Time Scavenger Hunt – *Your Place in Time*

Goals:

- To have fun!
- To create a series of direct connections from the student, to their immediate environment, to their regional surroundings, to the Earth, the Solar System, our galaxy and finally out to the furthest reaches of space.
- To give students a sense of perspective on "Their Place in Time".
- To allow students to understand that the very same thought processes they use to determine the relative ages of common objects (like a weathered picnic bench, a tarnished coin, and a crumbling bridge) are the same thought processes used by scientists to determine the ages of planets, stars, galaxies, and the age of the universe itself.
- To provide students with a more intuitive feel for the relative ages of objects around them, in the solar system and throughout the universe.

Materials:

Note: Anything a student wishes that they could collect, but can't for some reason (like a mountain, star, elephant, etc.) they can draw, paint, or take a picture of with a camera.

- "Time Category" labels, enough for each small group, and one "Master" set that all objects will eventually be placed into at the front or center of the room.

- Items students bring or collect, either from home, outside, or the room itself. Items students may want to collect could include:
    - Rocks, leaves, sticks, wood, sandwich, soda can, water bottle, glasses, ribbon, fabric
    - or point to things in the room such as tables, chairs etc. (or just write name of object on a piece of paper)
    - pictures of people
    - pictures or postcards of places they've been/seen, like the statue of liberty, Mt. Rushmore
    - antiques, artifacts from parents (nothing valuable or irreplaceable)

- Pictures, paintings or drawings that students create beforehand or during the activity. Items students may want to "collect" by picture could include: animals, birds, houses, buildings, parents, friends, relatives, famous people, stars, planets, galaxies, comet, moon, Earth, trees, rivers, mountains

- If students are to be doing paintings, drawings, and/or pictures during the activity session you will need to have on hand the materials to do that. These may include: Paper, pencils, crayons, paints, brushes, cups, digital camera, printer

- One copy of the images supplied at the end of this write up. These are to be included later in the activity when building the final timeline.

- Items that already have dates on them! These might be coins, newspapers, magazines, books (with publication or printing date inside), etc. Such items help more cautious students get involved because there is more certainty on the age of the objects. Also, having some items like this incorporated into the age categories will help when students are challenged to think about how they would be more quantitative about the ages of objects.

- Other optional items that the facilitator may want to add based on availability, to enhance the activity. These may include: meteorites of known age, fossils of known age, rocks or other minerals of known age, something made of bone (like a comb or such) of known age

Background:

How old are the objects around us and how do we know? What is our place in time? How is my thinking both the same and different from what a scientist would think to answer these questions?

In this activity, students will use a scavenger hunt to collect objects of different ages, and will group them to explore the concepts of time, change, and their place in time within their world and universe.

This activity is a great way to connect the students and the familiar world around them with the larger universe, (students being other trainers, leaders, or girl scouts themselves). They can pull in items of interest to them, that they have "ownership" of, either because they really own it (like a comb) or because they painted it, drew it, took a picture of it, or saw it through a telescope. Then these personal items are placed into the framework of items of all ages, from now to the beginning of the universe.

Note: The real power and fun in this activity is in the discussions themselves, allowing the students to really connect their own thought processes to that of scientists. Refer to the "Discussion Notes" section at the end of this write up to get ideas for inspiring students thinking. These discussion ideas can be used at almost any point in this activity, from gathering items, to working in small groups, to working at last together in the big group.

Suggestions for Introducing the Activity:

If students have time to prepare for the activity before hand, they can be encouraged to collect objects and pictures of objects from home. This can include pictures of things they've seen on vacations, photos they may have taken through telescopes, as well as drawings or paintings. Be sure to tell students not to bring anything costly, fragile or irreplaceable. Also, be certain objects that younger children bring with them have names on them, so that they don't get mixed up.

The more time you have, the more objects students can put in their collections. If you have less time, try to get each student to have five items spread over as many categories as possible. If you have more time, then each student can bring more objects, maybe 7 or 8, to their small group. If students do have the opportunity to think about and collect items before they conduct the activity, then you can allow them to talk with the other members of their small group to avoid too much duplication.

Since this activity may include a lot of pictures and drawings, it is important to emphasize that the age we'll be talking about is the age of the object in the picture, not the age of the picture itself (which could range from 2 seconds ago to several decades).

