BIOL 1620

Instructor: Dr. Geoff Zahn (gzahn@uvu.edu)
OFFICE: Biology Suite, 243c

Please fill out the following on a ½ sheet of paper:

1. Full Name
2. What you want from this class (i.e., why are you taking it?)
3. Your favorite species/organism
4. What, in your opinion, is the worst environmental disaster in history?

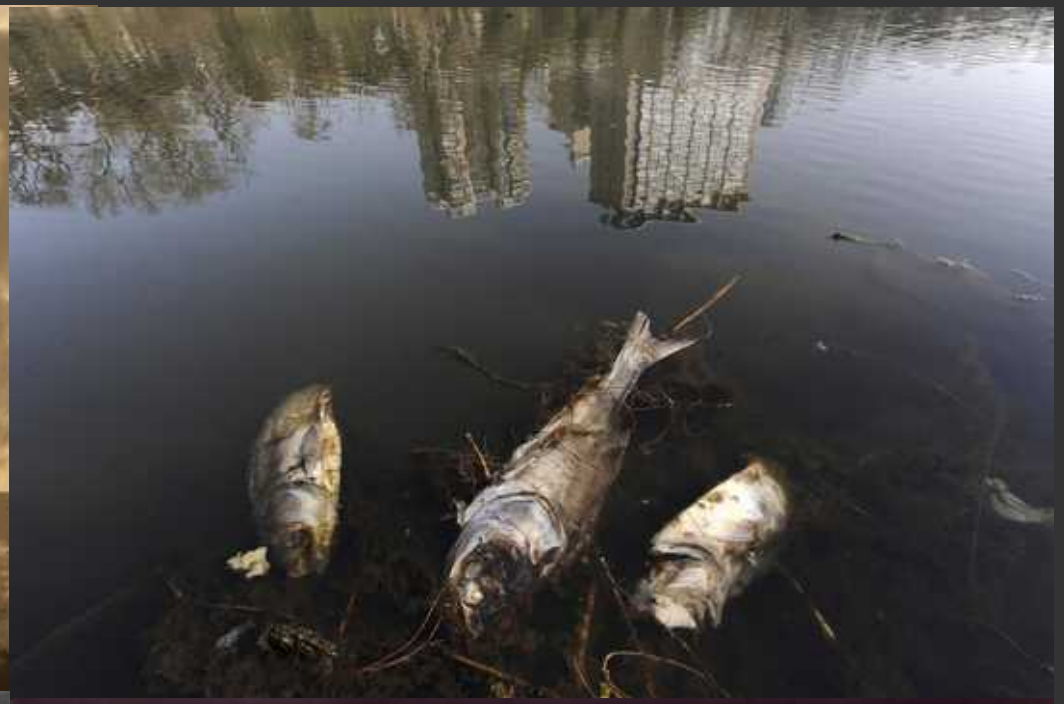
Name: Dr. Geoff Zahn

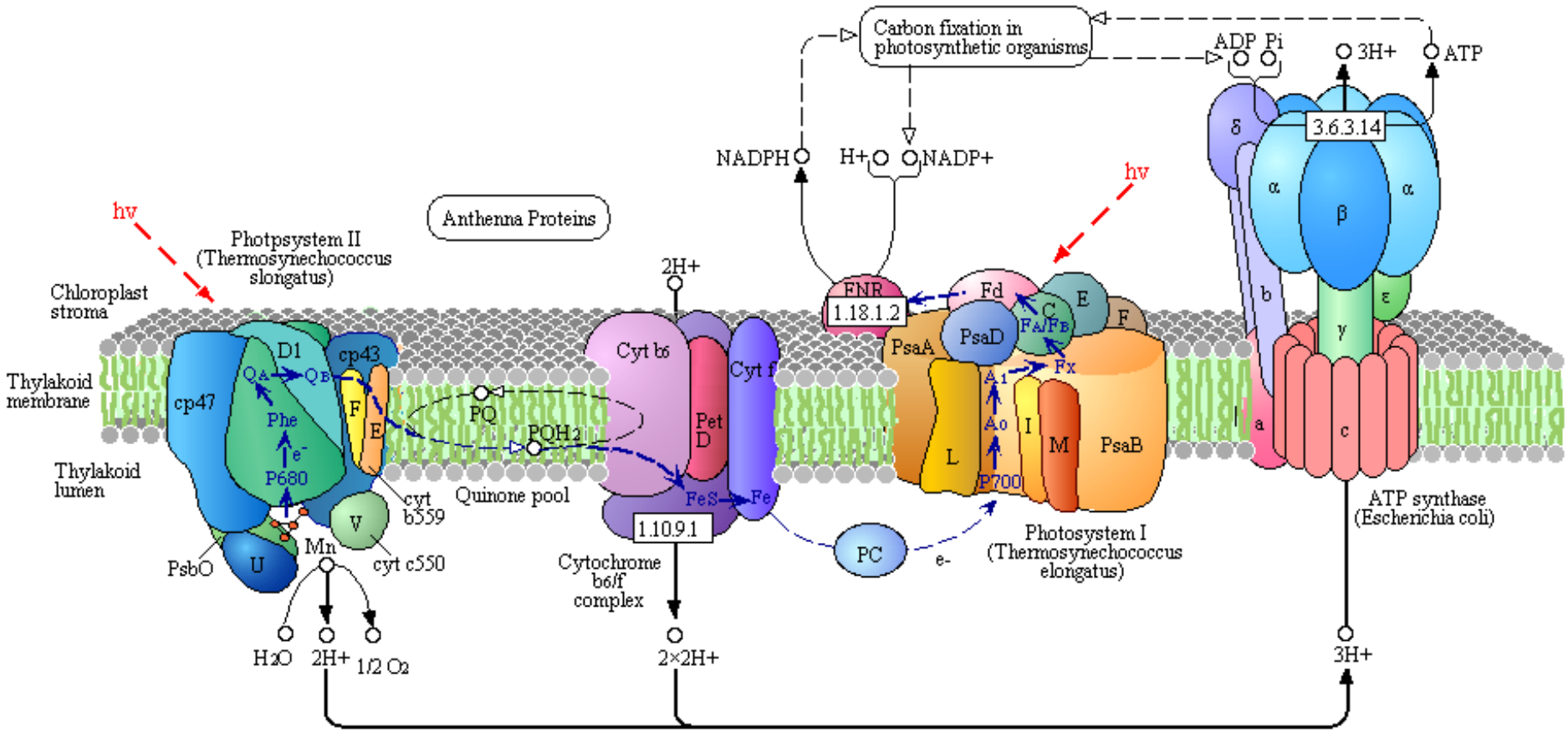
I'm here to facilitate your education. You are my first priority in this course. I want to help you meet your goals for the course, whatever they may be.

Favorite organism: This dog ->

Worst environmental disaster. . .

Environmental Disasters





Photosystem II

D1	D2	cp43	cp47	cyt b559		MSP	OEC
PsbA	PsbD	PsbC	PsbB	PsbE	PsbF		
PsbL	PsbJ	PsbK	PsbM	PsbH	PsbI	PsbO	PsbP
PsbQ	PsbR	PsbS	PsbT	PsbU	PsbV	PsbW	PsbX
PsbY	PsbZ	Psb27	Psb28	Psb28-2			

