

### To what extent is life random?

How much of life is in our control? Do our choices actually have much significance in the trajectory of our life? Where does free will and fate come into the equation? Is there a higher being(s) that has entire autonomy over us? Are we simply defined by probabilities, with no control over our fate? These factors must all be considered when attempting to determine (to some degree) if life is random, and I say attempting as it may be impossible to find certainty in this argument (but that's an essay for another day). By means of religion, science, philosophy and literature, some understanding of this matter may be achieved. We must also consider this on an individual (microcosmic) and external (macroscopic) basis.

Indeed, from a theist perspective, one may believe that a higher being – God – is in control of the trajectory of our lives, with a predetermined plan in place for all of us and therefore the point of human existence is to be the vessel for these plans to happen as God wants. This provides the sense that life is happening to us, but it is important to consider the significance of free will when it comes to religion. If we consider that God gave all human beings free will that could imply that we do have a degree of autonomy over the decision we make, and thus the consequences that follow. Or could this simply mean that we are only able to determine right from wrong, and God's plans still take primary force – we can only accept that they are right or wrong but have no ability to interfere with them? Free will is essential in defining our identities as individuals, fuelling the satisfaction of achievement or the shame of making immoral decisions. It is possible that religion in tie self gives believers the knowledge of what is right and wrong, leaving them with their own autonomy to make decision based on this knowledge. Therefore, if you 'do bad' then you can expect punishment or consequences – this in itself is not random; it is simple cause and effect, one follows the other, inextricably linked. So, if a God does exist, from a religious viewpoint we could argue that while God may have a plan for us, we still have some autonomy over our decisions. On a macroscopic level, God may have a plan for humanity – be kind, do good – but on a microscopic, individual level we can choose how we contribute to this plan and determine our own paths. Maybe in this way, the individual and external are linked directly and therefore not random.

As humans, we have goals, ambitions, maybe some of us have found a 'purpose'. Our actions and decisions centre around achieving these goals: if you want to do well on an exam, for example, you will study and work hard. Therefore, if you do well on the test (achieve your goal) how much of that achievement is based on randomness when you have proactively taken the steps to ensure that outcome? This links in with fate: do we each have a destiny, by the hands of fate, are we are simply doing what is necessary to achieve this destiny, without realising that this was already set out for us? – once again bringing into question the role of a higher being. Take Oedipus (*Oedipus Rex* – *Sophocles*)

for example, the epitome of a man ruined by fate: destined to kill his father and marry his mother, bearing her children. As King of Thebes, to save his people from a terrible plague he decides he will find who killed the previous king, Lias. His determination to do good leads him to discovering his unfortunate fate – that he killed Lias (his father and previous king) and married his mother (the previous wife of Lias) without knowing. His strive for achievement is undermined by his fate and so it could be argued that this was not random – he was always destined to this outcome no matter what actions he took to prevent or change this. Extending this to humanity, maybe we futilely try to control our lives, but fate ultimately wins, which may explain why maybe no matter how hard we try, some things still do not work out – they were not ‘meant to be’ as fate has ultimately won.

However, from an atheist point of view, if there is no God controlling and defining our lives than we have far more autonomy over the actions we make and what happens in our lives. We therefore need another means to try to understand randomness: science. Through the means of science, we are able to try to determine to what degree life is random. Indeed, from an atomic level the motion of particles in a fluid is random. Brownian motion is the random motion of particles, caused by fast-moving atoms or molecules that hit the particles in a medium (a liquid or gas). Therefore, fluids all around us that make up our life (water) move randomly – we cannot predict this movement or control it in a sense. Fluids ‘existing’ around us are random by nature, as they are made up of random particles. However, this acts on an individual level; using statistical methods we can predict the movement of gases for example – using the Ideal Gas Law ( $Pv=rt$ ) – as there are so many particles you can analyse. Therefore, the overall (macroscopic) movement of fluids is somewhat predictable and if we can predict this, it is no longer random. You could extend this to humanity: on an individual level each human may be ‘unpredictable’ and ‘random’ in some sense (like each individual particle in a fluid), but altogether (externally) we can predict what humanity would do, and therefore its actions are not random. This links in with the movement – or vibration – of particles in a solid, which is not random – they are arranged regularly and vibrate around a fixed point so are much less random in this way.

The Copenhagen interpretation of Quantum Physics asserts that a system is not in any of its allowable states or alternatively that it is in all of its allowable states simultaneously. A particle does not have a trajectory involving a definite location and velocity as a function of time. This implies inherent randomness, we cannot predict where a particle may end up, at what point or at what rate. This can be extended to humanity: maybe we do not have the ability to truly know where we will end up, where our journey will lead, who we will meet: we are all just particles – indeed we are essentially just atoms – with no definite trajectory and end point and so we must just ‘go with the flow’ so to say. Similarly, wave particle duality refers to the fundamental property of matter where at one moment it appears like a wave, and yet at another

moment, it acts like a particle. This sense of fluidity between states presents us with the inability to fully describe the behaviour of quantum objects. In the same way maybe, we are unable to define the random or non-random nature of life. At some points it may be predictable, at others, completely beyond our understanding. In this way should we just accept that there is uncertainty in life's randomness? Instead, we could find certainty in this uncertainty. This could link to absurdist philosophy – accepting that existence is absurd, rather than trying to *find* meaning and purpose, could be freeing and liberating instead of inconclusive and unresolved.