A student may "collect" a globe of the Earth, and be thinking about when the globe was made, not thinking about the age of the Earth. Be certain you know what idea they have in mind. Such items can also be used to represent both ages for older students, who won't get confused with that concept.

Safety Note: Children need to be closely supervised in this activity, so they do not collect inappropriate, dirty, or unsafe items. Lay clear-cut ground rules for younger students; nothing possibly dirty (birds nest, trash) and nothing possibly dangerous (broken glass, rusty nail). Ask children to be respectful of other living creatures, like plants and animals. Instead of breaking off a piece of a living plant, or capturing a live insect or animal, have students draw or paint these things instead.

Procedure:

Part 1: The Scavenger Hunt, Collecting Objects

Start by gathering ideas from students about age, time, and how they know these things. Ask specific questions and list their ideas; How do you know how old something is? Who is the oldest person in the room? The youngest? What do you think the oldest thing in the room is? What is the oldest thing you can think of in the whole universe?

This discussion is designed to get students thinking about the full range of ages of objects, the kinds of indicators and evidence that are available to them, and how they use those to estimate age. It also begins the process of allowing them to place themselves in the larger picture by grounding the activity in the familiar environment around them. You may want to specifically ask them what they feel is "Their place in time" to compare that answer to what they say after the activity has been completed.

Separate the students into small groups of 3-5 students, and send them on the scavenger hunt. This can take anywhere from 15 minutes to as long as the facilitator has time for. This may include time for students to draw or take pictures, roam outside, inside, and/or rummage through personal objects to include. If students have had time to collect or create objects before hand, then less time may need to be spent in this part of the activity.

Encourage them to use what they already know and the ideas they already have to try to get things of different ages into their collections. Have them think along the lines of trying to place them in the following "Time Categories": Totally new, Pretty young, Somewhat young, Medium Age, Somewhat Old, Very Old, Really Ancient. If everything they have from home seems young to them, suggest they try to find or think of other items to round out their collections, or vice versa.

Remind them that they are free to sketch, paint or take pictures of anything they'd like to have in their collection, but can't get because it is too big, unsafe, alive, or whatever. This allows them to "capture" any object or idea they have and bring it to their collection.

Part 2: Sorting the Objects in Small Groups

After the allotted time, bring the students back and get them into their small groups, each at its own table, set of tables or own area. Give each group a set of "Time Category" labels. Have them sort their collection of objects into piles according to the labels. Depending on the possible limit to the number

of objects you've given them, each group may have anywhere from 15 (3 people with 5 items each) to 40 (five people with 8 items each) items to sort. The "Time Categories" are:

Totally New
Pretty young
Somewhat Young
Medium Age
Somewhat Old
Very Old
Really Ancient

During this phase of the activity, circulate around to the small groups and help guide their thinking if they become frustrated. Let them know it is fine to have things in the "I Don't Know" category. Also try pointing out or adding things to their collection that have actual dates on them, like coins and magazines. Then help them try to assign categories to other objects relative to these.

Part 3: Sorting the Objects in the Big Group

After the time allotted to small group sorting and discussion, get the students into one big group. Have a set of Time Category labels on a separate table or other area. This will be the 'final' Time Categories to which each of the small groups will contribute.

Have each of the small groups choose some number of favorite objects from their Time Categories, and have them place them into the "final" Time Category piles for the big group. The number of objects they get to move from their own small group categories into the "final" Time Categories is dependent on how much time can be allotted (perhaps 4 to 10 items for each small group).

Have each small group put all their objects up before the next group goes, explaining for each item why they chose that particular category. Also ask them why they chose that object at all (was it something they owned, a drawing of their favorite mountain, a picture they took themselves, etc.?) It is important to continue to connect them to the Time Categories, so they feel ownership of what is being created.

At this time, don't worry if the first group places something like a leaf in the "Totally New" category, while another places a leaf in the "Pretty young" category. Let them know that that is just fine at this stage. The focus is to elicit their ideas and thinking on category placement, drawing from their discussions in the small groups. They are free to change their minds, too, based on the ideas from other groups.

Keep the discussion free-form and fun. If some of the categories have many fewer items than others, allow the small groups a chance to place one or two more items to fill them out. Also, don't forget items that students may have placed in their "I don't know" categories. This may be the source of a lot of good discussion.