Photosystem I

PsaA	PsaB	PsaC	PsaD	PsaE	PsaF	PsaG	PsaH
PsaI	PsaJ	PsaK	PsaL	PsaM	PsaN	PsaO	PsaX

Cytochrome b6/f complex

PetB	PetD	PetA	PetC	PetL	PetM	PetN	PetG

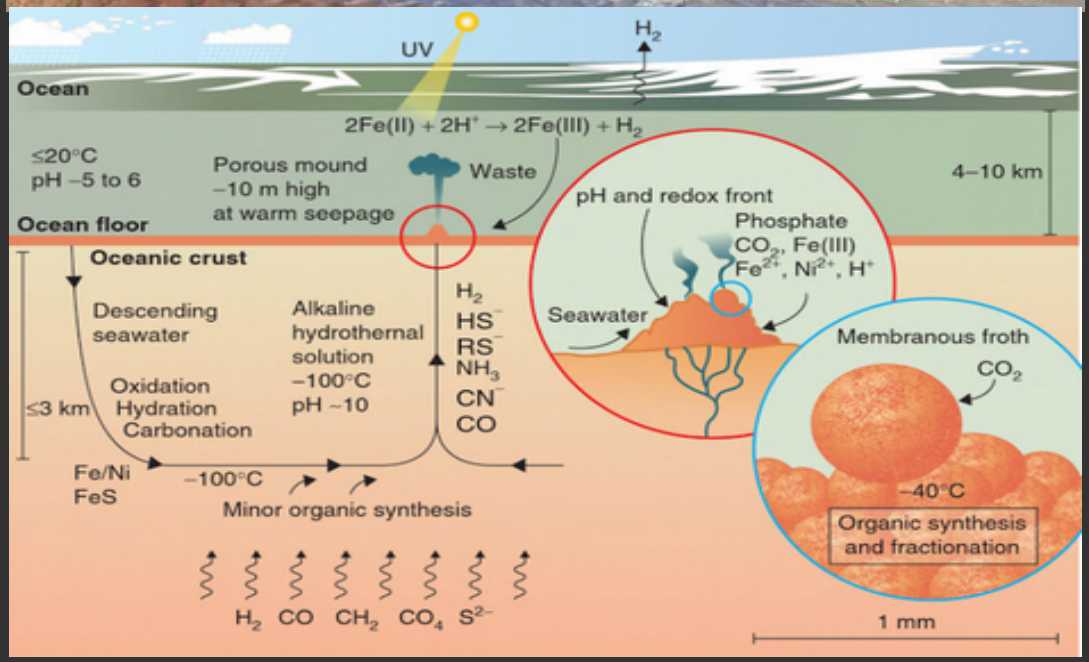
Photosynthethic electron transport

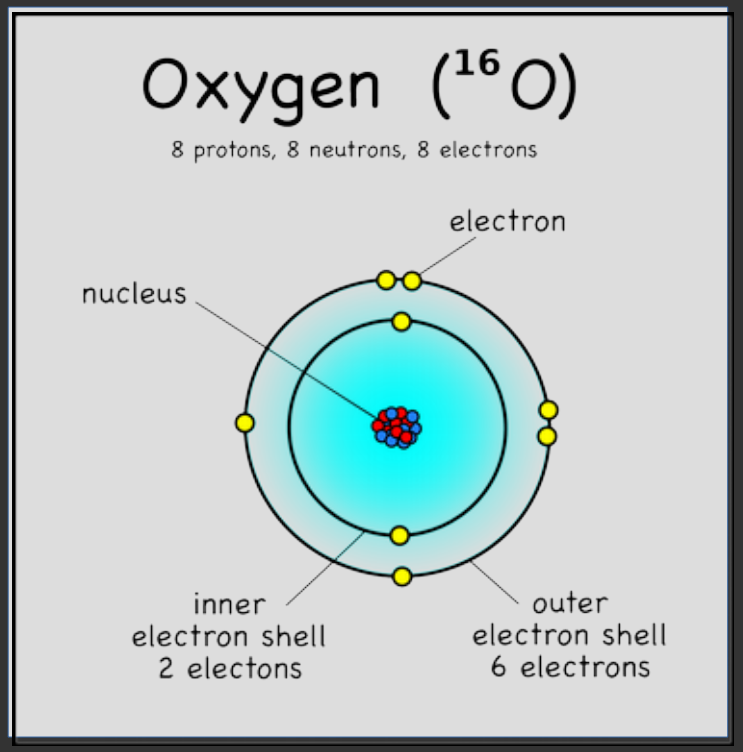
PC	Fd	FNR	cyt c6
PetE	PetF	PetH	PetJ

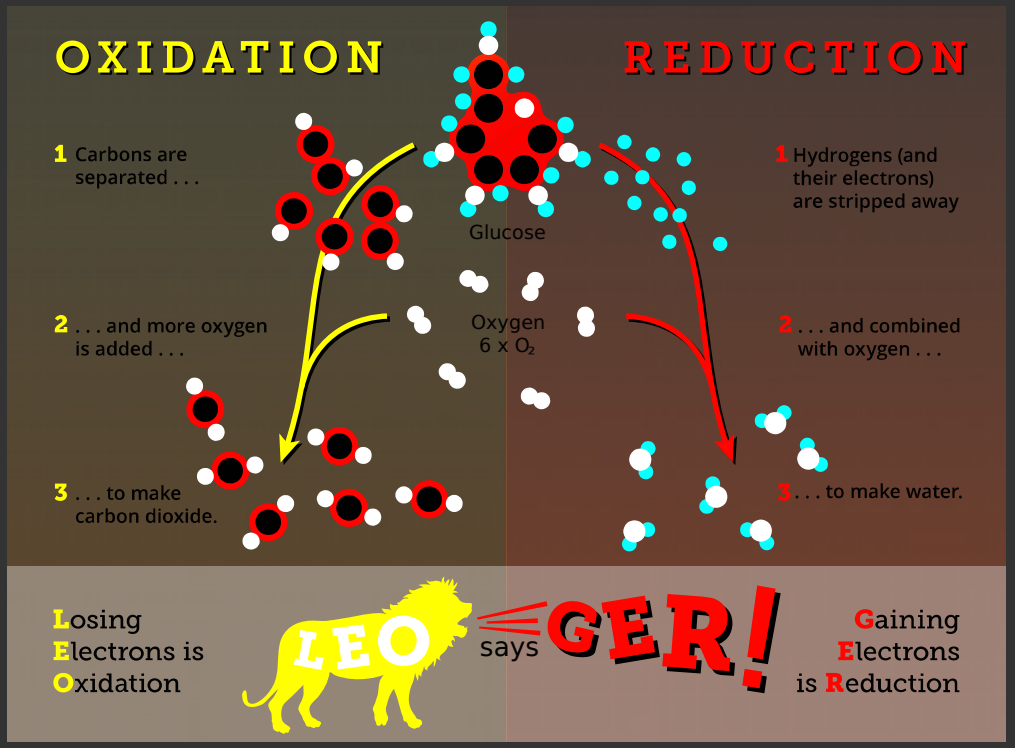
F-type ATPase

beta	alpha	gamma	delta	epsilon	c	a	b

Early Earth was a happy place



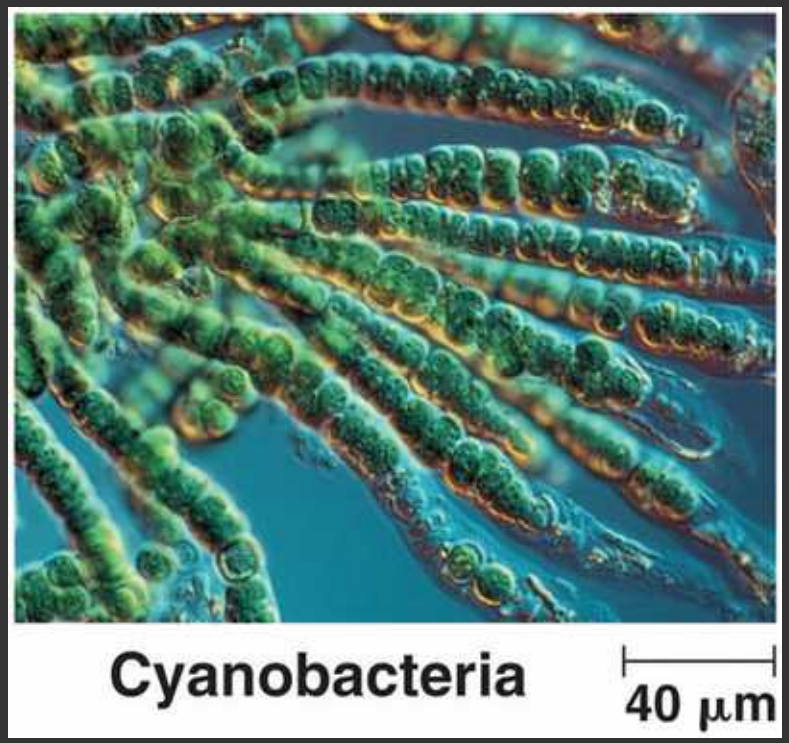


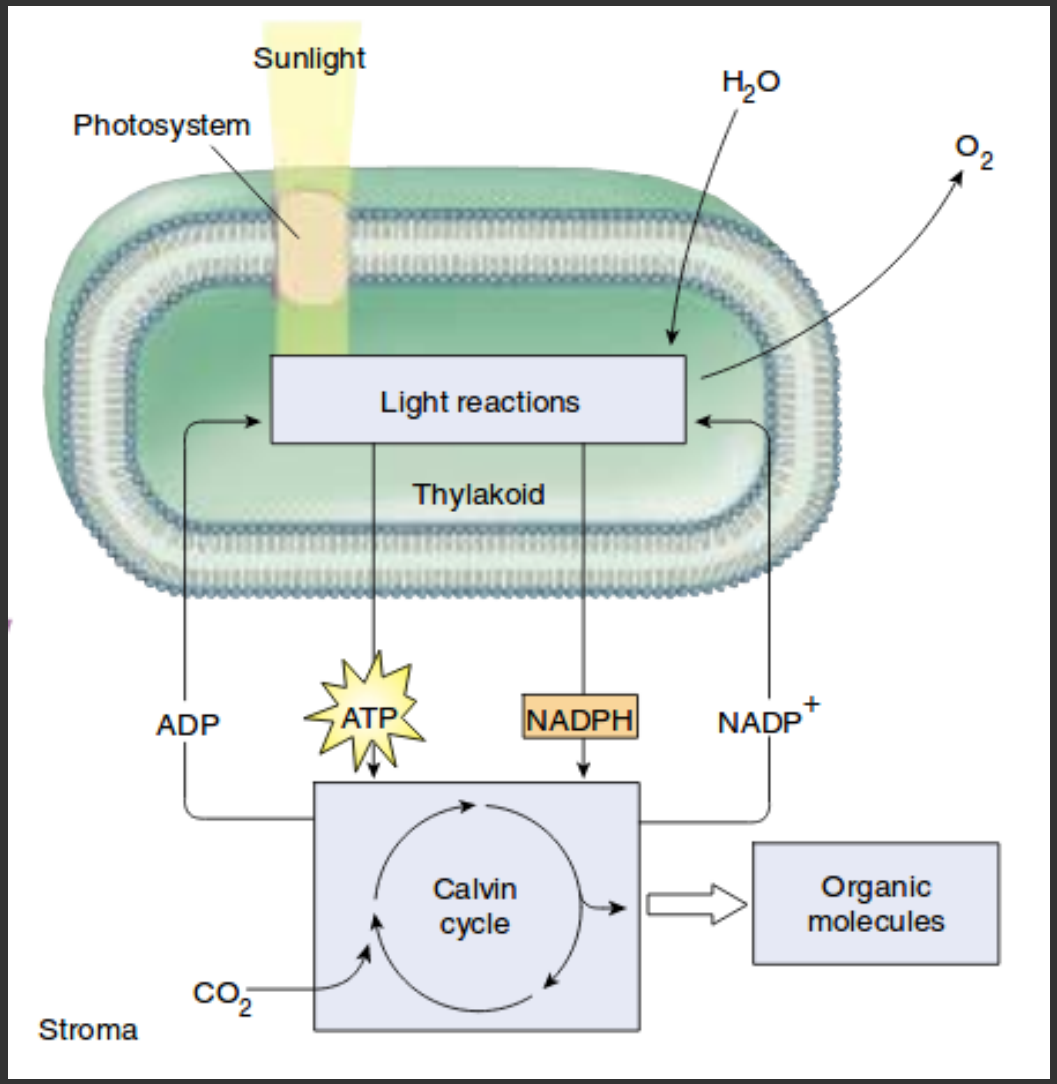


