

Advanced Earth Conditions

Corrections to the Analysis and Conclusions of Miller-Urey's 1953 Experiment

Greg Stafford**

In a brief yet important, scientific article published in 1953, Stanley L. Miller (1930 – 2007), with the assistance of Nobel Prize winner, chemist, and physicist Harold C. Urey, showed how an already existing, intelligent human being under simple but highly controlled and managed conditions could intentionally generate what are often called the basic building blocks of life (though not “life” itself), namely, amino acids.¹

But amino acids are *not* the building blocks of “life.” They are the building blocks of protein, which is part of living, physical things, but still not *life*. Amino acids are not alive. Protein is not alive. Therefore, neither of them are the “building blocks” of “life” unless it can be shown that “protein” is life in any demonstrable sense. Yet, evidence to the contrary often exists after a person dies, since the protein and amino acids usually remain for a time even though the person is no longer alive. This is because at a person's death something which was present as a part of the person's physical being is now gone, even though the amino acids and protein remain. Still, even though the amino acids and protein remain in the body for some time, neither will ‘build’ into or be “blocks” that create “life.” This is in part why scientists cannot “create life” using amino acids or proteins together with their knowledge and technology.

Yet, the origin of life is not this paper's primary focus, though it is part of it. This paper will primarily consider the question of whether existing, intelligent life is necessary for the Miller-Urey experiment and, comparatively, for early earth's atmosphere, and whether Miller-Urey properly accounted for the right cause(s) not only of their amino acid production but also for their “apparatus,” as well as the

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¹ See Stanley L. Miller, “A Production of Amino Acids Under Possible Primitive Earth Conditions,” *Science* 117 (May 15, 1953), pages 528-529, <http://www.sciencemag.org/content/117/3046/528.full.pdf> (last accessed: July 3, 2026). On amino acids as “building blocks of life,” see Yein Fein, “Amino Acids: The Building Blocks of Life,” *Journal of Evolutionary Medicine* 11 (2023), who writes, “Amino acids are the fundamental building blocks of life, playing a crucial role in various biological processes that sustain and shape living organisms” (Introduction). Compare this with the more careful and correct wording in “Amino Acids: Building Blocks of Proteins,” *ConductScience* (2022), doi.org/10.55157/CS20220612, “Amino acids... are monomers or *building blocks of proteins*. Proteins are one of the major biomolecules required for *the proper functioning of living organisms*” (emphasis added). For a discussion of “unintelligent” or accidental design versus “intentional intelligence,” see my, “The Intelligence in Life: Intent and ‘Time,’” *Watching the Ministry* (February 8, 2010), <http://elihubooks.blogspot.com/2010/02/intelligence-in-life-intent-and-time.html>, and my follow-up article, “Intentional Intelligence in Non-Human Life: The Division of Human Language,” *Watching the Ministry* (April 5, 2010), <http://elihubooks.blogspot.com/2010/04/intentional-intelligence-in-non-human.html>.

implications for early earth's atmosphere. It will also discuss the question of whether life is "eternal" in some sense based on scientific evidence. But the true implications of the 1953 Miller-Urey experiment are the focus, again, not only for the production of amino acids in early earth's atmosphere, but also for what is required for there to be either an "apparatus" in the case of Miller-Urey's experiment and for there to have been one also for early earth's atmosphere.

Note the latter part of the title of the Miller-Urey article with my emphasis, "... Under *Possible* Primitive Earth Conditions." This paper presents what I consider the best available reasons supporting the Miller-Urey hypothesis for the type of conditions which were not only "possible," or even likely, but *required* in early earth's atmosphere. Though there is agreement here with Miller-Urey's hypothesis for early earth's atmosphere's conditions in terms of what must have been present, this paper identifies a far different cause for producing amino acids than Miller-Urey concluded, though relying on the same available evidence. It is this unidentified but evident cause that I intend to show is required both for the Miller-Urey 1953 experiment and for any similar production of amino acids in early earth's atmosphere.

To this point, it is clear from Miller-Urey's article and from their experiment that the "Production" part of their title, and their experiment, is not accidental or achieved without intelligence. Rather, as Miller-Urey should have known, the possible amino acid production they describe and shown by their experiment is intentional and it is intelligent. As this paper shows, the Miller-Urey experiment constitutes part of the best available evidence that shows amino acids require intention and intelligence for their production, just as it did for the Miller-Urey experiment. In fact, there is no evidence to show amino acids could have been produced accidentally and without intelligence. This means, scientifically, it is not simply "possible" that amino acids can form under the conditions designed and maintained by Miller-Urey. It is likely if not required that it is how they formed, namely, with *living intelligent beings*.

