KING EDWARD VI COLLEGE

Stourbridge

2020-2022

Geology Student

Handbook & Workbook

Name: _____

INTRODUCTION

Congratulations on choosing Geology as one of your subjects. You have chosen to study an exciting, dynamic science that explores the planet on which we live. It will give you an appreciation of how the Earth developed into its present state, how it affects each and every one of us, and how we may be affecting it. This handbook is designed to prepare you for your first year of study and hopefully answer any questions you may have at this stage.

The first section is a 'handbook' which gives you vital information about the study of Geology, the details of your course, and gives you the opportunity to keep track of your progress. It must be kept in the front of your Geology file, as you will be using it throughout your course. At the end of the booklet you will find an Appendix of useful documents.

Your teacher is **Robyn Amos**. Lessons will take place in DD1.25 (room 5), you'll usually find me there or in the Earth Science office DD1.23 (room 3). Contact me by emailing robyn.amos@kedst.ac.uk. Please don't hesitate to email me over the summer if you have any questions ☺

AIMS OF THE COURSE

In Y12 and Y13 Geology you will:

- Develop an understanding of Geology, the branch of science concerned with the structure, evolution, and dynamics of the Earth and with the exploitation of the mineral and energy resources that it contains in a sustainable way.
- Gain a thorough understanding of the relevance of science today through your geological study.
- Apply physical, chemical, and biological principles to the investigation of the Earth, developing a distinctive scientific methodology, invoking internal and external Earth processes to explain the evolution of the planet through geological time.
- Apply geology to human activities and how we interact with the world around us.

THE COURSE

You are studying the Eduqas A level course in Geology (Eduqas used to be called WJEC). There are 11 modules that make up the course: Four at AS level (Year 12) known as the '**Fundamentals of Geology**', another seven at A2 level known as the '**Interpreting the Geological Record**' and '**Geological Themes**'.

An outline of the topics is given below as well as a link to the full detailed specification. Relevant excerpts from the specification will be included in each of the workbooks as we work through the course.

Fundamentals of Geology	**Interpreting the Geological record**	**Geological themes**
F1: Elements, Minerals & Rocks	G1: Rock forming processes	T1: Geohazards
F2: Surface & internal processes	G2: Rock deformation	T2: Geological map applications
F3: Time & change	G3: Past life & past climates	T3: Quaternary Geology
F4: Earth structure & global tectonics	G4: Earth materials & natural resources	

NB: Topics won't necessarily be studied in this order.

The complete specification for the course can be found online at:
https://www.eduqas.co.uk/qualifications/geology-as-a-level/#tab_overview
…and here is a link to a PDF of the specification:
https://www.eduqas.co.uk/media/rckbdnax/eduqas-a-level-geology-spec-from-2017-e-24-01-2020.pdf

ASSESSMENT

At the end of the course you will sit three exams and be awarded a grade A*-E:

- Component 1 Geological Investigations, 2.25 hour exam, 35% of qualification. Involves two short answer questions, and the interpretation of a geological map with associated specimens/ photographs.
- Component 2 Geological Principals and Processes, 1.75 hour exam, 30% of qualification. Involves six stimulus response questions.
- Component 3 Geological Applications, 2 hour exam, 35% of qualification. Involves two short stimulus response questions, questions associated with the interpretation of a Geological Survey map extract, and short questions based on chosen theme: Quaternary Geology.

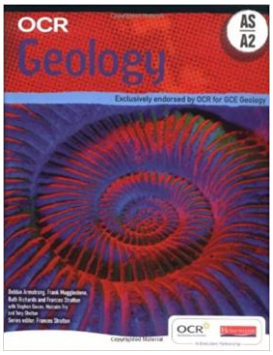
There is no coursework for Geology, but there are 20 Specified Practicals (SPs) which must be completed to meet the practical aspect of your qualification. This is similar to practicals you completed as part of your GCSE Science course, however while a few take place in the classroom, several practicals are completed in the field on our fieldtrips. You must provide evidence that you have completed all SPs and therefore you will be allocated an A4 folder to store this evidence in room DD1.25. These folders will always remain in DD1.25.

BOOKS

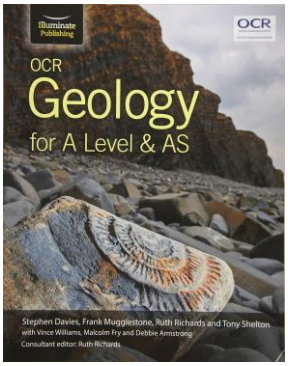
Reading (including research on the web) is essential for success at A Level. The more you read, whether it is a textbook or further reading, the better the geologist you will become. You should be prepared to broaden your knowledge and understanding of the subject of your own accord through extensive further reading. Once at College you'll find a good section in the Library that is devoted to Geology which you may use as a source for further reading or to help you with your homework. In DD1.25 there is a range of books that can be used during lesson time and if the classroom is free. But in the meantime there are a number of textbooks that can help you.