When every small group has placed their items into the 'final' Time Categories, ask them if any of the items need to be moved. Some students may feel that the item is fine, while others, after seeing what else is in the collection, might revise their idea of the relative age of the object. Shuffle items around until the group is generally content with the order.

In order to guide students thinking, you may need to ask them directly, "How did you know how old this was?" "Is there any evidence for the age of this object? (i.e. a date stamped on it, maybe it is

weathered or worn, etc.)" "What other clues to age are available?" (Again, see ideas in 'Discussion Notes') Do they equate shiny things with young things? Does grouping objects into shiny versus worn/rusted/tarnished help suggest a difference in age? Why?

Part 4: Connecting to the Universe

After the time allotted for the sorting of objects in the Big Group, and the general discussion at that stage, bring out your own selection of objects to add to the Time Categories. These will include the images at the end of this write up, along with anything from the materials section that you want to add (such as meteorites, fossils, whatever). (Note: If your time is very short, you may want to have these specialty items and images on the table at the start of Part 3, and combine the placing of small group objects with the placing of these specialty items. But separating these two will allow for more development of the student's ideas of age and how they know, based on their own environment and experience.)

Hold up each object and have students tell you what Time Category to put it into, and why they want it there. If the students have already included a picture of the Moon, or a drawing of a star or planet etc., then they may have already considered that these objects might be very old compared to most of the other things in their collection. Encourage them to make new, intermediate categories if they have to, like "Almost Totally New" or "Not Quite Really Really Old". (This refining of the age scale will help them when they have to think about not just the relative ages of objects, but the absolute ages, if you have the time to allow for the building of an absolute timeline).

Students may exhibit more frustration with trying to estimate the ages of astronomical objects as opposed to items in their everyday experience. Be prepared to guide them more at this stage if they want to put everything into the "I don't know" category. For example, you may want to tell them the absolute age of one planet, and see if that helps them in considering the relative ages of other planets.

Part 5: Getting More Quantitative

If time allows, you may wish to take the students to the next level of thought by discussing how the general categories they have created can be placed in a more absolute timeline.

Begin by seeing if they can order the objects in each pile from youngest to oldest. Help them using the discussion clues provided previously and in the "Discussion Notes" below. Use objects that have actual dates, like coins, magazines, etc., to start them on their way. If they can't give an absolute age for an object, can they give an age range, say from 100 to 1000 years old? Allow them to assign ages or ranges, even if the ranges are wide, to all the objects in the piles.

Thinking about the absolute ages of objects, especially for older students, allows the ideas of "clocks" to be brought into the discussion. Direct comparison can be made between the 'clocks' used to determine the ages of common objects, and the 'clocks' used by scientists to determine the ages of astronomical objects.

Part 6: Final Discussion and Fold Up Book

Help draw students back to the main goals of the activity by leading them in a final discussion.

Emphasize that everything changes with time. In many cases, things change in predictable ways, and at predictable rates as they get older. These allow us to estimate the ages of objects, like the age of a person based on our knowledge of human biology. Point out that scientists use these same ideas and knowledge of predictable change with time to estimate how old planets, stars, and galaxies are. The thought processes they use to estimate the age of a person is much the same as that of a scientist. Even to that of a scientist estimating the age of our own universe.

Take the students back through the objects and allow them to express in some way their connection to them. What is the story of the whole timeline or group of objects? How are they a part of that story? Ask them again "What is their place in time" and see how that answer differs from what they said before they began the activity.

As a final wrap up, allow students time at the end to illustrate their own fold up booklet of Time with images that have a connection to them. The back has reference information about how we know how old things are.

Variations:

- If you have access to a digital camera and color printer, then it is possible to add pictures of things students would like to collect "on the fly".
- Encourage students to each build their own "Time Scrapbook", which starts with pictures of themselves, their families and homes, and then moves out to include older and older objects, ending with pictures of stars, planets and galaxies. Some small items might also be fastened into the scrapbook, such as leaves, postcards, fabric, etc.
- Instead of the general age categories chosen in Part II of the procedure, different categories could be selected based on what appeals to the group by age, especially a younger audience. Categories just need to span through history, with each category covering more time as you get older (because it will be easier for students to fill the younger piles than the old ones). Some possibilities include:
    - Younger than me, Same age as my parents, The age of the country, As old as the Pyramids, When Dinosaurs lived
- If students have been involved with the MicroObservatory project, encourage them to use images they have taken for those activities in this scavenger hunt. If they have their own telescope, or want to include images from the MicroObservatory archives, that is also a good way to have them feel more "ownership".