Why, then, is Miller-Urey's 1953 experiment ever considered evidence in support of the accidental, *unintelligent* production of amino acids? As this paper will further discuss, the reason is neither those citing Miller-Urey for this reason, nor Miller-Urey themselves, account for the primary agents in the production of amino acids, namely, Miller-Urey! Two intentional and intelligent human beings who designed and constructed the apparatus for their experiment, two intentionally intelligent humans who also introduced the contents and who maintained experiment's conditions until it was complete. What this experiment really showed was something far different from Miller-Urey's conclusion. Instead of accidental *unintelligence*, the Miller-Urey experiment shows conditions to produce amino acids in an early earth atmosphere required intelligence to design, to construct, and to maintain a similar "laboratory" and "apparatus."

The balance of this article will demonstrate this more conclusively, using both the Miller-Urey article and their 1953 experiment, as well as a comparison between Miller-Urey's apparatus and other 'apparatus(es)' within which Miller-Urey and others believe amino acids could have been produced without intelligence. Due to the brevity of the Miller-Urey article, it is practical here for me to quote extensively from it in discussing its content and conclusions. In doing so I will explain how Miller-Urey, and others who use or rely on their experiment, do not rely on the best available evidence when they conclude that anything other than one or more already-existing, intelligent beings similarly put together the necessary controls and the required "apparatus(es)" for the production of amino acids in early earth's atmosphere. To this point, the opening paragraph in this Miller-Urey 1953 article reads on page 528:

The idea that the organic compounds that serve as the basis of life were formed when the earth had an atmosphere of methane, ammonia, water, and hydrogen instead of carbon dioxide, nitrogen, oxygen, and water was suggested by Oparin and has been given emphasis recently by Urey and Bernal.

The “idea” expressed here begins with and is only possible because of already existing (and, hence, existentially unexplained) beliefs about: 1) the earth existence, 2) earth’s atmosphere’s existence, 3) the existence of the gases such as methane, ammonia, and hydrogen, 4) the existence or presence in earth’s atmosphere of carbon dioxide, nitrogen, oxygen, and water which are subsequently circulated and controlled by 5) already-existing, living and intentionally intelligent beings, in this case, Miller-Urey. *These conditions* are the foundation for the Miller-Urey experiment. Only after they are existing and in place under the right conditions and correct quantities can the experiment take place. Here is how Miller-Urey describes the work in the second paragraph of their article, (page 528, with underlining):

In order to test this hypothesis, an apparatus was built to circulate CH₄, NH₃, H₂O, and H₂ past an electric discharge. The resulting mixture has been tested for amino acids by paper chromatography. Electrical discharge was used to form free radicals instead of ultraviolet light, because quartz absorbs wavelengths short enough to cause photo-dissociation of the gases. Electrical discharge may have played a significant role in the formation of compounds in the primitive atmosphere.

Setting aside all that was done or assumed as existing prior to the experiment (see prior paragraph), during the experiment Miller-Urey ‘used electrical discharge’ which was subsequently determined “may have played a significant role in the formation of compounds in the primitive earth atmosphere.” If this is the case, then the “significant role” should have been highlighted as a something resulting from an intelligent ‘use’ of electrical discharge. Yet, this is rarely the conclusion drawn by those familiar with Miller-Urey and it is not the conclusion reached by Miller-Urey, either.

Yet, the fact remains the Miller-Urey hypothesis implicitly *requires* an intentionally intelligent, already existing being who must first design and then build “an apparatus,” one that can be “used” to “circulate” already existing gases through “an electric discharge.” An intentionally intelligent being is also required to generate the discharge. Only after all these things are completed is there a “resulting mixture” which the “electrical discharge was used to form.” Note the language used here by Miller-Urey, “... *was used to form*.” But how was the electrical discharge “used”? *Who* used it? If the ‘use’ is from an intelligently designed, built, and maintained apparatus and from an intentionally generated electrical discharge, then so is the product (amino acids) of the experiment. At a minimum, in this case, those intelligences are Miller-Urey, though this does not include any intelligence(s) behind items used to construct the apparatus (glass tubes, electrical devices, etc.).

Recall the Miller-Urey conclusion from the quotation at the end of page 2, “Electrical discharge may have played a significant role in the formation of compounds in the primitive atmosphere.” This conclusion misses all the earlier described, surrounding, and even foundational elements which produce the “electrical discharge.” Indeed, Miller-Urey attribute more causation to “electrical discharge” than to their own intelligent planning and design of the apparatus! Based on the Miller-Urey experiment and without a non-intentional, or *unintelligent* experiment which could produce similar results, we must conclude differently from Miller-Urey’s “may have” and say, ‘intentionally discharged electricity definitely played a significant role in the formation of compounds in the earth’s primitive atmosphere.’