OCR GEOLOGY for A Level and AS

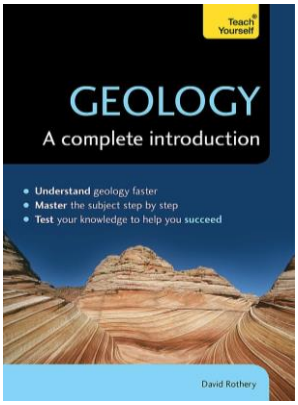
When you arrive at College you will be given a copy of this book to borrow for the two year course.



However, you may wish to purchase your own copy to get a head start over the summer, and if you do I would recommend this updated version published recently. We do have some copies of the updated version available in the College Library currently.



We use this textbook as it provides a good, comprehensive introduction to help you with the basics. It has some useful diagrams but is essentially an introduction book for another exam board so you need another reference to stretch you further.

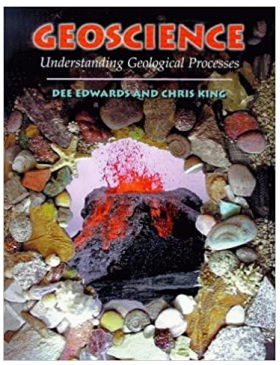


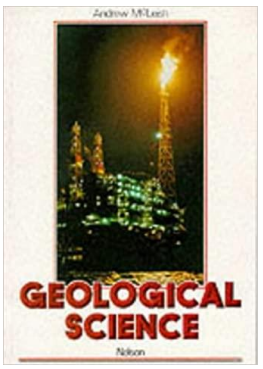
If you want to purchase a book to read over the summer which you won't have the opportunity to borrow once at College, I would recommend this one. It is a reasonably priced and particularly useful introductory book called **Geology: A Complete Introduction: Teach Yourself** by David Rothery.

Other textbooks you will have the opportunity to borrow once at College include:

GEOSCIENCE by Dee Edwards & Chris King
GEOLOGICAL SCIENCE by Andrew McLeish

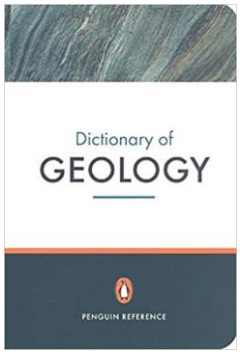
You may wish to purchase your own copy for reading over the summer, although these are aimed more at Y13 content beyond the basics.

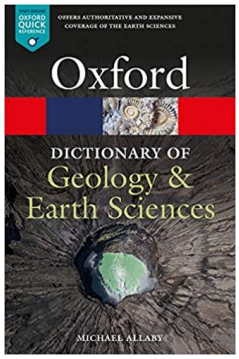


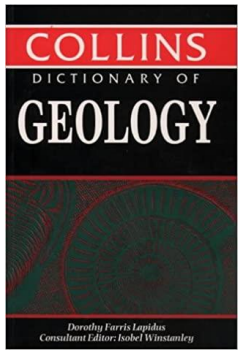


Geology has a language of its own, therefore, in addition to the course textbook I very strongly recommend that you buy a Dictionary of Geology. A Geologist's "DoG" is their best friend; you are expected to become familiar with the very wide range of technical geological terms if you are to communicate as a Geologist. There are several inexpensive versions available, you may even find a different version online which appeals to you:

- **Penguin Dictionary of Geology** by Philip Kearey
- **A Dictionary of Geology and Earth Sciences** by Michael Allaby
- **Collins Dictionary of Geology** by Dorothy Lapidus







As Geology is such a fascinating subject there are of course several TV shows which may appeal to you, many of which are available through online viewing platforms such as BBC iPlayer and All 4; although the whole series may not be available any longer sometimes shorter clips still are, which are worth watching too. I would recommend signing up for a free month's trial of Netflix or Amazon Prime Video over the summer and watching some of these:

Netflix recommendations:	Amazon Prime recommendations:	Other documentaries worth finding online:
• Into the Inferno (1 episode) • Chasing Coral (1 episode) • The Universe (series) • Walking with Dinosaurs (series) • Planet Earth (series) • Our Planet (series) • Blue Planet (series) • Blue Planet II (series)	• Voyage of the Continents (series) • Earth the Inside Story (1 episode) • Wonders of the National Parks (series) • The World's Greatest Geological Wonders (series) • Treasures of the Earth (series)	• Earth: the Power of the Planet • How Earth Made Us • Men of Rock • Journeys from the centre of the Earth • The Essential Guide to Rocks • How the Universe Works • The Rise of the Continents • Earth Story • Saving Planet Earth: fixing a hole (All 4) • Japan's Tsunami: Caught on Camera (All 4) • Episodes of Horizon

There is also an excellent Open University online Geology course.

