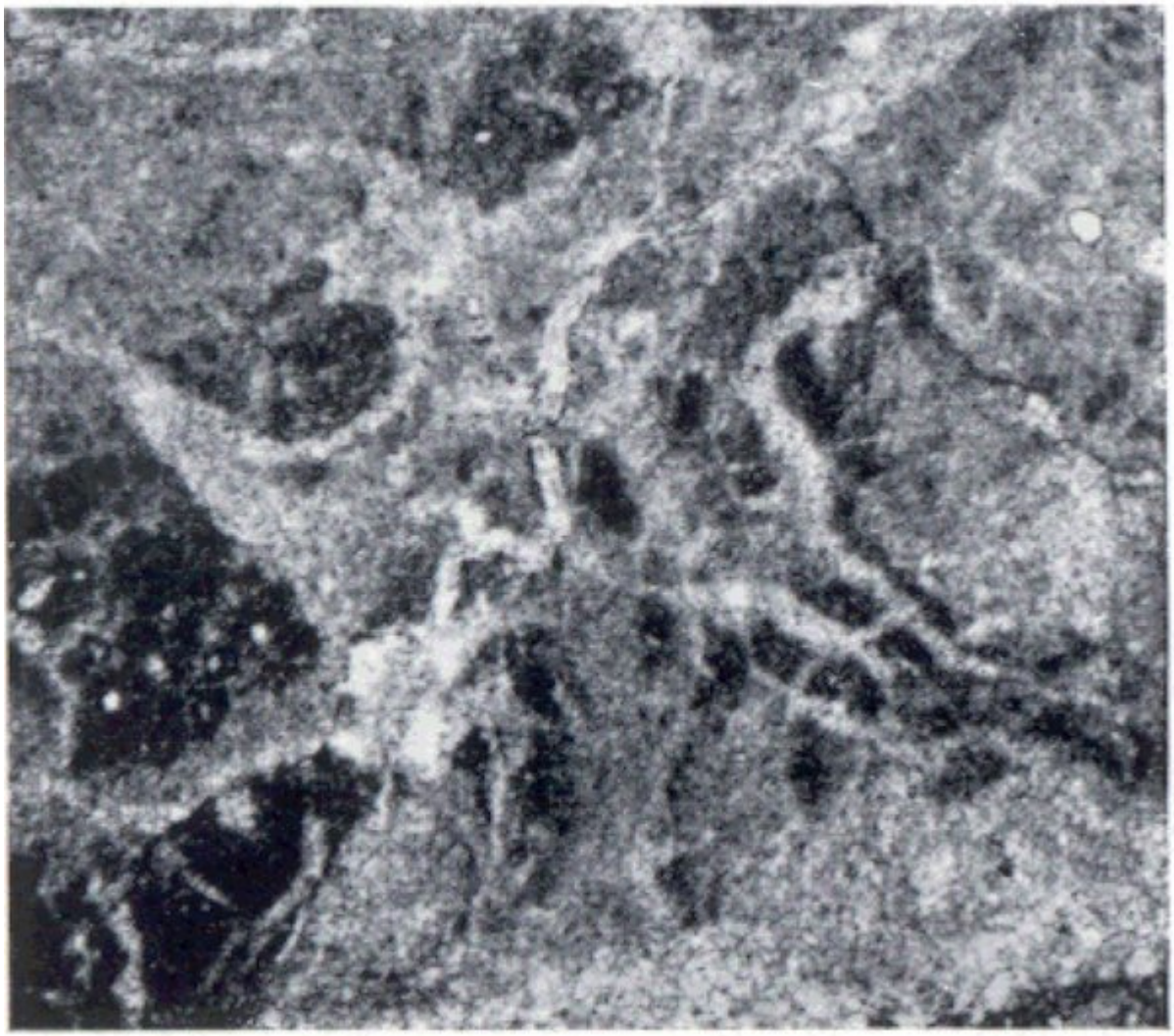


Plate 2. Photomicrographs of structures of limestones. FIG. 3. (S34658). SL 156, p. 98. Upper Old Red Sandstone, cornstone; Lannie-lane Limeworks, Straiton, Ayrshire. Clotted structure; original pelitomorphic calcite forms dark clots in a base of grey, recrystallized calcite of less fine grain. More coarsely crystalline calcite occurs in a network of veins which produces a breccioid structure. Polarized light. x 15.

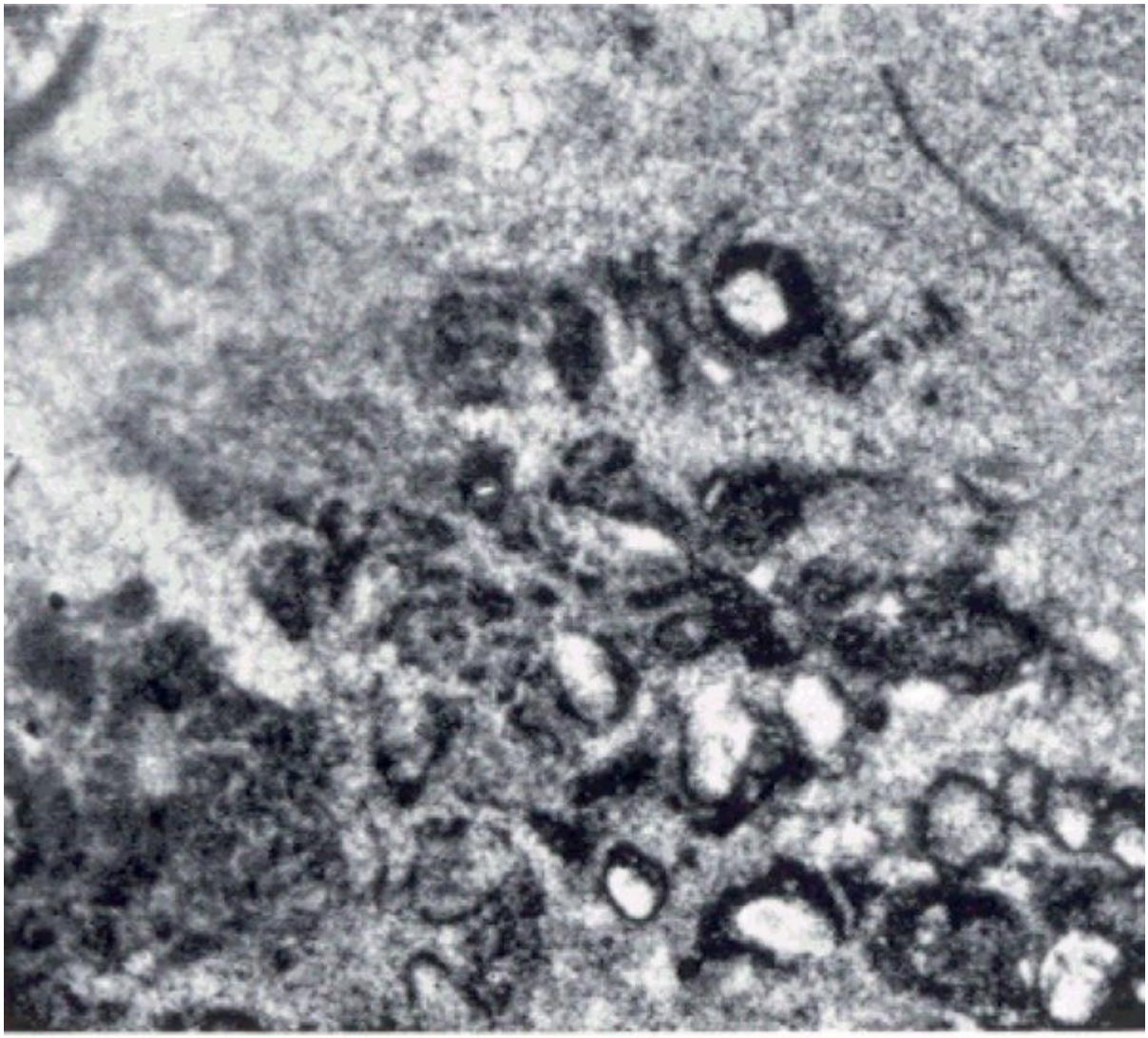


Plate 2. Photomicrographs of structures of limestones. FIG. 4. (S34854). SL 170, p. 98. Upper Old Red Sandstone, cornstone; Middlefield Quarry, Muirkirk, Ayrshire. Pellet structure; small ovoid bodies, thought to be faecal pellets, form groups in a matrix of granular, recrystallized calcite. The outer coat of the pellet seems to be more resistant to recrystallization than the interior. Polarized light. x 20.

