DATA & DEFINITIONS

Material supplied:

Location and Character name disclaimer

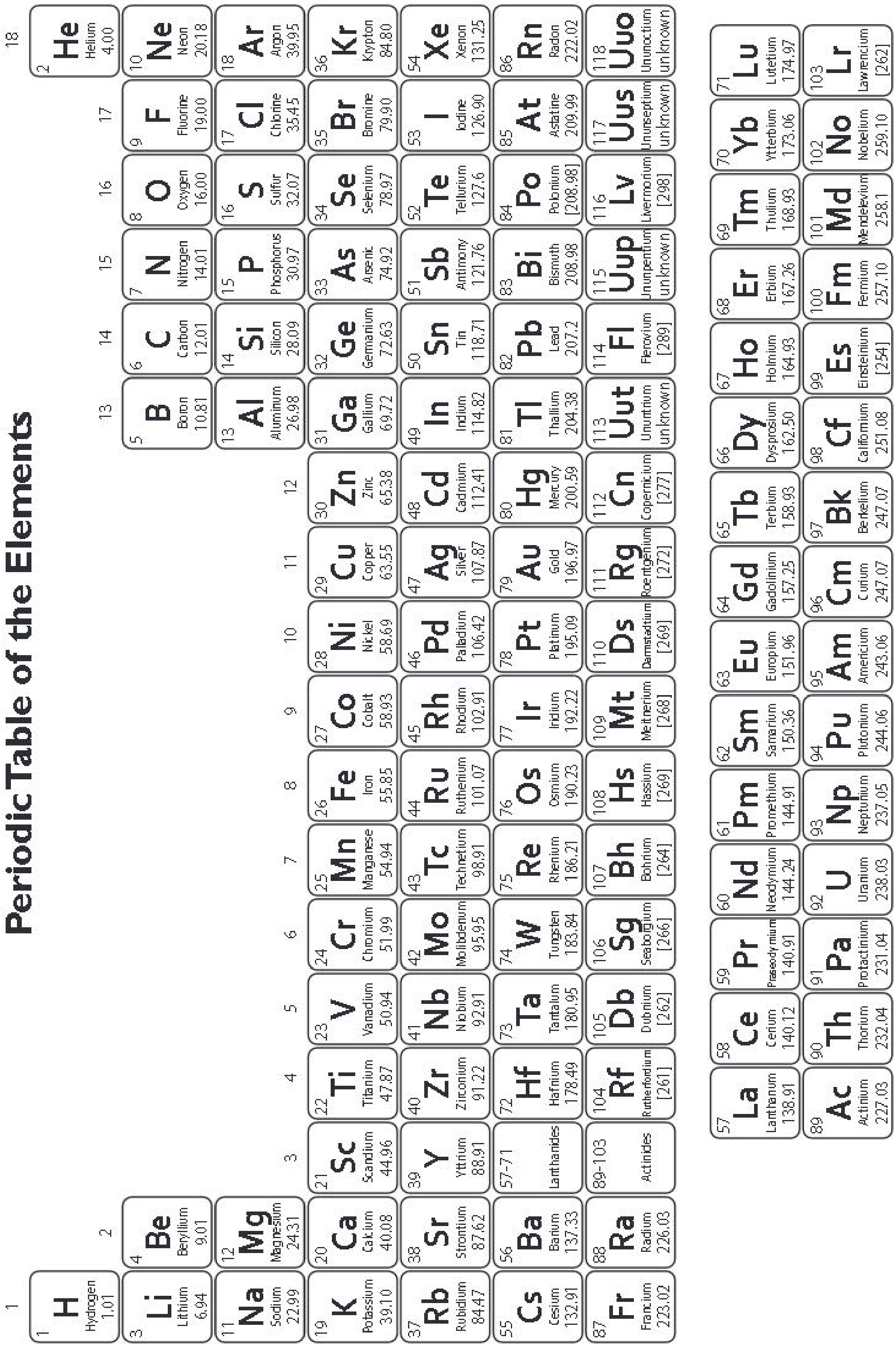
The characters and events portrayed in this paper are fictitious (but fun). Enjoy!

Locations on Earth, and the features they possess, are fictional unless otherwise stated (including those based on actual geography). Locations on other planets are real.