CAREERS AND HIGHER EDUCATION

Where possible we will invite lecturers from universities to come and speak to you, and if practical we will try to attend study days offered by universities. If you are interested in a career in geology and would like more information or ideas for suitable work experience, please ask. Further info can be found at:

https://www.geolsoc.org.uk/geologycareerpathways

ACTIVITIES TO COMPLETE

On the following pages you will find activities for you to attempt over the summer. You may wish to print out this booklet and complete them by hand, or you may wish to add textboxes and complete the tasks digitally. Once you have completed the booklet bring a copy to your first Geology lesson in September. Completing the tasks will cover some basic geological skills and knowledge giving you a head-start with the A Level course.
I have designed an introductory activity for a handful of the following Topics:

Fundamentals of Geology	**Interpreting the Geological record**	**Geological themes**
F1: Elements, Minerals & Rocks	G1: Rock forming processes	T1: Geohazards
F2: Surface & internal processes	G2: Rock deformation	T2: Geological map applications
F3: Time & change	G3: Past life & past climates	T3: Quaternary Geology
F4: Earth structure & global tectonics	G4: Earth materials & natural resources	

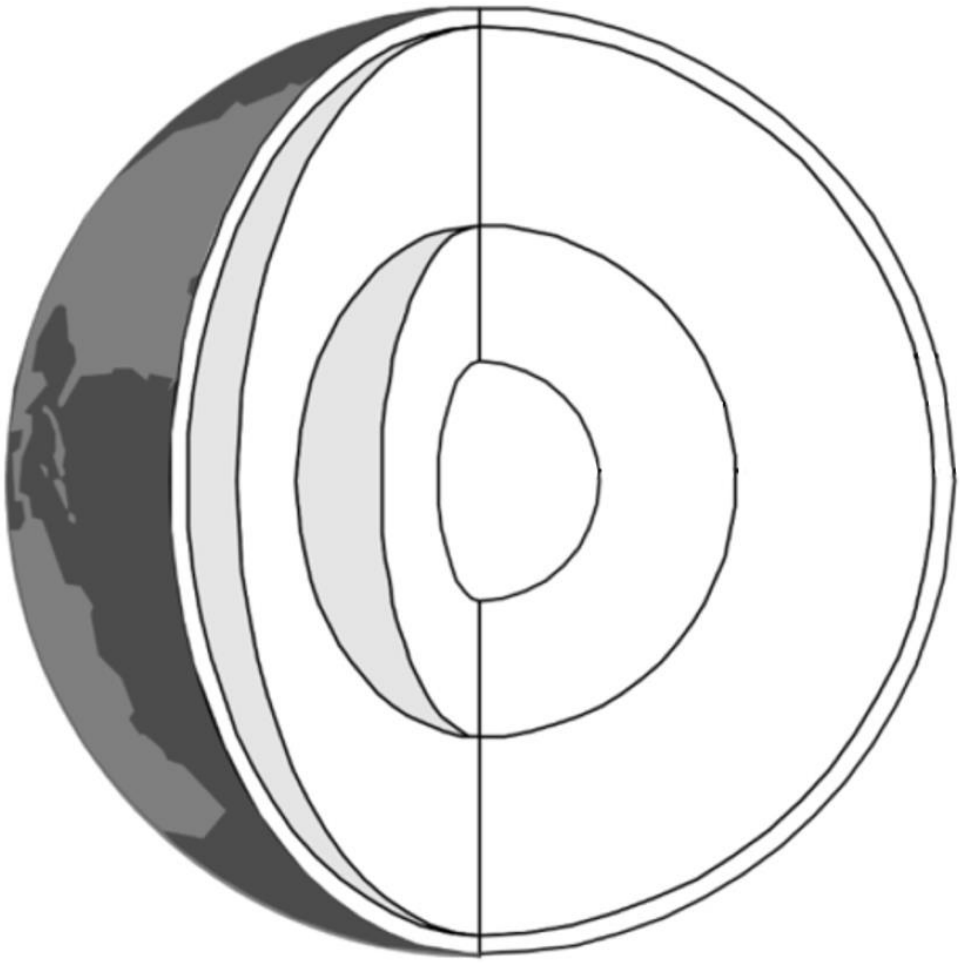
For the first task, use the letter key to label the tectonic plates of Earth's crust on the map below. Then go over the plate boundaries using three different coloured pens.

One colour should represent **constructive** plate boundaries where two plates are pulling apart.
The second colour should represent **convergent** plate boundaries where the two plates are colliding.
The third colour for **conservative** boundaries where the two plates are moving past one another.