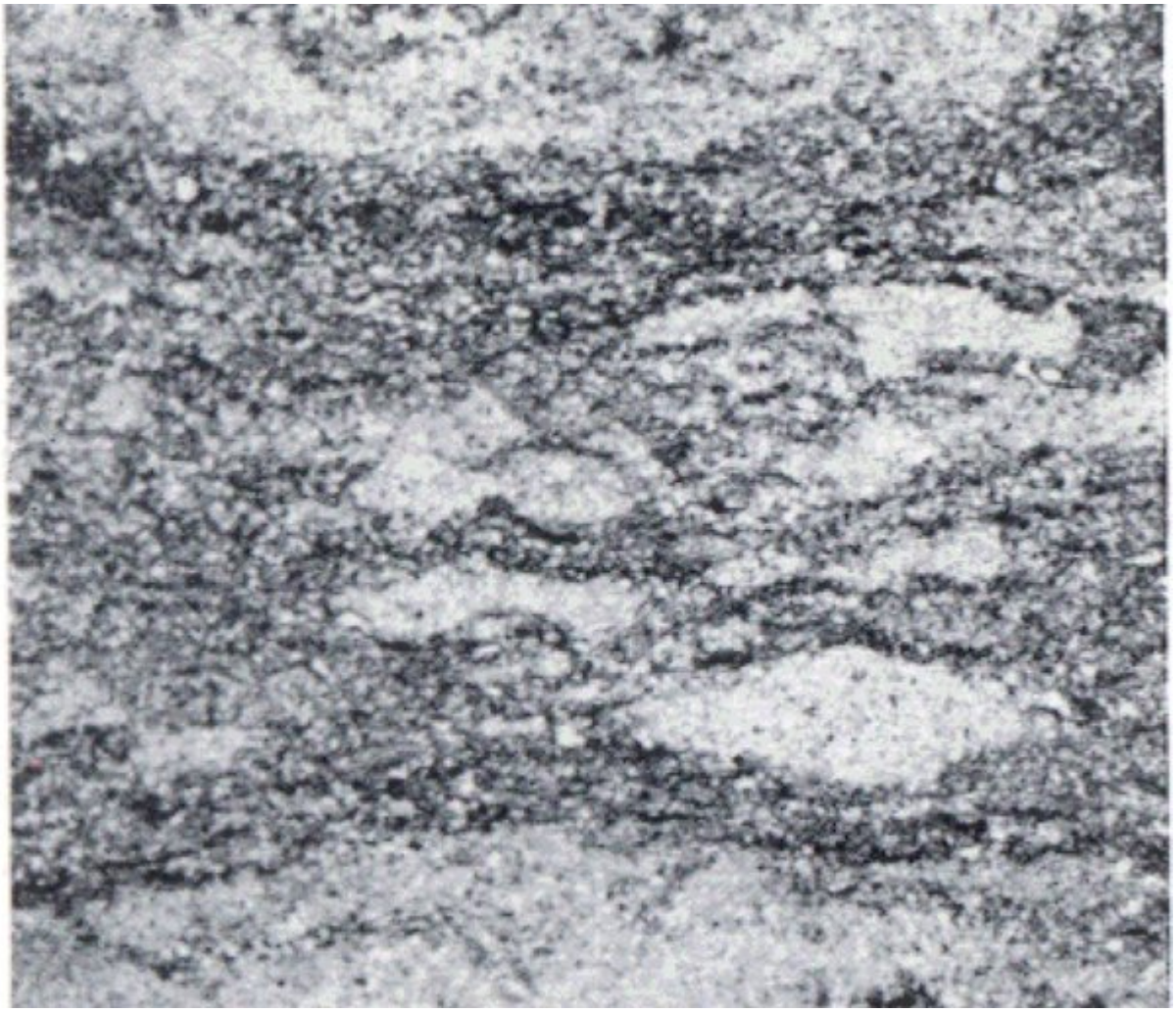


Plate 2. Photomicrographs of structures of limestones. FIG. 5. (S34851). SL 167, p. 97. Middle Old Red Sandstone; Robbery Head, Caithness. A dolomitic limestone showing micronodular structure. The small, clear nodules and lenses are of dolomite, the matrix of fine-grained calcite, bituminous clay, small rhombs of dolomite and clastic quartz. Polarized light. x 12.

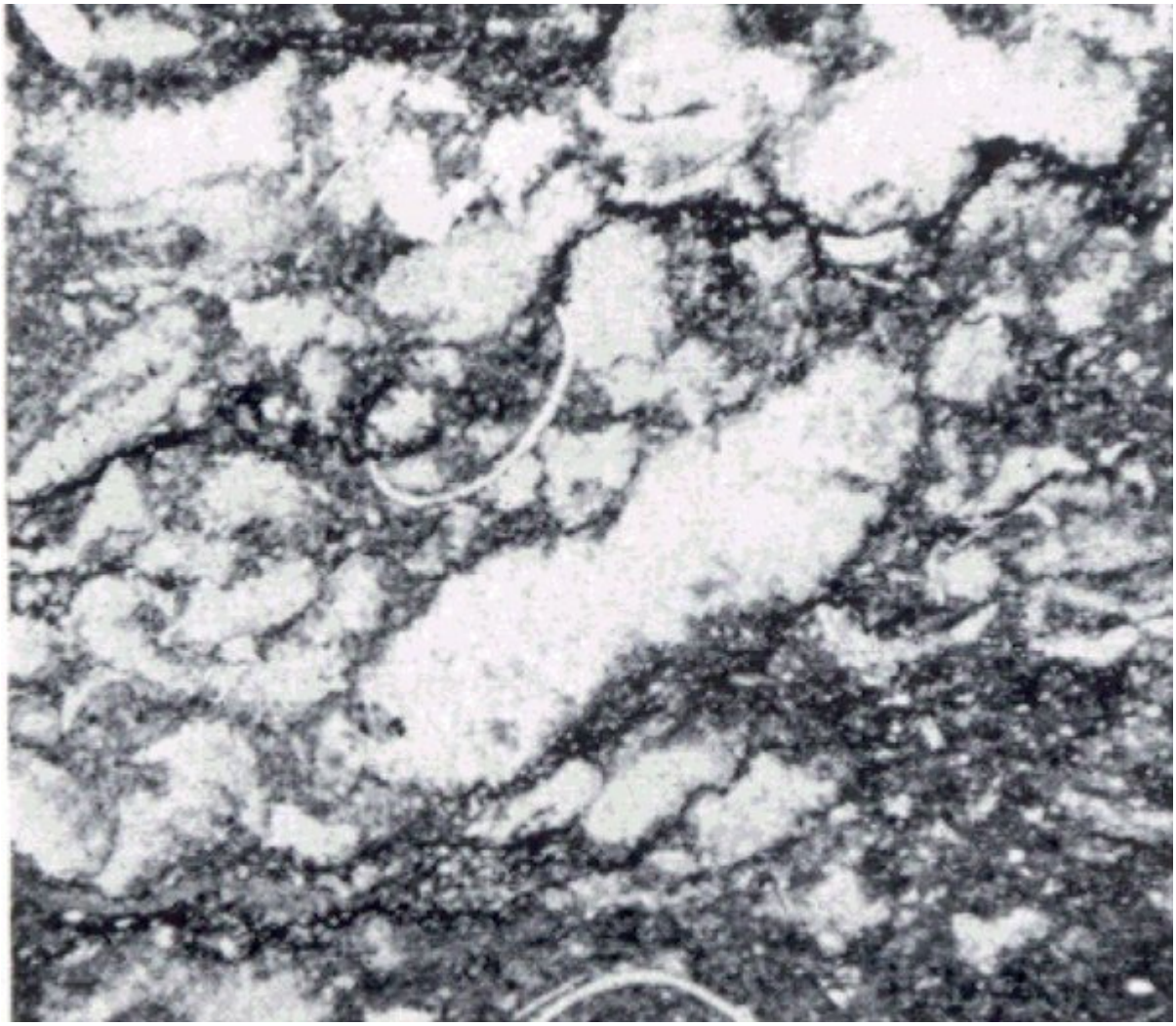


Plate 2. Photomicrographs of structures of limestones. FIG. 6. (S34525). SL 17, p. 106. Calciferous Sandstone Series, Burdiehouse Limestone; Clippens Lime Works, Midlothian. Unsorted pieces of pure limestone composed of clear, granular calcite, small fragments of collophane and incomplete ostracod shells, are enclosed in a matrix of pelitomorphic calcite darkened by bituminous matter; homoiolithic structure. Polarized light. x 13.

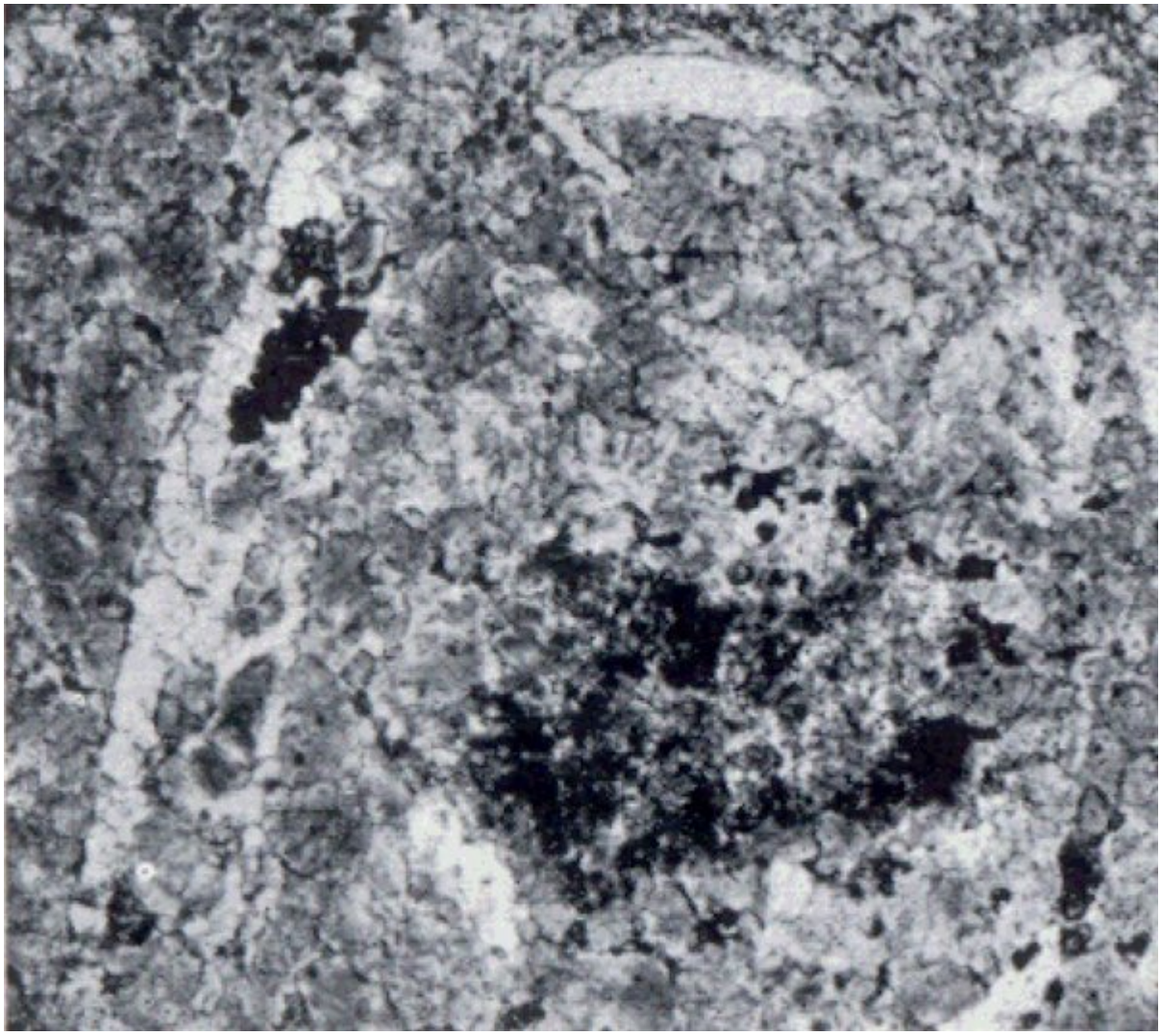


Plate 2. Photomicrographs of structures of limestones. FIG. 7. (S35904). SL 214, p. 120. Carboniferous Limestone Series, Charlestown Main Limestone; Chapel Quarry, Kirkcaldy, Fife. Zoophasmic structure in a thermally altered limestone. The carbonate has been completely recrystallized to coarse grains, and tiny garnets (small dark dots and aggregates) have been produced by the action of heat. The outlines of fossils are partially preserved. Polarized light. x 19.

