http://www.geology.19thcenturyscience.org/books/1887-Geikie-ScenScot/README.htm



Passing northwards along the eastern coast of Scotland we find that the sea has encroached to a marked extent on the sands of Barry, on the northern side of the Firth of Tay. The lighthouses which were formerly erected at the southern extremity of Button Ness have been from time to time removed about a mile and a quarter farther northward, on account of the shifting and wasting of these sandy shores. The spot on which the outer lighthouse stood early in the seventeenth century, was found to be in 1816 two or three fathoms under water, and at least three-quarters of a mile within flood mark.

If the waves can bring about such important changes, even when rolling into more or less sheltered estuaries, we may expect that their power will be found still greater where, without any bounding land to curb their fury, they can rush in from open sea, and fall with unbroken violence upon an exposed coast-line which has no bulwark of durable rock to oppose to their advance. That this is the case with the North Sea is shown by the form of the coast-line, the known effects of storms, and by actual experiment of the power of the breakers. The force with which the waves of this ocean fall on objects exposed to their fury has been measured with great care at the Bell-Rock Lighthouse. This massive structure, rising 112 feet above the sea-level, 'is literally buried in foam and spray to the very top during ground swells when there is no wind.' Experiments were made there from the middle of September 1844 to the end of March 1845, and the greatest recorded pressure was 3013 pounds on the square foot. Mr. T. Stevenson however, informs us that on the 27th November 1827, the spray rose 117 feet above the foundations, being equivalent to a pressure of nearly three tons on the square foot,[1] and a ladder

[1] *Trans. Roy. Soc. Edin.* xvi. 28.