David Bodecott

"Great things are done when men and mountains meet; This is not done by jostling in the street."

William Blake.

This short note is intended to be non-technical and non-academic as there are copious, published, detailed technical papers on all the complex lithologies from across the area. The author nevertheless is both geologist and climber, having survived roaming across these outcrops and crags for over fifty years.

As Cumberland geologists, outcrops become magnetically attractive, some are vertical or steep, some very high and hard to access, so many geologists become rock-climbers or scramblers as a natural part of their field work.

Many climbers were often also mining engineers, miners, quarrymen like the famous Jim Birkett who first climbed Overhanging Bastion on Castle Rock of Triermain in 1939.

Some Lake District climbing guides have been written by notable eminent geologists who were also top climbers - like Jack Soper for example, with Angela Soper writing the geology section in the latest Fell and Rock Climbing Club (FRCC) Langdale guide (2013).

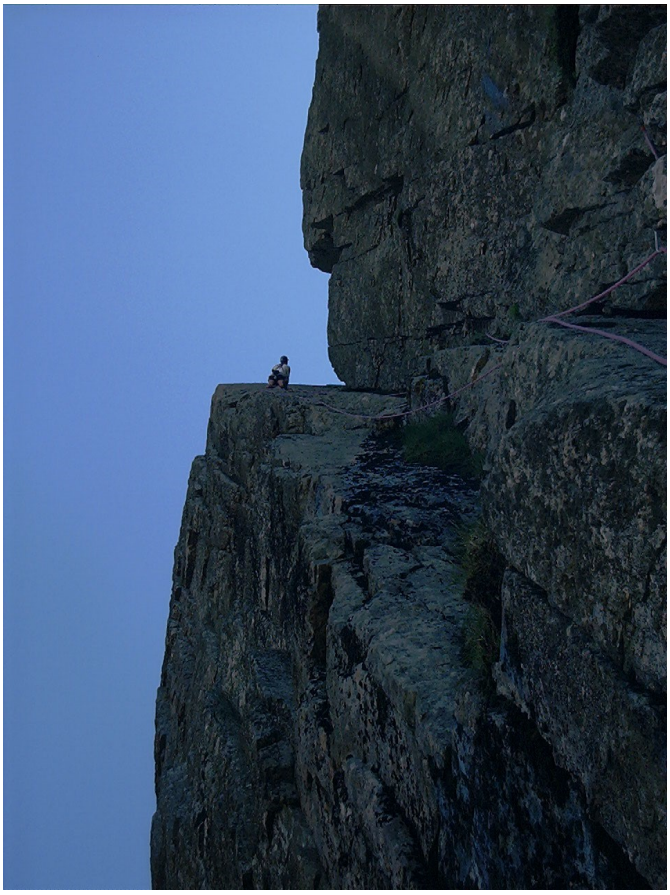


Figure 1. Botterill's Slab on Scafell Crag, first ascent by Fred Botterill, 1903.

Rock climbing is in physical terms a cross between ballet dancing and weightlifting. Climbing is instinctive in children. Moves can vary from the slow and methodical delicate balance of fingertip and tiptoe-holds to the sudden, brutal, gut-wrenching, animalistic and guerrilla-like progress up overhangs or steep walls. Climbing holds can be tiny flakes, crystals or large "bucket holds" or "jugs", pulling on these is akin to climbing a ladder.

Rock climbing is however, primarily a romantic and philosophical pursuit, whereby beautiful natural aesthetic lines that follow the rock architecture, can be climbed for maximum enjoyment. The soaring lines like Botterill's Slab (Scafell Crag) can invoke almost religious reverence from those who successfully climb such routes. See figures 1 and 2.

Climbers will climb anything to test themselves or to keep fit – buildings, bridge parapets, so it goes without saying that every piece of artificial, natural vertical or formerly quarried rock in the area has been climbed at some point. During the Victorian and Edwardian eras, it was common for climbers of the day to climb the



Figure 2. Scafell Crag from Pikes Crag showing the beautifully-architectured buttresses, slabs and grooves, including Botterill's Slab left of centre.

walls of their weekend huts for sport before dinner, followed by a good reading party discussion of a novel. Indoor climbing walls have now become the norm for winter training during the long dark nights, also erratic boulders in the outdoors such as the Bowderstone or the Carrock Fell boulders have likewise been used for training by generations of climbers.