Oxygen is hyper-reactive!

Cyanobacteria

Oxygen is waste product of using sunlight to gain electrons from water.





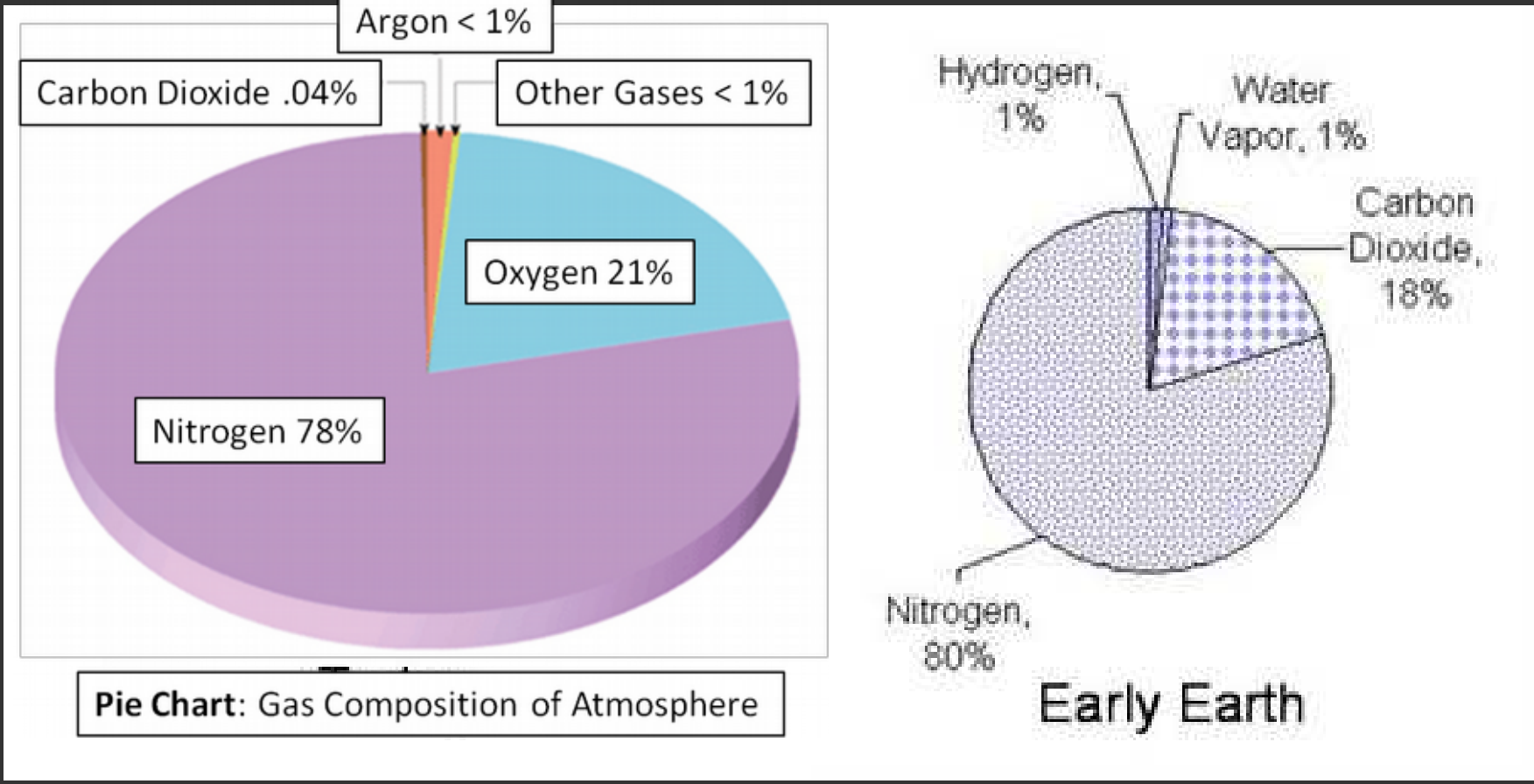
Autotrophy = getting your carbon from a mineral source

Mineral Carbon (CO_2)

Water (H_2O)

Light Energy

Before photoautotrophy, there wasn't much free oxygen on Earth



This was a pretty good thing, considering how toxic oxygen is...

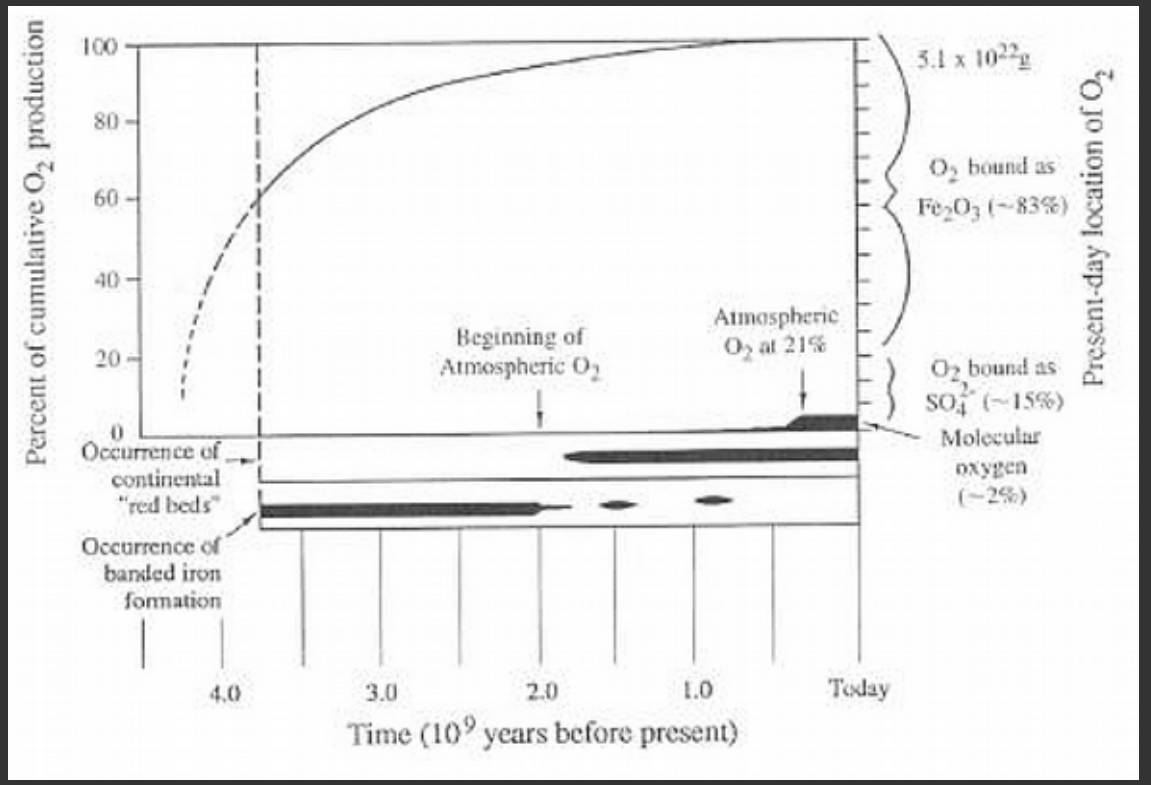
The cyanobacteria were pumping out oxygen as a waste product

