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ENGLISH FOR THE EARTH SCIENCES

An ESP Textbook for Intermediate and Advanced Students

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Unit 1 – The Hadean Eon

I.

Deep Time

Layered into all the evidence for how the Sun, the Earth, and the rest of our Solar System were born is the concept of immense time spans—4.5 billion years and counting. Americans love to quote the dates of famous events in human history. We celebrate great accomplishments and discoveries, like the Wright brothers' first flight on December 17, 1903, and the first manned Moon landing on July 20, 1969. We recount days of national loss and tragedy like December 7, 1941, and September 11, 2001. And we remember birthdays: July 4, 1776, and, of course, February 12, 1809 (the coincident birthdays of Charles Darwin and Abraham Lincoln). We trust the validity of these historic moments because an unbroken written and oral record links us to that not-so-distant past.

Geologists also love to quote historic time markers: about 12,500 years ago, when the last great glaciation ended and humans began to settle North America; 65 million years ago, when the dinosaurs and many other creatures became extinct; the Cambrian boundary, at 530 million years ago, when diverse animals with hard shells suddenly appeared; and more than 4.5 billion years ago, when Earth became a planet stroll through time. Each stride to the north exposes slightly older layers.

To get a sense of the scale of Earth history, imagine walking back in time, a hundred years per step—every pace equal to more than three human generations. A mile takes you 175,000 years into the past. The twenty miles of Chesapeake cliffs, a hard day's walk to be sure, correspond to more than 3 million years. But to make even a small dent in Earth history, you would have to keep walking at that rate for many weeks. Twenty days of effort at twenty miles a day and a hundred years per step would take you back 70 million years, to just before the mass death of the dinosaurs. Five months of twenty-mile walks would correspond to more than 530 million years, the time of the Cambrian "explosion"—the near-simultaneous emergence of myriad hard-shelled

animals. But at a hundred years per footstep, you'd have to walk for almost three years to reach the dawn of life, and almost four years to arrive at Earth's beginnings.

(Robert Hazen, *The Story of Earth)*

Reading Comprehension

1. Why does the author mention so many dates?
2. What does the author mean by '[e]ach stride to the north exposes slightly older layers'?
3. What does the author mean by 'to make even a small dent in Earth history'?
4. Why does the author make the analogy between the passing of time and walking?

Vocabulary in Context

Provide contextual synonyms for the following words from the text:

accomplishment	
to recount	
validity	
unbroken	
stroll	
stride	
rate	
emergence	

Fill in with the appropriate word: *a (an), per, every, every other, each.*

The course takes place..... Thursday, that is twice a month.
A hike ..... day keeps the doctor away.
We meet three times..... week and discuss the importance of clean energy.
.....geological era exhibits specific traits.
The speed of the drill reaches fifty meters .....hour.
This is a weekly seminar, and it takes place..... Monday.
The students' symposium is organized..... year. The next one will be in 2026.

.....recent geological era seems to have witnessed at least an extinction or two.
The fee is only a couple of dollars..... hour.
.....epoch of the Quaternary has been marked by human ingenuity.

Look back at the text and fill in with the right preposition or particle:

The discovery linked the level of nitrogen.....the emergence of life on Earth.
The stratum corresponds.....the Little Age glaciation episode.
The mission on the Moon was manned .....four astronauts.
The distance is equal .....ten loops around the Sun.
Our journey.....time will start with the formation of diamonds.

Language in Use – Numbers, Numbers, Numbers

Even short excerpts, like the one above, can be packed with numbers, so let's have a closer look at this topic in English.

NUMERALS IN ENGLISH

Fill in with the rest of the numbers:

CARDINAL		ORDINAL	
1	one	1st	first
2	two	2nd	second
3	three	3rd	third
4		4th	fourth
5			fifth
6			
7			
8			eighth
9			
10			

11			
12			twelfth
13	thir**teen**	13th	
14			
15			
16		16th	
17			seventeenth
18			
19	nine**teen**		
20	twen**ty**		twentieth
21	twen**ty**-one	21st	twenty-first
22	twen**ty**-two	22nd	twenty-second
26	twen**ty**-six	26th	twenty-sixth
30	thir**ty**		
40			
50	fif**ty**		
60			sixtieth
70			
80			
90	nine**ty**		ninetieth
100	hundred		hundredth
1,000	thousand		thousandth
1,000,000	million		millionth
1,000,000,000	billion		
1,000,000,000,000	trillion		
1,000,000,000,000,000	quadrillion		

NOTA BENE:

RO: 1.234,5 (o mie două sute treizeci și patru **virgulă** cinci)
EN: 1,234.5 (one thousand two hundred thirty-four **point** five)

Let's practice!

