S100: Science: a foundation course
S100/26: Earth history

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Clip transcript: Grain size measurements of sand taken from different areas of a beach.

Chris Wilson:
Well these sand dunes have been produced by wind blowing sand from the beach mainly by the westerly winds and you can see they stretch off into the distance towards the east. If we continue the sequence we come to another low marshy area which is a much older equivalent to the calm water area we saw between the storm beach and the sand dunes. And they're certainly not static, as you can see, this hut here has been half buried by the blowing sand. But generally the net movement on the sand is out towards the sea.

Think back to where the first specimen was collected out here near low tide mark. I also collected specimens from the storm beach here, then walked across the calm lagoonal area, collected another specimen from the sand dune, and finally ended up in the salt marsh and had a mud sample there. Now having collected these samples, one takes them back to the lab. Now how would we go about analysing these samples from a geological point of view? Well for a start, one could look at the chemical composition or the mineral composition. But the easiest thing to do is to measure the mechanical composition, the grain size distribution of the sand. Now this is fairly easy to do with a loose sediment like this one while using a stack of sieves. These are arranged with the coarsest mesh size on the top of the stack and the finer sizes then occur progressively downwards. The technique is quite simple. The sand is tipped in at the top and the whole thing is then shaken, actually it's shaken mechanically, one doesn't want to stand there for half an hour doing it. And then when that's over the sediment has separated out into its different grain size components on each sieve. The next step then is to take these off the sieve and weigh each one in turn and this gives us a grain size distribution by weight of each grain size. Now having obtained that data the next thing to do is to plot it up so that you can compare different sediments. The simplest way to do this is to plot a histogram as we've done here for the dunes sediments. This is a rather different kind of histogram, say to a rainfall bar chart, because what we've done is filled each tube with sediment to a height proportional to the weight that was retained on each sieve size. On this side we have sediment less than 0.5 of a millimetre in diameter, it increases in grain size over here, and if this bottle had anything in it, the grain size would be greater than 1.5 millimetres. You can see that this gives a rather jumpy looking appearance. It's only an approximation to the real grain size. If we had an infinite number of sieves we would get a much smoother distribution which would give us a frequency curve like this. Here what we've done is to smooth out that jumpy bar chart. I think it's a pretty fair thing to do and you can see it does express much more naturally the grain size distribution and we can do the same thing for the other two sand environments, the storm beach and the intertidal sands. Can you see any differences between the grain size distributions of each one? Well I think they're standing out very well. For a start both the storm beach and the intertidal sand have a much larger range of grain size, these last three bottles have sediment in them. But the storm beach has very little sediment in this fine grain bottle. Because it's so turbulent when the storms are washing the material up on to highest part of the beach, all this fine material gets winnowed away. But because the turbulence only lasts a short period of time because the storms probably soon die away, there hasn't been enough time to even out the grain size distribution at the courser end of the frequency curve. But this has been possible in the intertidal sand area. Here the waves are continually breaking and washing the sand to and fro so there is just a very small course

tail to this curve. But then contrast that, the intertidal sand, with the dune. Here you see the wind has transported the sand from the beach onto the dune and so there's been an extra process involved, first the waves and then the wind. So we have a much sharper peak to this curve so it's better sorted. So we can see then that there are differences in the grain size distribution according to the environment. And the question arises; can we use these geologically to detect different kinds of environments?