Redox (reduction-oxidation)

Iron-rich soils from same general area. Left is well-drained, right is stagnant.
Red iron = "rust" = oxidized Gray iron = anoxic = reduced

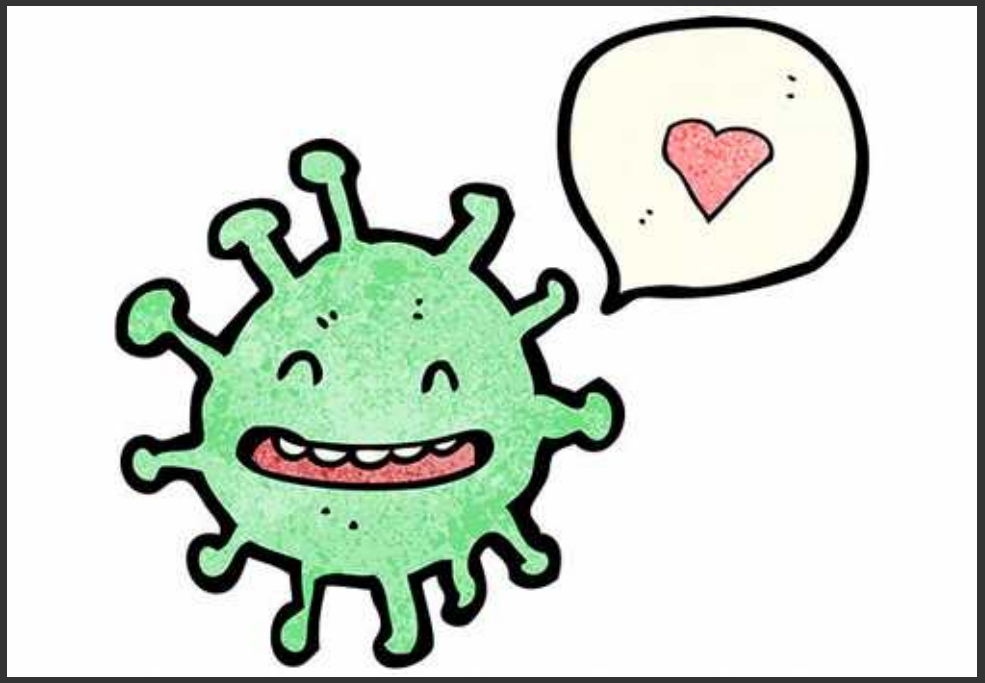
What happened to that waste?

Banded Iron formation, Australia



What caused the looooong delay from first cyanobacteria to present atmospheric oxygen levels?

Initially, toxic waste oxygen was bound to reduced iron in the ocean



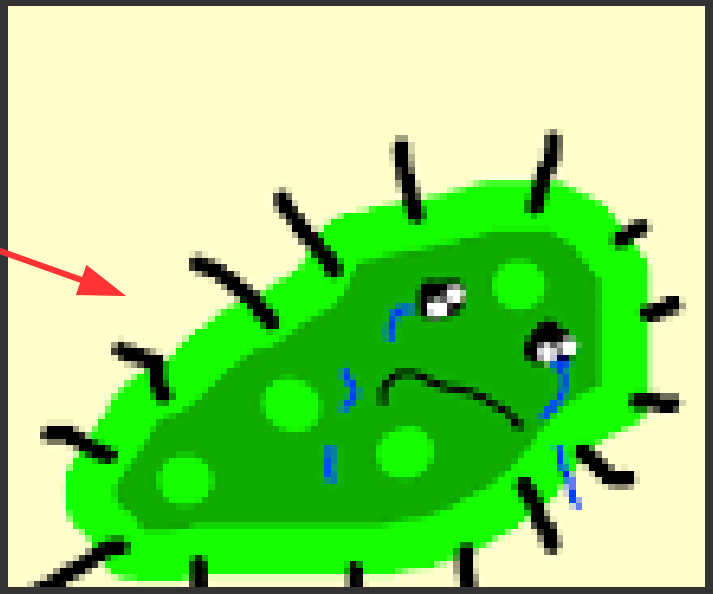
Happy bacterium is not worried about O_2

Pittsburgh, 1920

Salt Lake Valley

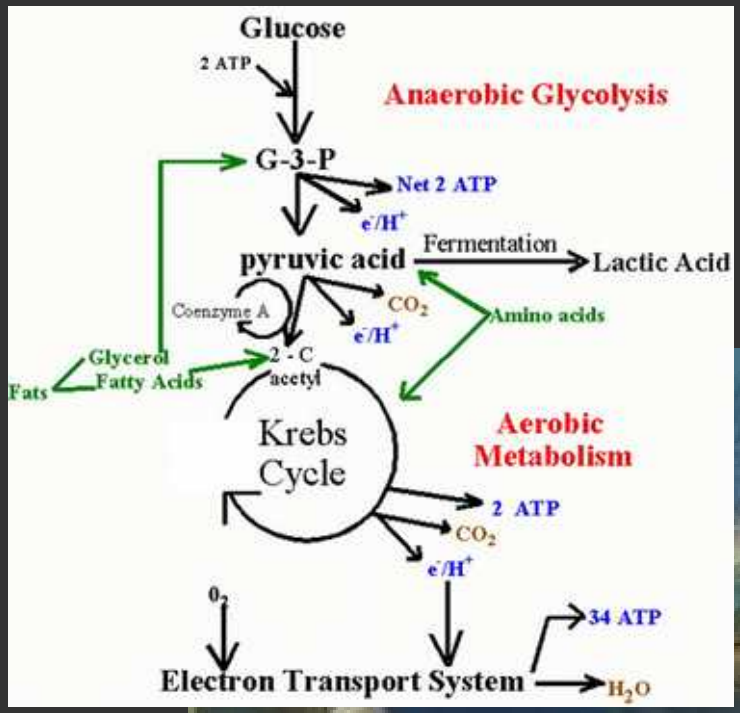
Once all the iron was oxidized, things got really bad really fast

Sad cyanobacterium



Now the Earth's atmosphere was completely toxic.

But that pollution meant...