Discussion Notes:

Specific Questions:

Why did you put this object in your collection?
What is your personal connection or interest in this object? (To get them to continue to think about 'their place in time'.)
Why did you place this object in this category?

Say you found this object (something you are pointing to, something you hand them), where would you put it and how would you know?
How did you guess the age of this object?
You say it looked old (young)? Why do you say that?
What is the very oldest (youngest) thing in the piles? What, given the whole universe to choose from, would be older (younger) than this? (Responses can be listed, and then you can bring out specialty items that are older, younger, or point to other objects, to get them thinking.)
You say it looked similar to other things already in that category or pile? How does it look similar? Why do you think that similarity has something to do with how old it is?
Is the object worn/shiny/rusted/tarnished/faded/used/smooth/rough etc.? Does that suggest anything about its age?

General Discussion Ideas:

Timelines as a Model

Discuss the idea of timelines as a scientific model with the students. Where and in what situations would the relative or absolute timeline they created be a useful model? Every type of method that is used to estimate age (note list above) is in itself a model for how we 'expect' that change to take place. What are some of the uses and limitations of these models? Where do they give you a good estimate for the age of an object, and where do they lead you astray? (For example, something rusty might be called "old" and a shiny version of that object "young" because students know some metal objects rust with time. But for that model to work, both objects must be subjected to the same conditions. If a shiny metal object was kept in an airtight package for 100 years, it might look brand new. The same object exposed for just a few weeks outside might be completely rusted.)

Records and Timelines versus Direct Observation and Evidence

Often students will say they know the age of an object because they have "been told" or "have read" the age at some time. Such written and oral histories are of course not to be dismissed as evidence, as a large part of our understanding of how the world works and our place within it is built on the thoughts of others through the ages. Written records are a common and acceptable source of information (although hardly error-free). A birth certificate or driver's license allows someone to 'know' your age, even though they were not there when you were born. Assuming your records are correct, of course (and therein is the limitation on that model). Much of the power of different methods for finding the age of an object lies in combining information from a written record with our own direct observations.

Students can be guided to think about these issues using questions such as "How do you know there were dinosaurs, since no one has ever seen one?" Students might at first say "Because I read it", but if pressed may come up with "I saw a dinosaur footprint on a vacation to the Southwest" or "I saw dinosaur bones in a museum".

Change as a Process with Predictable Rates and Timing

A critical component to this activity is helping students understand that they way they estimate age for common objects is the same as the way a scientist estimates age for astronomical objects. In both cases we look for signs of possible change (measurements, observation, evidence) and then use our

understanding of change with time (records, timelines, techniques) for that class of objects to estimate its age. For example, we can determine relative ages of objects by looking at:

Style, Fashion, Form – hairstyles, architecture, tools, pottery shards, music CDs, specific styles can be tied to specific decades or centuries.
Weathering - getting worn/used, faded/bright, exposure to the elements
Cycles and Growth - leaves change size and color, children grow into adults, stars are born and die
Positions and Layering - superposition, what's on top is generally younger than what is on the bottom, rock layers, lava flows; position changes, for example sand dunes can come suddenly to cover over rocky surfaces. The idea of position might also include knowing that a rock has to be older than a building, if the building is made of that rock.

While students may not understand the specifics of a scientific technique for determining age, like radiometric dating (nor is it necessary that they do), they can understand that it is not just the shape and form of something that can change with time, but also chemistry and composition. Molding cake, a rusting nail, and graying hair are some general examples of how the chemistry of something can change as time goes by. If you know how fast something rusts, or how fast a cake will mold, you can get a better estimate of its age.

Further Thoughts

Note areas of thought that seem to be confusing, perhaps like the age of a building, are they thinking of when it was built, or the age of the rocks that make it up? Help them clarify exactly what they are trying to date. For older students, the idea of an object having multiple ages will not be confusing, and this can be used to stimulate further discussion. Keep ideas simpler for younger children.