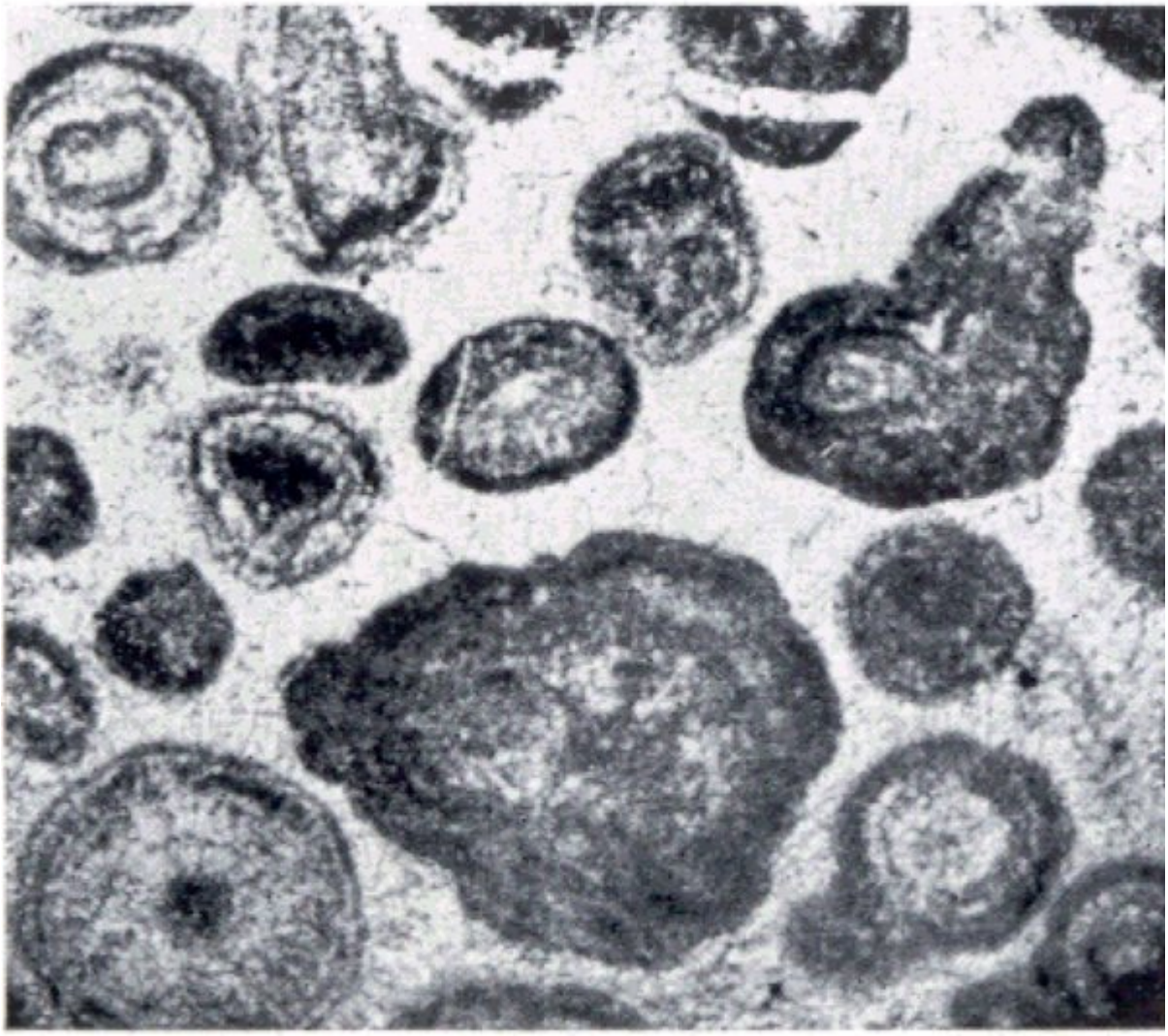


Plate 2. Photomicrographs of structures of limestones. FIG. 8. (S34656). SL 154, p. 96. Ordovician, Stinchar Limestone; Tormitchell Quarry, Pinmore, Ayrshire. Oolitic and pseudo-oolitic structures. Oval ooliths have radial and concentric internal structure pseudo-ooliths are less regularly rounded and do not possess regular internal structure. Polarized light. x 20.

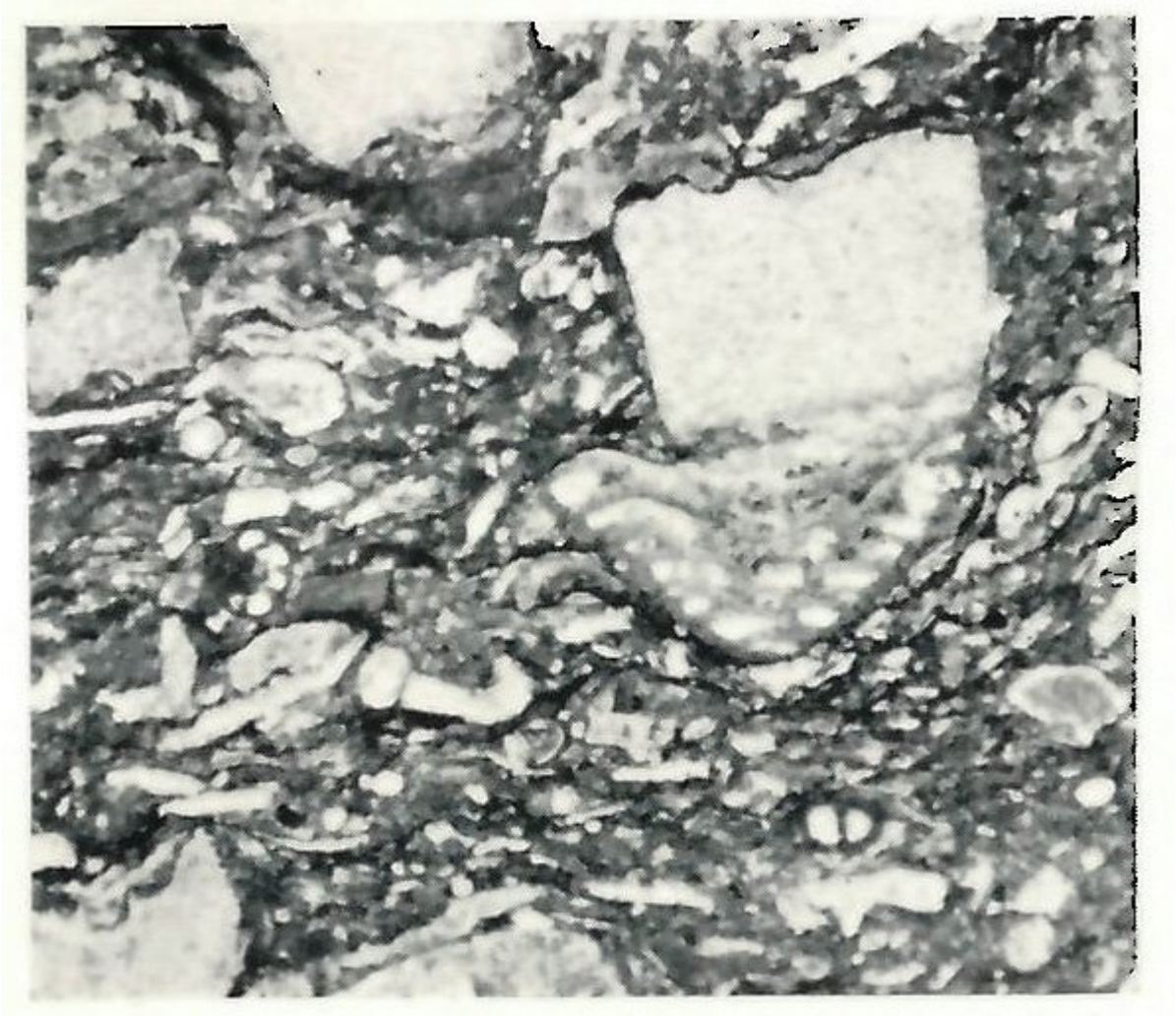


Plate 3 Photomicrographs of clastizoic limestones and calcilutites. FIG. 1. (S34622). SL 136, p. 108. Calciferous Sandstone Series, Broadstone Limestone; Auchenmade Quarry, Dairy, Ayrshire. A clastizoic limestone composed of unsorted fragments and debris of fossils in an unevenly bedded matrix of fine-grained calcite mixed with clay and darkened by bituminous and carbonaceous matter. Polarized light. x 14.

Plate 3 Photomicrographs of clastizoic limestones and calcilutites. FIG. 2. (S35799). SL 276, p. 121. Carboniferous Limestone Series, Charlestown Main Limestone. Charlestown Quarries, Fife. A clastizoic limestone or spergenite, unsorted and unbedded. The larger constituents are mainly fragments of crinoids and polyzoa. The matrix is dolomitized and recrystallized. Polarized light. x 19.