Physical constants and other useful information

Unit or constant	Symbol	Value
Astronomical unit	AU	1.496×10^{11} m
Light year	Ly	9.461×10^{15} m
Parsec	pc	3.261 light years = 3.085×10^{16} m
Speed of light	c	299,792,458 m/s ≈ 3×10^{8} m/s
Universal gravitational constant	G	6.67×10^{-11} Nm^2 kg^2

- Degrees Celsius (°C) to Degrees Kelvin (K): $T_{(°C)} = T_{(K)} - 273.15$

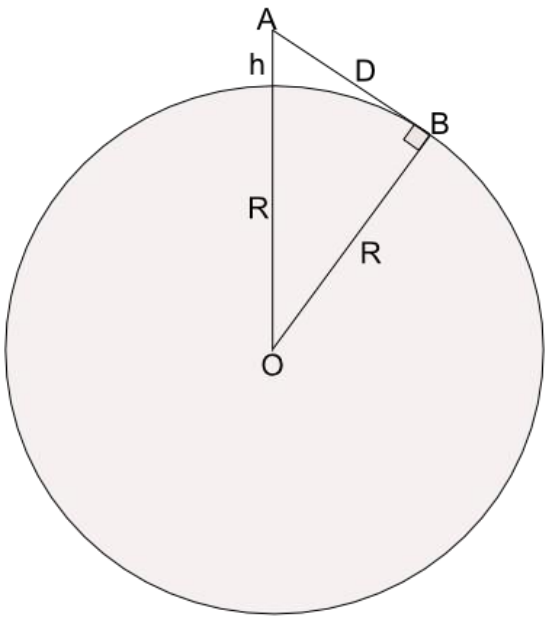


