Simplicity is a result of equilibrium, and seeking simplicity is a human specific preference

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Simplicity is that a relative few theories and mathematical models can explain a number of phenomena. While complexity is the opposite where there seems to be an unending need to invent new theories. By this definition, physics and astronomy are in the former camp and social science and biology belong to the latter.

Why is the universe is even understandable? This itself is hard to understand according to Einstein. I propose a line of reasoning here. Simplicity is a result of long term evolution in a close system. The resulting equilibrium gives rise to simplicity. The infinite possibilities of any member of the system have been largely reduced to a highly confined options. Most of the possibilities are prohibited due to forces that have long been cancelled out during the long evolution. Because of this simplicity, there appears to be causal effect. In other words, causal effect is a direct product of simplicity. Take our universe as an example, the universe is in equilibrium by and large. Only a handful forces remain. Because there are relatively few forces and laws, the universe appears to be orderly and thereby allows mathematics to even exist and work. Mathematics owes its existence to the equilibrium of the universe. Equilibrium brings orderliness and slowness to change. Just imagine, if one puts one stone by another stone, and because the stones decay so fast, by the end of this action of moving them together, one counts zero stone. The law of addition will be forever different from what we know today. In this sense, math and physics have 'this worldliness' feature, and is a localized knowledge to this universe at this phase of equilibrium. It could be vastly different in other possible states of the universe or other universes.

A corollary is that the rules governing a simple universe is discoverable and free of controversy. The simplistic nature of the rules make it hard to miss the mark, so to speak. Once the framework of the rules is tested true over numerous times, what's left is refining of the details. Contradiction between the rules and the reality should be worked away over the time. This is good news to scientists because it solves the age old anxiety of finding all theories are invalid one morning.

One notable exception to the simplicity in universe is the complexity in bio-sphere. Because the bio-sphere is inherently expansive and interactive, we cannot reduce the theories to a few laws and mathematics models. The bio-sphere is NOT an equilibrium system. Therefore it is very hard to apply causal effect to explain human society for instance. It is very hard to generalize theories or apply mathematics in bio-sphere or human society, as we are able to in cosmology.

Humans' brain is wired to understand simple things and not complex things. We seek patterns and generalize. This skill helps tremendously in our evolutionary past. For instance, our eyes are adept in figuring out patterns like straight lines. Our eyes are especially good at spotting moving object in a static background. The predisposition to seek simplicity gave humans survival advantage in its evolutionary history. We appreciate simplicity over complexity. Humans process limited computational power. It is most efficient to apply the limited resource to a fast algorithm. The design principal of

the fast algorithm is simplicity. There is an aesthetic side from human eyes for simplicity, whether be a new physics theory or a design of a gadget. The propensity of seeking simplicity is a very human specific trait, and has nothing to do with the reality whether the world is simple or complex.

The coincidence of the simplicity of the universe and human's preference of simplicity is fortunate and fruitful. Specifically in the math and physics the coincidence yielded amazing results. There is no reason to doubt that more amazing discoveries will surface in the future. However, a grain of salt must be added so that we are conscious that there is less mysterious processes or agent involved in the coincidence. This article hopefully explained why. In fact, if we are blindly led by our pursuit of simplicity, we might fall into traps of naturally complex traps. For instance, any attempt to gain simplistic insight into a complex system is not a good idea. Our brain comes into my mind as an example of complex system. There are so many facets to this simple object that no one can claim a brain can be modeled with a finite number of rules.

However, the simplicity on the surface for the natural world might be just a disguise of a chaotic and unpredictable reality. The equilibrium masks over much of the chaos and most noises or complex nuisances cancel each other out. What's left is the poetic simplicity skin. Underneath the skin, things might not be that smooth, or elegant or simple after all. It is a possibility. We probably are able to see some hints as we get more refined data, better models and more powerful observation tools.

Another aspect of the simplicity is that it indicates the death process of the universe toward infinite entropy. Based on the second law of thermal dynamics, our universe is slipping into this final death of maximum entropy. An accompanying result of this process is that the universe becomes simpler and simpler. Imagine a universe where homogeneity rules and any imaginable infinitesimal particles and forces are distributed absolutely uniformly and cannot be changed a bit. This would be the simplest state and requires the simplest mathematics or physics. If we are slipping in that direction, which I think we are, then we should not be surprised that the physics laws in describing the universe is becoming simpler. Our current simplistic physical forces and laws are hinting that.