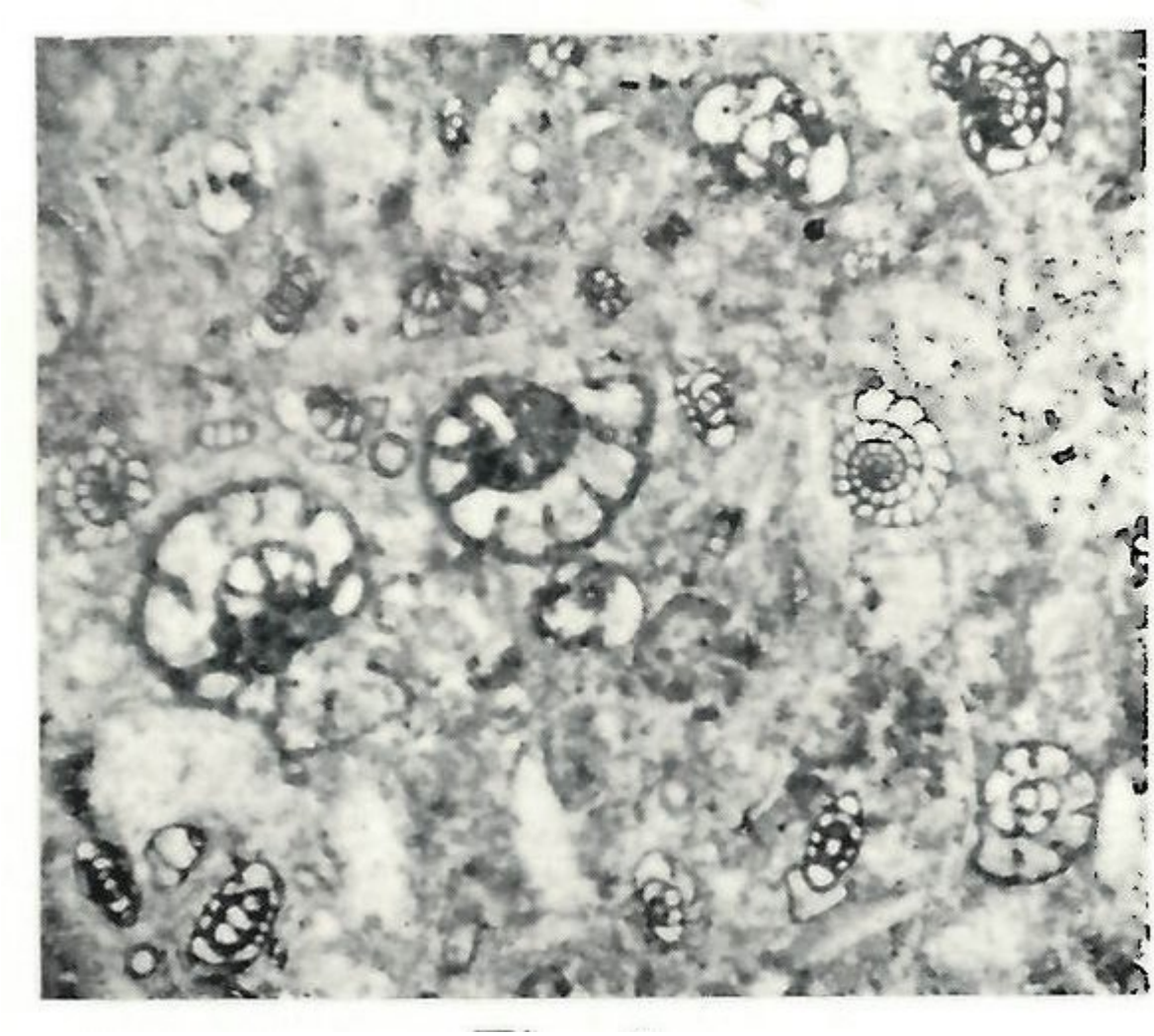


Plate 3 Photomicrographs of clastizoic limestones and calcilutites. FIG. 3. (S34447). SL 52, p. 125. Carboniferous Limestone Series, Petershill Limestone; 1000 yd N. by E. of Petershill Reservoir, West Lothian. A microclastizoic limestone, of small fossil debris and entire foraminifera in a matrix of finely granular, recrystallized calcite. Polarized light. x 15.

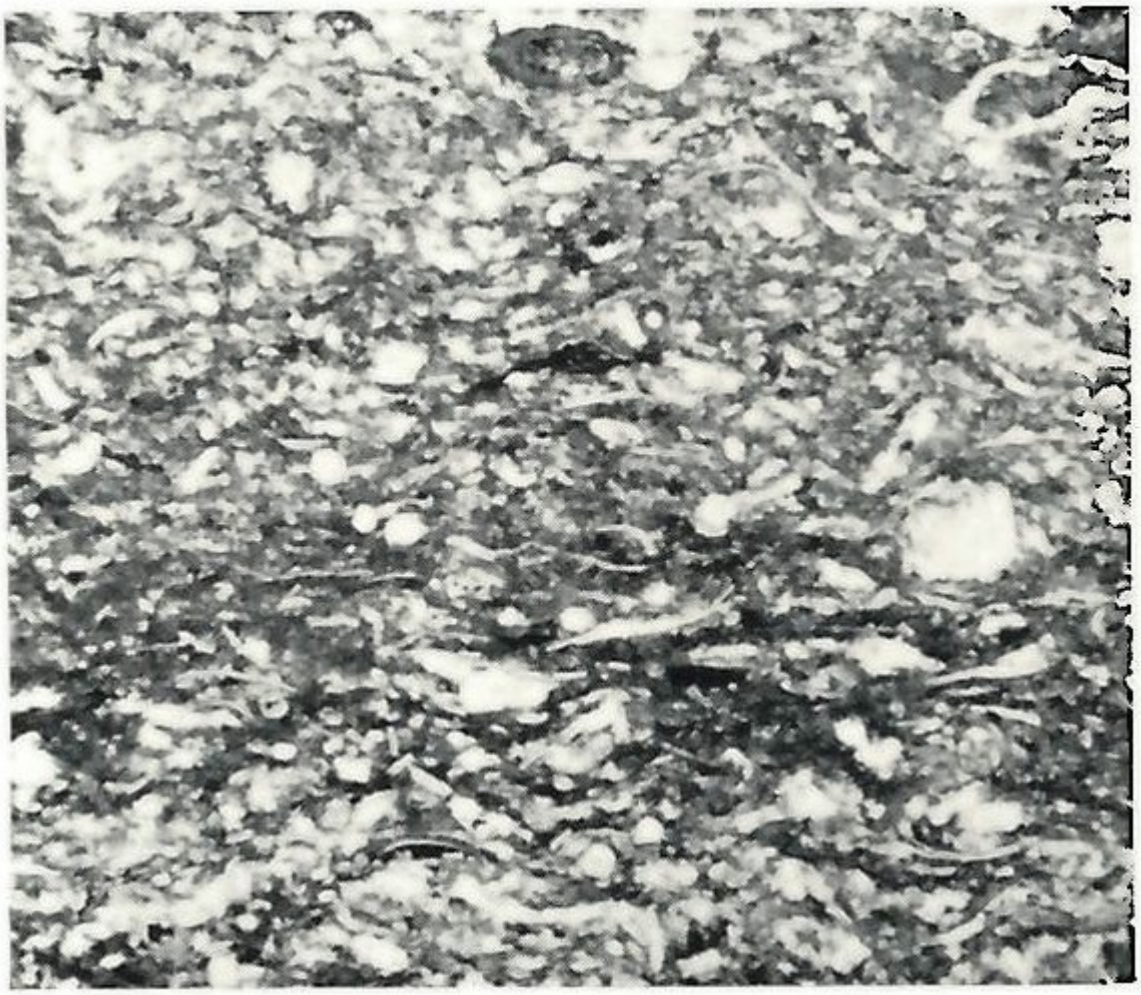


Plate 3 Photomicrographs of clastizoic limestones and calcilutites. FIG. 4. (S34541). SL 59, p. 124. Carboniferous Limestone Series, North Greens Limestone; Cousland Lime Workings, Dalkeith, Midlothian. A microclastizoic limestone composed of well-sorted small fragments of fossils and entire microfossils of comparable size embedded in a bedded matrix of pelitomorphic calcite admixed with clay and bituminous matter. Polarized light. x 13.

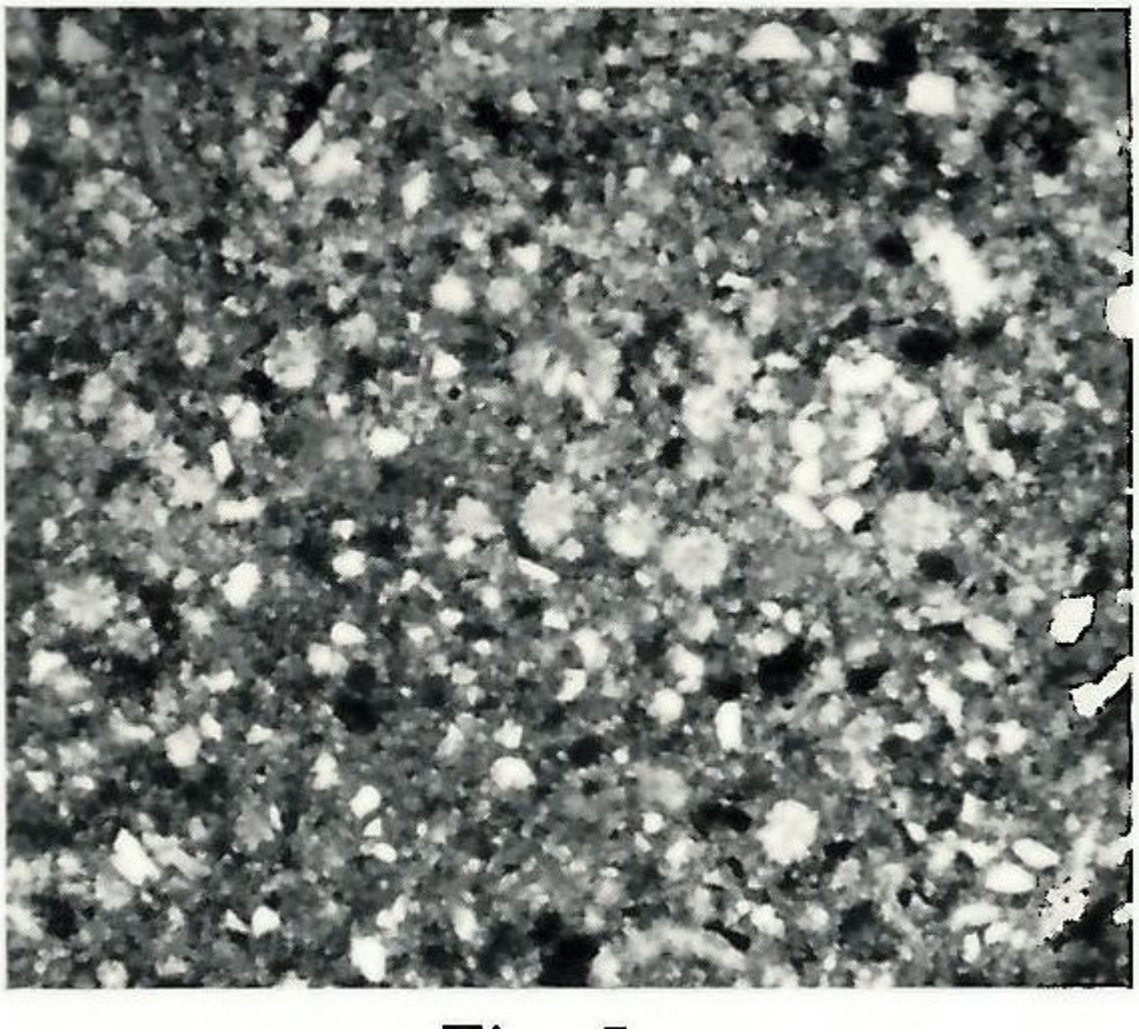


Plate 3 Photomicrographs of clastizoic limestones and calcilutites. FIG. 5. (S34848). SL 161, p. 133. Jurassic, Brora Arenaceous Series; Ardassie Point, Brora, Sutherland. Impure limestone or microcalcarenite, composed of pelitomorphic calcite admixed with silt of quartz, mica, coaly matter and pyrite, and containing microdebris of fossils together with numerous 'round bodies', possibly algal, composed of radially arranged calcite. Polarized light. x 23.