A. Pacific Plate
B. North American Plate
C. South American Plate
D. Eurasian Plate
E. African Plate
F. Antarctic Plate
G. Australian Plate
H. Indian Plate
I. Arabian Plate
J. Juan de Fuca Plate
K. Nazca Plate
L. Cocoas Plate
M. Caribbean Plate
N. Philippine Plate
O. Scotia Plate

Understanding the internal structure of the Earth is essential for any Geologist. Research the following terms and annotate the diagram with as much information as you can find about each layer. For example, how thick is the layer, what is it made of, which types of earthquake wave can pass through it.

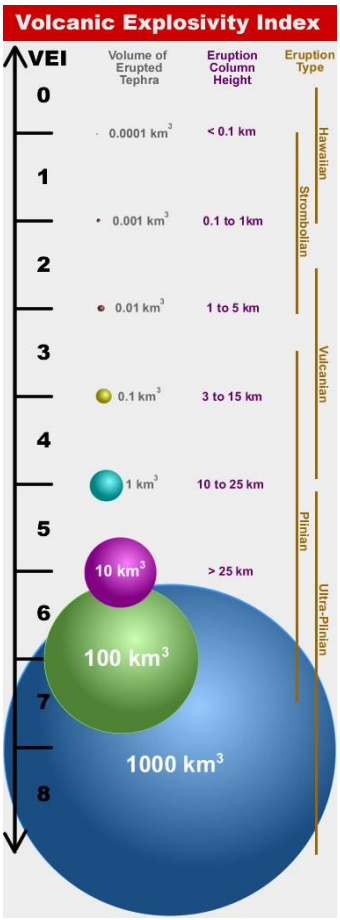
- **Crust**
- **Mantle** (you can divide this into upper and lower by adding a boundary)
- **Outer Core**
- **Inner Core**



Studying natural hazards is an essential part of Geology. The magnitude of earthquakes is recorded on a scale. The table lists 10 significant earthquakes that have occurred in the last 100 years or so. The table records the location of each, it's magnitude, and the number of human fatalities (if any). Fill in the yellow gaps, then label all 10 earthquakes on the world map below using the letters as a key.

	Date	Epicentre	Magnitude	Fatalities (if any)
A.		Léogâne, Haiti	7.0	46,000-316,000
B.	March 25th 1998	Balleny Islands, Antarctica	8.1	0
C.	March 27th 1964	Prince William Sound, Alaska, USA	9.2	131
D.	December 28th 1908	Messina, Italy		123,000
E.	September 22nd 2002	Dudley, West Mids, England	4.7	0
F.		İzmit, Turkey	7.6	17,127
G.	December 26th 2004	Indian Ocean	9.1-9.3	
H.	December 13th 1982	Dhamar, Yemen	6.2	2,800
I.	September 1st 1923	Kantō region, Japan	7.9	
J.	September 19th 1985		8.0	10,000

Another natural hazard that Geologists study is Volcanic eruptions. They are recorded on the Volcanic Explosivity Index. The table lists 10 significant eruptions that have occurred in the last 100 years or so. The table records the name and location of each volcano, it's VEI number, and the number of human fatalities (if any). Fill in the yellow gaps, then label all 10 volcanoes on the world map below using the letters as a key.



	Name of volcano	Country	Year	V.E.I number	Human fatalities (if any)
A.	Mt. Pelée	Martinique		4	33,000
B.	Bezymianny	Russia	1955-57	5	0
C.	Taal	Philippines	2020	4	39
D.	Nevado Del Ruiz	Colombia	1985	3	
E.	Eyjafjallajökull	Iceland		4	0
F.	Cerro Azul	Chile	1932	5	0
G.	Mount Pinatubo	Philippines	1991	6	
H.	Volcán de Fuego		2018	3	190
I.	Mount Nyiragongo	DR Congo	2002	1	147
J.	Mount St Helens	USA	1980		57

Just like a Chemist uses a periodic table, a Geologist uses a chronostratigraphic chart. You'll find an up-to-date version of this at the end of the booklet.

You'll refer to a chart like this regularly. But it's still important to learn a little about each of the main Geological Periods. These are listed below in a table, followed by a mnemonic to help remember their order. Fill in as much information as you can about each period. Use internet research and the chart at the end of the booklet to help you. The interesting fact could be about the Geologist who first named the Period, or how the Period got its name. Perhaps the Period ended with a significant mass extinction. Use your imagination!