Periodic Table of the Elements

courtesy of http://sciencenotes.org/category/chemistry/periodic-table-chemistry/

Distance to the horizon calculation

-assuming the Earth is a sphere and there is no atmospheric refraction



Observer at A

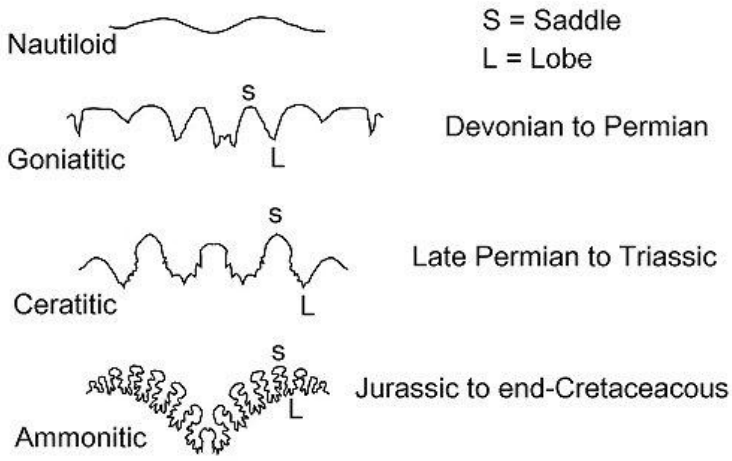
Horizon at B

h is observers height above sea level

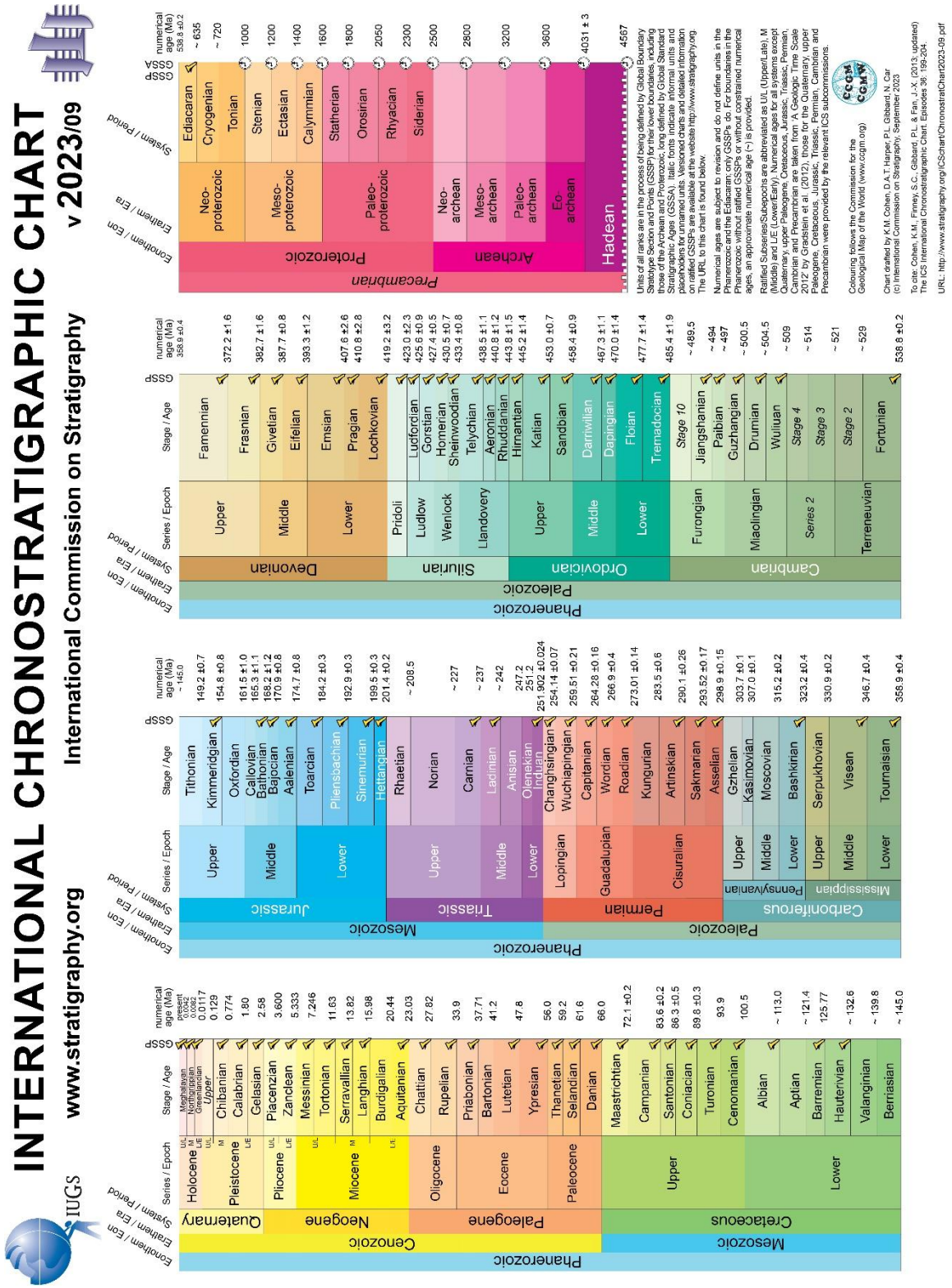
R is the radius of the sphere - for Earth this is 6371 km