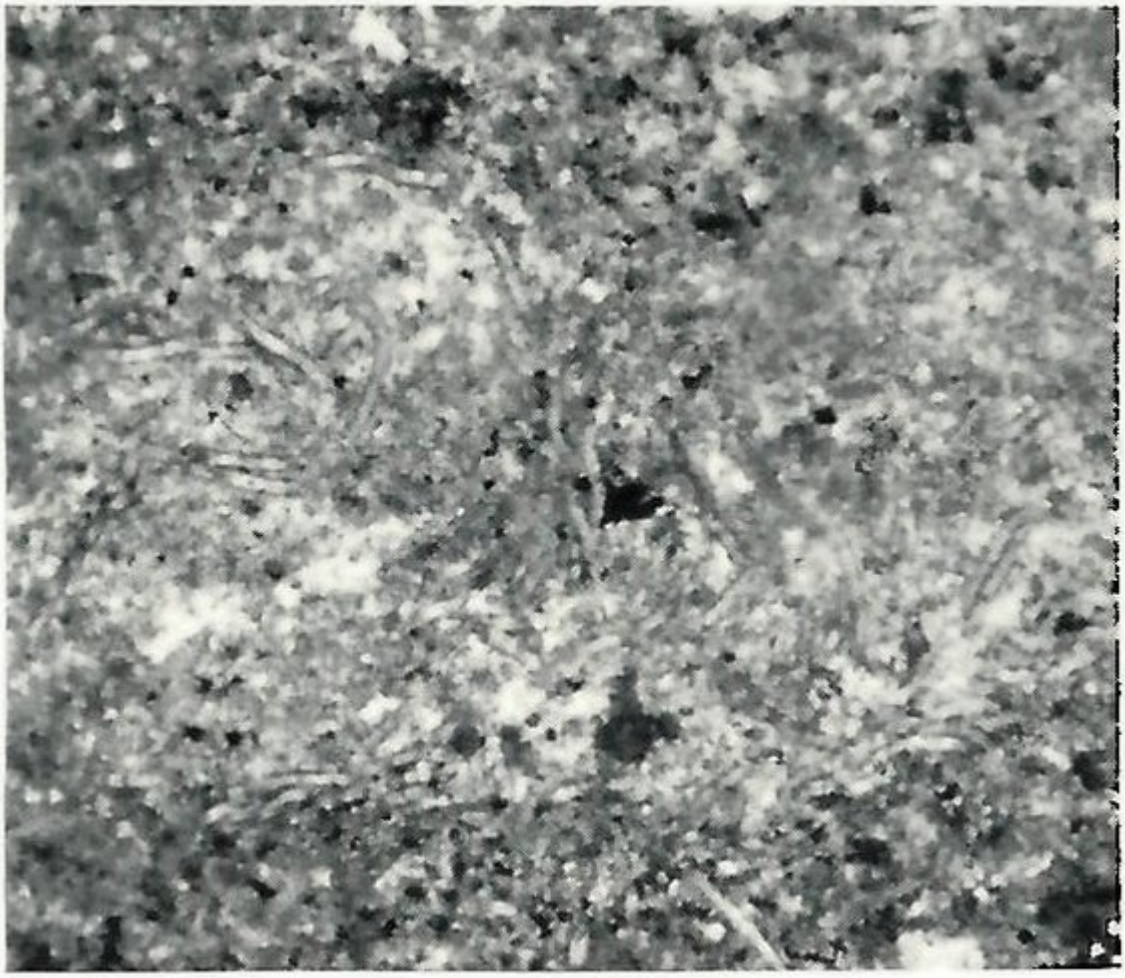


Plate 3 Photomicrographs of clastizoic limestones and calcilutites. FIG. 6. (S35505). SL 267, p. 96. Ordovician, Stinchar Limestone; Kirkdominae Hill, Barr, Ayrshire. A calcilutite, composed of slightly recrystallized pelitomorphic calcite, scarce microdebris of fossils and numerous algal growths. Polarized light. x 25.

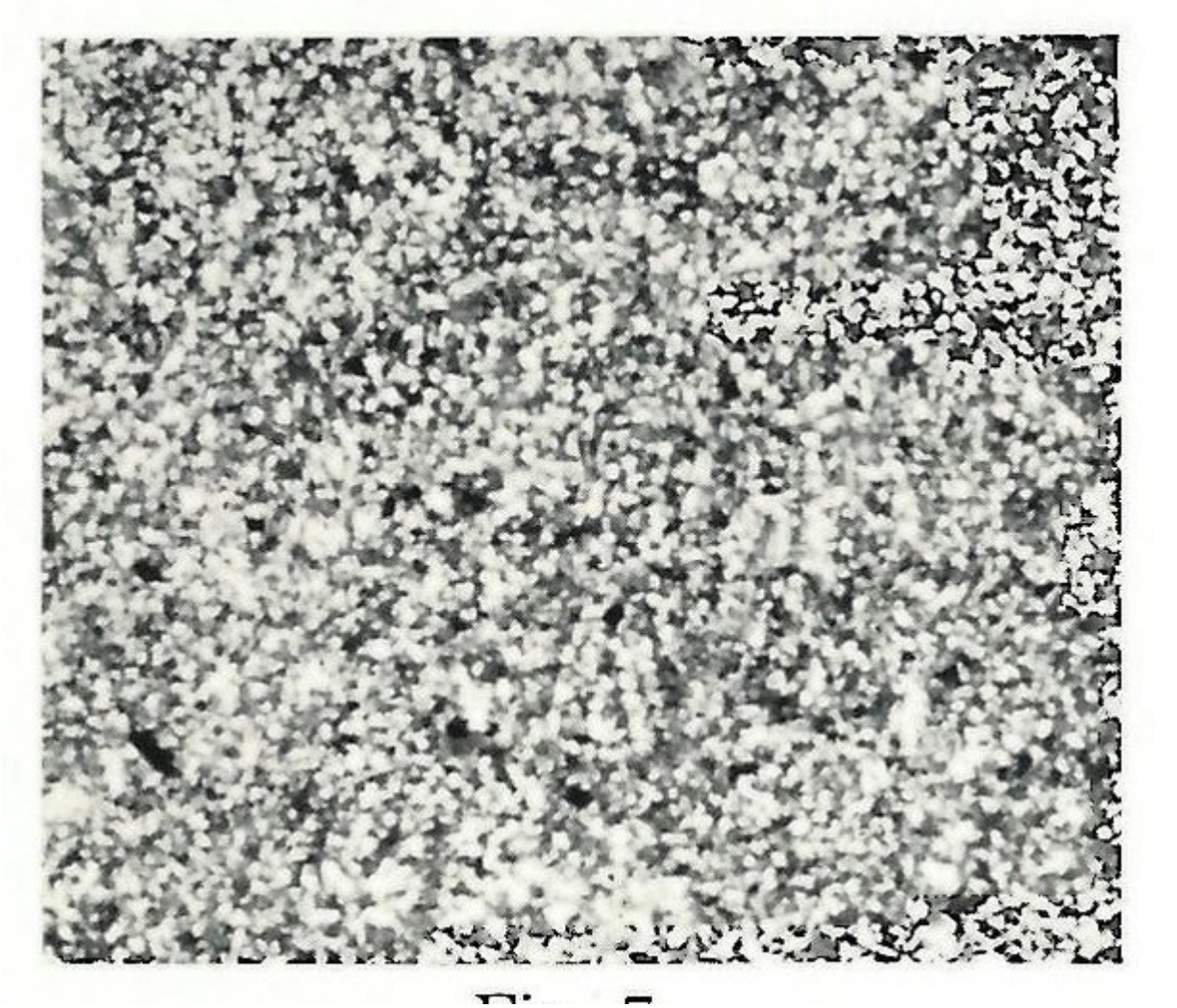


Plate 3 Photomicrographs of clastizoic limestones and calcilutites. FIG. 7. (S40472). SL 183, p 115. Carboniferous Limestone Series, Gilmerton Limestone; Whitfield Limeworks, Peebles-shire. A calcilutite composed of granules of clear calcite in a pelitomorphic matrix of calcite and clay. The granular calcite is in part recognizable as fossil debris and includes tiny algal growths. Polarized light. x 24.

