Why are we all left handed? – Theory of elementary particle origin

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All life is left-handed. You are left-handed; your parents are left-handed. Your pets are left-handed. Even the blades of grass in your lawn are lefties.

Amino acids are the building blocks of life. They make up the proteins in our bodies. Because amino acids are asymmetric, then they can have two forms – two mirror images. Just like your hands, which are mirror images of each other, all amino acids (except for glycine, which is symmetric) have two possible mirror images. One mirror image cannot be rotated to look like the other. We call these two mirror images "left-handed'' and "right-handed." We refer to this handedness as "chirality" from the Latin word for hand. Except for their chirality, left and right handed amino acids are identical in every other respect. Many things in nature are chiral – your hands, snail shells, pine cones, and even subatomic particles.

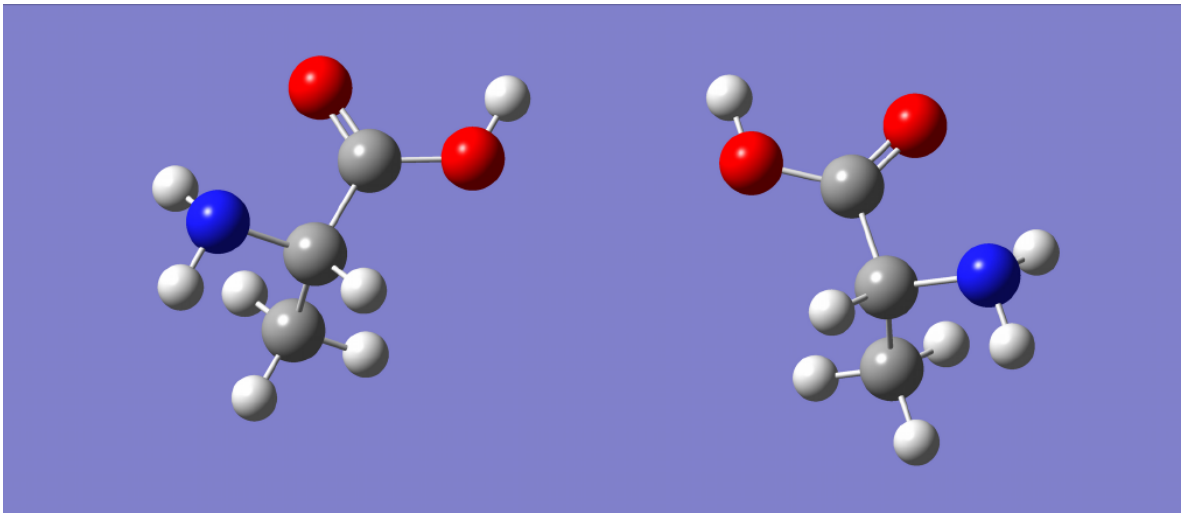

Illustration 1: The amino acid alanine in its left-handed form and right-handed form. The grey, red, blue, and white spheres are carbon, oxygen, nitrogen, and hydrogen respectively.

This bit of knowledge would be mundane were it not for two facts. The first is that all amino acids relevant to life are left-handed. All the amino acids that make up the proteins on our planet come in only one mirror image. Life doesn't use the right-handed form.

The second fact is that amino acids have been found in meteorites. This means that amino acids can be made in space. However, not only are amino acids found in meteorites, but the

ones that have been found are predominantly left-handed. Could it be that amino acids at not only made in space, but that they are also made with the right chirality?

Since Louis Pasteur studied molecular chirality nearly 170 years ago, chiral molecules have fascinated scientists. Today, how amino acids got to be left-handed is one of the biggest questions in science with several competing theories. This question is listed by the National Academy of Sciences and by Science magazine as one of the most important questions in science today. It has gone unanswered for nearly 120 years.

Now, scientists at Western Michigan University, in collaboration with scientists in California and Japan, have come up with a possible way in which Mother Nature selects left-handed amino acids in space. This new theory brings together fundamental particle physics, electromagnetism, biology, and chemistry. Molecules in magnetic fields can interact with leptons (some of the tiniest particles in nature which include electrons and neutrinos). Because leptons can also be chiral, they interact with amino acids differently depending on the combination of lepton chirality and amino acid chirality. This interaction can selectively destroy one mirror image more than the other, resulting in the imbalance that we see in meteorites. There are several possible places in the universe where this can take place.

Not only does this discovery predict how amino acids got to be left-handed, it also predicts how they became left-handed in space. The ramifications for life on the earth and elsewhere in the cosmos are significant.

The latest news on this discovery will be published in Scientific Reports (a Nature journal) on Monday, June 11 at 10am GMT.

References:

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