East Antrim U3A geology group report – Brown's Bay, Islandmagee 6th September 2022
Part 2

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Links to all previous excursion reports can be found at https://eau3a.org.uk/geology/ (scroll down web page)

The plan. A small group of us gathered on a fine afternoon at Browns Bay. On the east side of the beach there is a good range of rock types and also one of the most easily and clearest examples of faulting. Rocks on the west side of the bay consist of one of the most accessible examples of the Inter-basaltic horizon, of considerable commercial/industrial importance as a source of iron and aluminium ores. The headland of Skernaghan Point on the east side of the bay, exhibits a fine example of a 'raised beach'. Finally, along the way we looked at modern beach and stream processes.

Part 1 covered the solid geology. In part 2 we will look at the modern beach processes.

Without planning for it, the walk across Browns Bay beach revealed a number of classic beach landforms. As noted in part 1, the extent of exposure of rocks at Browns Bay is largely dependent on the state of the beach level. Beaches are very dynamic things with the level of sand varying over much of the beach according to recent/current conditions. As the beach changes over most of its area, its actually the volume of sand that changes.

Simply put, in storm conditions, wave energies are high and are powerful enough to remove large volumes of sand. The sand is moved offshore into deeper water where the wave energy is reduced and the sand settles. Typically the sand accumulates in offshore sand bars. Storm conditions produce waves with close spacing which have lower energies at depth (I know – it sounds counterintuitive). During calm weather, waves are less dramatic looking and are more widely spaced – this means they have higher energy at depth (all true I promise you). The offshore sand bars, deposited during windy/storm conditions, are remobilised in calmer weather and sand is slowly moved onshore again. These changes can be quite rapid with the state of the beach changing from one day to the next in the right conditions.

During calm conditions, the sand is moved onshore in the form of advancing bars known as ridges, the intervening depressions, often retaining water at low tide, are called runnels. On our visit, the floor of the runnel was patterned with wave ripples. The direction of movement of the ridge landwards could be determined as the avalanche landward slope was progressively covering the ripples on each high tide. Eventually, if they progress far enough landward and are not destroyed by a storm event, ridges can become stranded at the upper tidal limit. If the ridge is not destroyed the ridge sand can dry out and if there is an onshore wind during this period, the sand can be blown further up the beach and even inland.

Material on the upper beach (strandline debris or vegetation) or natural small-scale hollows and ridges, can provide sheltered locations where wind energy drops and sand is deposited. These can become colonised by a select range of

plants that can tolerate this exposed environment, leading to stabilisation of the embryo or foredunes. Sand progressing further inland can be deposited around another group of plants, especially Marram Grass – this grass actually needs sand deposition to thrive and is a very important 'engineering species' critical to formation and retention of mobile or yellow dunes. Further inland, where sand deposition events are rarer, stable or grey dunes form.

At Browns Bay the dune sequence has been impacted by human development with only occasional foredune features being present (they are regularly eroded by big storm events and human impact) and a narrow zone of the mobile or yellow dunes. The dune series are 'attacked' by wave and human pressure – footfall and buckets and spades. The majority of the yellow dunes and the stable dune series further inland have been levelled and built on by the seaward path and grass verges, the road and the car park. A glimpse of what was once present can be seen to the west side of the car park/former caravan park where sand is exposed and some of the typical plants associated with dunes are managing to hang on.

A further past pressure on many of our beaches was commercial scale sand removal. Sand replenishment is thought to be a limiting factor on many of our beaches. Much of the sand now present dates from the end of the last ice age, being 'recycled' by the processes described above. Little new sand is being brought into the beach systems either by rivers or erosion of adjoining rocky shores. Large scale removal of sand then lowers the beach profile allowing high energy waves to progress further towards the dune front, causing significant erosion. Hence the fact that many of our beaches are engineered to some degree, with a call for more 'coastal defences' along other eroding sections of our coast.

Browns Bay has a small stream (apparently unmade) that discharges across the beach at low tide, but swamped by high tides. At low tide, provided there is adequate flow in the stream (prolonged dry spells reduces it to a trickle), the stream can remobilise and transport quantities of sand back towards the sea. If the sand ridge system is large and robust enough, the stream can be diverted along the runnel until it reaches a point where it can 'break through' the ridge and flow to the sea. Usually however the stream makes its way more or less across the beach. High tide can smooth out

the beach sand so as the tide falls, the river starts all over again, slowly eroding but as the tide continues to fall, the ‘base-level’ drops (the stream is continually trying to adjust the level of its bed towards the current sea-level which of course is falling as the tide goes out).

The main stream flow can switch position, eroding sand as it moves. If it moves position and occupies a new, lower level, the former stream bed can be left abandoned. The photo below shows at least 4 of these abandoned features which are known as terraces. These are probably also partially defined by gentle wave action on a falling tide. Of course when the tide comes in again, all of this will be erased leaving a tabula rasa for things to start again on the next falling tide.

Although on a small scale, the range of beach and stream processes are fascinating resulting in an ever changing picture at Browns Bay – once you know what to look for.