We must also conclude from the Miller-Urey experiment that the “formation of compounds” required intelligence, not only to construct the apparatus in which the compounds were formed, but also to provide the electrical discharge. This is because it is precisely what Miller-Urey demonstrated and it is consistent with everything else which can be and is repeatedly shown using similar intelligently designed apparatuses with measured components with intelligently set temperatures and with intentionally (not accidentally) controlled conditions. This includes “an aspirator arrangement to promote circulation” in

one version of the experiment using “a different apparatus.” However, when circulation was slower in another apparatus amino acid production increased.²

Based on the Miller-Urey experiment, it is likely the atmosphere in which such formations (amino acids) occurred was not at all “primitive,” unless “early” is all that is meant. But if Miller-Urey in any way mean early earth’s atmosphere was not as complex if not more so than the same or similar conditions which Miller-Urey intelligently designed, created, and maintained, the evidence does not support them. In fact, there is no basis in the Miller-Urey experiment for concluding anything other than under the very same or similar conditions an already existing, intelligent being or beings (in the experiment, Miller-Urey) who designed, built, and maintained an apparatus to produce amino acids in early earth’s atmosphere. Though this does of itself explain what “life” is or how “life” came to be part of anything physical that is composed of (among other things) amino acids. For more on this, see page 1, paragraphs 1-2 of this paper. Now we return to Miller-Urey, page 528, paragraph 3:

The apparatus used is shown in Figure 1 [shown on page 6 in this article (GS)]. Water is boiled in the flask, mixes with the gases in the 5-l flask, circulates past the electrodes, condenses and empties back into the boiling flask. The U-tube prevents circulation in the opposite direction. The acids and amino acids formed in the discharge, not being volatile, accumulate in the water phase. The circulation of the gases is quite slow, but this seems to be an asset, because production was less in a different apparatus with an aspirator arrangement to promote circulation. The discharge, a small corona, was provided by an induction coil designed for detection of leaks in vacuum apparatus.

The intelligently designed and intentionally built apparatus (Miller-Urey’s Figure 1, shown on page 7) is used by already existing beings (Miller-Urey) to ‘boil water.’ The boiled water is then intentionally ‘mixed with gases’ and ‘circulated past electrodes’ before the intentionally built apparatus (from an intelligent design) “empties” the mixture “back into the boiling flask.” Once again, intentional intelligence is shown in the apparatus’ designed *prevention* of ‘circulation in the opposite direction,’ this so the “amino acids formed in the discharge... accumulate in the water phase.”

Subsequently, Miller-Urey noted varying degrees of success in the resulting amino acid “production” from “a different apparatus,” one also designed and built by an intelligent, already alive being (Miller-Urey). Indeed, Miller-Urey write of a “small corona” discharge that “was provided by an induction coil,” which was also “*designed* for detection of leaks in vacuum apparatus” (emphasis added). Then on page 528, paragraph 4, of Miller-Urey we read:

The experimental procedure was to seal off the opening in the boiling flask after adding 200 ml of water, evacuate the air, add 10 cm pressure of H₂, 20 cm of CH₄, and 20 cm of MH₃. The water in the flask was boiled, and the discharge was run continuously for a week.

The “procedure” here described (and previously) clearly shows that an already existing, intelligent being had to “seal off the opening in the boiling flask.” This is done after the already existing, intelligent being adds water, removes the air, and then adds measured quantities of specific gases exclusive of other gases. After all this, then the “water in the flask was boiled” and the discharge “run continuously for a week.” What Miller-Urey repeatedly fail to account for in this experiment is *the necessity of living intelligence* as a precursor to any “experimental procedure.” Miller-Urey continue on page 528, paragraph 5:

During the run the water in the flask became noticeably pink after the first day, and by the end of the week the solution was deep red and turbid. Most of the turbidity was due to colloidal silica from the glass. The red color is due to organic compounds adsorbed [adsorbed involves one substance sticking to

² Miller, “A Production of Amino Acids Under Possible Primitive Earth Conditions,” page 528 (see quote of the same on page 4 of this article).

another substance (GS)] on the silica. Also present are yellow organic compounds of which only a small fraction can be extracted with ether, and which form a continuous streak tapering off at the bottom of a one-dimensional chromatogram run in butanol-acetic acid. These substances are being investigated further.

Here Miller-Urey describe what occurred *after* they arranged for the previously described and controlled conditions. Yet, from the apparatus to the boiling water, from the measured and included gases to any gases which were intentionally excluded, from the included air to the vacated air, it is Miller-Urey who set everything in motion, including circulating the mixture past electrodes. Without Miller-Urey, none of what took place in this experiment would have happened according to any known scientific study. *Miller-Urey are responsible* for everything taking place in the experiment, all while being excluded as such from the conclusions they reach! Miller-Urey are also responsible for the following parts of the experiment:

At the end of the run the solution in the boiling flask was removed and 1 ml of saturated HgCl_2 was added to prevent the growth of living organisms. The ampholytes were separated from the rest of the constituents by adding $\text{Ba}(\text{OH})_2$ and evaporating *in vacuo* to remove amines, adding H_2SO_4 and evaporating to remove the acids, neutralizing with $\text{Ba}(\text{OH})_2$, filtering and concentrating *in vacuo*.

