This article was downloaded by: [UQ Library]
On: 05 November 2014, At: 14:45
Publisher: Taylor & Francis
Informa Ltd Registered in England and Wales Registered
Number: 1072954 Registered office: Mortimer House, 37-41
Mortimer Street, London W1T 3JH, UK

Transactions of the South African Philosophical Society

Publication details, including
instructions for authors and
subscription information:

[http://www.tandfonline.com/loi/
ttrs19](http://www.tandfonline.com/loi/ttrs19)

IX. The Granites and Gneiss of the Colony

W. Prosser F.G.S.

Published online: 28 Jun 2010.

To cite this article: W. Prosser F.G.S. (1877) IX. The Granites and Gneiss of the Colony, Transactions of the South African Philosophical Society, 1:2, 93-100, DOI: [10.1080/21560382.1877.9526129](https://doi.org/10.1080/21560382.1877.9526129)

To link to this article: [http://
dx.doi.org/10.1080/21560382.1877.9526129](http://dx.doi.org/10.1080/21560382.1877.9526129)

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed

by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

IX. *The Granites and Gneiss of the Colony.*—By W. Prosser, F.G.S.

[Read 27th February, 1878.]

There are certain features in connection with the granites and gneiss of Sea Point that are of sufficient importance to entitle their being brought before the notice of this Society. For the sake of clearness, I shall briefly enumerate the chief points to which I am desirous of directing your attention this evening.

Firstly.—There are evidences that the granite of Sea Point, after protruding itself through the Silurians had overlaid these sedimentary beds, in lateral directions, for some distance.

Secondly.—That this overlying granite was one of the agents concerned in bringing about the present metamorphic character of these rocks, when it occurred at any considerable distance from the line of the central granitic dike.

Thirdly.—That the presence of gneiss over the clay-slate and immediately beneath the granite, tends to prove that more than one granitic eruption must have taken place.

Lastly.—The utilization of the presence of the position of the granite over the clayslate for obtaining water by boring.

The Table Mountain range is one of the best places to commence studying the rocks of the Colony. Here we have a certain order of succession.

- (1) Granite.
- (2) Silurian.
- (3) Devonian.

The same order is always observable elsewhere. The Silurian, in all its mountain chains, is accompanied by the protruding granite, and is generally capped by the Table Mountain sandstone. Hence it follows that any general laws which can be deduced respecting the relative

positions of these three great rock divisions as seen in our own neighbourhood, holds good for the rest of the colony. For instance, the granite of Bain's Kloof is superimposed by the Silurians which in turn are again covered by Devonian sandstones. Again, near Worcester, we have the Silurian, with the granite, and above them are seen the sandstone. Nay, more, the very tabular form of this district is exceedingly common in the southern and western parts of the colony.

Considerable analogy seems to prevail between the granites of the Cape and those of Namaqualand as described by Mr. Wyley. There, as here, the same order is preserved with the Silurian, Gneiss, Granite, and Table Mountain Sandstone. Thus, for all practical purposes, we may regard the lithological phenomena of the Lion's Head, and its spur, Sea Point, as a type of what is seen in other parts of South Africa.

With the exception of Kamiesberg and Lilyfontein the granite of the colony nowhere gives that air of grandeur to the scenery which one sees associated with it in Europe. On the contrary, in South Africa, the granitic scenery is always subordinate to that of the Silurian and Devonian, because it is always capped by these formations. The Paardeberg and the Paarl are the most prominent granite elevations; still these are only some twelve or fifteen hundred feet in height. Possibly the present elevation of the granite peaks, is by no means what it was before the abrading and lessening influences of the Silurian and Devonian periods were brought to bear upon them. The presence of granite, however, as a basement rock of many of our mountain ranges, plays an important part in the formation of the scenery of the colony: nowhere has it contributed to form bolder or more picturesque views than in the neighbourhood of Cape Town.

At one time granite was considered to be the primary rock work in the earth's crust, that upon which the earliest sedimentary formation were invariably laid. Now, however, a different view is held, for many examples occur of newer granites. Indeed, granite may be of any age, as far as the era of its deposition is concerned; as to the time or source of its origin nothing is known. The space in time, when the granite of the Cape colony was brought to the surface, is placed beyond a doubt by the

surrounding rocks. Having protruded through, or been spread out over, the clayslates, the granites in question belong to that period in palæozoic days which is between the Silurian and the Devonian, *after* the Silurian, and *before* the old Red Sandstone days. This is at once demonstrated by its occurrence first through, and then over, the former, while it lies below the latter. There is no instance in the colony of the old Red having been in any way disturbed by the granite. This proves that the granitic eruption had ceased with the deposition of the Devonian rocks.

