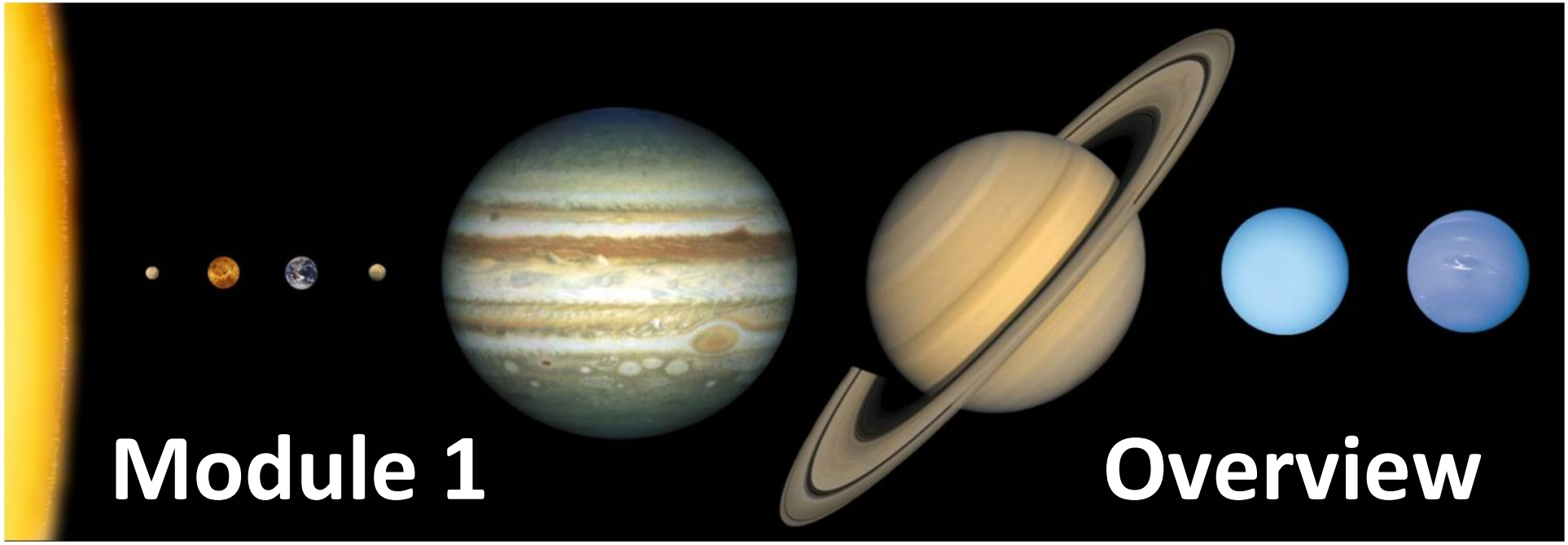
Earth Sciences 2150 – Fall 2023

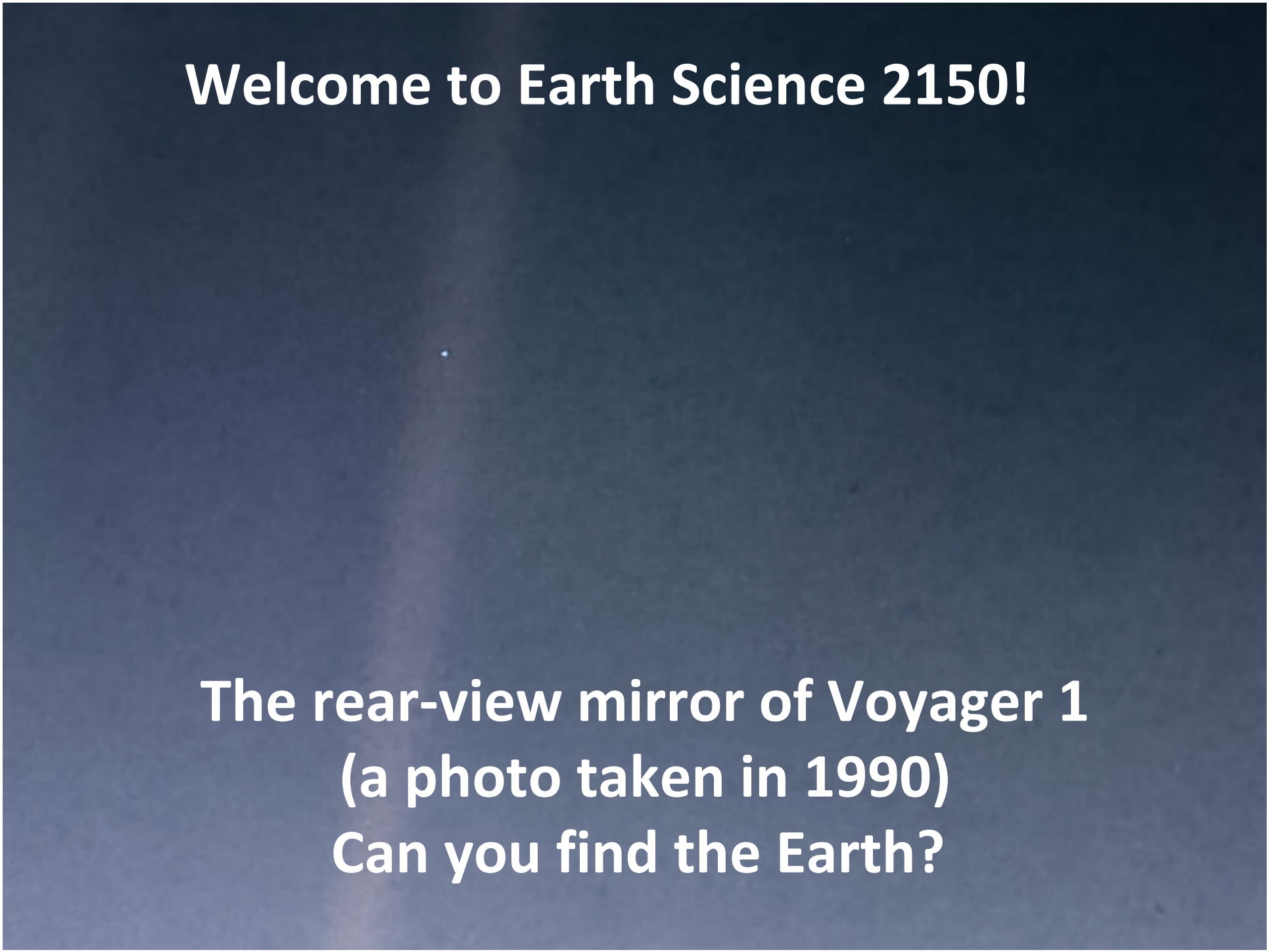
Solar System and Planetary Science



Orientation and Information

General Course Introduction

Welcome to Earth Science 2150!



The rear-view mirror of Voyager 1
(a photo taken in 1990)
Can you find the Earth?

What this Orientation is about

You are HERE

- To give you some information about how the course is presented, learning methods and the assessment of your learning.

- To give you some practical advice on getting started, and how to succeed in your efforts.

- I am sure that you all remember this stuff……..
- Luckily, this is now in the past, but it had a lot of impacts in education. Some were bad, but some were good (in retrospect). **We have tried to keep the latter.**

What does “hybrid” actually mean ?

- There will be regular class sessions on most Wednesdays (7-8.30 pm). These will provide overview lectures on modules, “space news”, and chance for discussion.
- These classes will be available online. Online Q&A/ Discussion sessions will also be held most weeks.
- More detailed classes on each modules will be available online (typically 2 per module) so you can study these easily on your own schedule(s).
- Assessment quizzes and final exam will be online in Brightspace, with defined time slots for completion.
- Other assessment work will be completed online through Brightspace, with deadlines for submission.
- All can attend online discussion sessions if they wish.

How are online classes Presented for study?

- All class presentations are supplied as **Adobe PDF** documents.

- Each presentation is accompanied by an **audio podcast** file (MP3 format) that will discuss material slide-by-slide.

In 2020, we called this "Radio Solar System" and the name has stuck.

- You can download MP3 files to any of these devices or to any non-Apple phone or player. You can put the sound files in your music library. Or you can also listen on your laptop as you view.

- Podcast files have the same name as the associated presentation. All files can be downloaded for offline study.

Why am I doing the course in this way?

- Those of you who did remote learning during the pandemic will know that this is a bit different from the ‘video lectures’ used in many other courses. But it has some real advantages for me and also for you!
- **It makes it easy for you**. All you need is a device that can view PDF files (most can) and play an MP3 sound file. Files are relatively small. You can use any computer, a tablet, and probably your phone. Many students like to view a class on a listen from their phone or iPod. You can download and work offline.
- We are able to host students from Grenfell and other locations worldwide. You can be in-person, fully online, or opt for a mixture of the two. Up to you!

Low-Tech Methods can work well!

•Dr. Robert Goddard, a famous inventor, now has a NASA space centre named for him.