Lake District rock climbing takes place on the following rock types:

Skiddaw Slates

The oldest and least secure climbing medium. Ordovician of course, and 485-465 million years old. Skiddaw Slates are inherently loose, fractured, brittle and insecure, possibly even dangerous, partly due to a relatively low level of metamorphism! However, at Goat Gills Crag above Hassness, Buttermere and at Bowness Knott, Ennerdale, the slates are more intensively metamorphosed due to the underlying proximity of the Ennerdale granophyre. As a result, the crags are more solid. See figure 3.

At this location, slates are contorted and folded in places. This is common and due to Caledonian folding and cleavage development, also due to syndepositional slumping and soft-sediment deformation.

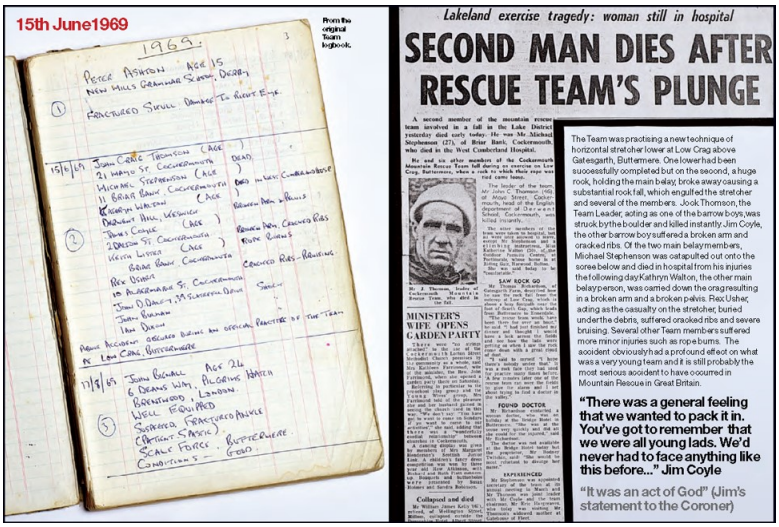


Figure 4. Cockermouth Mountain Rescue team accident, 1969.

There is a famous Victorian-Edwardian era photograph of Keswick's Abraham Brothers climbing simultaneously, roped together on the sunny flank of Sharp Edge on Saddleback-Blencathra. This is remarkable as not only one of the earliest climbing photos in The Lakes, but it is taking place on some of the most unreliable rock in the area. Sharp Edge slates have not been greatly metamorphosed and in wet weather they will deliver a brown muddy residue on the fingertips and this is the cause of many modern-day slips and falls due to the greasy and soapy nature of the rock when wet.

A tragic accident in June 1969 occurred at Low Crag, Buttermere (below High Crag and above Gatesgarth) – A Skiddaw Slate crag used for practice at the time by Cockermouth Mountain Rescue team. The very dry weather had shrunk soil and earth around the anchor block at the crag top. During a practice stretcher lower, the block came away and two sadly died with others injured. This accident cast a pall over Cockermouth Rescue team, Cockermouth Mountaineering Club, and climbing on Skiddaw Slate crags.

The rescue team shifted their practices to nearby Striddle Crag on more solid volcanic rock. RIP "Jock" Thomson (with whom the author had climbed), and the young Michael Stephenson. See figure 4.



Figure 3. Afternoon sun on the route Billy the Kid, Goat Gills Crag, Hassness, Buttermere. Note contorted slates on the right wall.

So in general, climbers avoid the Skiddaw Slate crags, but in desperation to "feed the rat" (a phrase coined by the climbing academic Al Alvarez) as part of their obsessive pursuit, climbers will sometimes gravitate to Ling Crag beside Crummock Water, Goat Gills or Bowness Knott in Ennerdale (all on Skiddaw Slate) as a change from the more solid traditional crags on volcanic and other rock-types. At Bowness Knott, the huge corner of Green Gash, and Black Crack Route are interesting routes for those who seek out unfrequented adventure off the beaten track. Skiddaw Slate crags – a minority sport none the less.