Again, without Miller-Urey none of this would have occurred. Therefore, the Miller-Urey 1953 subject experiment shows that even for amino acids to form there were likely many conditions in the early earth's atmosphere which were intelligently designed and created or arranged, and thereafter maintained by the same living, intelligent being under highly controlled conditions. The obvious conclusion resulting from complete consideration of the involved person(s), the designed and built equipment, the included and excluded gases, and the other intentionally controlled conditions is what makes the first full paragraph-sentence on page 529 of Miller-Urey so surprising (underlining added):

The amino acids are not due to living organisms because their growth would be prevented by the boiling water during the run, and by the HgCl_2 , $\text{Ba}(\text{OH})_2$, H_2SO_4 during the analysis.

There is really no question about whether “living organisms” (Miller-Urey) are responsible for this experiment and, therefore, also for the resulting amino acids. At the very least the amino acids are due to Miller-Urey, two living and intelligent humans who planned and conducted the experiment. Yet, they exclude themselves from their own analysis when it comes to causation! Nevertheless, the related question of how life came to be is outside the Miller-Urey experiment. But it is not outside the limits of this paper. Elsewhere I have argued that, scientifically, life is both eternal and intelligent, including by comparison with the Miller-Urey experiment.³ Here is one form of my argument translated into a categorical syllogism:

- 1) No Q is from S.
- 2) All P is from Q.
- 3) Therefore, no P is from S.

- 1) No existing life [No Q] is from something unalive [from S].
- 2) All new life [All P] is from existing life [from Q].
- 3) Therefore, no new life [No P] is from something unalive [from S].

³ See, for example, “The Origin of Life Is Life (or Something or Someone Already Alive),” *Watching the Ministry* (January 13, 2010), <http://eliubooks.blogspot.com/2010/01/origin-of-life-is-life-or-something-or.html>.

Apart from a credible third option, the only alternative to something dead (S) is something alive (Q). Since new life (P) comes from existing life (Q) every day, many times a day, life must always have always in some form. Otherwise, we are claiming there was a time when no life existed, but new life came into being anyway! That never happens, and it is not possible according to science, and (S) retains its truth value in the argument. What is possible, what happens every day many times a day, is new life comes from existing life. No exceptions.

Since life exists, something or someone always has been alive (Q) to give life to new life (P). Put differently, the above argument requires life in some form to be eternal, either as a single, eternal life form or through an eternal succession of existing life forms giving life to new life, both of which require life to be eternal for life to exist, scientifically. Otherwise, no life can exist apart from a credible third option between existing life (Q) and something unalive (S). Since there is no credible third option, and since life *does* exist without coming from something unalive, but *always* comes from existing life, life is eternal, or something or someone always has been alive to give life to new life.

Further, the argument remains based on what we can show *now*, namely (again), life does not come from something unalive but *always* comes from existing life. Yet, it remains scientifically falsifiable if another credible source or cause for new life (P) is identified other than existing life (Q). Since new life coming only from existing life means life is eternal, or that someone or something has always been alive, and since new life never comes from something unalive (S), absent a scientifically tested and credible third option life in some form is eternal. With this and the prior syllogism requiring existing life before any new life clear in mind, we can advance the following inferential argument:

- 1) If P then Q.
 - 2) P.
 - 3) Therefore, Q.
-
- 1) If life exists [If P] something has always been alive [then Q].
 - 2) Life exists [P].
 - 3) Therefore, something has always been alive [Q].

Since all available evidence supports the belief that life exists (P) and that new life only comes from existing life, something has always been alive (Q). Without a scientific demonstration or credible theory of how new life can come to be without already-existing life (or from something unalive), we are left with the only observable, reliably predictable, and repeatedly demonstrated answer: New life only comes from already-existing life. This means something or someone has always been alive or pre-existed each new life that has come into being.

It also requires life to be eternal since new life receives life only from something or from someone alive. Therefore, together with our earlier categorical syllogism and the related inferential argument for eternal life, and based on Miller-Urey's 1953 experiment and from what we can observe and demonstrate from all other complex systems which provide utility or support, such as earth's atmosphere, we can argue for eternal life's intelligence as follows:

- 1) All S require P.
 - 2) Q is S.
 - 3) Therefore, Q requires P.
-
- 1) All complex containment systems providing utility [All S] require intelligence [require P].
 - 2) Earth's atmosphere [Q] is a complex containment system providing utility [is S].
 - 3) Therefore, earth's atmosphere [Q] requires intelligence [requires P].

Based on these arguments and the respective truth values of S and P, eternal life in some form exists which, among other descriptions, many call “God.” Since Miller-Urey failed to account for the necessity of intelligent life to produce amino acids in their own experiment, it is not too surprising to find they also failed to conclude that already-existing, intelligent life was not only “possible,” or even likely, but *required* to design, to build, and to maintain a sufficient apparatus for similar productions in early earth’s atmosphere. Inferentially, the argument for intelligence in complex systems providing utility to their environment like Miller-Urey’s apparatus or early earth’s atmosphere looks like this:

- 1) If P then Q.
- 2) P.
- 3) Therefore, Q.