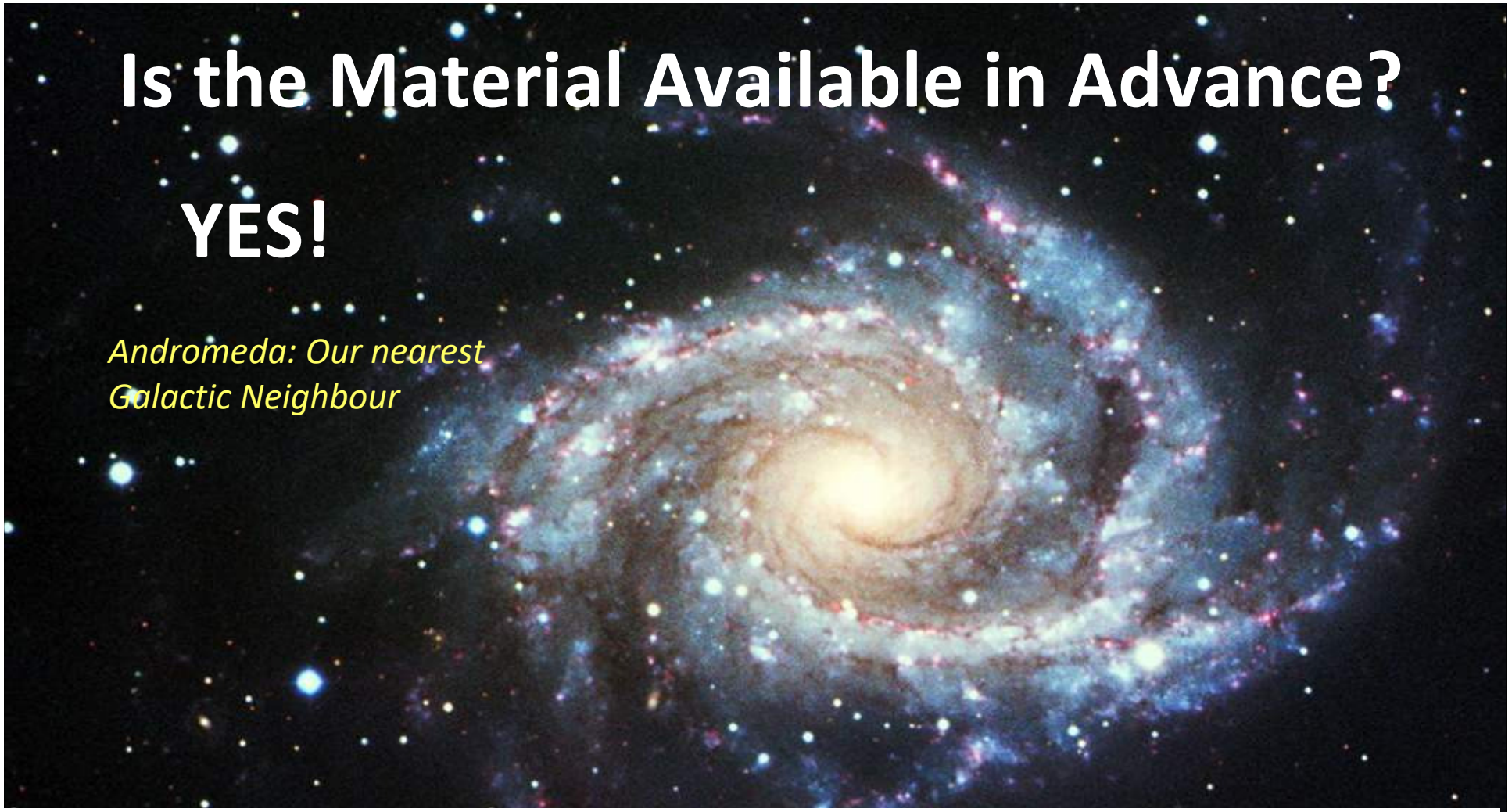
• His pioneer rockets were pretty low-tech, but that same basic design was applied to get Neil Armstrong and Buzz Aldrin to the Moon in 1969…..and Jeff Bezos' Amazon rocket is really not that different.

Where and when will I get materials?

- The primary method for all activities outside classes is MUN's online learning system, **Brightspace (aka D2L)**. D2L stands for 'Desire to Learn'; it is a powerful tool but takes some use to become familiar.
- Choose the <Login> button on MUN's home page, then choose <Online Learning>. After you enter your MUN login details, you will see your courses. Look for the Banner with the Planets, it is easy to find.
- The course home page has a "News/Announcements" window that is **important to read every time you log in.** You will also see a variety of different modules that hold the course content. You can download the files from each of these as you wish.

Is the Material Available in Advance?

YES!



Andromeda: Our nearest Galactic Neighbour

- **Sometimes Brightspace can seem as big and confusing as the Galaxy; as far as I know, you cannot download in bulk.**
- **Most of the material is already there, stored in folders for each module. Some things will be added. I recommend downloading module-by-module, work ahead if you can!**

Will material be added in the Semester?

- **YES !**
- The summary classes delivered as traditional classes will appear each week, as will short ‘features’ on new research findings. If a lecture is updated for some reason, I will inform you. **You need to check Brightspace on a regular basis. I suggest doing so EVERY DAY. Look first at “Announcements/News”**
- Brightspace is also the vehicle that will be used for assessment quizzes and other assessment material. More information will be provided in the Course Introduction. **Becoming familiar with Brightspace is important**, and not just for this course.

A Computer.

Not like this one!

What kind of gear will I need for this?

- It does not have to be a fancy gadget to do this course, and you might get away without a computer one as long as you have internet access.

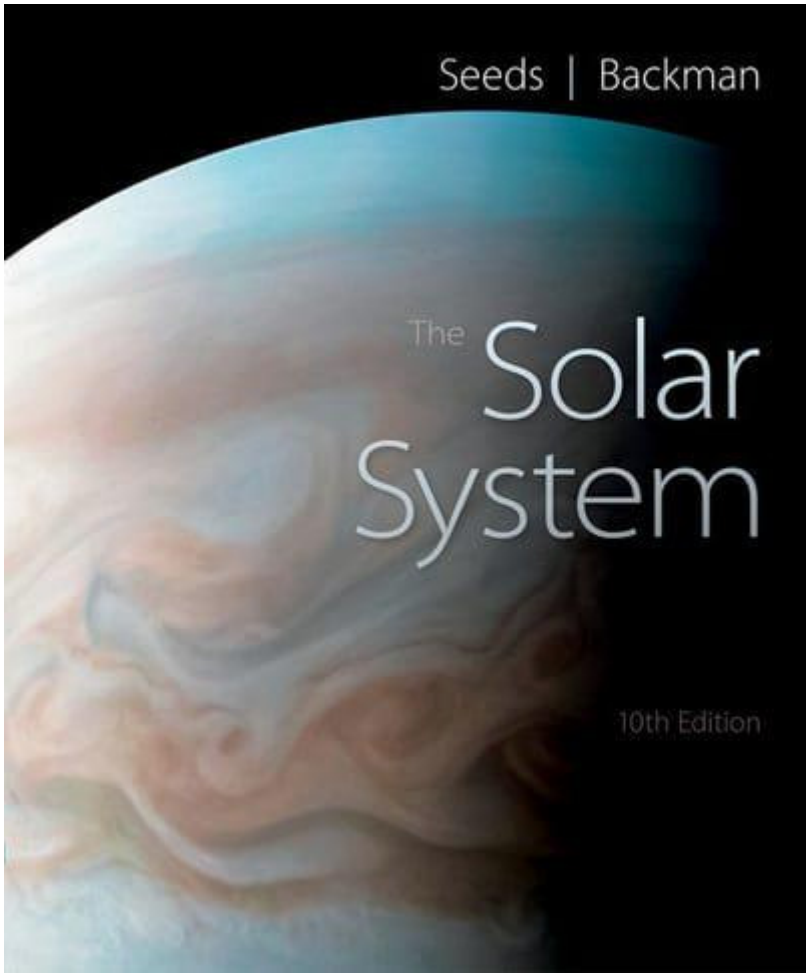
MUN Guidelines exist for online learning… see link!