Name of Period	Dates	Typical organisms	Interesting fact	
Quaternary		Sabre-toothed tiger (Smilodon) and Giant Sloths		
Neogene	23 to 2.5 Ma			
Palaeogene			The time after which Dinosaurs had become extinct allowing mammals to diversify	
Cretaceous				
Jurassic	201 to 145 Ma			
Triassic			The Triassic was named after 3 distinct rock layers (*tri* meaning "three") found in Germany and NW Europe	

Permian				Younger in age
Carboniferous		Plant life dominated. Also, giant dragonflies and millipedes.		
Devonian		First amphibians		
Silurian				
Ordovician				
Cambrian	541 to 485 Ma		Named after Cambria (Latin name for Wales) where Britain's Cambrian rocks are best exposed	
Precambrian	Older than 541 million years ago (Ma)			

Can you think of a better way to remember the geological periods in order?

P – C – O – S – D – C – P – T – J – C – P – N – Q

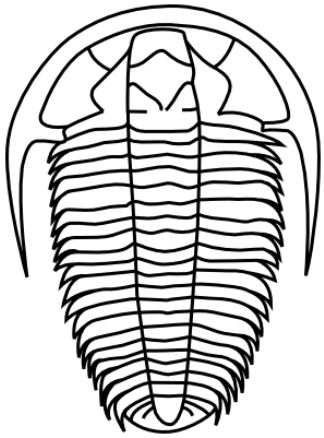
As well as rocks and minerals, Geologists also study fossils. One example is the **Trilobite**. Research trilobites to answer the following questions.

How old (in millions of years) are the oldest trilobites?

_____

When did trilobites become extinct?

_____

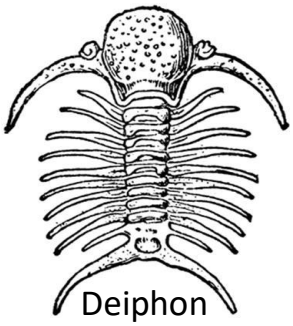


Label the following parts of a trilobite fossil:

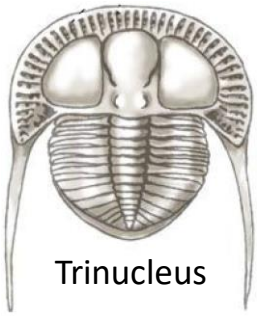
- Glabella
- Pygidium
- Genal spines

Can you find the names of any other parts?
If so, label them too.

Trilobites were marine organisms, they lived in the sea. Many different species of trilobite evolved to survive in different marine conditions. Research the following two trilobites. Why do they look so different? What were their various parts used for? Hint: think about how they moved (crawling, swimming) and how they fed.



Deiphon



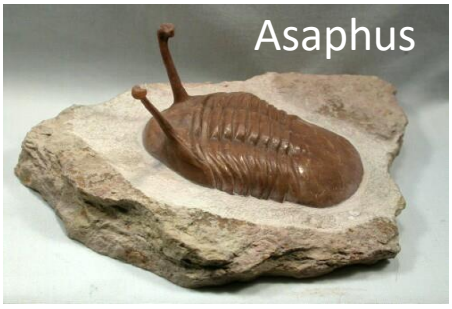
Trinucleus

Some trilobites like this one had their eyes on stalks. What do you think would be the evolutionary advantage of this?

_____

_____

_____



As you study Geology, you'll begin to appreciate that it's like conducting a CSI (crime scene investigation) of Earth's history using rocks and fossils.

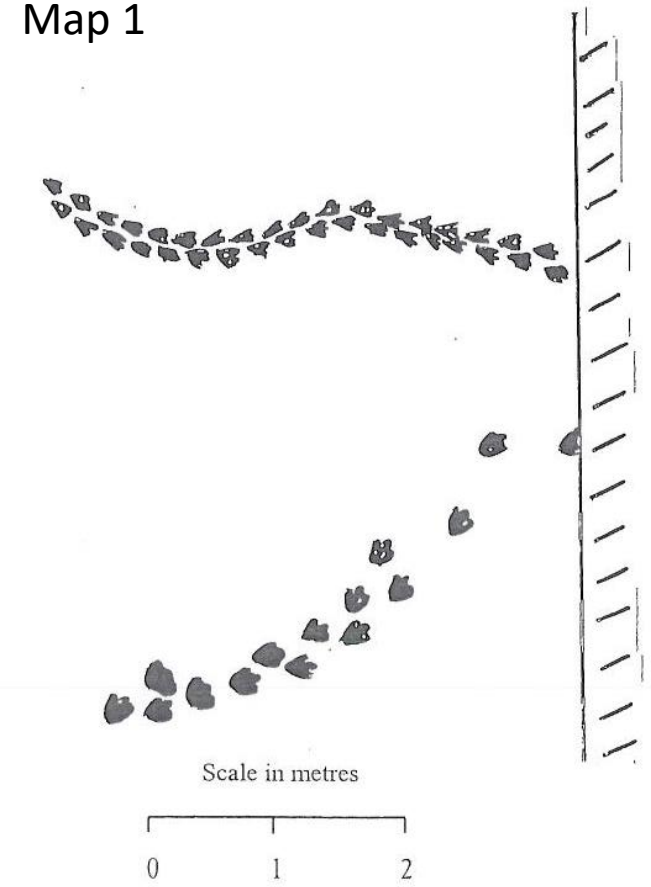
The Earth cannot speak to us and tell us what has happened, we need to figure it out. Let's practise your skills using **Dinosaurs** as an example.