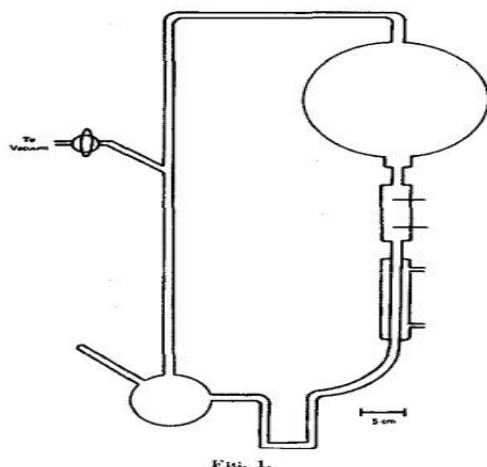
- 1) If earth’s atmosphere is a complex system with utility [If P] it required intelligence [then Q].
- 2) Earth’s atmosphere is a complex system with utility [P].
- 3) Therefore, it required intelligence [Q].

To contradict the truth value of P one must show that earth’s atmosphere it is not a complex system providing utility like Miller-Urey’s apparatus, which apparatus was designed, built, and maintained to replicate the containment of early earth’s atmosphere. To contradict the truth value of Q, one must show that systems similar either to Miller-Urey’s apparatus or to early earth’s atmosphere can exist and provide utility without intelligence.

If neither the truth value of P or Q is credibly contradicted with scientifically tested evidence, then according to all available scientific evidence intelligence is a requirement for both the Miller-Urey apparatus and for early earth’s atmosphere. Intelligence is also, therefore, required for any production of amino acids resulting from either one. If we remove intelligent, living beings from either the Miller-Urey 1953 experiment or from what by comparison likely occurred in early earth’s atmosphere, nothing useful will be produced including amino acids. That is why Miller-Urey both had to be involved for their experiment to produce anything.

The second and third full paragraphs on page 529 of Miller-Urey’s article further describe the results of their 1953 experiment. In their fourth paragraph Miller-Urey reference their “apparatus,” which is then shown on page 528 as follows:

Miller/Urey “Apparatus”⁴

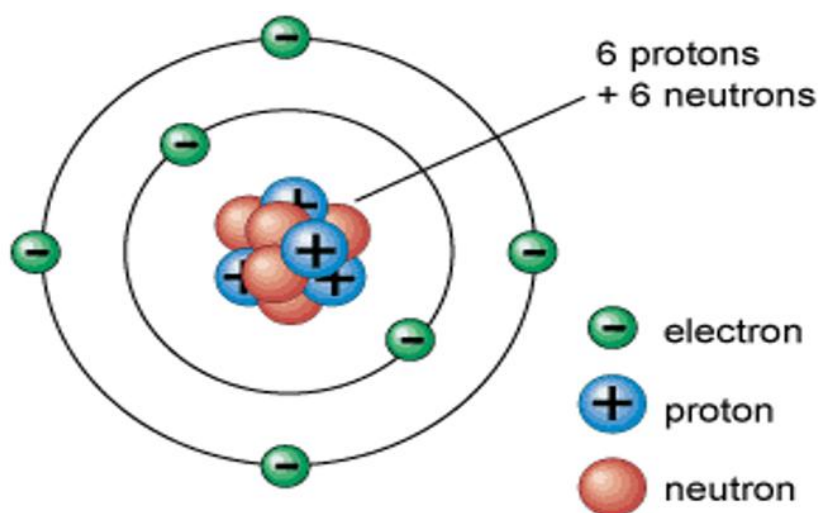


⁴ See Miller, “A Production of Amino Acids Under Possible Primitive Earth Conditions,” page 528.

Miller-Urey's second-to-last paragraph reads, "In this apparatus an attempt was made to duplicate a primitive atmosphere of the earth." While this experiment resulted in amino acid production which, though a small "yield," according to Miller-Urey "*with a more efficient apparatus...* this type of process would be a way of commercially producing amino acids" (emphasis added).

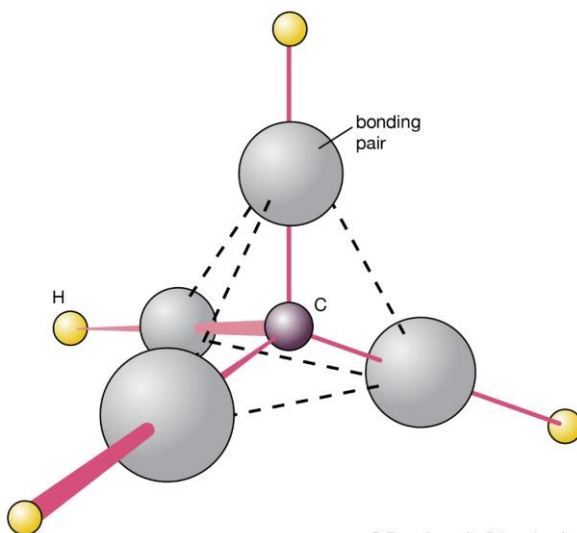
Though "a more efficient apparatus" was no doubt required to produce anything in early earth's atmosphere, if even a small yield of amino acids took this much intelligent life (two human scientists, as well as any others involved in designing and/or building the apparatus), a much greater intelligence would be required for a similar type of apparatus to be built out of early earth's atmosphere to produce amino acids. Further, there are other "apparatuses" than early earth's atmosphere and other productions than amino acids to consider in this light, including the following images shown on pages 8-11:

Carbon Atom



[Image link: http://www.phy.cuhk.edu.hk/phyworld/articles/laser/c-atom_e.gif (last accessed August 4, 2026).]