https://www.mun.ca/covid19/news.php?id=13580&type=news

What will I need beyond a computer?

- **The most important thing is an enquiring mind.**
- Your computer needs to have software that can read “Portable Document Files” – known as PDF format. Most internet browsers and word processors can do this, but the free **Adobe Acrobat Reader** is best.
- Acrobat reader also allows you to add notes, comments, highlights and handy things to PDF files.
- You need to be able to listen to MP3 files (same as music files). All media players on computers can do this, and virtually all phones or tablets will do it also.
- You need to be able to read, edit and create files in Microsoft Word (DOC or DOCX format). **As a MUN student, you can get Microsoft Word for free.**

What about a textbook ?



Students have passed this course without a textbook, but rarely have they excelled.

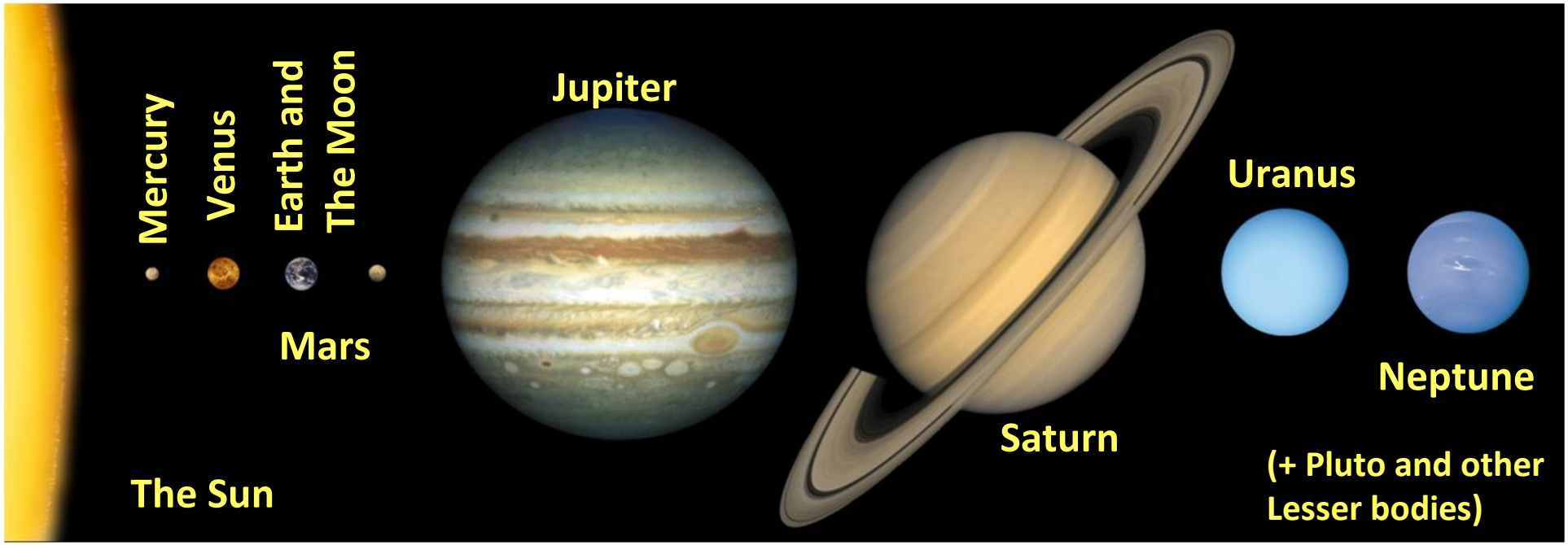
- **There is a recommended textbook for the course. It is an e-text, with access to other learning resources.**

- **The text is also available as a hardcopy book, from the publishers or through Amazon, etc.**

- **Additional material related to Earth Science aspects is in the course presentations.**

- **This is an excellent book!**

Earth Sciences 2150 in a Nutshell



- The eight planets are a major focus, obviously. This is an Earth Science course but only one module is about the Earth. We also discuss the Sun, and we even venture into ideas about "exoplanets" associated with other stars.
- In order to make sense of all this, we also need to cover some generalities and principles. We need to understand some of the methods…..so expect some physics & chemistry.