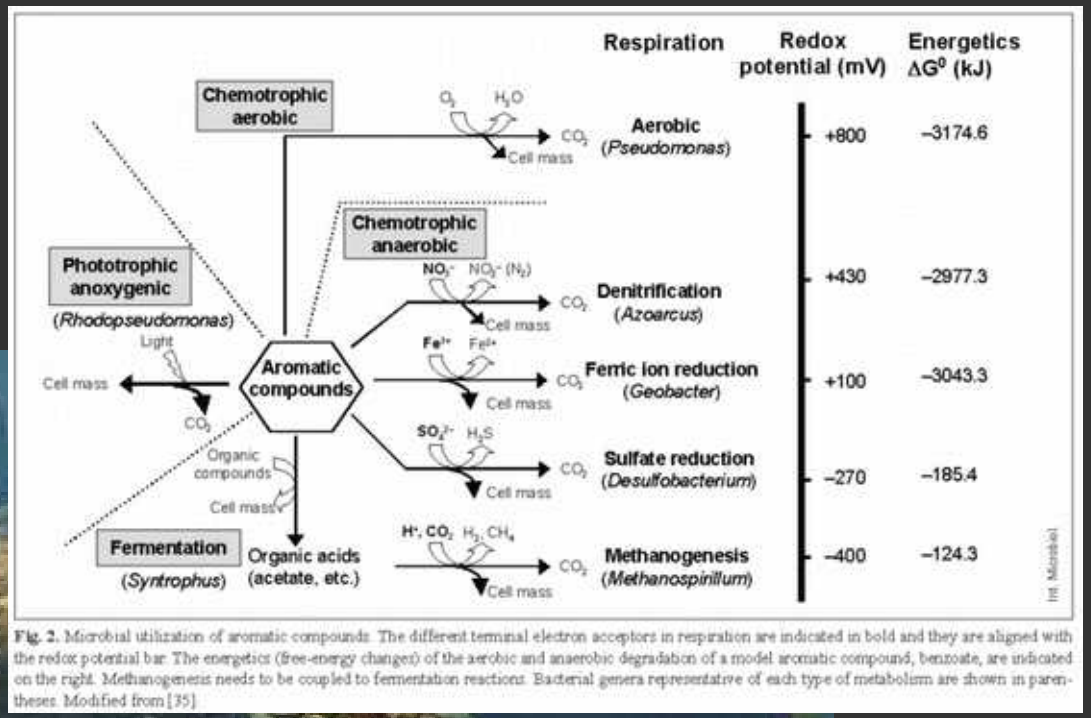
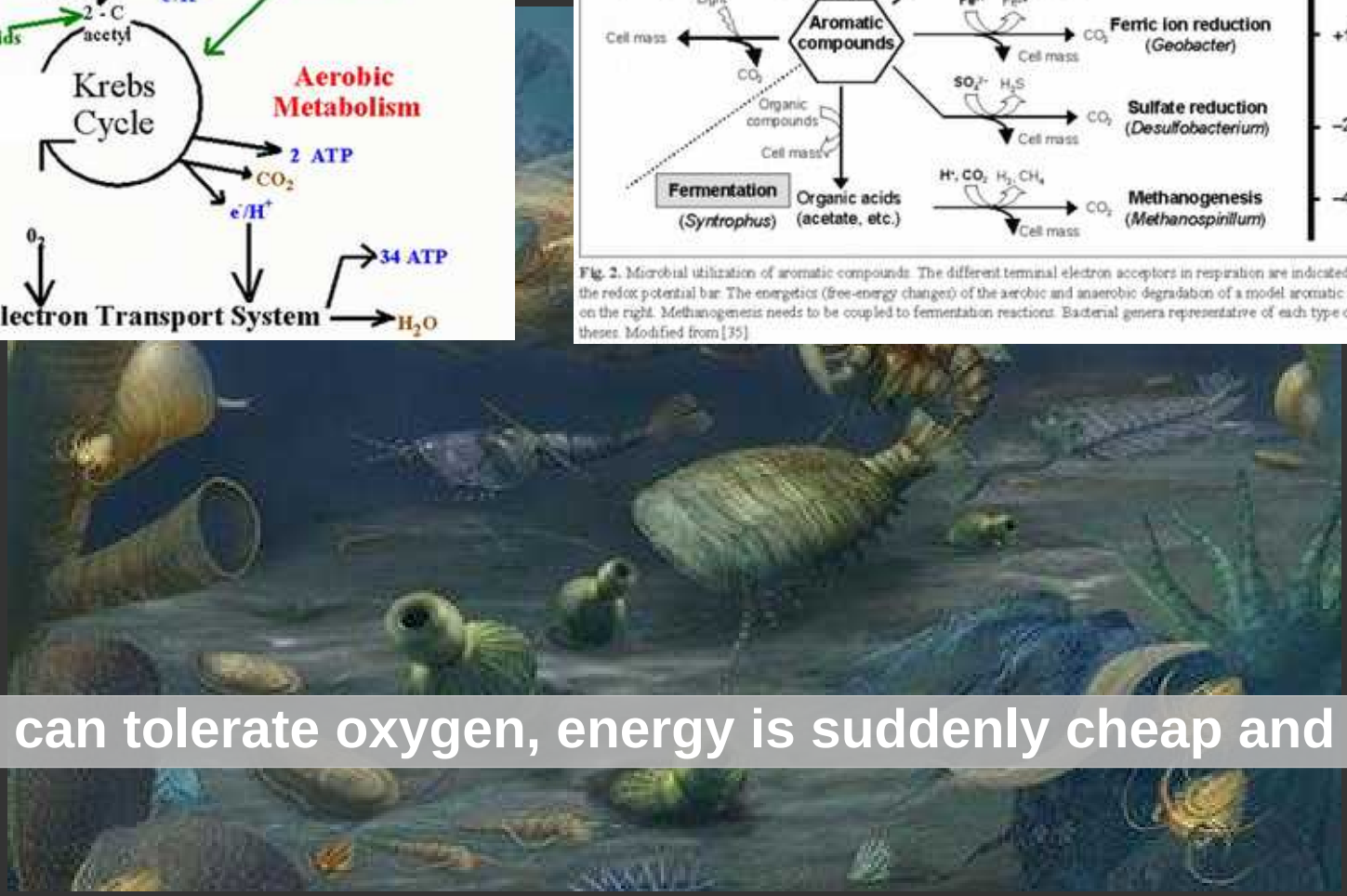


Fig. 2. Microbial utilization of aromatic compounds. The different terminal electron acceptors in respiration are indicated in bold and they are aligned with the redox potential bar. The energetics (free-energy changes) of the aerobic and anaerobic degradation of a model aromatic compound, benzoate, are indicated on the right. Methanogenesis needs to be coupled to fermentation reactions. Bacterial genera representative of each type of metabolism are shown in parentheses. Modified from [35].



If you can tolerate oxygen, energy is suddenly cheap and plentiful

What's the moral of this story???

The history of life on Earth is full of events just like this, where conditions change and make certain mutations more or less-advantageous.

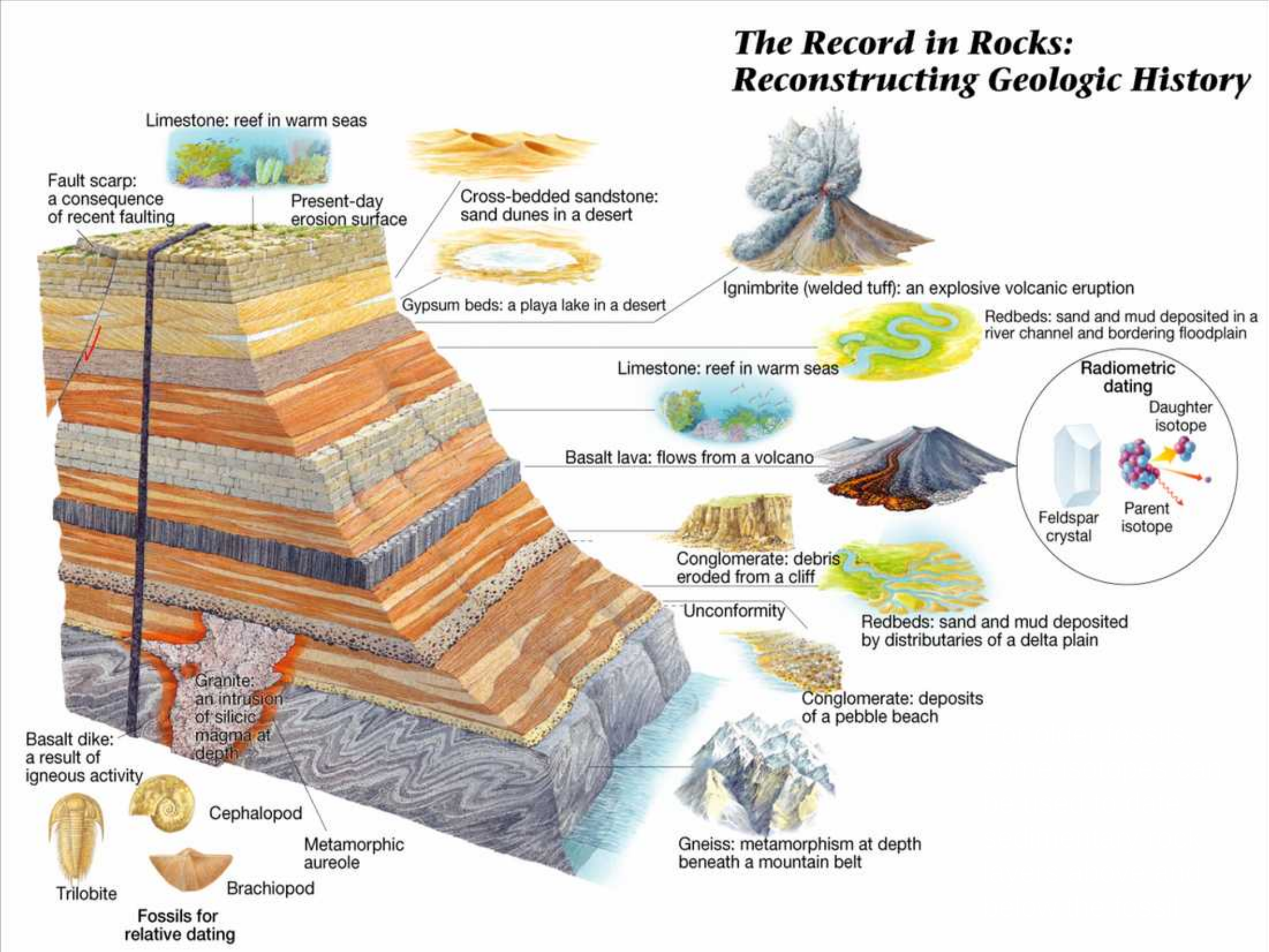
But how do we know any of this to start with?