D is distance A to B

Identifying different types of ammonites by their sutures



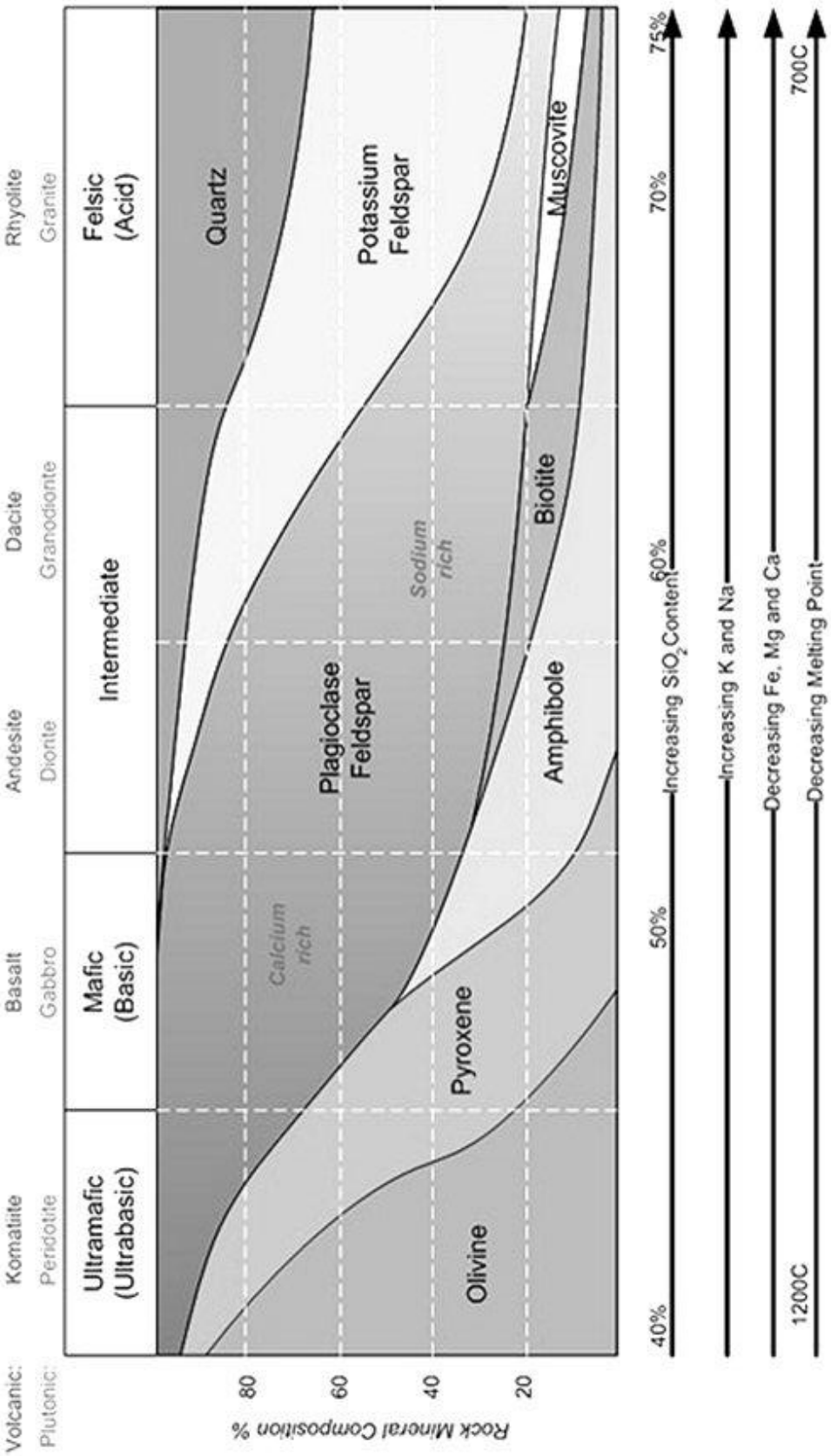
Nautiloids and Ammonites are cephalopod molluscs. Their shells vary from straight to tightly coiled and are divided into chambers by thin dividing walls (septa). Septa vary from very simple curved structures to extremely complex convoluted structures. Suture lines are formed by the intersection of the septa with the outer shell wall. These lines are only visible on external surfaces that have had most of the outer layers worn away to reveal the intersections between the shell wall and the septa.



International Chronostratigraphic Chart 2023/04 courtesy of

https://stratigraphy.org/chart

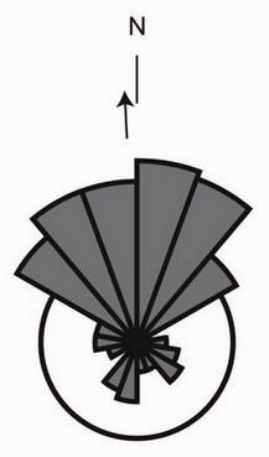
Note: Numerical age (Ma) means the age in millions of years



Igneous rock classification chart

Palaeocurrent patterns

The direction of flow of fluids depositing sediments can be determined from characteristic sedimentary structures constructed as the deposits are laid down. These structures include pebble imbrication, cross-lamination, cross-bedding, flute marks and the profile of ripples.