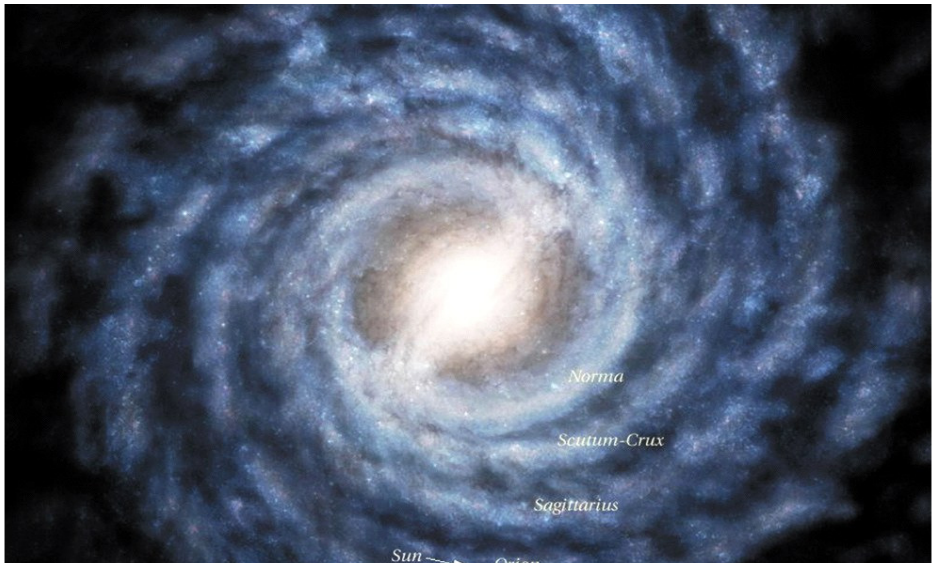
Earth Science 2150 – Some Specifics

- The Solar System in its wider context (galaxy, universe)
- Development of ideas in astronomy/planetary science.
- Geometry, formation and evolution of the solar system and its many components – over 4.5 billion years.
- What we know about the other worlds and what we are continually discovering as we explore them.
- What we do not know and still need to find out. In some areas, like the Outer Solar System, we know very little.
- What we can learn about the Earth from other worlds, and what we can apply from our knowledge of the Earth.
- The history of life on Earth, and the role it has played in shaping our planet – and possibilities for life elsewhere.
- This is *literally* the frontier of Natural Science…. There are few courses at MUN that involve such a journey.

The Structure of the Course

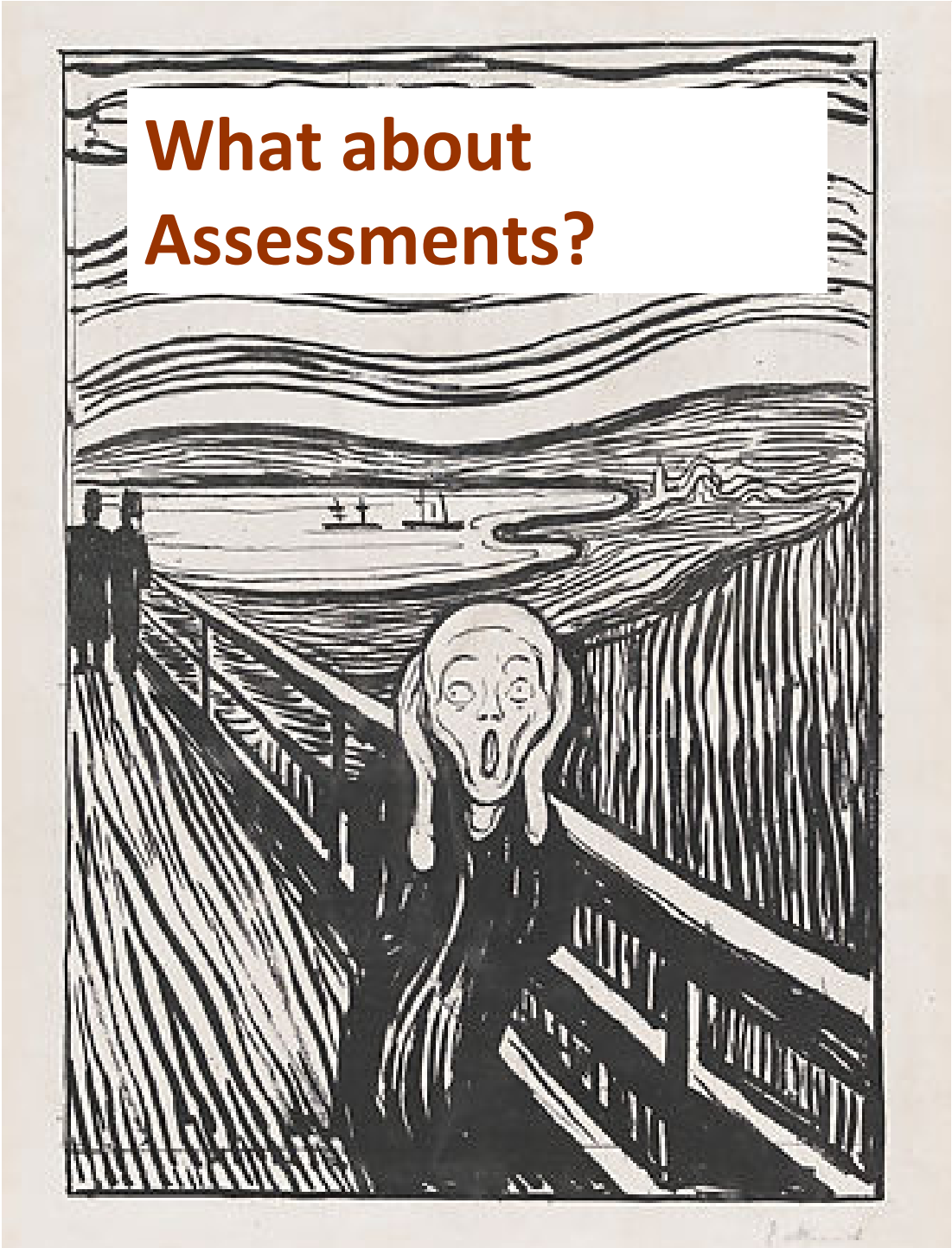
- There are actually 13 ‘modules’ in the course, but it may be helpful to think of it as having two main parts.
- The first section is concerned with the history of solar system science, the methods that are used, and topics that relate to the **entire** solar system – such as energy, planetary motions, and models for formation and evolution. The second section is a grand tour through the planets and other important objects, ending with a discussion about the possibilities for life on worlds other than Earth.
- *Module 2 contains some critical background on Science and Earth Science concepts – for those who will need it. It is a good place for all of you to start.*

