

How else do we use Strontium (Sr) isotopes?

Geological Fingerprints

Rocks have different $^{87}\text{Sr}/^{86}\text{Sr}$ ratios – ‘a geological fingerprint’ based on their age and type. Erosion transports the ‘fingerprint’ into water and soils.

Anything which grows in soil or takes up water can acquire a unique $^{87}\text{Sr}/^{86}\text{Sr}$ signature. This is used as an archaeological tool. By analysing the Sr of teeth and bones we can trace the migration patterns of man and animals. You have a strontium isotope ratio in you which reflects where you live and where you have been!



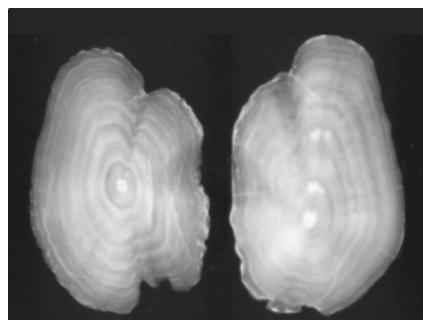
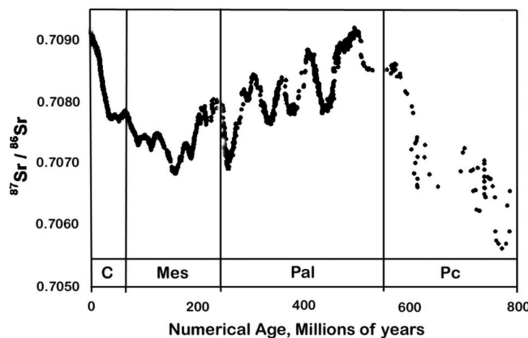
Geological timescale

		Age (Ma)	
CAINOZOIC	QUATERNARY	0	
		1.8 First Appearance of Modern Humans	
	PLIOCENE	5	
		MIOCENE	24
		OLIGOCENE	34
		Eocene	55
		PALEOCENE	65 Major Extinction Event
	CRETACEOUS	Late	98
		Early	141
	MESOZOIC	JURASSIC	Late
Middle			184
Early		205 Major Extinction Event	
TRIASSIC	Late	230	
	Middle	241	
	Early	251 Major Extinction Event	
PHANEROZOIC	PERMIAN	Late	270
		Early	298
CARBONIFEROUS	Late	325	
	Early	354 Major Extinction Event	
PALAEOZOIC	DEVONIAN	Late	369
		Middle	384
	SILURIAN	Early	410
		Late	425
ORDOVICIAN	Late	434 Major Extinction Event	
	Early	466	
CAMBRIAN	Late	490	
	Middle	498	
	Early	509	
	545 First Appearance of Multi-cellular Organisms		
PROTEROZOIC	NEOPROTEROZOIC	1000	
	MESOPROTEROZOIC	1600	
	PALAEOPROTEROZOIC	2500	
ARCHAEAN	Beginning of Life	4560	

Dating Deep-Sea Rocks

The oceans of the world contain strontium with a uniform isotope composition. The levels haven't always been the same and over the millennia, with changes in geology and climate it has varied. This oceanic $^{87}\text{Sr}/^{86}\text{Sr}$ ratio is now very well characterised over the Ceneozoic period (today – 65.5 million years ago).

Fish, sea-shells and plankton contain strontium absorbed from sea water. When they die they sink and are buried in the sediment on the sea bed. Over geological time these sediments are turned into rocks. By analysing the $^{87}\text{Sr}/^{86}\text{Sr}$ of fossils we can work out the age of the sedimentary rocks in when they were found. This is called ‘Strontium Isotope Stratigraphy’.



Fish ears, otoliths



Planktonic Foraminifera ~0.5cm