Write the following numbers in letters:

The anatomy of the Earth does not seem very complicated. Our planet's internal structure consists of a metal inner core, which has a radius of **1,220** kilometres and is situated at about **6,450** to **5,181** kilometres beneath the surface of the Earth, an outer core, which is in liquid form and is located some **5,182** to **2,888** kilometres from the surface, the mantle, which is **3,000** kilometres or **1,865** miles in thickness, and the crust, which is only about **30** to **70** kilometres thick. Temperatures in the core reach **5,400.9°** Celsius or **9,800°** Fahrenheit, and the pressure here is **3,000,000,000** times greater than on the surface, where we all live. Also, every **200,000** to **300,000** years, Earth's magnetic field switches and the Poles are reversed. Isn't that interesting? What do you think will happen **50,000.5** years from now?

"What is **300** times **400**?"
"What do you mean? Do you mean **300** multiplied by **400**?"
"Yes, that's it. Is it **1,200** or **12,000** or **120,000.12**?"
"How could it equal **120,000.12**?"
"You're right! It's definitely **1,200,000.12**. Now, divide that by **22** and raise it to the power of 2. Is it **600,000,000**?"
"You're quite far off the mark and you seem to have lost the **.12** somewhere."
"I know, Math is so hard. Do you think the final answer is **-6,000,000,000**?"

DATES AND YEARS IN ENGLISH

1. Dates (can appear differently, depending on the version of English)

British English:	15th April	- the 15th // the fifteenth **of** April
	2nd June	- the 2nd // the second **of** June
American English:	April 15, 2024 – April 15 fifteen / fifteenth	
	June 2, 2024 – June second	

2. Years (the numbers are typically read by twos)

18*76*	–	**eighteen** *seventy-six*
1907	-	nineteen-**oh**-seven
1999	-	nineteen ninety-nine
2007	-	two thousand-and-seven
2011	-	two thousand-(and)-eleven // twenty eleven
1300**s**	-	the thirteen hundred**s**
1760**s**	-	the seventeen sixt**ies**
1990s	-	the nineteen nineties
50s	-	the fifties
40s	-	the forties

20s ---- **early** twenties (20,21,23) **mid** twenties (24,25,26) **late** twenties (27,28,29)

Write the following years in letters or read them out loud.

On **2 September 1945** the Second World War came to an end, leaving the world divided. In the late **40s** and the early **50s**, the gap between East and West deepened. In **1955** the Race to Space was officially on and on **20 July 1969** it ended when the Americans landed on the Moon, unveiling some of its secrets. But many more secrets remain. For instance, did you know that because of the moon the day on Earth has increased by 1.09 milliseconds per century since the late **1600s**? Or that in **2007** scientists accurately modelled the creation of the Moon? Or that computer simulations from **2023** suggest that a part of the body which hit the Earth and formed the Moon may still be present inside the Earth?

But on the geological time scale, how can we handle great spans of years?

Fill in with the appropriate word: eon, era, period, epoch, subepoch, age.

When talking about millions or tens of millions of years, we generally use the term ……...
The ……..is such a large geochronologic time unit that there are only four in the history of the Earth.
The Palaeozoic …….. ended with a great extinction event.
The smallest geochronologic unit is a/an……..
Hundreds of thousands of years make up a/an …….
The use of a/an …… as a geochronologic unit of time became official only in 2022.

What do these abbreviations stand for?

Kyr/Ky –

M –
Myr/ Mya -
Ma –

B/Bn -
bya / b.y.a.–

Gya –
Ga -

II. Present Simple and Present Continuous

Let's look back:

Americans **love** to quote the dates of famous events in human history. We **celebrate** great accomplishments and discoveries […]
We **recount** days of national loss and tragedy[…]
We **trust** the validity of these historic moments because an unbroken written and oral record **links** us to that not-so-distant past.
Each stride to the north **exposes** slightly older layers.

All these are examples of the Present Simple, a tense you will use and encounter often. So, let's have a closer look and let's compare it with the Present Continuous.

These two tenses are meant to be complementary, so they ought to be learnt in tandem.

FORMS

Present Simple	Present Continuous
(+) S+ vb short infinitive + S/ES (3rd p.sg.) *When is the "ES" used?	(+) S+ AM/ ARE/ IS + vb ING
(-) S + DON'T/ DOESN'T + vb short infinitive	(-) S+ AM NOT/ AREN'T/ ISN'T +vb ING
(?) DO/ DOES + S+ vb short infinitive?	(?) ARE/ IS +S+vb ING?