The Purpose of Blending in-person and online



- Galaxies are different, but have common features! The same is true for learning methods. We are trying to blend the best of both.

In-person classes once a week provide a chance to meet instructors and other students, and get overviews of course modules.
However, it is important that you also examine detailed classes for each module that are online. Online Q&A/discussions are important for those unable to attend in-person classes, or for anyone who is interested in talking. Online quizzes are useful to all.



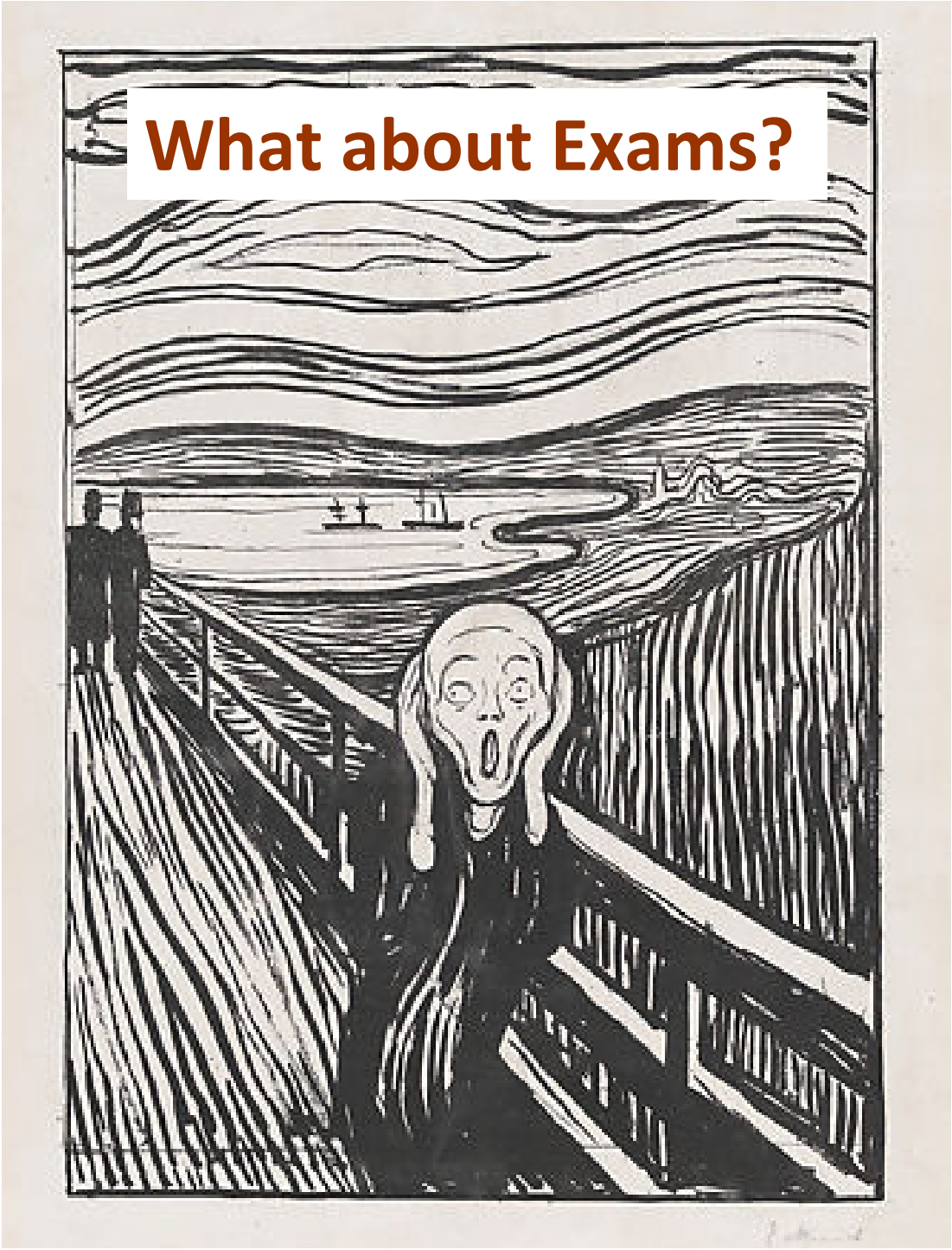
- There are 8 “modular” quizzes online, which will be available from 8.30 – midnight on Wednesdays.