Mr. G. A. Bain, speaking of the Gneiss (Granites) of the Cape, says :—" Gneiss never occurs but in contiguity with granite, for it seems always to pass into clayslate when beyond the influence of the Plutonic rocks below. Gneiss occurs at Platte Klip at the foot of Table Mountain, Hottentots' Holland, and near Little Brak River in the district of George. I consider it to be contemporaneous with the clayslate."—Bain, p. 180. Though Mr. Bain is correct as to the correlation of the gneiss and the granite, the section at Sea Point disproves the passage of the former into the clayslate. Not only is the gneiss unconformable to the clayslate, the latter being vertical, while the former is as horizontal as the rock surface will permit, but the abraded character of that surface proves, that, the periods elapsed between the deposition of the Silurian and Gneiss; one ranging from the time of its deposition to its upheaval, and a second period reaching thence until the gneiss was formed. And judging by the smoothly worn appearance of the face this second period was not a brief one.

The Granite of the Table Mountain Range presents one feature, which is almost unique even for this rock, which presents so great a variety of physical appearances, as well as lithological structure. We refer to the fact that it once must have covered a not inconsiderable area of the adjoining sedimentary clayslates. This phenomenon is best studied on the shores of Green Point, where evidence of it can be examined in numerous sections, views of which are now before you; some of the specimens which lie on the table will still further assist us in realizing the matter. Most of these specimens have been taken from the shore beds which lie to the a little westward of Sea Point Cottage, the residence

of H. Solomon, Esq. Right opposite Mr. Solomon's flagstaff, on the beach, may be seen a layer of a somewhat coarse-grained granite overlying the sedimentary rock (See Specimen A). This layer of superficial granite commences at nothing, at the distance of a few yards above high water mark, but rapidly thickens as it passes under the sea. The surface of the subjacent rock bears all the evidences of having been water-worn, and the superincumbent granite has insinuated itself into every hollow and crevice. At little further east, and at a spot which is present almost entirely covered by the low tides, is another outlier of granite, which also appears to thicken in a northerly direction, that is, under the sea.

As we have already intimated a marked change has been effected in the sedimentary rocks lying below the granite. They have been rendered highly crystalline. Both the chief component ingredients, or the *material*, as it were, of which the bulk of the rock has been formed, and the cementing medium, silicic acid, have been crystallized. The former appears in separate aggregated crystals, while the latter has assumed the appearance of branching forms; both the crystals and the reticulated forms lie, as a rule, parallel to the plane of the deposition of the original beds. (See Specimen X.) This peculiar crystalline appearance, coupled with the direction of the master joints, clearly proves that these beds of sedimentary origin have been metamorphosed, and in the absence of all other agents we must conclude by the superincumbent granite. This metamorphosed character is therefore a fair guide to the extent of surface which had at one time been covered by the granite; in other words, wherever this peculiar form of metamorphic change is now seen, although other rock lies near at the present day, we may fairly conclude that it was once covered by the adjacent granite, and if this view be a correct one, the granite rock must have originally overlaid the older Silurian rock to a distance of more than half a mile from the edge of the great granitic mass. There are, however, two ways of looking at this correlation of the granite and clay slate. Those who believe granite to be itself an altered stratified rock, would at once overcome the difficulty by considering that it had been deposited

in its present situation by water, and that it had been subsequently metamorphosed into its present crystalline condition. This theory does not agree with the difference in the planes of stratification, if one may say that granite has plane *a* of stratification. Curiously enough, this view is apparently supported, if not greatly confirmed, by a mass which forms itself into a bold rugged little headland a short distance to the west of the spot where the granite was seen directly overlying the metamorphosed sedimentary rocks. The rocks composing this little headland are to all appearance bedded; and their bedding too is conformable to that of the sedimentary rocks below.

On proceeding still westward, across the little bay which is bounded on the east by these last mentioned beds, and coming nearer the great central granite mass, another phase of the same rock is seen. Here, a little quarry gives a good section, showing gneiss resting on the sedimentary rocks, following the various inequalities of their worn surface. Over the gneiss again comes coarse crystalline granite. (See Specimen C). Whatever it may be elsewhere, there is no great thickness of gneiss at this place. Here too, one sees how the two rocks gradually pass into each other.

The gneiss rests unconformably on the metamorphosed clayslate, and is of that kind which is generally considered as gneiss proper, passing into mica schists. I have seen no porphyritic gneiss *ortyuile* in the colony. As is commonly the case it is hard, tough, and crystalline, showing the curves and flexures of its stratification in a marked degree. And though in the main Gneiss may belong to any age, the time of the deposition of the rock under our notice is fixed by the surrounding formations. Its plane of deposition lies at right angles to that of the clayslates below. Higher up it becomes coarser-grained, until it resolves itself into granite, containing large crystals.

A more instructive section can scarcely be found. True it is on a small scale, but the lessons it teaches are none the less interesting, on that account. And they are as follows:—After the upheaval of the clayslates there was a period of rest, during which the adjoining granite was sorted by water, and the resulting gneiss laid over the previously water-worn shore beds.