Table 2.2

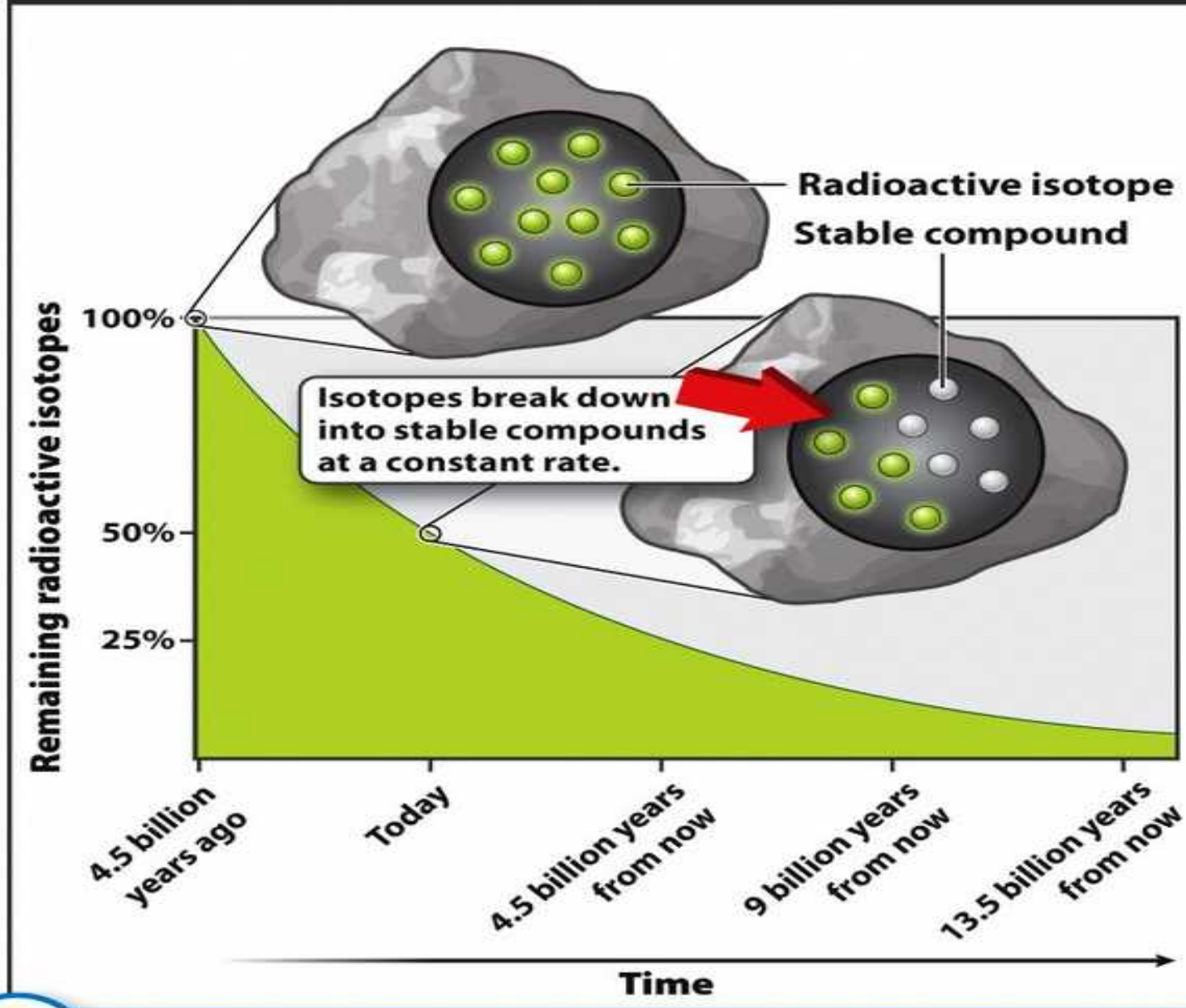
Scientific tools providing information about Earth history and evolution

Discipline	Tool	Insights
Geology	Global surveys of terrestrial and oceanic rocks	Sedimentary, igneous, and metamorphic formations reveal tectonic and other processes governing Earth's evolution
Nuclear chemistry	Radioisotopic dating	Ages of rocks, minerals, and their components are revealed
Paleontology	Fossil record	Organism structures preserved in stratified sediments provide records of evolution
Analytical chemistry of biomarkers	Analytical determination of biomolecules via chromatography and mass spectrometry	Molecular remnants of biomolecules (membranes, pigments, cell walls, etc.) document ancient biota
Analytical chemistry of isotopic ratios	Isotope ratio mass spectrometry	Enzyme reactions favor substrate molecules composed of lighter atoms. Biomass assimilates the lighter isotope and the remaining isotopic pool becomes "heavier" for a given process
Experimental biochemistry	Model systems that simulate ancient Earth	Discovery of precursors of cellular structures and their self-assembling properties
Molecular phylogeny	Sequencing and analysis of informational biomolecules	Alignment of sequences from DNA, proteins, and other molecules allow evolutionary inferences to be drawn, especially regarding the three domains of life
Mineralogy and geochemistry	X-ray diffraction and wet-chemical analysis of rocks	Chemical reactions and reactants of past ages can be inferred from the composition and oxidation/reduction status of ancient sediments
Biochemistry	Comparative biochemistry of cellular materials	Trends in evolutionary relatedness among and between members of *Bacteria*, *Archaea*, and *Eukarya*

The Record in Rocks: Reconstructing Geologic History

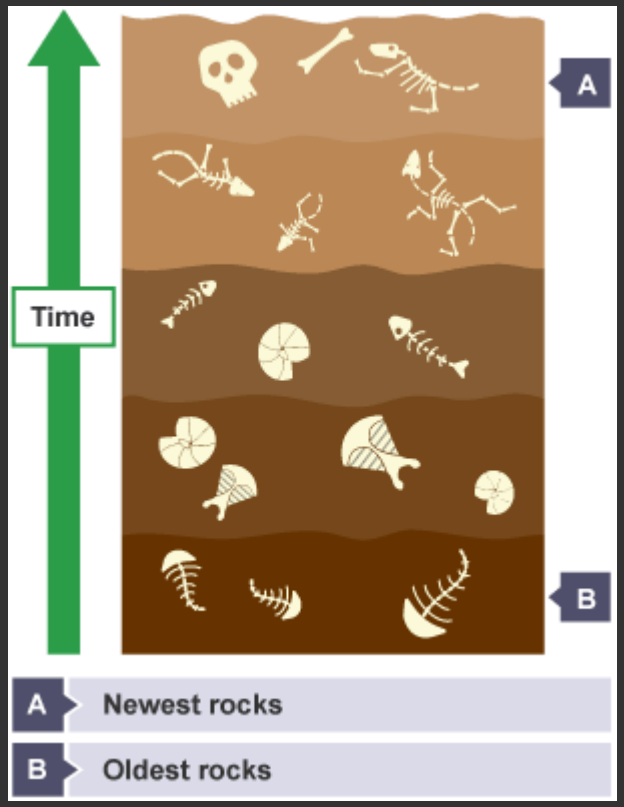


RADIOMETRIC DATING



By using uranium 238, with a half-life of 4.5 billion years, scientists have determined that the earth is about 4.6 billion years old!