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Figure 5. Grey Crags, Birkness Combe, Buttermere – detail of repeated parallel alternations of coarse and fine tuff, typical of primary pyroclastic fall-out deposits from pulsating eruption columns. There is a strong element of flow (lenticular bedding) and fall-out (parallel draping) in the depositional mechanism. Note the asymmetric bomb sag at top of photo, with bomb in situ – typical of phreatomagmatic explosions

Borrowdale Volcanic Group

The Late Ordovician (ca. 450 million years old) BVG forms the main impressive crags of the central Lake District – the 600 foot Scafell Crag pictured above (figure 2), Gimmer Crag, Pavey Ark, Great Gable – the Napes ridges and Tophet Wall facing the sun and Gable Crag facing north, Pillar rock, Esk Buttress, Bowfell and Flat Crags, Dow crag, Pikes Crag, Dove Crag near Kirkstone pass and the Buttermere crags such as Eagle, High Crag, Grey Crags. There are numerous other smaller crags varying from fifty to two hundred feet in height across the whole area.

There is a huge number of variable lithologies involved from rhyolites, dacites, andesitic lavas, then all the explosive volcanic facies – tuffs, ignimbrites, lapilli-tuffs, volcanic breccias, ash-fall tuffs, water-laid tuffs, volcanoclastic sandstones, welded tuffs and pillow lavas, plus some contemporaneous intrusive sills. See figure 5 for an example of phreatomagmatic facies from Buttermere.

The substantial amount of soft sediment faulting present probably occurred penecontemporaneously with deposition and suggests that the sediment was cohesive.

The coarser grained facies produce rough rock and high-friction climbing. Sometimes individual crystals or clasts/porphyryblasts are weathered out into pocketed features or they may protrude as finger holds (see Figure 6).

The finer grained volcanic units have usually been cleaved into slates. They were metamorphosed by heat and pressure during the Caledonian orogeny between 400 and 395 million years ago. The original rocks were relatively (and still are mostly today) flat-bedded or only gently dipping. The cleavage that developed has a strong vertical or inclined geometry at odds with the bedding, hence slate quarries have dominant vertical lines that cross the original bedding, with huge soaring vertical lines.

On natural crags like Buckstone How and Miners Crag, the slatey BVG has a smooth feel and appearance with obvious vertical features forming routes such as Sinister Grooves (Buckstone) and Miners Grooves (Miners Crag). Both routes were the creation of pioneer mining engineer and renowned artist Bill Peascod,



Figure 6. "Padding" and tiptoeing up rough, sunny ignimbrite, first ascent of "The Borrowdale Stare", Hind Crag North Gully Wall, Borrowdale, 2014.

who's famous "journey after dawn" and eponymous 1985 book took him from the early morning end of night shift in the mines of West Cumberland onto the high crags of Buttermere and Newlands. Bill named his routes with appropriate grandeur such as "Eagle Front" in 1940. When rock synonyms were running short, he also enjoyed using women's names such as Delilah, Cleopatra and Jezebel. Figures 7 and 8 illustrate further examples of attractive volcanic facies.

Within the areas quarried for slate, many of the smooth faces have attracted the attention of climbers. These can be sunny, sheltered venues especially in the low-lying Coniston area such as at Hodge Close, but the smooth rock creates very difficult routes with tiny holds, poor security and often rather loose or dangerous rock that is always on the move!



Figure 8. Pavey Ark pyroclastics looking like wet concrete above Jack's Rake

This contrast between the coarse-grained high friction natural crags and the very smooth quarries brings us to an important distinction in Lake District climbing, a direct result of the contrasting geology.



Figure 7. Cyclical pyroclastic deposits at Doves Nest Slabs above Combe Ghyll in Borrowdale. Photo: Ron Kenyon.

This is the distinction between "trad" (traditional climbing, using only natural protection – cracks, chockstones, spikes, trees or whatever is available), and "sport" (climbing faces that have no natural protection or "gear") into which bolts have been drilled, fixed with hangers, into which protection can be clipped. "Sport" is best described as "French-style" i.e. best for impressing the girlfriend or boyfriend, totally safe - just like the indoor climbing walls, in fact – an outdoor climbing wall.

