Ask A Genius 82 – Chaos and Order (1)
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Scott: So, there's a little argument to be made that you can get chaos in pockets of an ordered system, but, I would argue, you would probably need a, not a nothingness chaos but, bubbly-inconsistency chaos as your foundation to get any real type of order. From that order, you can get standard chaos.

Rick: Three forms of chaos come to mind. One is non-existent chaos, which is that with total chaos you have no information, and so no space and no time. Thus, no existence, so things are sufficiently undefined across your entire system that you don't have a system. You have nothingness.

Scott: Is it a bit like the Empty Set (Weisstein, 2017)?

Rick: Yes, it is not an existent nothingness. There's no space and no time. It's null. It is not something that you can experience or that contains anything. It is a zero information deal. It is just not there.

Then you can imagine as you come out of chaos, as you impose a timeline upon any ordered system, you can probably imagine or see that system arising from chaos that goes from nebulousness that contains no information, no space and no time, to this chaos that is gauzy, hot, messy and contains a little information to something that contains more causality as information bootstraps itself out of chaos, but the chaos it comes out of is this non-existent chaos that has nothing.

Another flavor or form of chaos is chaos within an ordered system. It is an ordered system that is so large that it can afford to have big pockets of random fluctuations across space and time that are either 1) this true randomness or 2) what looks like randomness but you don't have the right informational framework to contextualize what looks random to you.

That could be two flavors of randomness. Some true randomness within an ordered system that has the wherewithal to set up arenas or pockets of chaos or chaos that is chaos because you can't decode it. So, 2 ½ or 3 flavors of chaos.

Scott: The last one half or one whole provides the basis for chaos within order, technically, and that's what we see.

Rick: Yes, we see a lot of processes. The universe can be understood thermodynamically. You have large aggregations of random fluctuations that create statistical stability, like all of the air in a room being roughly the same temperature and all of the molecules being roughly evenly distributed.

That all of the molecules don't go over to the other side of the room and you suffocate because there's no air where you are. That doesn't happen because of statistical action. Also, that all of the

heat in the room doesn't collect in a single point and burn your ear. That doesn't happen. The stability of temperature and the even distribution of stuff is statistical for the stability we see.

Based on the averaging out of the behavior of large numbers of individual, randomly acting things in the universe, some kind of deep randomness is behind a lot of the stability that we enjoy.

But! If the universe is a semi-closed, self-consistent, information processing system, then every one of those random blips in the room full of air actually contains information and isn't random at all, but is a read-out to the overall framework of the universe that's interpreting the information of a vast and timeline-traversing tapestry of information.

Information that is flowing in - like the biggest most HD TV ever. What we see as randomness is pretty much because we're not watching the TV, we're part of the TV, but if we could understand everything within context, then that randomness would be the unfolding of information within the sensory-perceptual information-processing system that is the entire universe.

Thus, not random, random, but only random in the sense that the unfolding of time is incompletely determined. Where what happens as we travel through time, we don't have enough information to tell what the future is exactly going to be.

You have to pump in more and more information as you traverse time to tell you what is happening moment-to-moment. That moment-to-moment unfolding in time is a moment-to-moment hosing down of the universe and of your perceptual system with information.

Before the Super Bowl, we can't exactly tell how the Super Bowl is going to turn out. That's new information unfolding or being piped into the universe, which is different than randomness. It is information being piped in.

Scott: All of this requires agents, perceptual entities.

Rick: It requires a lot of stuff. To be an information processing system, there has to be a hidden armature. There has to be hardware that is probably not visible to the information processing system. The information processing system processes the information that is piped into it. That information may or may not contain a model of the armature. You need an armature. You need a hardware framework. We can argue as to how much of that framework is visible to the information processing structure. It doesn't have to be visible at all, or it can be very visible, depending on how much information about the armature is being piped into the information processor.

That at a metaphysical level you need a physics of the interaction of information, which is how information sets up its own space and time that is dependent on the rules of information and on the hardware that contains the information.

But there's a metaphysics of it, and then, more precisely, there's a physics of information within an information processing system, which looks to us – if you're informationist – like information as matter following the rules of physics. We're made of matter. Anyway, it requires a lot of stuff.

Scott: The stuff about the 3 or 2 ½ types of chaos, and the example of the Super Bowl with the unfolding of the information of the universe where the universe is having new information "piped into" itself through the unfolding of time. In a way, that requires agents.

It requires information sub-processors in the universe to identify that. The idea of the Super Bowl requires a lot of components and a lot of interrelationships perceived within some sub-set of sub-systems within the universe.

There's some integral part of that to be played by sub-processors. However, looking at the scale of things, the scale of the brain and the scale of the universe, the difference is so vast.

Even if you take all the minds on the planet, it doesn't come to anything extraordinary in terms of its importance - or even integral - to the information processing of the universe. Unless, you take the style of information processing as integral. Something like that.

Rick: So, are you saying on the scale of the universe the Super Bowl is inconsequential? Or is human cognition inconsequential because the amount of information contained in the Super Bowl or in a human brain is so negligible compared to all of the information being processed across the entire universe with these as tiny little motes? Is that what you're saying?

Scott: To get the Super Bowl, you need a lot of things out in the outside world. You need processors too. Both to make it a more or less a real thing.

Rick: There are agents at various scales.

Scott: No people, no Super Bowl.

Rick: Yes, a single human person with his or her physiology consists of a number of agents at all different scales from atomic processes that are arranged in such a way that they form chemical functions that are arranged in such a way that they perform biological functions that are often packaged in organs performing specific functions that feed back with each other in ways that involved the entire body.

You have different feedback loops. You have the basic physics of electron exchange all the way up to the way your brain regulates hormones. You've got a bunch of agency going on there. The Super Bowl, you've got the various agents associated with having a society.

A society that wants humans to come together to develop football skills, play a football game, and where people benefit from more than 100 million people paying attention to the game. There are all sorts of civilizational and cultural, and historic, agents that make the Super Bowl possible. So, there are agents at all sorts of different levels.

References

1) Weisstein, Eric W. (2017, February 3). "Empty Set." From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/EmptySet.html

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