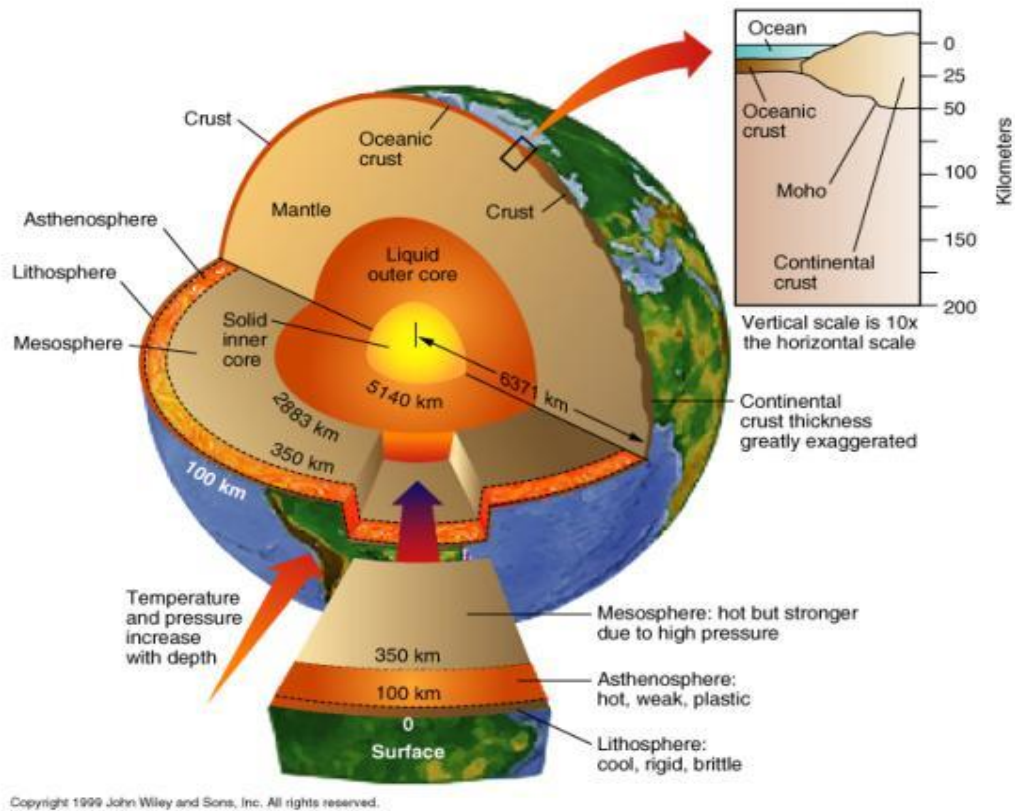
Methane Molecule



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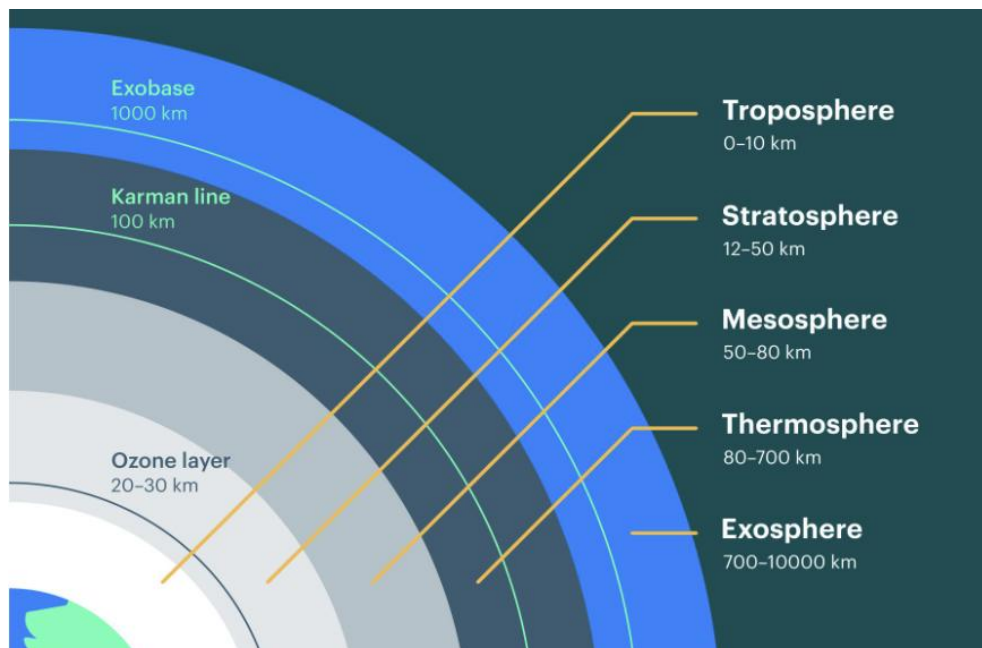
[Image link: <https://www.britannica.com/science/methane> (last accessed August 4, 2026).]