There is a very sharp boundary between which places are "trad" and which are "sport". Unfortunately, due to the general popularity of artificial climbing walls over the past twenty-five years and the propensity of younger climbers of the modern era to wish for sanitised and totally safe space (an oxymoron in climbing terms), "sport" or bolted climbing has expanded into areas that were previously the preserve of "trad", true risk and adventure.

There is a continuing battle to keep the natural crags free from bolts, and as far as is possible, untouched by the "thin end of the wedge". This is pure environmental responsibility at its best, i.e. leave nature alone – if you can't climb it trad, don't bolt it!! There are many who would bolt Scafell or Gimmer, yet we know from experience in France and Germany that this would simply "burn-out" or ruin the natural rock patina with the beautiful weathered surfaces and lead to excessive artificially induced polish or wear. For the time being, the high crags of the Lake District, usually on BVG lithologies are "bolt-free" and long may they stay so. However, quarries are fair game for bolting due to the absence of natural protection.

Silurian Slates

Somewhat south of the main Borrowdale volcanic belt and the slate belt of Honister, Kirkstone and Coniston are the Silurian slates and greywackes of the South Lakes, ca. 430 million years in age. In climbing terms, these are subtly different from the Ordovician slates, perhaps they should be called siltstones?

These rocks are not strongly cleaved and often suggest a very low level of metamorphism rather akin to parts of the older Skiddaw Slates described above. The cleavage and metamorphism diminish away from the central volcanic belt just to the north. As a result of the less cleaved nature, the slates are used for floor slabs or field boundary stones rather than for roofing slates. From a climbing perspective, the rocks are softer and polish easily, so some of the outcrops that have been used (Stott Park Heights, Brown Howe Coniston and Lindale Slabs), particularly by the outdoor education industry, become smooth and polished.

There is one unusual geological feature found in a disused Silurian quarry just south of Broughton in Furness, this place is known locally as The Donkey Rocks. A local climber describes this as follows: The 60 -foot back wall features a blistered wall rather reminiscent of the lower skirt of a Dr. Who Dalek set at an almost vertical angle. The rock is hard and sound, cleaved by thin vertical cracks, one just wide enough for fingertips, climbed over 40 years ago. As a geological feature it is unique in the north of the country, and similar to formations of the Devon Culm coast. One could assume that this description should be interpreted as possibly due to load casts.

Carboniferous limestones

The Lake District dome is ringed by a superb and scenic escarpment of “Carb lime” with superb views and outlook. This ring is incomplete between Egremont and Millom where Permo-Triassic rocks overstep the Carboniferous in Southwest Cumberland. The Carboniferous rim scenery has such great beauty, with high and intangible value, that it would be a worthy aim to keep free of industrialisation and wind turbines. Deposited when an equatorial location prevailed, around 350 to 320 million years ago, these fossiliferous limestones, marls, carbonate oozes and clays, sometimes re-crystallised to hard sugary textures, form natural escarpments and sometimes large quarried holes.

There are many small and large climbing crags within the Carboniferous rim. These extend around North Cumberland, North Lancashire, Westmorland and the Pennine escarpment. See figure 9. Some are “trad” where natural protection is adequate such as at Cumrew between Croglin and Castle Carrock, other outcrops such as Chapel Head Scar above Witherslack in the South Lakes are so steep, smooth and featureless that bolting, and a “sport” designation prevails.



Figure 9. Head End quarry, Sandale. Photo: Ron Kenyon.

“Carb lime” climbing is geographically extensive around the area. The limestones are usually relatively gently dipping, with the climbing on sunny scarp or quarried faces. However, due to the north-trending Silverdale disturbance between Arnside, Silverdale, Warton and Milnthorpe, the limestones at Trowbarrow quarry are folded into vertical beds. Huge bedding planes often covered by corals and trace fossils have been fractured by quarrying and blasting, making superb steep walls for climbing. See figure 10.