- MUN requires that there be overlap with set class times (7-9.30).

- Availability window can be adjusted for students who have timing conflicts.

- Only the 6 best quiz scores are retained for evaluation purposes.

What about Exams?



- There is no midterm exam in the course. Some credit will be given for learning exercises, which represent ‘easy marks’.

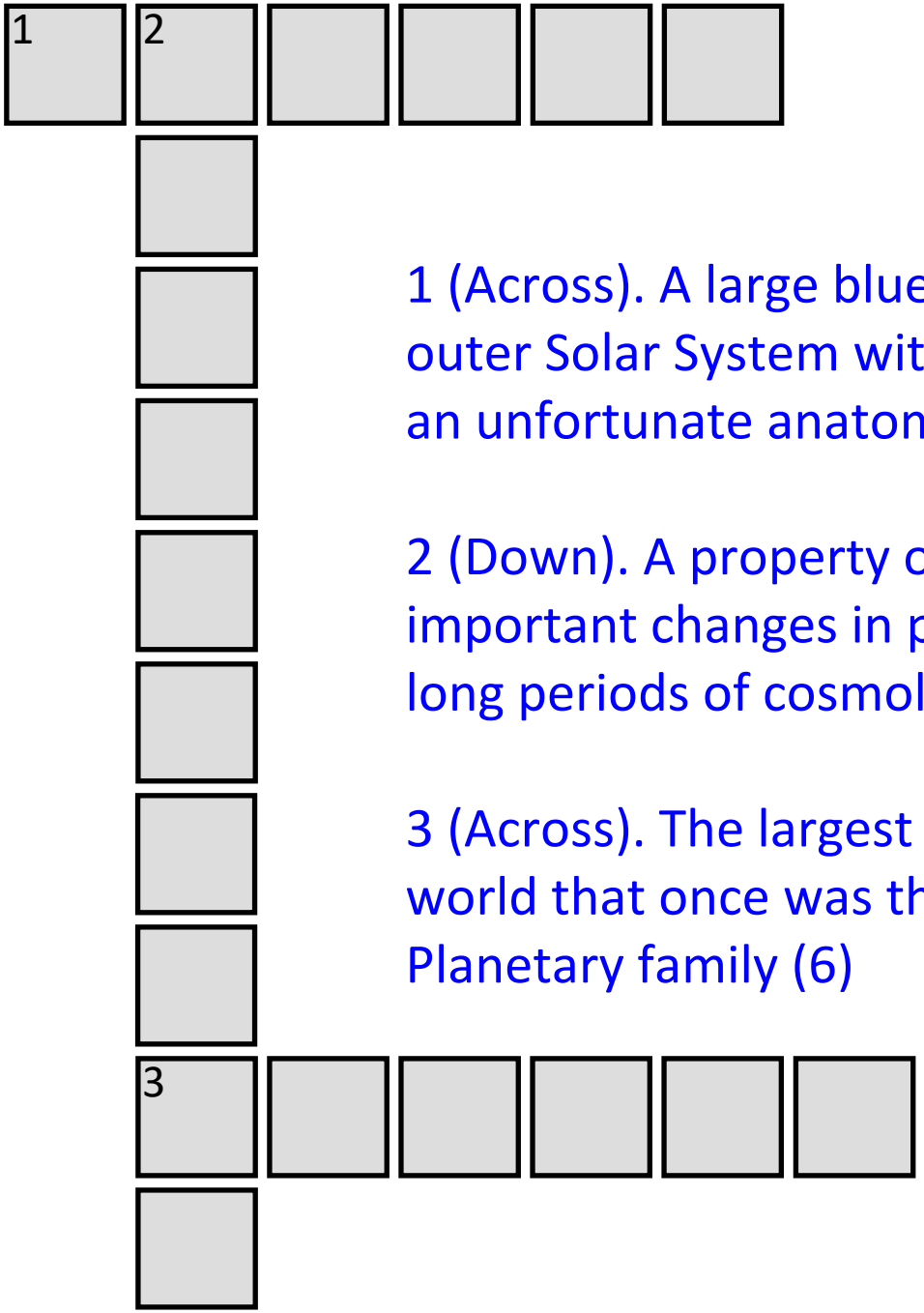
- There will be a final exam, which will have two parts. The first part is an online multiple-choice quiz. The second part is a take-home short-answer exam, which may involve some simple math. Details TBA.

I am available for discussions as needed

- I can arrange to meet up in person if needed at times, but I am also available for discussions by phone or webconference. Timing needs to be set up in advance……

- You can contact me by email, through the Brightspace System

Online or in-person discussion sessions are useful and you should try to attend. We are here to help!

