Lesson Unit

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**TITLE: Between Time and Eternity**

**TOPIC: Scientific and Theological Concepts of Time**

**DESCRIPTION:** This lesson will explore scientific and theological concepts of time. Through an exploration of deep time through a geological lens, students will uncover how their human experience of time in relation to our ancient world relates to the past, present, and future of the eternal God and His Church.

**ESSENTIAL QUESTIONS**:

1. Humanity is a product of an ancient, evolving planet. What does this mean for our understanding of our connection to creation?
2. Geological evidence reveals many creatures that have come and gone through evolutionary processes before humanity was on the planet ~300,000 years ago. How does our scientific knowledge of prehistory and of time impact the way that we understand ourselves?
3. If the eternal, omniscient God knows everything across space and time, why is it necessary for us to pray to God? Or more broadly, how does God (who is outside of time, in eternity) interact with creation, which is bound by the physical constraints of time?
4. Jesus experienced time as a mortal human being, yet God is outside of time, as an eternal being. What qualities of human life are inextricably linked to a sense of time?

**The KNOWLEDGE that students participating in our lesson will gain is:**

1. Demonstrate knowledge of when major events occurred during the history of the Earth in geologic time
2. Describe how Humanity is both a product of evolution in deep time and made in the image and likeness of God
3. Describe the way that the Incarnation and the Paschal Mystery re-oriented time in relationship to sacred time and human measurements of time.
4. Explain how God, who is outside of time, interacts with His time bound creation.
5. Explain how human beings, created in God’s image, exist between time and eternity.

**The SKILLS that students participating in our lesson will gain will be:**

1. Articulate how the geologic time scale is organized and why
2. Create a model of the geologic time scale and place major events in Earth’s history in sequence
3. Articulate different theological conceptions of time.
4. Evaluate the differences between scientific and theological concepts of time

**OUR METHOD IS BELOW:**

**Day 1: Introduction to Geologic Time**

1. Administer Pre-test (5-7 minutes)
2. Warm-up activity: Assessment of prior knowledge and misconceptions. Creation of a timeline of the history of the Earth from scratch. (~15 minutes; NOTE: This can take as long as you want it to. Students can and will drag this out for a long time, or you can request that they do it as quickly as possible, perhaps with a timer set, taking no more than 10 minutes to complete the student portion).
	1. Materials: [A 4.6 m long piece of adding machine paper](https://www.amazon.com/Gorilla-Supply-Machine-Receipt-El-1750/dp/B0BZZMC3PS/ref%3Dsr_1_1_sspa?dib=eyJ2IjoiMSJ9.UIi0wF-XTohirQBcKCSGhAIvU3LjDvdXhJj2PnWn2_ejjVSz475W9UfB7WY7CvDN6ZyC_Tf1drmR495Z_n_m0SV-oarxFpzFC_BP9zdullsGAB6mvZy7jKWVfIwhAoue90MTmbaxti_cx7hgfR91ESECTpC9_nfrzFso-XoCyFt8eFEqbxcAhq2QqaHqcmmKh5ECKgOIwx14tFcUyeIesMkZEPhgHBNMHzSl3HZ4yOAliQ8_K_iFCVb5YNT6znnt5Ysi7qU47WTox5Q72xyr89nmT7zlG3_3joTN2xF8WPI.siEMzQmzKANMfSnOv5pIQL7gvP6dgK9kohPE7_xywMA&dib_tag=se&keywords=adding+machine+tape+2.25+inch&qid=1715019289&sr=8-1-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&psc=1) (pre-measured, pre-labeled with “origin of the earth” and “today,” and pre-taped to the desks to save class time), a pack of colored pencils and Worksheet 1.
	2. Instructions:
		1. Have students break into groups of 3-4 and give them a set of materials
		2. Instruct students that without any expectations of prior knowledge and without looking anything up, to do their best to put a list of the major events of Earth history in order on a timeline using the list of events on Worksheet 1. Their timelines *will* very likely turn out incorrect. *(Note: instead of a list on a handout, you could make labeled arrows or images that could be taped onto the timeline which can speed up the process)*
		3. After all groups are finished with their timeline, show the students an accurate timeline of these events on the board that you made ahead of time (see Worksheet 1: Instructor Copy for detailed instructions) and ask students to write on their worksheet how their version of the timeline compares.
3. PowerPoint Presentation: The Geologic Time Scale (30 minutes)
	1. Handout of geologic time scale distributed
	2. An introduction to the purpose and structure of the geologic time scale (PowerPoint Slides)
	3. Guided note-taking outline assignment (Worksheet 2)

Instructor Resources:

* [A youtube video of how to make the time scale on paper](https://www.youtube.com/watch?v=mq4YStqyQqk&ab_channel=ScienceGonnaGetYou)

**Day 2: Geologic Time Scale Activity**

Note: It is possible to move directly to day 3, though this exercise is a great way to allow students to engage with the concept of geologic time and evolutionary history in an accurate, hands-on way, resetting misconceptions revealed on Day 1.