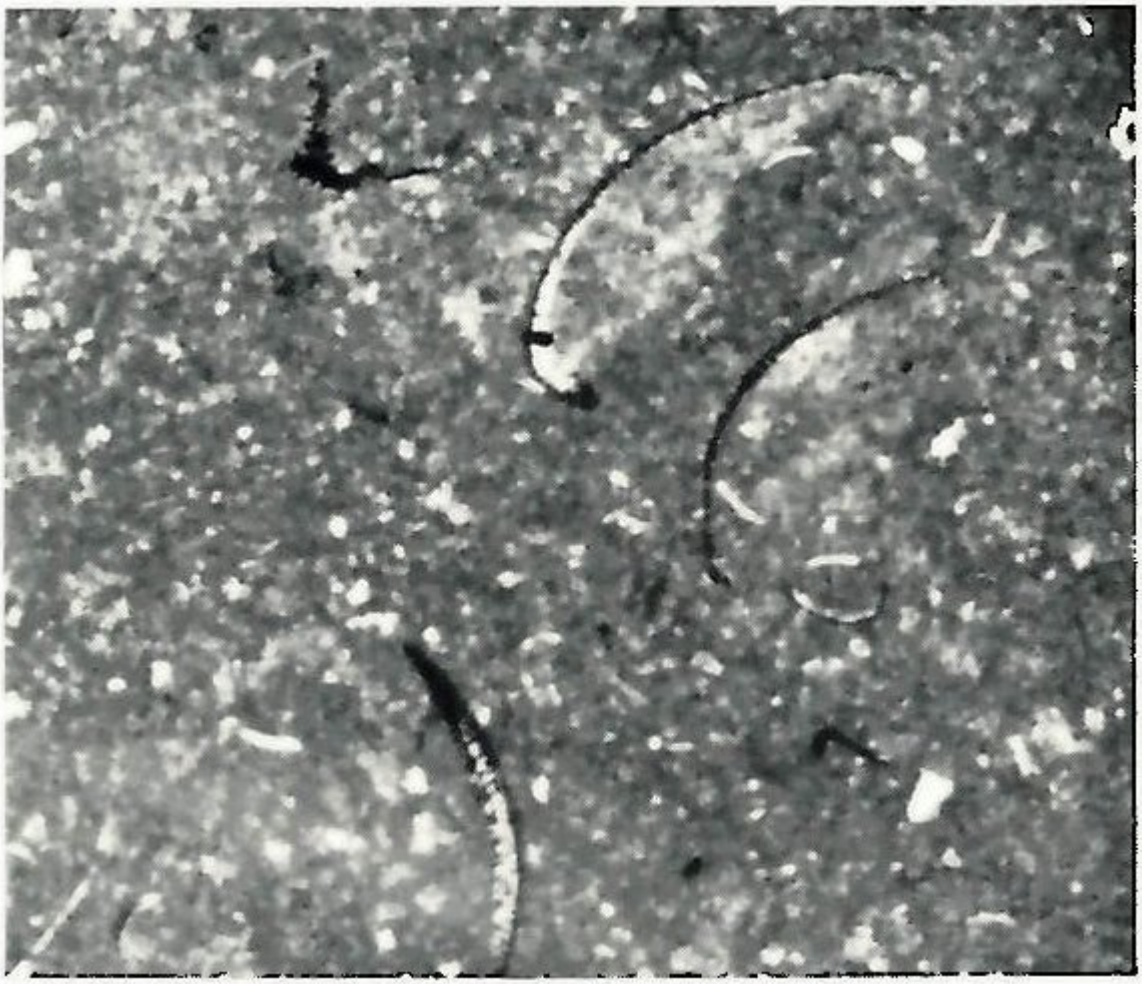


Plate 3 Photomicrographs of clastizoic limestones and calcilutites. FIG. 8. (S35897). SL 217, p. 106. Calciferous Sandstone Series, Burdiehouse Limestone; Newbigging Mine, Fife. A calcilutite composed of pelitomorphic calcite enclosing pyritized ostracod shells, small grains and cleavage fragments of calcite and chips of shell. Polarized light. x 20.

Plate 4 Photomicrographs of dolomites. FIG. 1. (S34489). SL 97, p. 118. Carboniferous Limestone Series, Charlestown Main Limestone; Easter Glasslie, Fife. Dolomite grains of varying size form an uneven mosaic. Contiguous grains interpenetrate so that in section detailed portions of one grain appear isolated within another-diacrystallic structure. Polarized light. x 30.

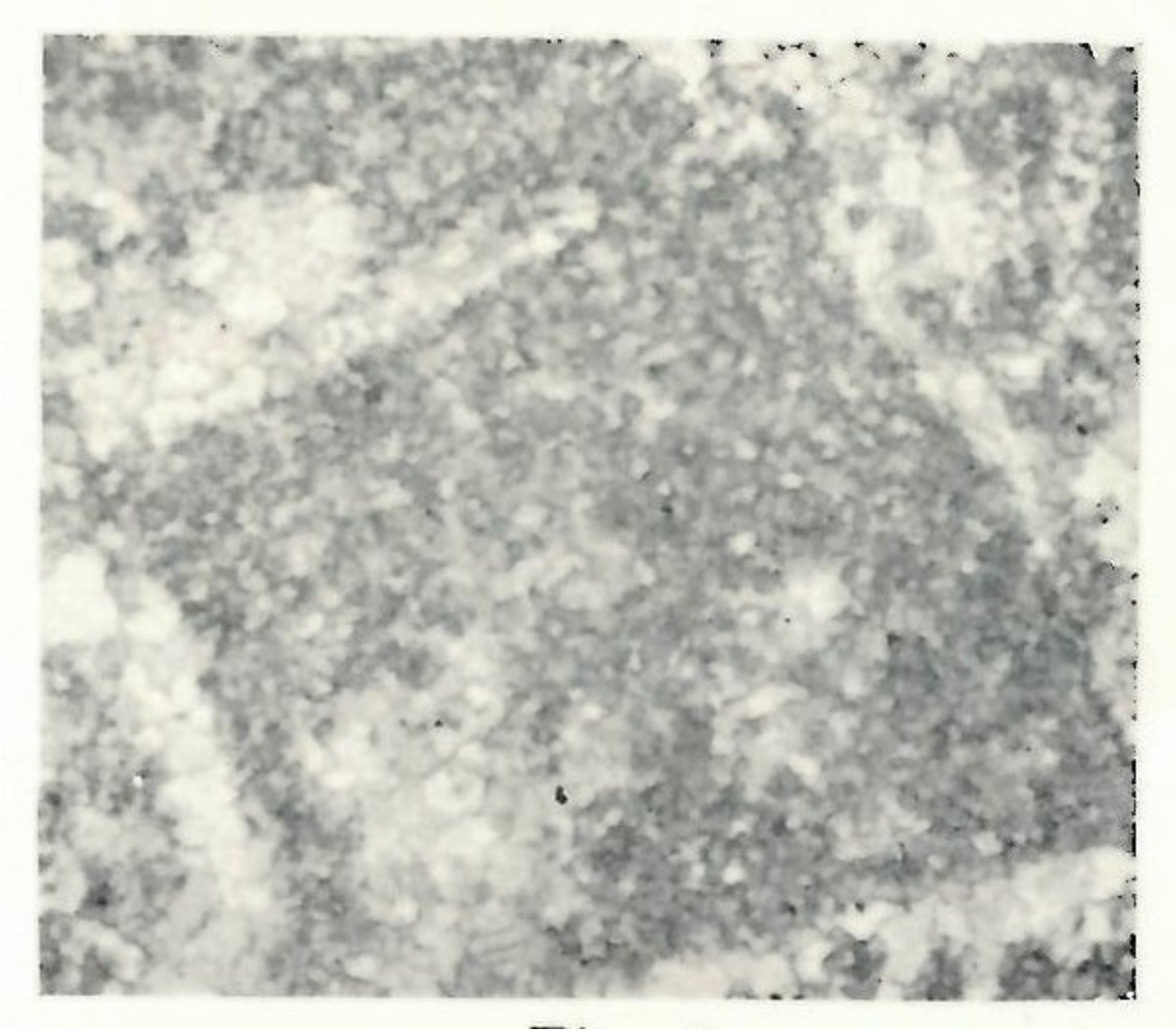


Plate 4 Photomicrographs of dolomites. FIG. 2. (S34839). SL 176, p. 93. Cambro-Ordovician, Durness Limestone; Sarsgrum, Sutherland. Breccioid structure in dolomite. Recrystallization to coarse grain has taken place along sharp-walled channels separating portions in which recrystallization to smaller grain has occurred. Polarized light. x 20.

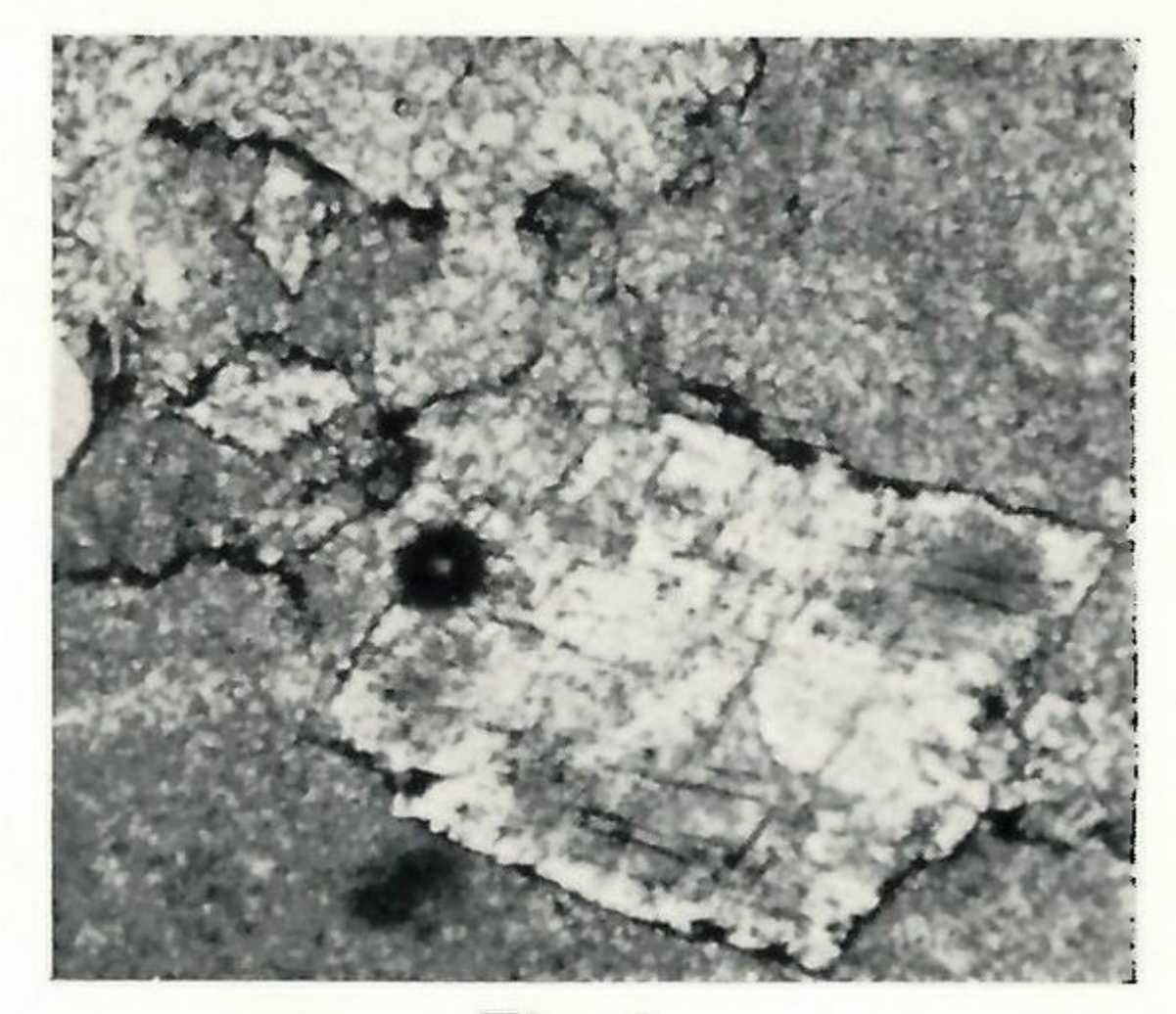


Plate 4 Photomicrographs of dolomites. FIG. 3. (S40621). SL 158, p. 102. Calciferous Sandstone Series, cementstone; Devonshaw Old Quarry, Kinross. Porphyrocrystallic structure in dolomite. One large and two smaller euhedral crystals of dolomite appear within a matrix of fine-grained, granular dolomite. These crystals occur at the intersection of bituminous films which may have guided and concentrated the action of the recrystallizing solutions. Polarized light. x 38.