More Advanced students may enjoy thinking about and discussing the ages of a more abstract class of objects, and how you determine those ages. For example, water. How old is water? The age of the last rainstorm? The age of the oxygen and hydrogen that make it up?

Totally New

Pretty young

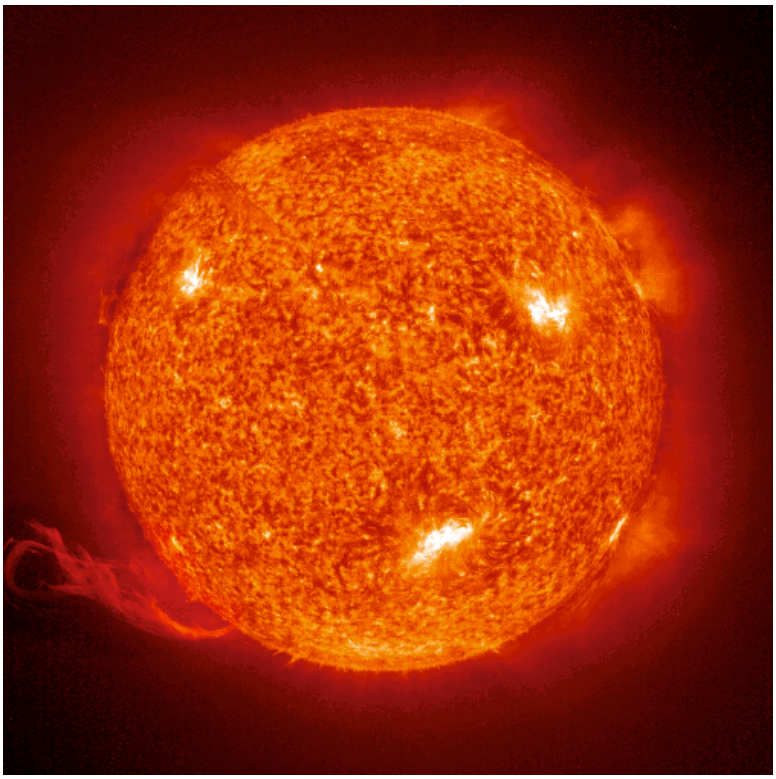
Somewhat Young

Medium Age

Somewhat Old

Very Old

Really Ancient



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NASA Goddard Space Flight Center

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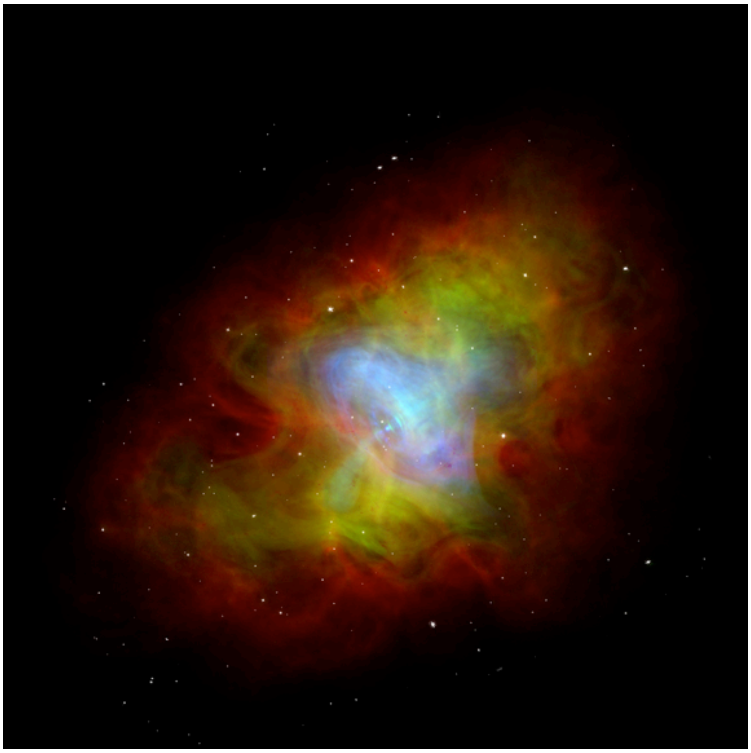

Credits: X-ray: NASA/CXC/ASU/J. Hester et al.; Optical: NASA/HST/ASU/J. Hester et al.; Radio: VLA/NRAO)