During the Tertiary period, the Morecambe Basin was inverted between seven and ten thousand feet. The Trowbarrow units on the margin of this basin appear to have been uplifted about 1200 feet. It is the author’s view that this verticality is a classic example of Tertiary basin inversion whereby the shallowest most marginal basin areas experienced the greatest local reversal, yet the deep basin centre retains an



Figure 10. “Trad” climbing on vertically bedded fossiliferous limestone at Trowbarrow quarry near Silverdale. Photo: Ron Kenyon.

almost flat or pre-existing geometry despite being jacked up thousands of feet as Africa crashed into Europe.

Chapel Head Scar above Witherslack Hall is a “monster” crag – very steep and high, a hard and difficult “sport” venue, well worth a visit to look at the rocks and the rock athletes in action! Post-glacial processes have produced extensive vertical tufa deposits at Chapel Head with some pockets from water-washing. As a crag of the modern era, some of the route names are culturally interesting such as “Route of all Evil”, “Maboulisme Merveilleux”, “La Mangoustine Scatouflange”, and the inevitable “Tufa King Hard”. Rock culture, French influence and comic books all have a hand in the naming of routes. Things have moved on from the romantic era!

Permo-Triassic Sandstones

The Permian cross-bedded desert sands (275 million years old) of the Eden Valley have been climbed on at Armathwaite, Lazonby, Scratchmere, Cowraik and the Appleby area for many years. Riverside Armathwaite was the training ground for top Carlisle climbers for many years. The Hoff at Burrells is a beautiful Brockram outcrop with large limestone holds and pockets within a sandy matrix at a gentle angle (note: currently out of bounds to climbers).

Some of these outcrops such as Coudy Rocks at Appleby have now been bolted as sport venues, others retain their risk and adventure and are bolt-free as at Armathwaite. See figure 11.



Figure 11. Bouldering on dune-bedded sands at Armathwaite. Photo: Ron Kenyon.

The Triassic St Bees Sandstones (Sherwood Sandstone Formation, 250 million years old) form huge 300-foot cliffs that are loose, sandy and dangerous at St Bees Head. Various high-risk adventure routes have been made up these enormous cliffs since the 1960s. They might even be easier to climb with ice axes and crampons, the same style in which the Chalk cliffs of Beachy Head are sometimes climbed!

Now the high cliffs are being returned to the birds, as the climbing focus since the 1990s has switched to the wave-cut platform and water washed cleaner sands near sea level which have been bolted and turned into a

"sport" venue due to the lack of natural protection. See figure 12. These sandstones are cyclical, cross-bedded alluvial units with minimal wind influence and frequent joint and bedding planes.



Figure 12. Sport climbing at St Bees. Photo: Ron Kenyon.

There are no rocks younger than Triassic climbed on across the Lake District and surrounding areas, but in addition to the main climbing rock types described above, there is one other group to describe – intrusive bodies. They are common across the Lake District and form a major part of climbing activity.

Igneous Intrusives

The main intrusive bodies were all emplaced between 450 and 400 million years ago, apart from the Whin Sill (300 million years) and these are as follows, including their climbing potential:

Carrock Gabbro

Small crags and boulders on the flank of Carrock Fell – a popular training ground particularly for bouldering. The coarse Gabbro and related veins and micro intrusions have good friction.

Ennerdale Granophyre: No significant climbing potential.

Eskdale Granite: Numerous small granite crags that are popular in the Eskdale area.

Threlkeld Microgranite

The winner by a country mile. During the past ten years, a former Nottinghamshire miner and active local climbing pioneer (over the previous forty-five years) has converted the defunct Bram Crag Quarry into a huge sport climbing venue with almost 200 newly bolted routes. As a result, this is a very popular and easily accessible outdoor climbing wall! The rock is smooth, hard, light grey and was intruded as a laccolith or sheet-like body. The contacts with the adjacent Skiddaw Slates can be seen at the south end of the lower quarry. In the higher and more adventurous parts of the main upper quarry, there is a capping roof of BVG, also visible are some rudimentary columnar joints.

The quarry has been climbed on for over thirty years, but the recent bolting has given a new lease of life and some very gymnastic routes that catch the afternoon and evening sun.