The Layers of the Earth



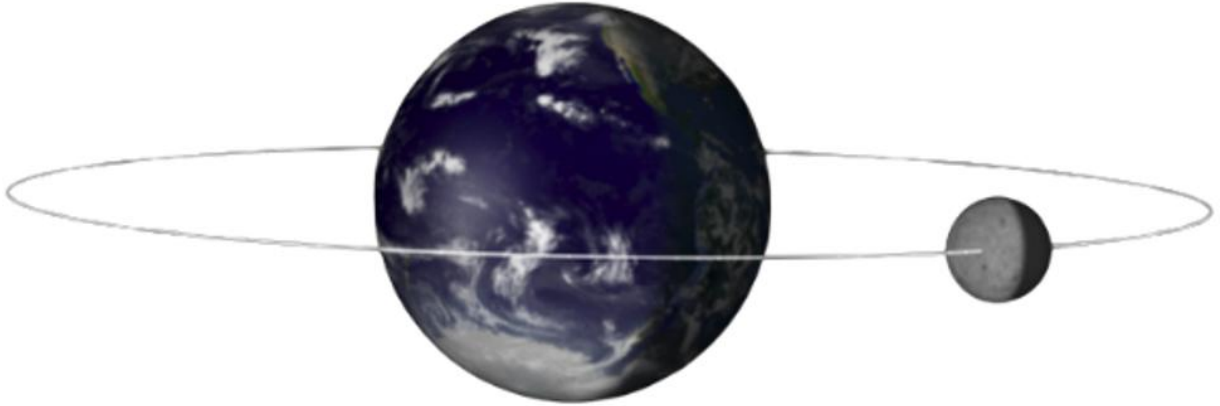
[Image link: <https://maggiesscienceconnection.weebly.com/layers-of-the-earth.html>
(last accessed August 4, 2016).]

The Layers of Earth's Atmosphere



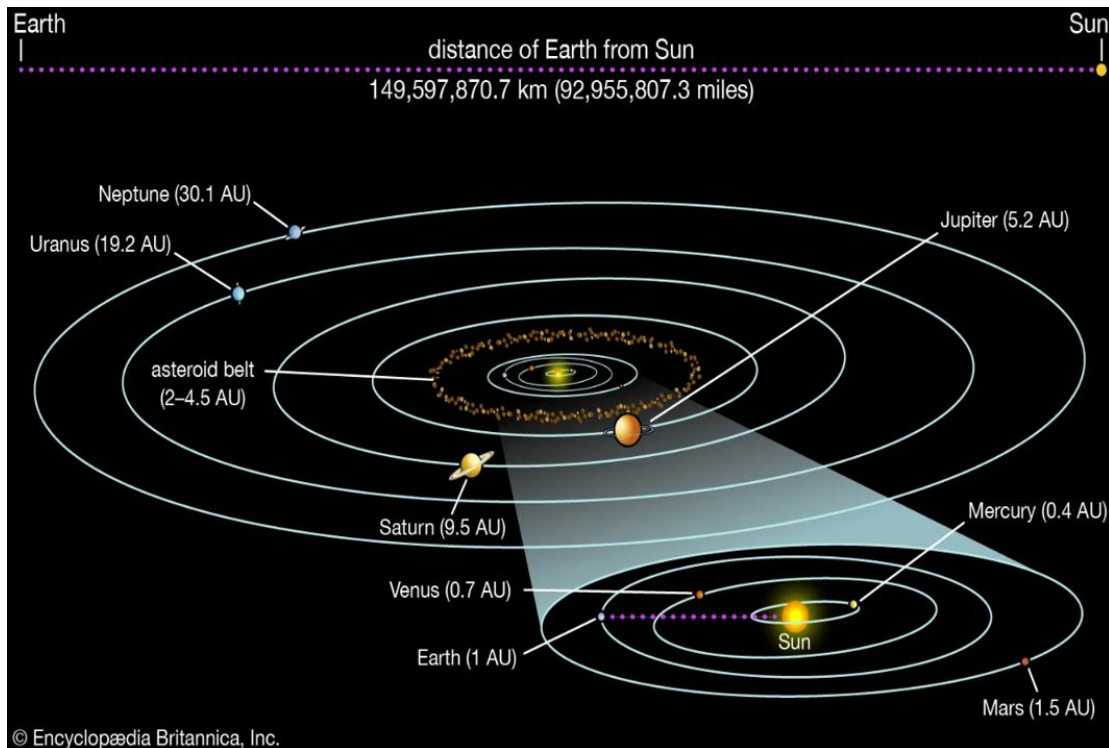
[Image link: <https://windy.app/textbook/five-main-layers-of-atmosphere.html>
(last accessed August 4, 2026).]