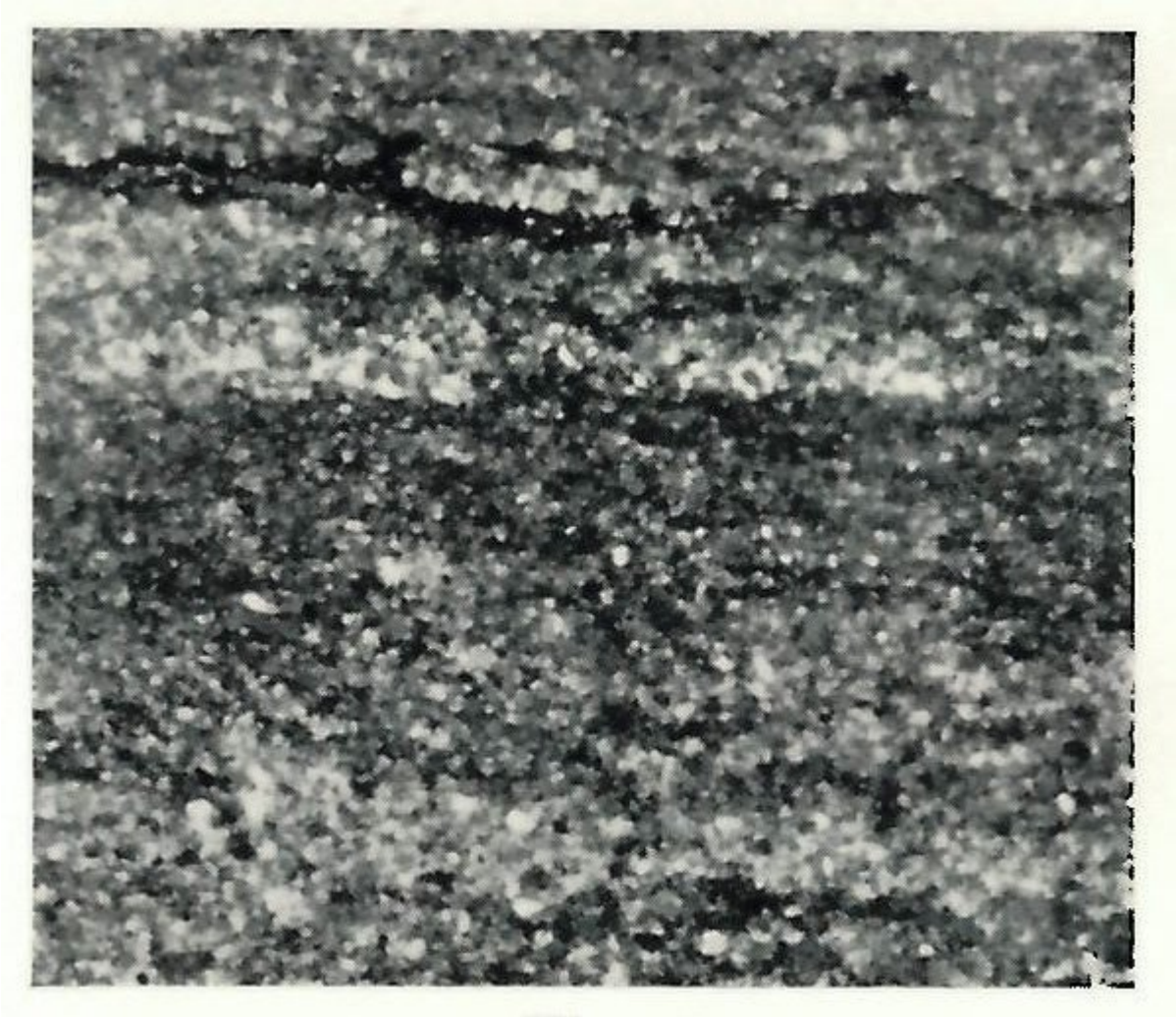


Plate 4 Photomicrographs of dolomites. FIG. 4. (S34843). SL 175, p. 92. Cambro-Ordovician, Durness Limestone; Keoldale, Sutherland. A luteous, taxichnic dolomite in which the original sedimentary structure of alternating fine and finer grain of the carbonate and silt particles has been preserved. Polarized light. x 11.

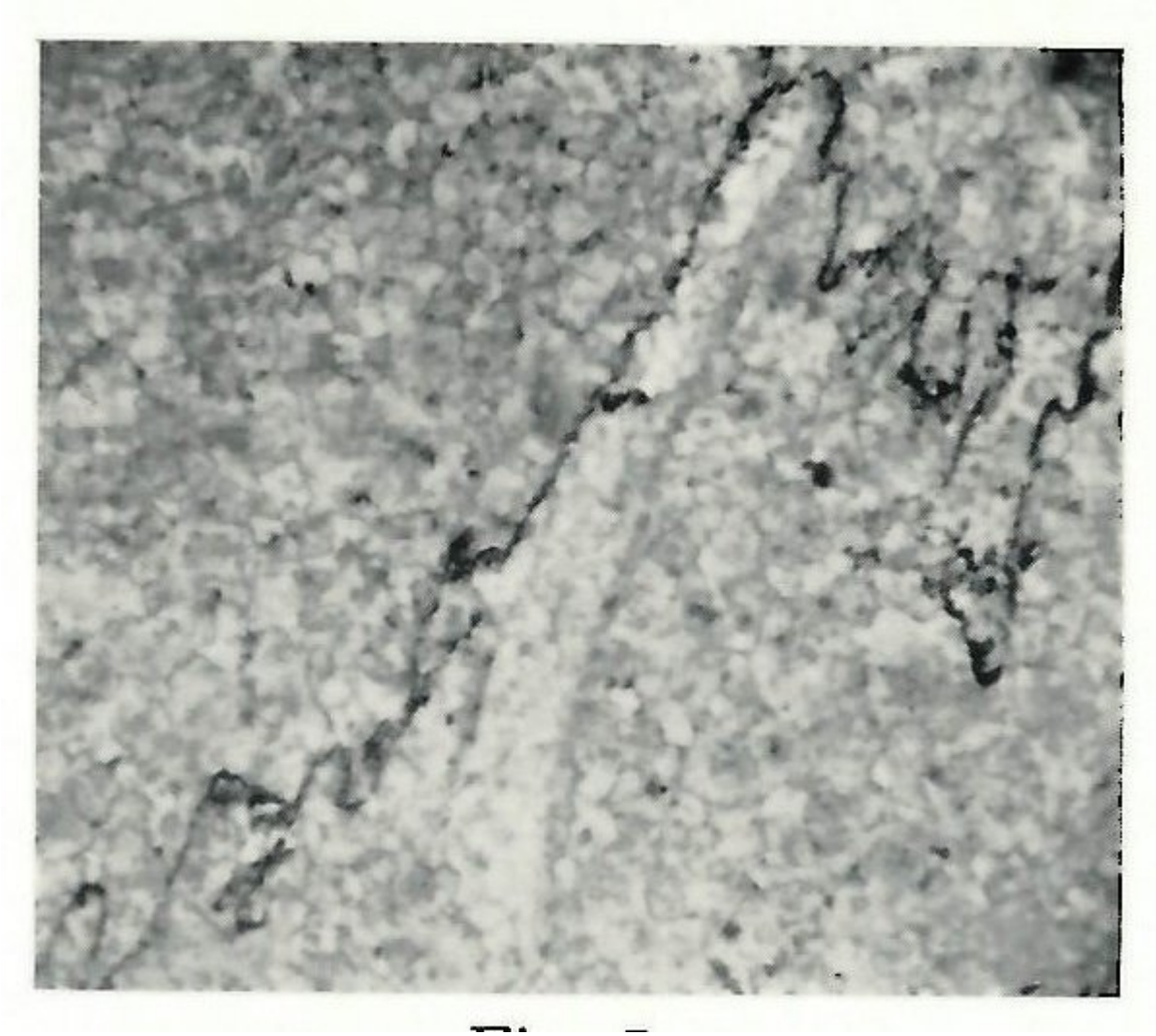


Plate 4 Photomicrographs of dolomites. FIG. 5. (S34593). SL 120, p. 130. Carboniferous Limestone Series, Castlecary Limestone, Culross, Fife. Stylolitic film in a zoophasmic dolomite. The original fossiliferous limestone has been dolomitized to a mosaic of uniform grain. The ghost of a shell fragment, one margin of which is followed by the straight part of the styloitic film, can be seen. Polarized light. x 20.

