Examples of Fine Tuning

A proton is 1000 times heavier than an electron, while a neutron is only .1% heavier than a proton. If neutrons were another .1% heavier, all protons would convert to neutrons, leaving no possibility for atoms in the universe!

From Reasonable Faith – The Scientific Case for Christianity, by Dr. Jay L. Wile, Apologia Educational Ministries, Inc., Anderson, IN, 2001, p. 13, taken from The Anthropic Cosmological Principle, by John Barrow and Frank Tipler, Oxford University Press: New York, NY 1986, p. 400.

If the force of gravity were changed by just one part in 10^{40}, stronger or weaker, stars like the sun would not exist in the Universe and nor would life!

From A Case Against Accident and Self Organization, by Dean Overman, Rowman & Littlefield Publishers, 1997, p. 134.

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"One might wonder why Beryllium (mass 8) is not more prevalent. This is because it too readily reacts with helium to create carbon. Stability is an important consideration here, and it is also a very important feature of most engineered systems. Energy resonance levels are the major determinant of stability. Resonance here refers to how beryllium and helium have a combined energy almost exactly equal to an excited carbon atom. Cosmologist Fred Hoyle actually predicted carbon's resonance level based solely on the anthropic assumption that it was necessary in large quantities for life. He was later proven correct. If the resonance level of carbon was 4% lower, essentially no carbon would form. If it was 0.5% higher, almost all carbon would react and become oxygen [11]."

From "The Coherence of an Engineered World" by Dominic Halsmer, who referenced Gingerich, O., Revisiting *The Fitness of the Environment* (Chapter 2). *Fitness of the Cosmos for Life*, ed. J.D. Barrow et. al., Cambridge University Press: New York, pp. 20-30, 2008.

Note: The resonance of carbon referred to is one of several possible energy levels of the C-12 nucleus. These energy levels exist in discrete steps. Hoyle predicted the resonance level based on the kinetic energy of He-4 at the elevated temperature inside a star. As the He-4 slams into the (otherwise short lived) Be-8, the resulting nucleus stays together because the kinetic energy is successfully absorbed into the new nucleus, achieving the acceptable (stable) resonance energy level of C-12. Otherwise, the He-4 would just bounce off the Be-8, due to either insufficient energy to combine the nuclei or excess energy needing release. The reason much C-12 remains C-12 rather than forming O-16 is that the kinetic energy of He-4 plus the energy of C-12 does not match a resonance of O-16. If it did, nearly all C-12 would convert to O-16 and life as we know it would not exist.

From Just 6 numbers (Reese) The positive charge of a proton matches the negative charge of an electron more closely than 1 part in 1.0 E-21 (we can't currently measure with more precision than that).

From THE SYMBIOTIC UNIVERSE (George Greenstein) "The charges of the electron and proton have been measured in the laboratory and have been found to be precisely equal and opposite. Were it not for this fact, the resulting charge imbalance would force every object in the universe--our bodies, trees, planets, suns--to explode violently. The cosmos would consist solely of a uniform and tenuous mixture not so very different from air… No....1 percent is too great a discrepancy. How precise must the balance be? How accurately must the charge of the electron be matched with that of the proton before such disasters can be avoided? The question is easy to answer--a good high-school student could do it---but the result one obtains is impressive. Relatively small things like stones, people and the like would fly apart if the two charges differed by as little as one part in 100 BILLION. Large structures like the Earth and the Sun require for their existence a yet more perfect balance of ONE PART IN A BILLION BILLION."

The amazing thing is that electrons and protons, made of different sub-atomic particles (leptons, quarks, ect), are so well balanced, which is critical to life.

"If the Big Bang is regarded as only an impressive accident, there is no explanation why it produced a universe with such a high degree of order, contrary to the Second Law…in 1989 (Roger) Penrose computed that to provide a universe compatible with the Second Law the precision needed to set the universe on it's highly ordered course was to an accuracy of one part in $10^{10(123)}$." A Case Against Accident and Self-Organization, by Dean L. Overman

"A common sense interpretation of the facts suggests that a superintellect has monkeyed with the physics, as well as with chemistry and biology." Sir Fredrick Hoyle (founder of the Cambridge Institute of Theoretical Astronomy and originator of the steady state theory of the origin of the universe.) as he pondered the significance of the fine tuning involved in carbon production by stars, *Engineering and Science* (Nov. 1981)

"Natural law…reveals an intelligence of such superiority that, compared with it, all the systematic thinking and acting of human beings is an utterly insignificant reflection." Albert Einstein, Ideas and Opinions – The World As I See It (New York: Bonanza Books, 1931), p. 40.

"For the scientist who has lived by his faith in the power of reason, the story ends like a bad dream. He has scaled the mountains of ignorance; he is about to conquer the highest peak; as he pulls himself over the final rock, he is greeted by a band of theologians who have been there for centuries." Robert Jastrow, Former Dartmouth Professor and Director of the Mount Wilson Observatory, commenting on the discovery that the universe had a finely tuned beginning in God and the Astronomers (New York: Harper & Row, 1979), p.250