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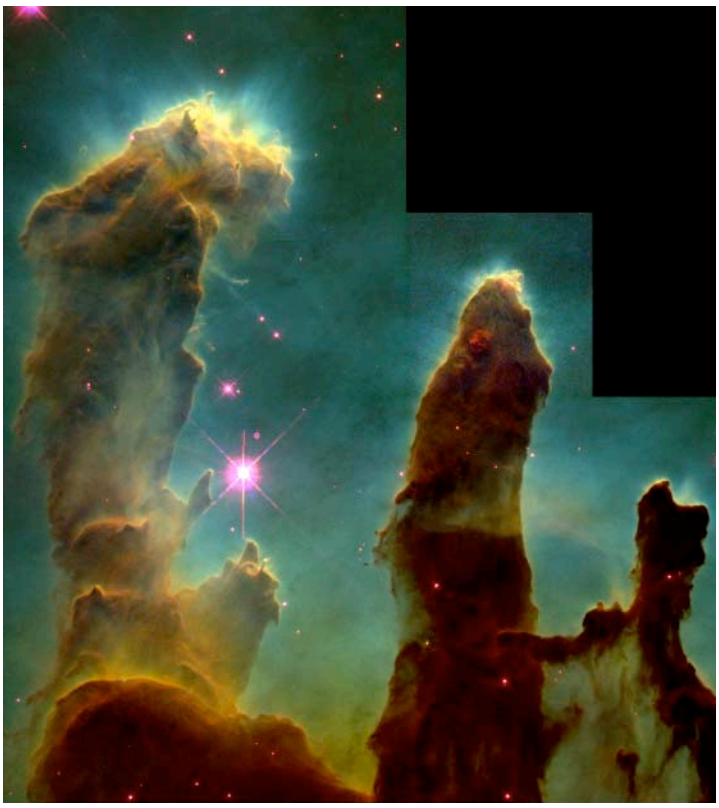
Steve Lee (University of Colorado), Jim Bell (Cornell University), Mike Wolff (Space Science Institute), and NASA



Jeff Hester and Paul Scowen (Arizona State University), and NASA

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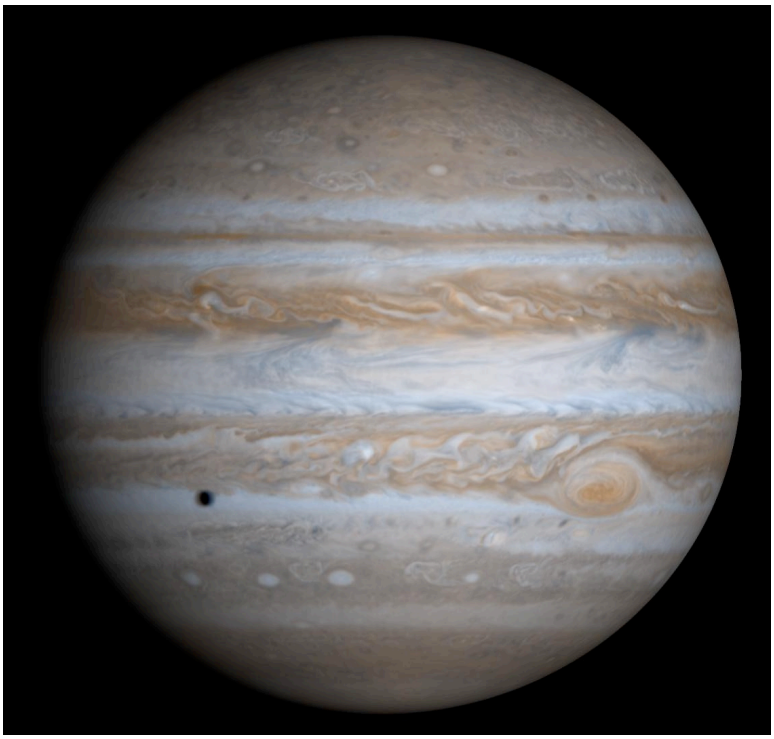