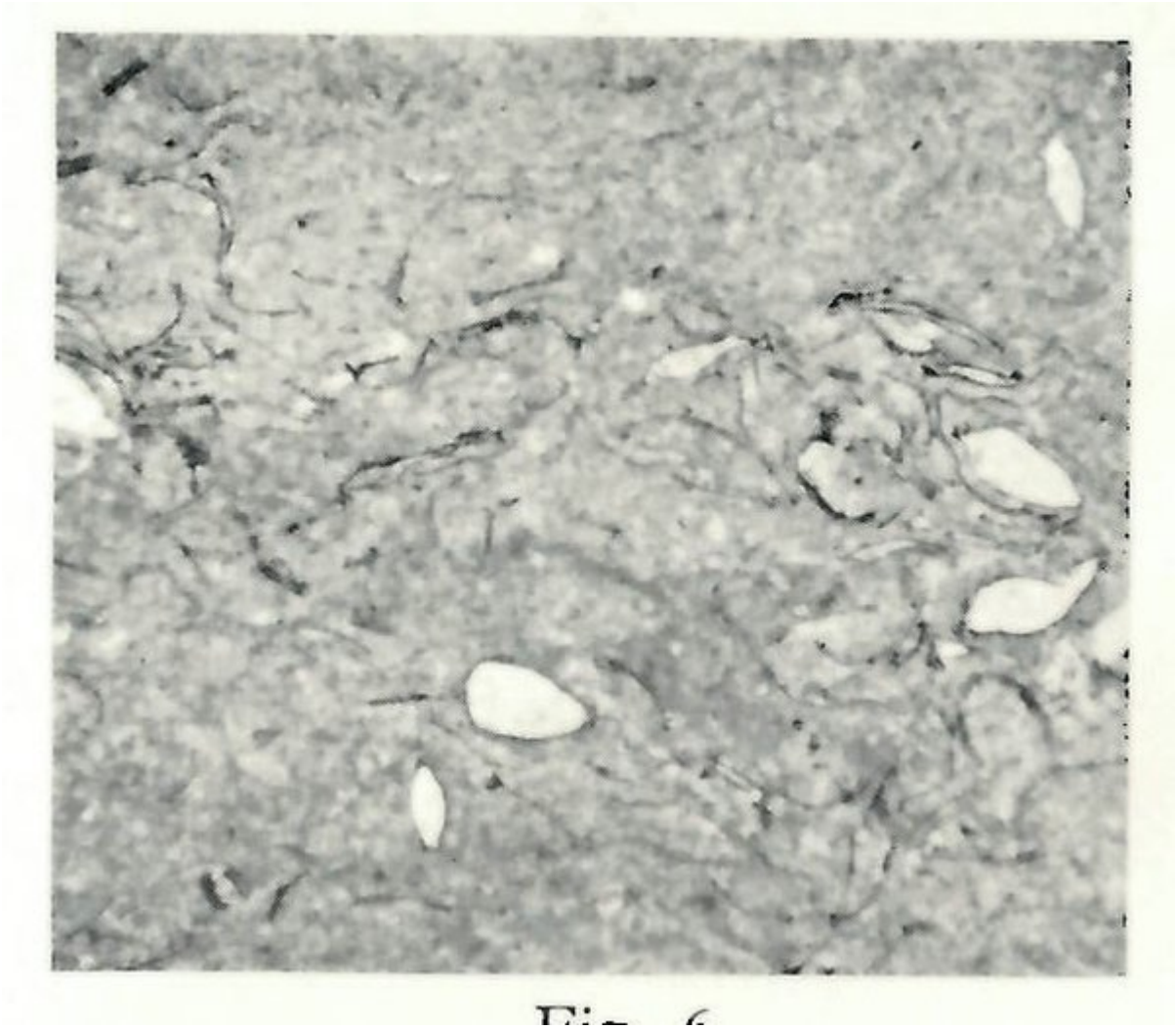


Plate 4 Photomicrographs of dolomites. FIG. 6. (S34450). SL 28, p. 101. Calciferous Sandstone Series, 'Kirkby's Ina Limestone'; Randerston, Fife. A ferriferous dolomite in which the grain varying from microcrystalline to pelitomorphic probably reflects the variation of grain in the original limestone. Shells of ostracods are delineated by more and less dense concentrations of pyrite powder through which the more coarsely crystalline dolomite within the shells grows. Polarized light. x 14.

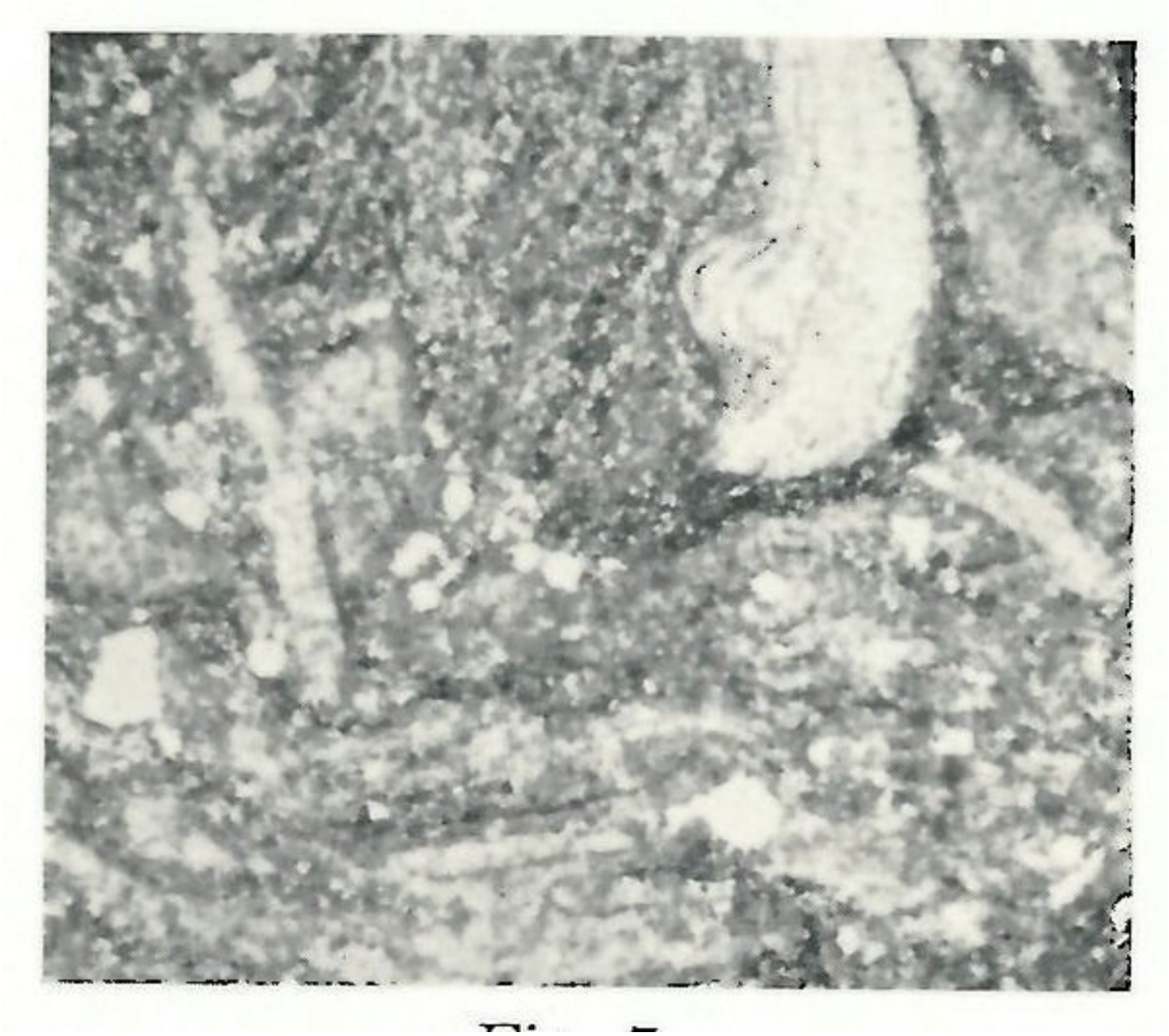


Plate 4 Photomicrographs of dolomites. FIG. 7. (S34588). SL 115, p. 130. Carboniferous Limestone Series, Castlecary Limestone; R. Black Devon, Fife. Arenaceous dolomite in which the original elastic and clastizoic structures are preserved, though the internal structure of the fossils has been destroyed; the dolomite is clastizoichnic. Polarized light. x 11. .

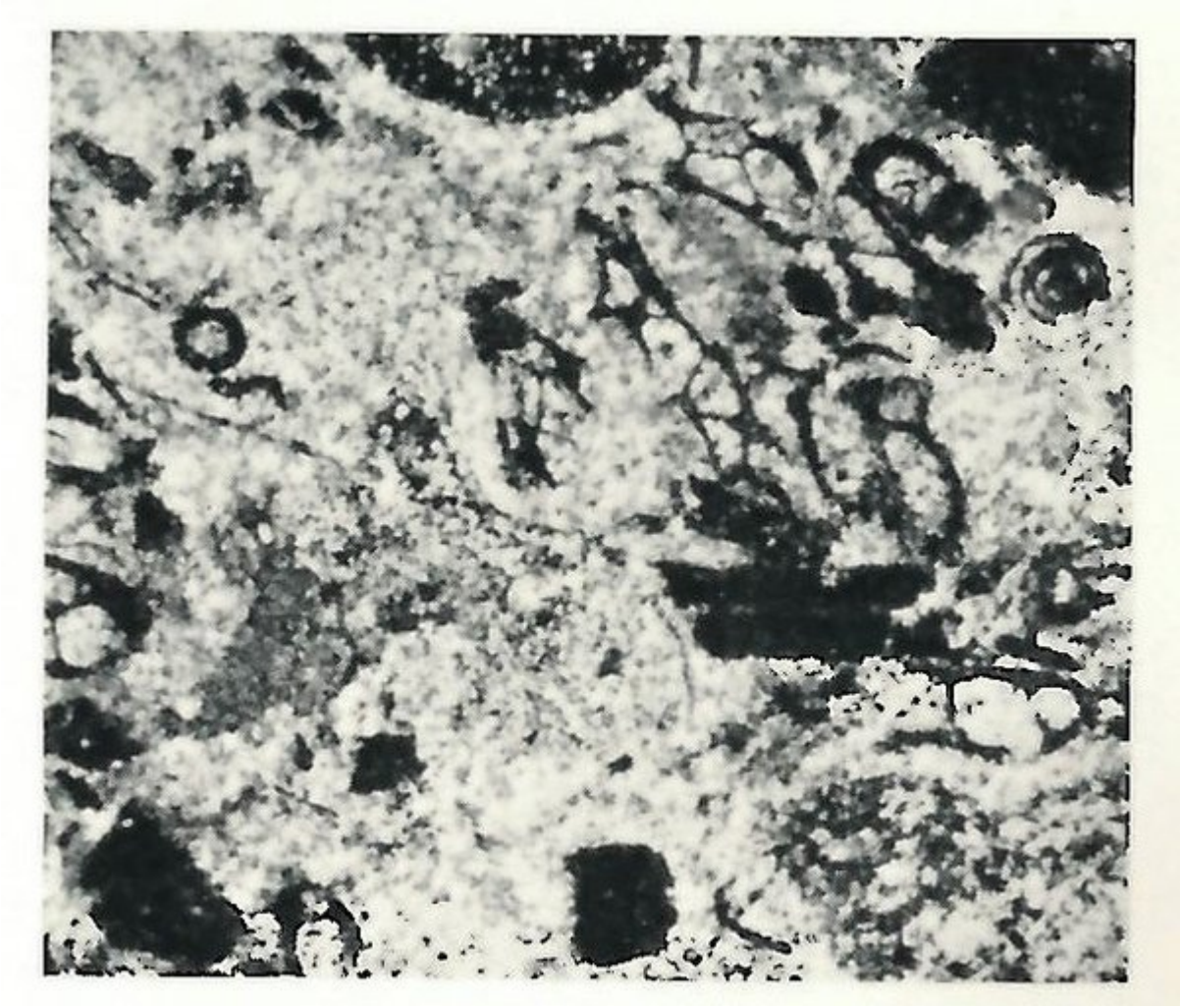


Plate 4 Photomicrographs of dolomites. FIG. 8. (S35799A). SL 276, p. 121. Carboniferous Limestone Series, Charlestown Main Limestone, Charlestown, Fife. A partially dolomitized limestone in which fossil framework is preserved in calcite (black) while the matrix and the infillings of the chambers within the fossils have been converted to dolomite. The calcite has been stained dark by treatment in silver nitrate and potassium chromate. Polarized light. x 20.