Fossil Record Biochemical Record



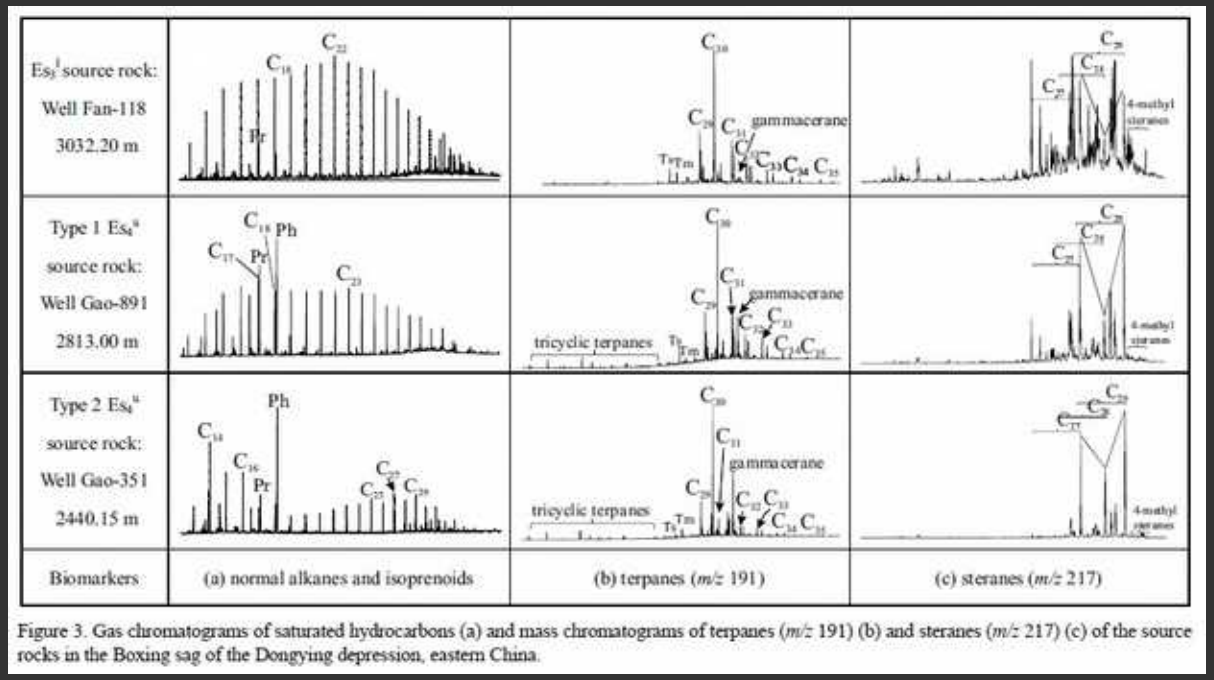
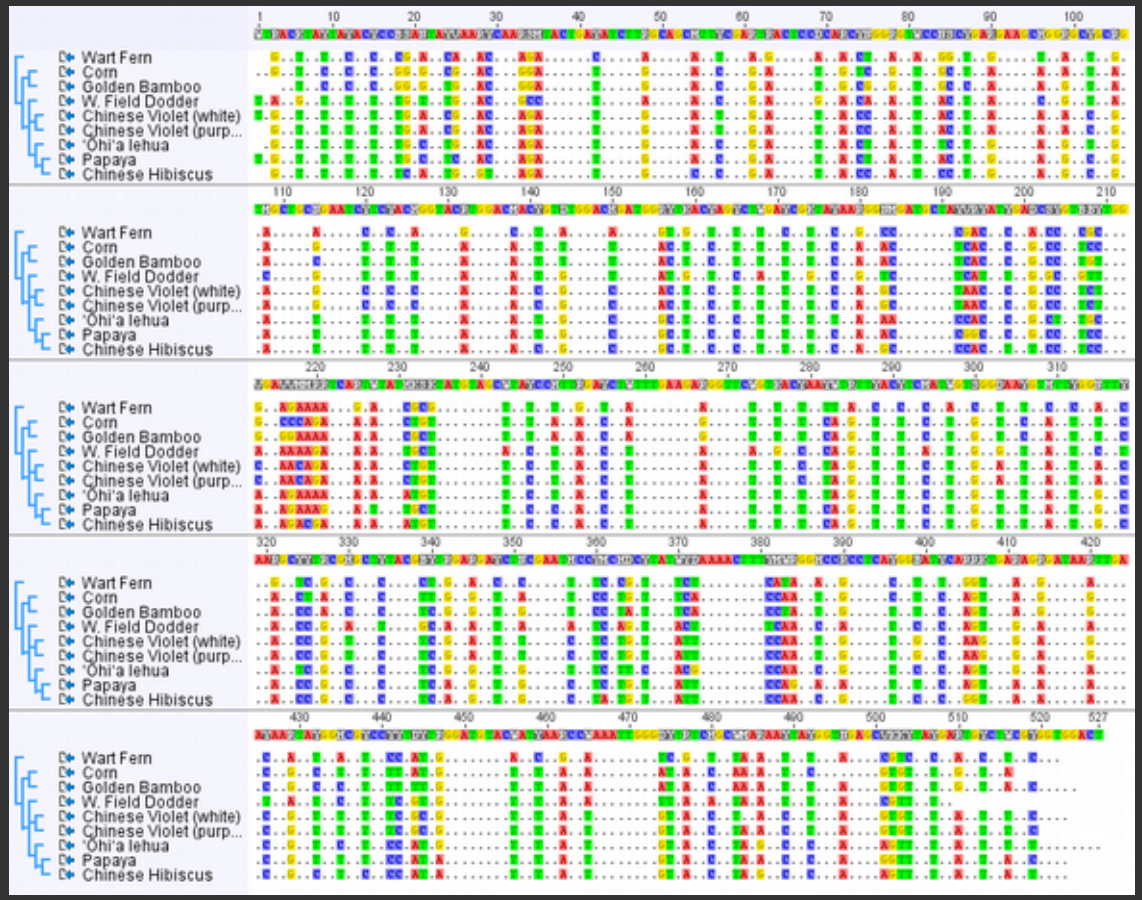
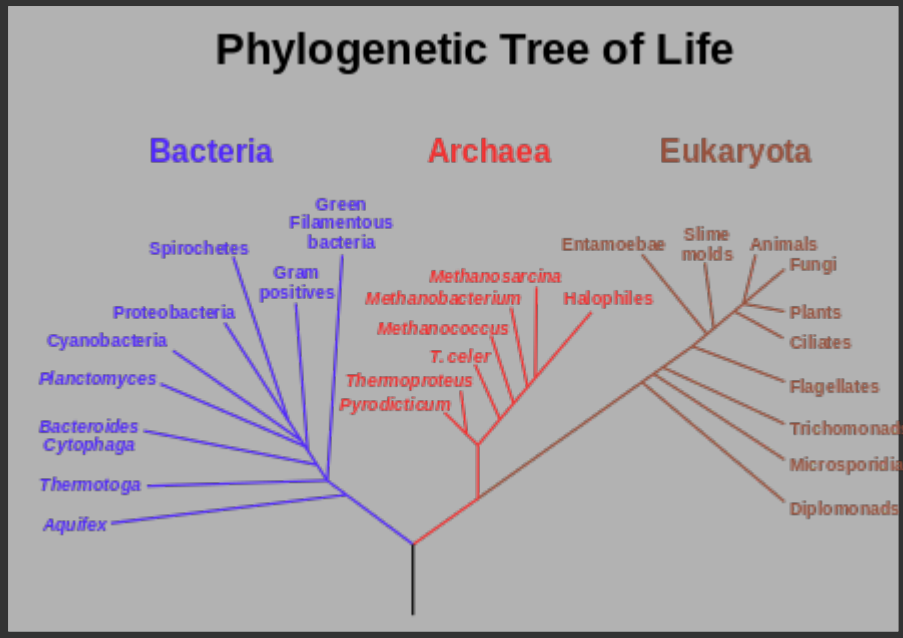


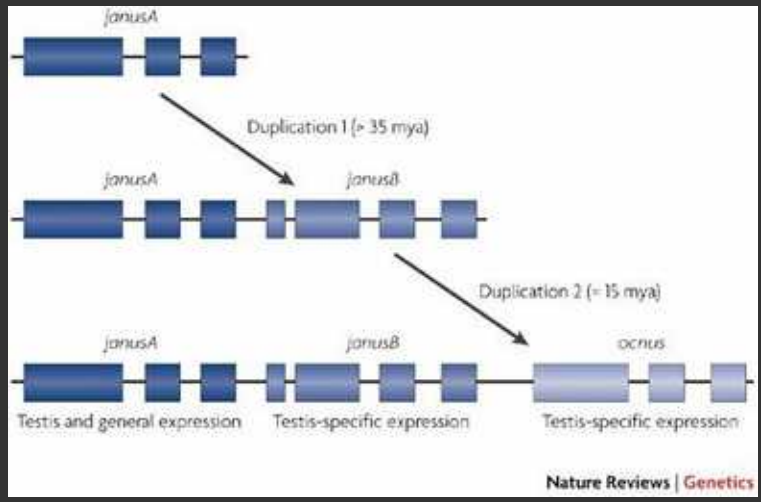
Figure 3. Gas chromatograms of saturated hydrocarbons (a) and mass chromatograms of terpanes (*m/z* 191) (b) and steranes (*m/z* 217) (c) of the source rocks in the Boxing sag of the Dongying depression, eastern China.