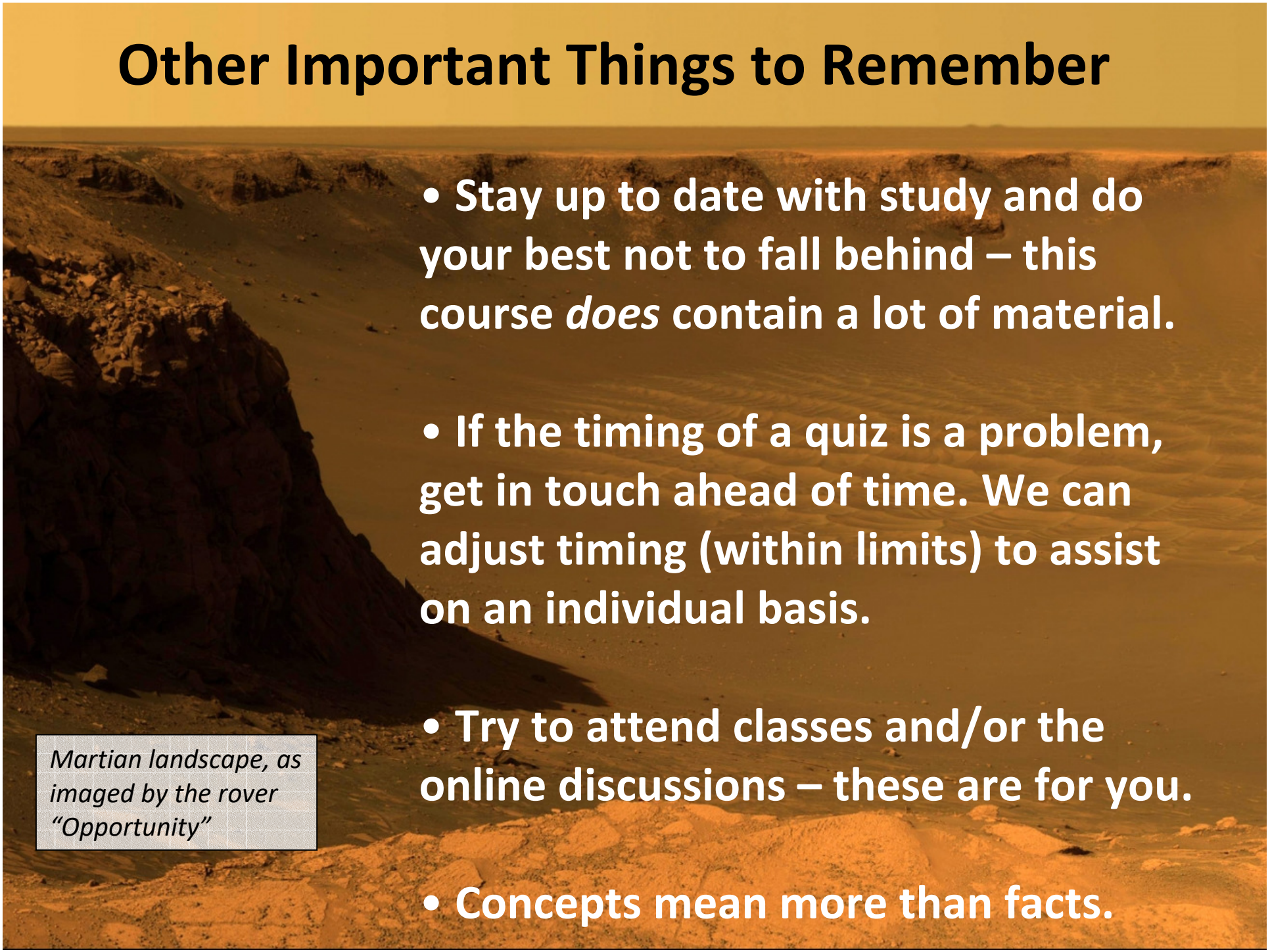


1 (Across). A large blue-green object in the outer Solar System with a name that contains an unfortunate anatomical reference (6).

2 (Down). A property of orbits that can cause important changes in planetary motions over long periods of cosmological time (9).

3 (Across). The largest moon of a small lonely world that once was the ninth member of the Planetary family (6)

Other Important Things to Remember



- Stay up to date with study and do your best not to fall behind – this course *does* contain a lot of material.

- If the timing of a quiz is a problem, get in touch ahead of time. We can adjust timing (within limits) to assist on an individual basis.

- Try to attend classes and/or the online discussions – these are for you.

- Concepts mean more than facts.

Martian landscape, as imaged by the rover "Opportunity"

Some Things to Get Started With….

- To get you started on this, and hopefully to interest you, there will be orientation material on Brightspace. These are NOT for credit, but you should look at them.
- **EXAMPLE QUIZZES:** This shows you what to expect in quizzes. The normal time allocation for a quiz like this is 25 minutes for multiple choice and 15 minutes for true/false questions. The questions are mostly general knowledge. You can repeat the quiz if you want to research the ones you do not know!
- **EXAMPLE CROSSWORD:** I use crossword puzzles to assist in learning, with marks given for completing them. They are intended to be fun as well as instructive. Answers will be provided to you later.

Important Documents :
Course Outline and “Read this First”

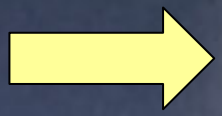
- **The Course Outline Document contains important information. It is on Brightspace in Module 1. Please read it! “Read this First” explains our plans for classes and discussions in writing.**

- **If you are ‘in person’, you should also look at these documents, just in case.**

- **About 20 years ago, I was lucky enough to attend a space shuttle launch at Cape Canaveral. It's the kind of experience that you do not forget.**

- **There is a LOT to learn in this course, but it really does explore new worlds, taking you to the outer edge of research into Planetary Science. *Make the effort to learn and your horizons will expand.***

Welcome to Earth Science 2150!



(Earth as seen from the Edge of the Solar System – A very small blue dot)

No MUN course that I know of takes a journey like this through space and time. I can't MAKE you enjoy the ride, but I hope that you find it interesting and rewarding