There is much loose rock and regular rock falls occur as per any quarried environment. See figure 13.

Skiddaw Granite: No climbing potential, deeply weathered and does not form craggy scenery.



Figure 13. Bram Crag Quarry is a dangerous place!

Shap Granite: Commercially sensitive and not accessible in working or suspended quarries.

The Permian Whin Sill intrusion (300 million years old)

Close to the Lake District, the Whin Sill intrusive forms attractive steep crags at Crag Lough and Peel Crag near Hadrian's Wall. The fine-grained dolerite tends to be smooth with rather less friction than other rock types. There are also some routes at High Cup Nick above Dufton.

Gravity and Earthquakes – rockfalls and major collapses.

Our geological environment is dynamic and constantly changing, perhaps more quickly than many realise. Even within a human lifetime we can witness many changes and catastrophic events.

There are regular earth tremors along some of the major Lake District faults. It was the Coniston fault (that runs north-south through the Lake District) that moved on the winter solstice, December 21st, 2010 thus precipitating the opening of the crack at Castle Rock of Triermain in Thirlmere. Eight years later on November 26th, 2018, at 2pm, when progressive movement led to critical failure, 1600 tons of rock collapsed onto the scree below and a number of fine climbing routes were reduced to rubble. The devastation is well worth a look. See figures 14a and 14b. Geology at work!



Figures 14a and 14b, The destroyed path and gate below Castle Rock of Triermain, November 2018.

A similar but larger collapse took place at Deer Bield Crag in Easedale (1997) resulting in the loss of several classic routes like Deer Bield Buttress.

The Slabs Ordinary route on Grey Crags in Birkness Combe partially collapsed in 1972 with several climbers standing on the large block that moved. Fortunately, no one was killed.

At Kern Knotts on Great Gable, the route Sepulchre collapsed in 1981 after an earthquake.

Hodge Close Quarry near Coniston has regular decadal collapses, it is in a permanent state of flux. Most collapses are related to earthquakes and the damaging variety occur on a twenty to thirty-year cycle. A future event could be the collapse of the huge upper left wing of Buckstone How to the left of Bill Peascod's famous route Sinister Grooves. There does not seem to be much that holds this mass of rock in place.

Conclusions regarding climbing geology and the sensory climbing environment

Good climbing is defined by sun – giving light, warmth, and clean, dry, moss-free rock. Having no shade, particularly trees at the crag base, is a distinct advantage, as indeed it is for inspecting outcrops in purely geological terms. Remove the trees and we can see the beautiful rocks!

Tress at the crag top however, are very useful for belays, abseil points or field geologists' safety ropes.

The smell of lichen, moss, rock and peat on the fingers creates a wonderful natural aroma, plus of course the occasional dead sheep (there seems to be one at the bottom of every crag). The scent of Juniper, wildflowers, or even the smell of cordite after rockfall or lightning is redolent of nature's raw edge. As geologists and climbers, we are blessed with these pleasures. Bilberry ledges rich in berries and protected from sheep are a delight. There is one route on Upper Heron Crag, Borrowdale called "Bilberry topping".

As geologists, it is helpful not to smash boulders with a hammer as we may be removing the key foothold of someone's favourite boulder problem! This is a serious problem with student groups and appeals have been made to stop the vandalism. The beautiful weathered surfaces must be protected.

During the author's exploits in the Lake District, the summers have decidedly cooled over the past forty years. This is clear from photographs, climbing diaries and the clothes worn. This has led to the spread of vegetation over clean rock in some places.

The benefit of drought-dry hot weather for enjoyable climbing (and field geology) can not be stressed too much. The possibility that we may slide into another rapidly cooling period is a frightening thought for rock-climbers in this area. It is tough enough to keep warm in summer already, hence many climbers are neglecting the Lake District crags and heading overseas on "hot-rock" trips.

This brief excursion around the Lake District outcrops reminds us that we are mere spectators at nature's steady evolution.

Acknowledgements and thanks to:

Ron Kenyon FRCC

Al Phizacklea FRCC

David Millward, BGS

CGS publications

CGS Proceedings

All photographs by the author unless acknowledged differently.