1. Warm up: Review and self-grading of the Geologic Time Lecture guided note-taking outline assessment. (5-10 minutes)
2. Create scale model of Geologic Time Scale (40-45 minutes)\*
	1. Materials: [A 4.6 m long piece of adding machine paper](https://www.amazon.com/Gorilla-Supply-Machine-Receipt-El-1750/dp/B0BZZMC3PS/ref%3Dsr_1_1_sspa?dib=eyJ2IjoiMSJ9.UIi0wF-XTohirQBcKCSGhAIvU3LjDvdXhJj2PnWn2_ejjVSz475W9UfB7WY7CvDN6ZyC_Tf1drmR495Z_n_m0SV-oarxFpzFC_BP9zdullsGAB6mvZy7jKWVfIwhAoue90MTmbaxti_cx7hgfR91ESECTpC9_nfrzFso-XoCyFt8eFEqbxcAhq2QqaHqcmmKh5ECKgOIwx14tFcUyeIesMkZEPhgHBNMHzSl3HZ4yOAliQ8_K_iFCVb5YNT6znnt5Ysi7qU47WTox5Q72xyr89nmT7zlG3_3joTN2xF8WPI.siEMzQmzKANMfSnOv5pIQL7gvP6dgK9kohPE7_xywMA&dib_tag=se&keywords=adding+machine+tape+2.25+inch&qid=1715019289&sr=8-1-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&psc=1) (pre-measured, pre-labeled with “origin of the earth” and “today,” and possibly pre-labeled with each meter representing 1 billion years and pre-taped to the desks or floor to save class time), a pack of colored pencils, masking tape, a meter stick, a ruler, and Worksheet 3.
	2. Instructions:
		1. Have students break into groups of 3-4 and give them a set of materials
		2. Instruct each group to take the list of events with their accurate ages on Worksheet 3 and accurately indicate where they go on the timeline
		3. After all groups are finished with their timeline, each student will complete the question prompts on Worksheet 3. This will include some opportunities to look up answers on the internet as well as some questions meant to stimulate critical thinking related to where God and his creative presence in the world fits into this picture of the history of the Earth and humanity. These questions will be explored formally on Day 3. (Worksheet 3-Instructor Copy will be provided).
	3. Homework: Choose one of the four Essential Questions listed in this lesson plan that you would like the students to contemplate on a deeper level through a journal reflection. Consider assigning different groups different essential questions (Note: if Day 2 activity is skipped, move this homework activity to the end of Day 1)

**Day 3: Theological Explorations of Time**

1. Warm up activity: Ask students to discuss their journal reflection homework response in pairs. (5 minutes)
2. Power Point Presentation (30 minutes)
	1. Theological Concepts of Time: an introduction to how we understand God’s eternal nature in and outside of the human conception of time (PowerPoint Slides)
	2. Guided note-taking outline provided (Worksheet 4)
3. Whole class discussion of Essential Questions (10 minutes or as time allows). If a fourth day is possible, we recommend spending a class period using small and large group discussions to explore the Essential Questions in greater depth, with the post-test at the end.
4. Post-test (5-7 minutes)

**Our ASSESSMENT SECTION will include the following**

**Day 1**

* Pre-assessment: Pre-test
* Pre-assessment: Geologic Time Warm Up Activity (WS1)
* Formative: Guided Notes Worksheet (WS2) for PPT on Geologic Time Scale

**Day 2**

* Formative: Geologic Time Scale Activity (WS3)
* Formative: Homework Journaling Assignment Using Essential Questions (HNDT 2)

**Day 3**

* Formative: Paired Warm up Discussion of Homework Assignment/Essential Questions
* Formative: Guided Notes for PPT on Theological Concepts of Time (WS4)
* Formative: Whole Class Discussion of Essential Questions
* Summative: Post-test