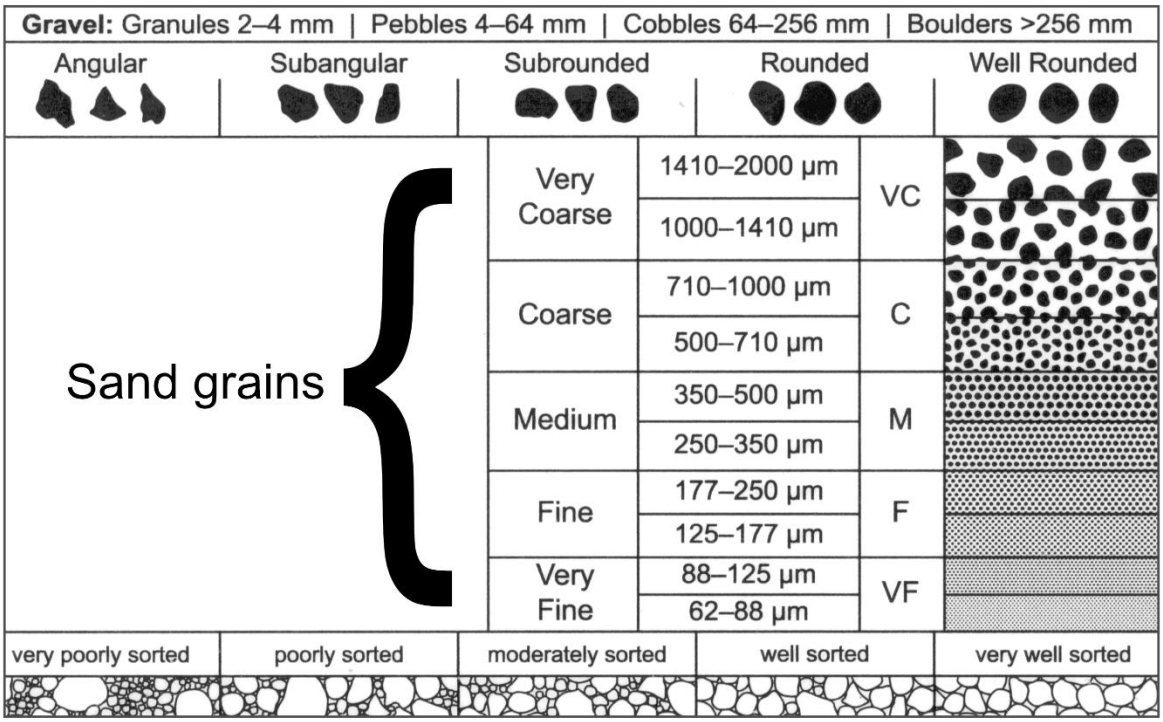


These structures can also be found in ancient sedimentary rocks, enabling the direction of flow at the time, the palaeocurrent, to be measured.

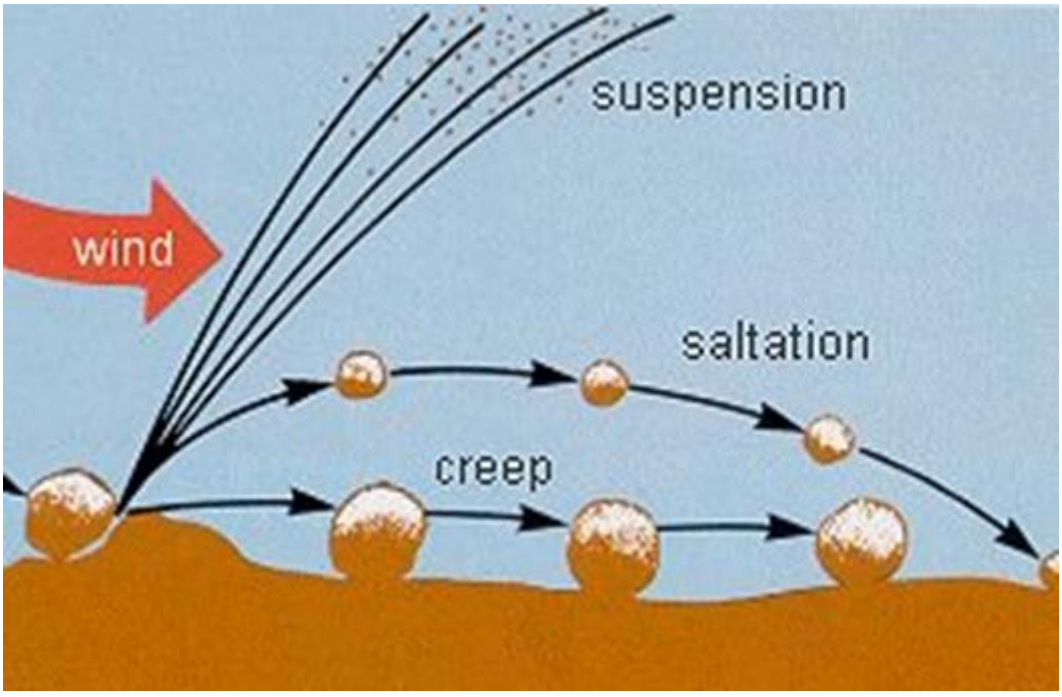
Visual representation of the data using a compass rose enables a quick insight into the nature of the depositional environment for each strata or group of strata. In this type of rose, each wedge represents a 'bin' of data for intervals of 5^{o} to as much as 30^{o}. The radial distance of each wedge is proportional to the frequency of the data in that bin.