The Earth and Its Moon in Orbit



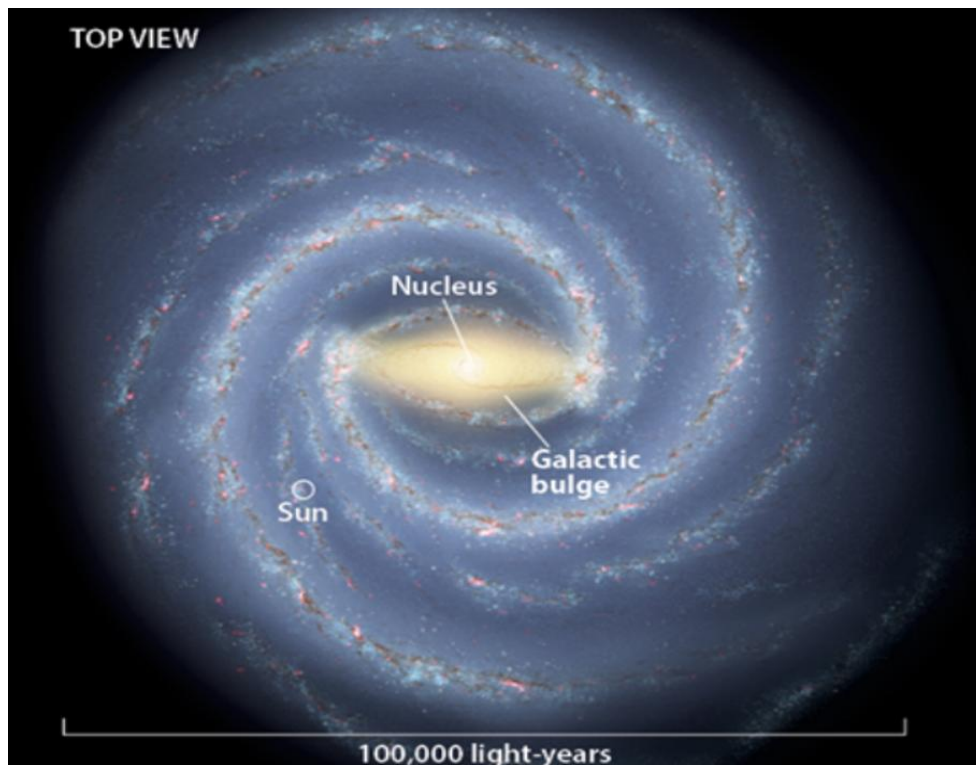
[Image from Neptune, 2003, magnified by 20:
http://xplanet.sourceforge.net/Gallery/20031202_earth/earth.png
(last accessed August 4, 2026).]

Our Solar System



[Image link: <https://www.britannica.com/science/solar-system>
(last accessed August 4, 2026).]

Our Milky Way Galaxy



[Image link: <https://www.britannica.com/science/astronomy/Study-of-the-solar-system> (last accessed August 4, 2026).]

Like the Miller-Urey apparatus, these structures show intelligence through their complex utility, in ways which reflect but which also go beyond what Miller-Urey concluded from their 1953 experiment, since they left out the primary cause(s) for their experiment and its production, namely, living, intelligent beings. Rather than accept and support the conclusion which results from their 1953 experiment, Miller-Urey attributed their results to accidental non-intelligence, believing also that amino acids could be produced in early earth's atmosphere under similarly accidental and *unintelligent* conditions.

While Miller-Urey are correct in noting conditions similar to their experiment could produce amino acids in early earth's atmosphere, they failed to fully explain the conditions of their own experiment, which required living, intelligent beings. Miller-Urey erred by concluding that early earth's atmosphere could similarly produce amino acids, that is, without living, intelligent beings. In this respect, what Miller-Urey really showed was the opposite of what they concluded, both with respect to their own experiment, and likely also with respect to early earth's atmosphere, as this paper has explained with argument and with evidence, including Miller-Urey's own experiment.

At its beginning, in its middle, and at its end the Miller-Urey 1953 experiment provides evidence that even for the formation of basic compounds in early earth's atmosphere, such as amino acids, there was already intelligent life existing. Like Miller-Urey, this existing, intelligent life designed, set up, and maintained the conditions within which further productions took place both in and outside of early earth's atmosphere, in similar "apparatuses" to those shown on pages 8-11, and many others, all of which require intelligence. Intelligence requires someone or something to be alive. If someone or something is alive, either it always has been alive or it came from something or from someone already alive, or eternal, as all new life requires life to already exist before any new life exists... the way life exists now.