Then came a period of commotion and unrest, in which the gneissic sediment, in common with a considerable area, of the adjoining Silurian rocks became covered with freshly erupted granite. But no disturbance of the gneiss-covered strata accompanied this outburst, for the gneiss shows no sign of fracture, or of displacement. Then came a long period of subsidence; during which the Silurian hills were submerged beneath the sea level, and became covered over with the Table Mountain Sandstones; and lastly, by a general upward movement, these were again lifted high out of the ocean.

Most of the usual minerals accompanying the granite are found at Sea Point. Good hand specimens of black obsidian are found on the slopes of the Table Mountain. Large crystals of tourmaline are frequently left in the partially-decomposed very coarse granite. Talc of moderate size is occasionally seen. The slopes of the hills above a certain height are covered with immense deposits of decomposed felspar in the form of kaolin, much of which is of sufficient purity for the manufacture of porcelain. Trachite occurs in a few places, as at Sea Point. Here other lodes of pyrolusite or the peroxide of manganese are found either in the granite or at the junction of the granite with the overlying sandstones.

Nor is it uninteresting amidst all these and many subsequent changes to find the continuity of life on the globe such that the very same waters which deposited those far-off Gneissose and Devonian beds and those which wash our shores this day, contain one and the same organism. The modern *terebratula* of Sea Point is scarcely distinguishable from its patriarchal fossil Devonian prototype. This shell has come down in an unbroken line from the youth of the earth to these latter days.

The granites of Sea Point, in common with those of the Paarl, are of the usual typical kind, and composed of quartz, felspar, and mica, arranged in distinct grains or crystals. It is highly crystalline. It presents no traces of deposition or stratification, but varies from a fine to a very coarse-grained kind.

But to proceed a little further east comes the great mass of protruding granite. It rises in mountain masses, giving that peculiarly bold appearance to that singular hill, the Lion's Head. On the eastern side of

the granitic wall, the clay slate beds are seen to be in an almost vertical direction, while both the plutonia and the sedimentary rocks are crowned with the horizontal red sandstone beds.

Let us now endeavour to trace the connection which may have existed between the protruding granite and the present upturned position of the adjoining clay-slates; and especially, as to whether their now high inclination is solely due to the extrusion of this plutonic matter, or whether we have to seek for some other cause of the change from the horizontal to the vertical from. The first consideration is that of the quantity of matter to be upheaved; that is, supposing the granite to have been the primary and sole agent in uplifting the beds from their once level position to that on edge, how great a depth of beds had to be overturned. These clayslates are at least two miles thick, and during the whole of the two miles the component beds have a very high angle. It is scarcely probable, or even possible, for any force acting at any one spot or along an axis of hundreds of miles to have the power of changing the plane of inclination from the horizontal to that of 90° for a depth of two miles—to have changed or rather overturned strata two miles deep, so that they might stand on edge. It is impossible to conceive of any force, acting with such an unrigid leverage as that of rock matter, being able to so revolve, as it were, on a hinge such an enormous mass of matter. Besides, an eruptive force is more of a shattering, a riving, than an uplifting, or an overturning power. To effect such a complete change in the position of strata over a large area so as to place them on edge, the uplifting force must act under much, or the whole, of the said strata. And even then there must be a free end, to permit of the swinging action, for no overturning can occur without considerable room. A shattering results instead. Besides an irruptive action, like that of granite, can only be exercised on one spot, and vertically upwards, and could not by any possibility have operated over large areas.

We do not mean to say that the extrusion of so much granite had not an effect and a great effect, though an indirect one, on the conversion of the clayslates from their original horizontal position to the vertical one which they now occupy. That the granite had much to do in this

matter is evident from the fact that the axis of the line of dislocation of the clayslate is parallel with that of the granite; the same might be said of the axis of the adjoining synclynals and anticlynals on either side. The probable series of operations were the following. The intrusive force, acting vertically upward, would remove away a sufficient portion to permit the molten matter to issue forth. A fissure would then be created equal in width to that of the issuing granite. In time, as the molten matter continued to issue forth the superficial beds would be weakened more and more until at last they would fall in like the flat roof of a house, and would stand at a greater or less angle of inclination.

A knowledge of the fact that the granite covers the sedimentary rocks has some importance from a utilitarian point of view. Water is certain to be flowing through the small interstices which invariably occur between the two rocks. If, therefore, the granite be bored through, this supply of water would be recovered. Fountains would greatly enhance the value of lands which lie too high on the hill side, as at Sea Point, to obtain water from the waterworks.

A still newer eruptive rock than the granite appears a little this side of the Clifton Hotel, on the side of the Kloof-road, in the form of a dyke of Greenstone. It is easily distinguished from the surrounding granite by its colour and form.

“B.”