When viewed this way patterns do emerge and these patterns are summarised below:

Environment of deposition	**Palaeocurrent vector pattern**	**Regional pattern**
River – braided	Unimodal – low variability	Often fan-shaped
River – meandering	Unimodal – high variability	
Wind blown dunes	Unimodal, bimodal or polymodal	Large variations over vast distances
Deltas	Unimodal	Radiating
Shorelines	Mostly bimodal	Mostly on-shore / off-shore
Marine turbidites	Mostly unimodal	Often fan-shaped



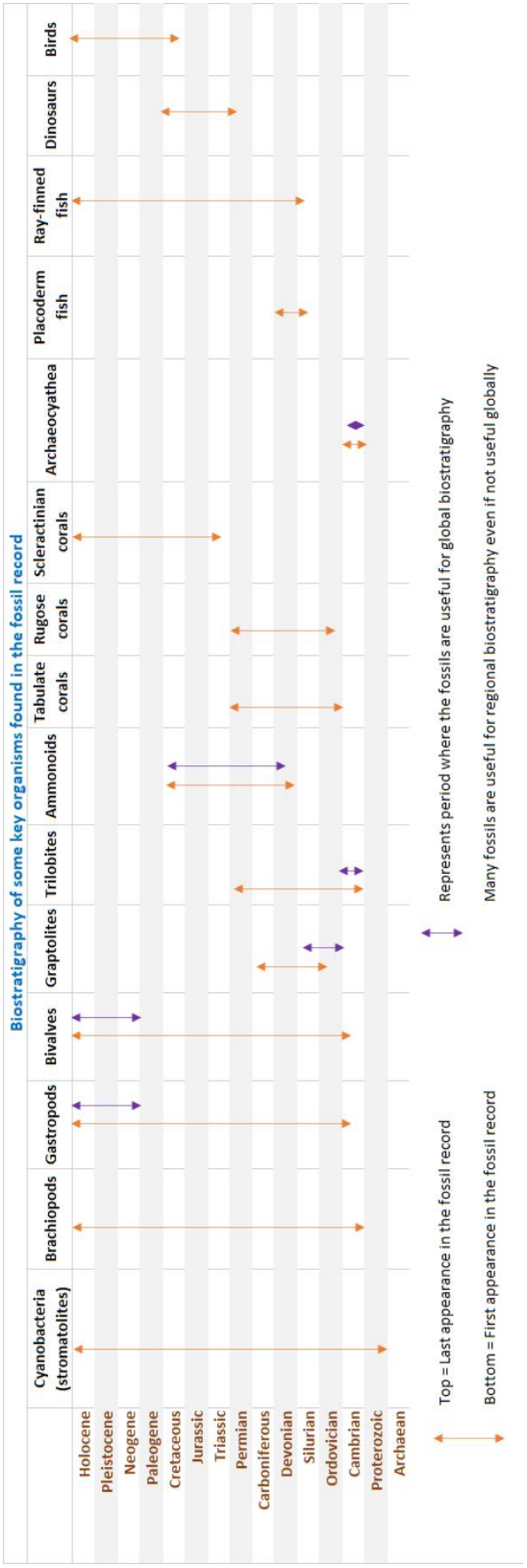
Grainsize chart, courtesy of the Geological Survey of NSW



Movement of sand by fluids. Sediments move, driven by fluid motion, by being pushed along or by rolling along the ground (creep), bouncing from one spot on the ground to the next (saltation) or by suspension in the fluid without touching the ground. The transport mode for any given grainsize will vary as the fluid velocity changes. Image source: https://en.wikipedia.org/wiki/Saltation_(geology)

Hardness	Example Minerals/materials
1	Talc
2	Gypsum
2.5	Fingernail, pure gold, silver, aluminium
3	Calcite, copper coin
4	Fluorite
4.5	Platinum, iron
5	Apatite, Pyroxene group (5 to 6)
6	Orthoclase feldspar, titanium, spectrolite, Pyroxene group (5 to 6)
6.5	Plagioclase feldspar, steel file, iron pyrite, glass, vitreous pure silica
7	Quartz, amethyst, citrine, agate, olivine, tridymite (high temp quartz)
7.5	Garnet, coesite (high pressure quartz)
8	Hardened steel, topaz, beryl, emerald, aquamarine
9	Corundum, ruby, sapphire
9.5	Carborundum
10	Diamond

Mohs Hardness Scale



Biostratigraphy of some key fossils