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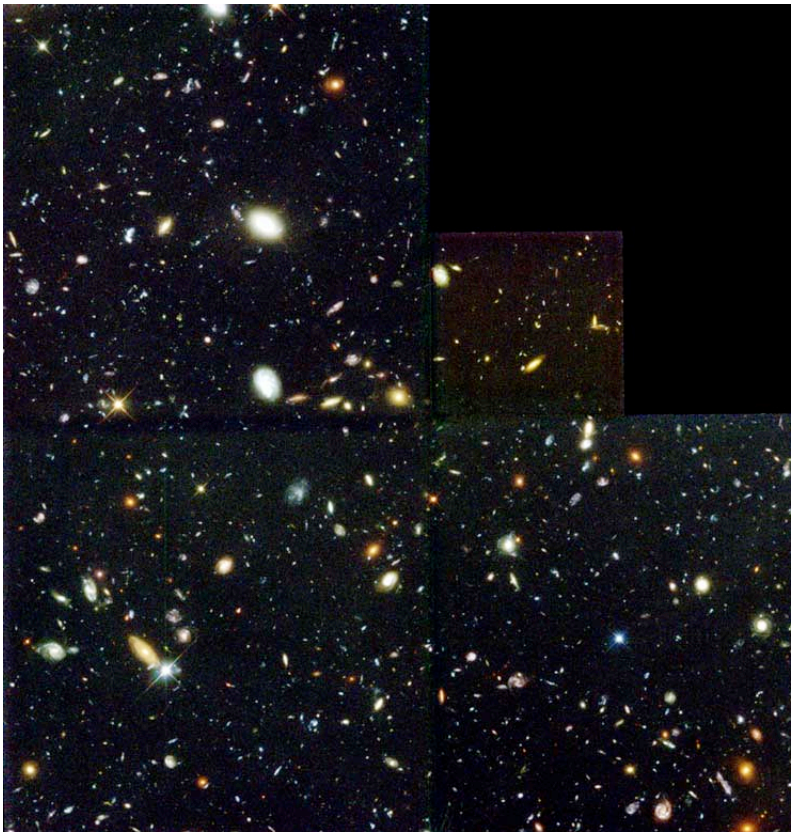

R. Williams (STScI), the Hubble Deep Field Team and NASA

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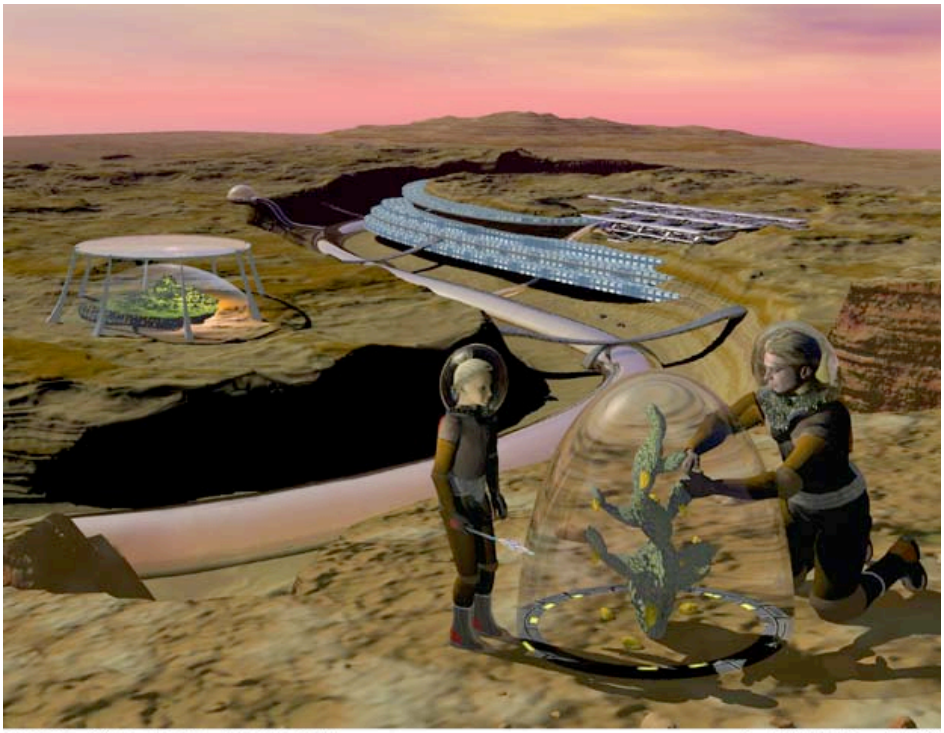

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