CONTEXTS OF USE

Present Simple	Present Continuous
-habitual: a repeated event in the present Adverbs: every day, on Mondays, in the morning, etc. Eg. I **read** a book before bedtime. -generic: an event which is considered generally, universally true Eg. I **am** short./ Titanic **lasts** three whole hours. I **work** as a lab assistant. The Sun **rises** in the East./ Wood **floats** on water.	-temporary: an event in full progress at the moment of speech Adverbs: currently, right now, at the moment, etc. Eg. I **am reading** a good book at the moment. -temporary: an event taking place only for a limited period of time Adverbs: this term, this year, etc. Eg. I **am working** at Nasa this year. I **am feeding** the cat while Jill is on holiday.
-future value: official schedule Eg. The academic year **resumes** on the 1st of May. The train **leaves** at five o'clock. -temporal/ conditional clauses (will/would)	-future value: personal plans Eg. I **am starting** school later than planned. He **is leaving** with the five o'clock train. They **are buying** their parents a laptop. She **is meeting** her sister for a drink.

Eg. I will give you the money/ when you **come**./ I will give you the money/ if you **come**./	
-instantaneous: in live comments Eg. Hagi **gets** the ball, he **shoots** and he **scores**! I **take** the phosphorus, **grind** it and **add** it to the mixtures.	-showing a process: a progression of some sort Common phrases: more and more, less and less, larger and larger Eg. The weather **is growing** colder and colder. Students **are becoming** more and more engaged with the subject.

Some problems with the ING

Special attention should be given to the use of the following categories of verbs:

-Verbs of feeling don't take the ING: to like, to love, to abhor, to hate, to dislike, etc.

Eg. I **love** Math./ I **dislike** swimming.

-Verbs of sensory perception only sometimes take the ING (when agency/ intentionality is emphasized) : to see, to hear, to feel, to taste, to smell

Eg. I **see** you. (Te văd.)// vs.// I am seeing Jimmy tonight. (I am meeting you, on purpose)

I **smell** coffee. (Miroase a cafea.)// vs. // I am smelling the perfume. (I am intentionally smelling the perfume)

-Verbs of mental perception take the ING only when there is an intense mental process:

to think, to consider, to believe, to judge, etc.

Eg. I **think** this is nice. (Cred...) // vs. // I am thinking of buying a car. (Mă gândesc să…)

-Miscellaneous: to be, to to want, to need, to seem, to appear, etc.

Eg. He **is** mean.(Este rău.)// vs. // He is being mean. (Se comportă răutăcios.)

He **needs** money now.

This **seems** to be a futile gesture.

Let's practice!

1. Fill in with the Present Simple or Present Continuous.

I…….(to go) to the museum every Friday night.
It…….(to snow) heavily in winter.
What ……..(you- to do) now? Oh, right! That is exactly what you……(to do) every night.
My best friend ……..(to wash) rock specimens this semester, since he ……..(to need) extra credit for this class, if he ever ……..(to want) to pass, that is.
Currently, I ……. (to draw) the last details on my map and next Saturday I……..(to write) the report for the Cartography seminar. I ……(to hope) I'm going to get a good grade on it.
……(you- to think) this opal is pretty? // ……(you- to think) what I ……(to think)? Yes, we should look at it under the microscope.
They……..(to read- neg) right now, they ……(to watch) a documentary about the internal structure of the Earth. When it……(to end), they will have to start reading that book.
We……(to water) the plants on Sundays.
…… (he- to listen) to the instructor at the moment?
The paleontological conference……..(to begin) at the end of April next year and I……(to consider) a suitable proposal. As soon as I ……..(to decide), I will talk to my professor.
No, no! You ……..(to do) it wrong! Let me show you. You ……(to grab) the hard hat and the safety goggles first, then you…….(to put) them on. And after this you ……(to pick up) the hammer, ……(to hit) the rock and the fossil ……(to appear).
The climate ……..(to become) hotter and hotter with each decade that …….(to go) by.
The moment you……(to find out) the bibliography, please call me. I ……(to know) that right now I ……(to understand- neg) anything in this class, so I must hit the books as soon as humanly possible.
Sophie ……(to fly) to Berlin next November because she ……(to wish) to see the Stegosaurus skeleton. In addition, she …….(to visit) the special dino exhibition before it ……..(to come) to an end in late November.