Introduction

This is an exercise which involves you making deductions based on fossil evidence which has been uncovered in a quarry. There is no right or wrong answer.

200 million years ago where the quarry now stands was a lake. The lake was a popular haunt for all sorts of animals of the day such as Stegosaurus, Triceratops and the mighty Tyrannosaurus Rex. The lake was surrounded by fine-grained sands and muds which are excellent for preserving footprints. The hot, dry climate also helped in preservation by drying the prints out before the action of the water destroyed them. These footprints can tell us a great deal about the animals that made them.

Map 1



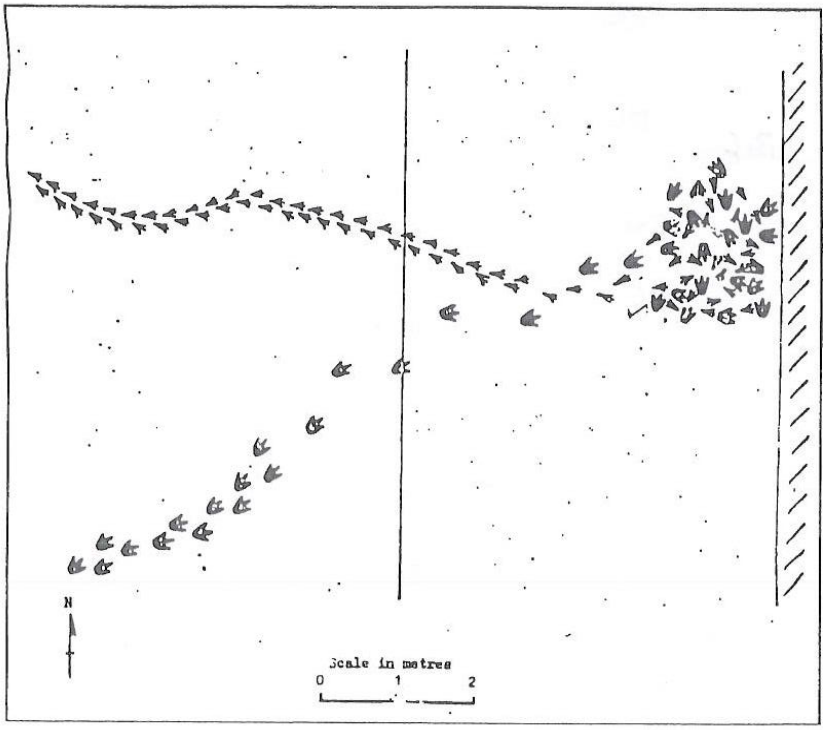
Study Map 1.

1. What could the footprints tell us about the dinosaurs themselves? E.g. type, number, size

2. Think of theories which could explain the pattern of footprints leading up to the quarry wall

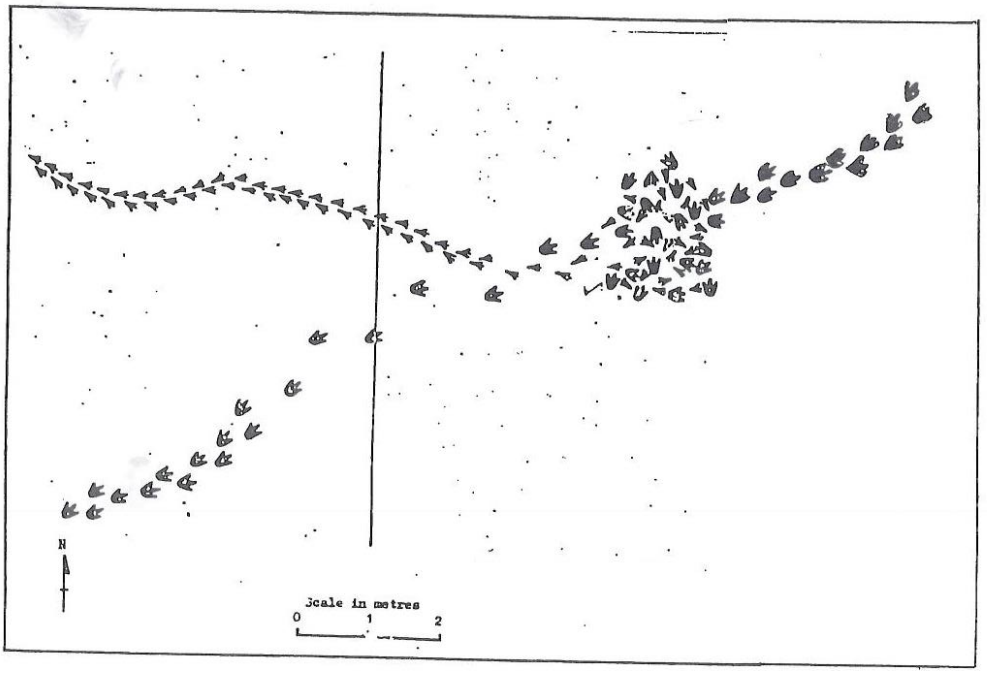
3. What evidence would you expect to find when the quarry wall moves back to support your theory?