Both let us see what life forms were present in rocks of varying ages

Comparative genetics







Course Structure:

Read the designated book chapters BEFORE class each week.

Ten (10) reading quizzes to make sure you are reading ahead of time. 100 pts

Four (4) exams, including final. 400 pts

Your-Choice points - Variety of ways to earn points 100 pts
Your-Choice assignments that take you past 100 points are extra credit (up to 50 pts)

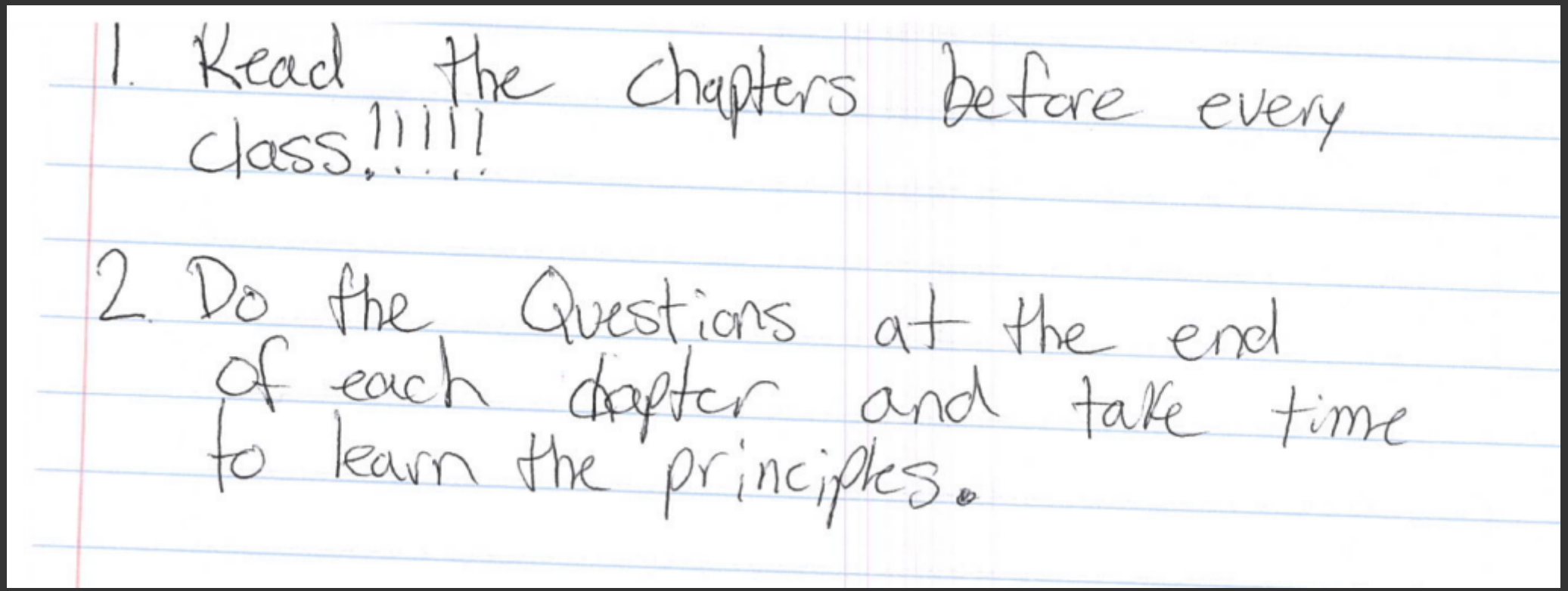
Pre-test (Everyone gets 50/50 for turning it in) 50 pts

Post-test (Similar material as pre-test) 50 pts

600 / 700 pts earns an A
(that's 85.7%)

This course is a survey of biodiversity, starting with early life, evolutionary mechanisms, and lightly exploring bacteria, fungi, animals, plants, and protists...
What are they, what do they do, how did they get that way, how do they make a living, and why does it matter?

Advice from former students



1) MAKE SURE TO TAKE GOOD NOTES AND THE SLIDES THAT DR. ZAHN GIVES YOU IN CLASS, TAKE AS MANY PICTURES AS YOU CAN BECAUSE AFTER THE CLASS YOU WILL NOT HAVE ACCESS TO THEM AGAIN. THESE ARE HUGE BECAUSE A LOT OF TEST MATERIAL COMES FROM HIS SLIDES.

2) TAKE FULL ADVANTAGE OF ALL THE EXTRA CHOICE POINTS YOU CAN GET! THIS IS A GREAT HELP IN THE CLASS AND THEY ARE NOT DIFFICULT TO COMPLETE. GET ALL 150 POINTS, YOU WILL NOT REGRET YOUR EFFORTS WITH THESE ASSIGNMENTS.

1) Actually join a study group that discusses the ideas in a useful $ in real world application
2) Talk to your professor $ figure out why you sucked on the first exam so you dont continue the rest of the semester like a wounded gazelle waiting to die

1. TAKE VERY CAREFUL NOTES ON THE LECTURE, AND TRY TO FOCUS MORE ON APPLYING THE CONCEPTS INSTEAD OF JUST MEMORIZING VOCABULARY WORDS.

2. DO EXTRA YOUR CHOICE ASSIGNMENTS, AND NOT JUST FOR THE EXTRA CREDIT. SEVERAL OF THE BOOKS IN PARTICULAR ARE VERY INFORMATIVE, AND HELP EXPAND YOUR KNOWLEDGE OF BIOLOGY TO MORE REAL WORLD APPLICATIONS.

He is very knowledgeable of the subjects but his class is very difficult. When questions are asked he will hardly ever give a straight answer. His tests are extremely difficult. I never saw the average above 75 and he doesn't curve them at all so that makes it very difficult. He does offer extra credit opportunities to a point so take advantage of.

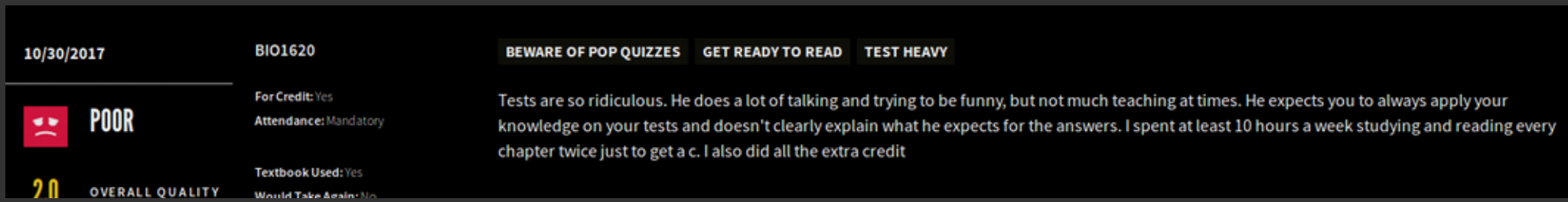
Why did UVU hire him as a biology professor?? He cant teach. For those taking his class in the future pay special attention to his slides, and to the long tedious hours of reading because it wont do any good!

2 people found this useful 0 people did not find this useful

report this rating

Awful at teaching. Doesn't provide you with what he expects. You cant seem to study enough for his tests. Dont take him. You'll have to wait for another biology professor to take his spot because he's the only one if it means you want a decent grade going forward in your college experience.

Dr. Zahn does not hand out good grades to people who just show up. His tests require you to not only read the material but understand what it means. If you come to him outside of class he is very willing to help you in any way he can. People who hate on him just can't believe a professor would expect them to do more than memorize something.



Best comment ever!

Zotero!?

Want an A?
Here's what to do:

Actually, like, for real, do the readings **before** the lectures. Like, every time.

Pay attention to lectures and ask questions

Do Your-Choice assignments early . . . start reading one of the books *now*

Don't try to BS a book review or I'll BS your grade on it

Don't email me to say "I'm only x points away from an A, what can I do?"