**RESOURCES FOR LESSON PLAN**

**Day 1:**

* [Pre-test](https://docs.google.com/document/d/1g_-BTVkrAWuMT9Kkh6BKaczEiPTZaZFX/edit?usp=sharing&ouid=104855406998957373688&rtpof=true&sd=true)
* [WS1: Directions for Geologic Time Warm Up Activity](https://docs.google.com/document/d/17OYYilIaEcLFOudlgAwXp_H8wHuLtmV_/edit?usp=drive_link&ouid=104855406998957373688&rtpof=true&sd=true)
* [WS1.1: Instructor Version of Directions for Geologic Time Warm Up Activity](https://docs.google.com/document/d/1xZI4jDv_9mAv0iJjzTul9-1xkgUE6BDO/edit?usp=drive_link&ouid=104855406998957373688&rtpof=true&sd=true)
* [PPT 1: Geologic Time Presentation (instructor notes included)](https://docs.google.com/presentation/d/175wwQCGD9L2Gx01wt9T3i4bfViGHzh9w/edit?usp=drive_link&ouid=104855406998957373688&rtpof=true&sd=true)
* [WS2: Guided Notes for Geologic Time PPT](https://docs.google.com/document/d/1ZZnOIG9A7Sgp4NV-QGycPpfEj_m78TVo/edit?usp=drive_link&ouid=104855406998957373688&rtpof=true&sd=true)
* [WS2.1: Instructor Version of Guided Notes for Geologic Time PPT](https://docs.google.com/document/d/1ZZnOIG9A7Sgp4NV-QGycPpfEj_m78TVo/edit?usp=drive_link&ouid=104855406998957373688&rtpof=true&sd=true)
* [HNDT 1: Geologic Time Scale](https://docs.google.com/document/d/1qCvcw8K3C3Jdqz6W6uxv-9WnZr5_LA_m/edit?usp=drive_link&ouid=104855406998957373688&rtpof=true&sd=true)

**Day 2:**

* [WS 3: Geologic Time Scale Assignment 2](https://docs.google.com/document/d/1sGZ_eHmYJwMx2OZxeEUiKL-VfyM9sPJx/edit?usp=drive_link&ouid=104855406998957373688&rtpof=true&sd=true)
* [WS 3.1: Instructor Version of Geologic Time Scale Assignment 2](https://docs.google.com/document/d/1Z32vVQ5JoPGjtK9_k1mwVtZDsHClA7Qb/edit?usp=drive_link&ouid=104855406998957373688&rtpof=true&sd=truer)
* [HNDT 2: Homework Prompt](https://docs.google.com/document/d/1uKkftd20uir8ZERnbbSmIgyNohZTi8yv/edit?usp=drive_link&ouid=104855406998957373688&rtpof=true&sd=true)

**Day 3:**

* [PPT 2: Theological Concepts of Time (instructor notes included)](https://docs.google.com/presentation/d/12EWgIqEfSN8Bovw8Q6FC9nEx5vmKDpL7/edit?usp=drive_link&ouid=104855406998957373688&rtpof=true&sd=true)
* [WS 4: Guided Notes for Theological Concepts of Time PPT](https://docs.google.com/document/d/15o54OVoKO1VFzCwAYrWvGQvNrNAy2k2W/edit?usp=drive_link&ouid=104855406998957373688&rtpof=true&sd=true)
* [WS 4.1: Instructor Version of Guided Notes for Theological Concepts of Time PPT](https://docs.google.com/document/d/1hhMDmJguno-MAs_hXduh1s9rVA4t21ZL/edit?usp=drive_link&ouid=104855406998957373688&rtpof=true&sd=true)
* [Post-Test](https://docs.google.com/document/d/13ncG3NDttxn29KDMUNbq3LPxwYgtrJ9U/edit?usp=sharing&ouid=104855406998957373688&rtpof=true&sd=true)

**Additional Resources:**

* Video of timeline activity- may be helpful for visualizing how to make the time scales <https://tinyurl.com/5t54z9ts>
* Resource for the Geologic Time Scale: <https://ucmp.berkeley.edu/help/timeform.php>
* Resources with concepts around how God creates *cum tempore* (with time)by Dr. Chris Baglow, Director of the McGrath Institute for Church Life Science and Religion Initiative
	+ <https://mcgrathblog.nd.edu/faith-and-science-acknowledging-god-as-the-creator>
	+ Page 10: <https://tinyurl.com/4sw8wxff>
* Resource: A youth group lesson about time and the Church calendar from Rev. Dr. Craig Sanders, an Anglican curate. Includes 14 minute audio version of lesson. <https://csanders.substack.com/p/journey-to-the-center-of-time-part>
* Resource with additional ideas about philosophical, theological and scientific concepts of time.

Written by Jimmy Akin, author and Catholic apologist <https://jimmyakin.com/2017/03/3-views-of-time-and-eternity.html>

* Book Recommendation: [The Seashell on the Mountaintop:](https://www.amazon.com/Seashell-Mountaintop-Science-Sainthood-Discovered/dp/0525947086) A Story of Science, Sainthood and the Humble Genius Who Discovered a New History of the Earth by Alan Cutler

An excellent and accessible summary of the life of Bl. Nicholas Steno

* Book Recommendation: [The Map that Changed the World:](https://www.amazon.com/Map-That-Changed-World-William/dp/0061767905) William Smith and the Birth of Modern Geology by Simon Winchester

Discusses how the science of geology took shape using stratigraphic principles

* Video clips from the PBS show Closer to Truth which explores many theological and philosophical questions. There are a number of episodes and video clips concerning God, Eternity, and Time. Guests include many accomplished philosophers, theologians and scientists including theoretical physicist and President of the Society of Catholic Scientists Stephen Barr. <https://closertotruth.com/topic/god-and-time/>