Map 2



Now the quarry has moved back, have you changed your previous answers?

Map 3



The quarry wall has been moved back by a further 5 metres exposing more of the fossil tracks.

Were you right? Say which of your theories best fits the latest evidence. Does this evidence change your ideas of why each dinosaur was on the mud flat? If so, how?

INTERNATIONAL CHRONOSTRATIGRAPHIC CHART

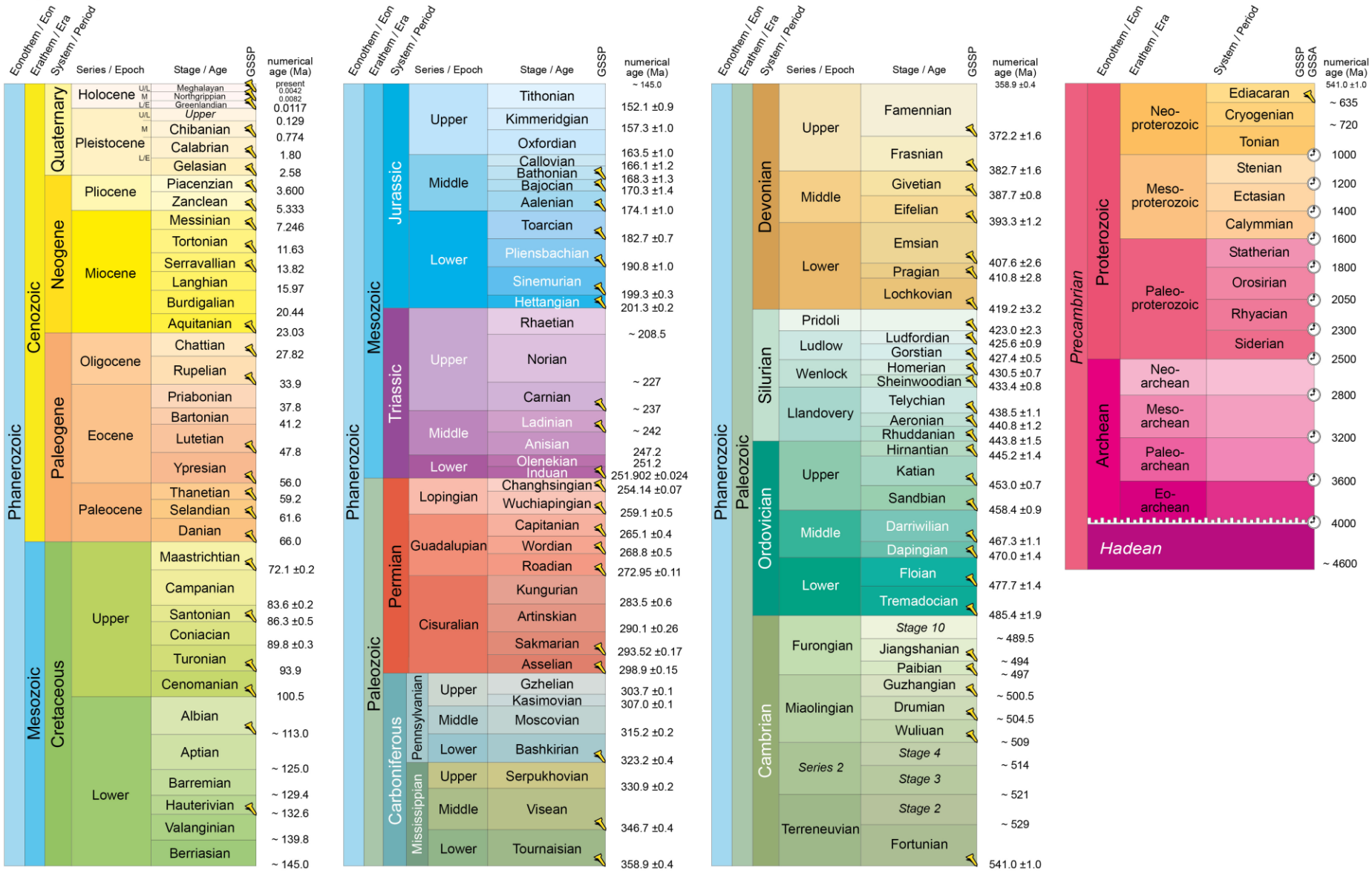
IUGS

www.stratigraphy.org

International Commission on Stratigraphy

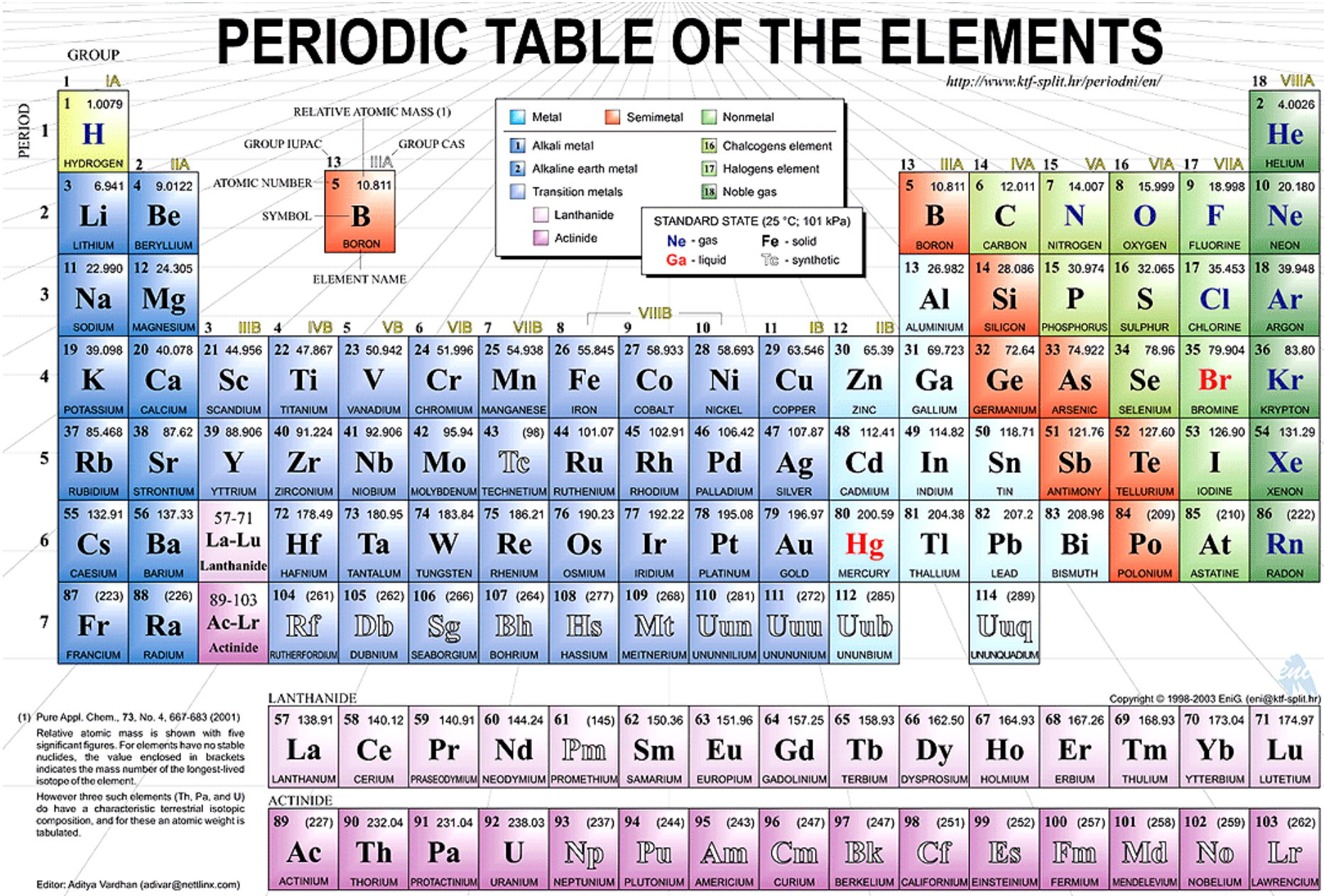
v 2020/01

Appendix



PERIODIC TABLE OF THE ELEMENTS

http://www.ktf-split.hr/periodni/en/



(1) Pure Appl. Chem., 73, No. 4, 667-683 (2001)

Relative atomic mass is shown with five significant figures. For elements have no stable nuclides, the value enclosed in brackets indicates the mass number of the longest-lived isotope of the element.

However three such elements (Th, Pa, and U) do have a characteristic terrestrial isotopic composition, and for these an atomic weight is tabulated.

Editor: Aditya Vardhan (adivar@nettlinx.com)