This brings into question whether perfect randomness exists: at some point and circumstances life is random, at others, not so much. According to Ramsey theory, pure theory (in the sense of there being no discernible pattern) is impossible, especially for large structures – if the graph is large enough, you are guaranteed to find some kind of order within it. Mathematician Theodore Motzkin suggested that “while disorder is more probable in general, complete disorder is impossible”. Maybe we therefore have to distinguish between the natural world and quantum world; in the quantum world there are instances of true randomness such as the unpredictable nature of proton behaviour, whilst this may not explicitly be true in the natural world. Patterns, in the natural world, can help us understand some order. The golden ratio has been used to analyse the proportions of natural objects and artificial systems such as financial markets and appears in nature, including the spiral arrangement of leaves and other parts of vegetation. If patterns can be recognised then by definition there is not perfect randomness: it follows order, structure and therefore be predicted. Our human bodies have the golden ratio, from the navel to the floor and the top of the head to the navel. By this reasoning, the ‘construction’ of humans is not random, it follows an order; we have a specific ‘shape’ or format in this sense that links us all together and so life in this sense is not random. In addition, recently scientists have concluded that the height of one unit of the DNA helix shows the Golden; we are by definition made from substance that is not randomly formulated. However, this is on a macroscopic level; DNA in general shows the Golden Ratio but each person is unique and does not follow such a clear pattern and so is random in this sense. Fractals also show the patterns of randomness: from seashell to spiral galaxies to the structure of human lungs. A fractal is a type of mathematic shape that is infinitely complex. Its pattern repeats forever, and every part of the Fractal, regardless of how zoomed in, or zoomed out you are, looks very similar to the whole image. Their formation is random yet consistently follows a pattern, no matter how it is observed. Branching fractals include trees, ferns, the neurones in our brains, the blood veins in our lungs, lightning bolts, rivers branching, the shoreline and rock formations. These highlight how all kinds of life around us are in a limbo of sorts between random formation for an existence based on pattern and predictability – both at the same time (linking back to wave particle duality).

Can our existence simply be reduced down to probabilities? If it is, to what degree can we predict life? Our birth in itself was a probability of one out of millions of sperms reaching the target first. Our actions, decisions, reality is just a probability of what is possible; in this sense we are somewhat limited by human knowledge and capacity to understand – we are not omnipotent in this sense, so if we do not know what is possible, if we are unaware as we are yet to understand the possibilities of life, then how can we simply rule them out as not probable, if we are unaware or do not understand them in the first place. Maybe some of the perceived randomness of life is actually because we do not understand the probabilities of such events (yet), and not because they are actually random. Our own limitations possibly contribute to this supposed randomness of reality, but if our understanding of reality is incomplete or ever-changing then maybe we can neither know if there is randomness nor if there is not. We are possibly in this constant state of fluidity between random and non-random but maybe we can take comfort in that constant, non-random fact.

Continuing with the example of the probability of our birth we can determine randomness from a biological level. The probability of a sperm successfully reaching the egg is  $1/1500000$ . This suggests a pattern of success that can be scientifically proven. Or, linking back to Ramsey theory, is this simply recognisable because humanity as a kind of 'graph' is large enough to notice this discernible pattern. Indeed, evolution is not a random process. The genetic variation on which natural selection acts may occur randomly, but natural selection itself is not random at all. The survival and reproductive success of an individual is directly related to the ways its inherited traits function in the context of its local environment. This once again highlights the fluidity between external non-randomness (the environment an individual is in and the internal, individual randomness (the specific genetic variation)). Evolution can be predicted in the short term from knowledge of selection and inheritance. However, in the long-term evolution is unpredictable because environments, which determine the directions and magnitudes of selection coefficients, fluctuate unpredictably.

Entropy is also important to consider; it is the measure of a system's thermal energy per unit temperature that is unavailable for doing useful work. As work is obtained from ordered molecular motion, the amount of entropy is also a measure of the molecular disorder, or randomness, of a system. In other words, it is the measure of the number of possible arrangements of atoms a system can have so is a measure of uncertainty or randomness. This links back to probabilities and thus predictability: entropy is always increasing and as it does so, disorder increases and so predictability decreases. This implies that at time = 0 (the beginning of time so to say), entropy was at its lowest (presumably 0) and so existence at that time was very predictable and so in that sense not random. That implies that now, life is far more unpredictable and will continue to be so, also increasing the randomness of life. Is this because life has become more complex? Indeed, life does behave as a complex system; each aspect of life interacts

with each other to create 'life' and existence as we know it and as human life has become more advanced, is it possible that disorder and randomness have increased as there are more outcomes now possible that need to be considered? There are now more inputs and outputs that have an effect on what happens in life and so unpredictability and disorder increases. How does this relate to our ability to predict the future? For example, a seven day forecast can accurately predict the weather about 80% of the time but the nature of our atmosphere means it is not possible to predict the weather on a particular day months to years ahead. At this range we have to acknowledge that many outcomes remain possible, even though only one can eventually happen. This once again emphasises the importance of time when considering randomness and predictability. However, if we can notice certain patterns in the weather – such as a gradual increase in world global temperature – then we can infer what is to come and the following consequences. In this sense, things may seem random but when observed on a much larger scale, display a pattern and sense of non-randomness (Ramsey theory once again). Does déjà vu relate to our ability to predict things, contributing to non-randomness? What about nostalgia? How can we use the past patterns we have observed in life to predict the future? If we use these patterns, then surely they cannot be considered random?

We must also consider our own influence of our actions in our own lives and how these impacts the randomness of our existence accordingly. On an individual level our daily routines are not random in this sense – our actions directly influence our routines: for example, getting up at 6am everyday, going to the gym for an hour, having breakfast, going to work/school etc.. Therefore, on the surface level, there is no randomness in this sense; we proactively choose what we will do on a day-to-day basis. This may create a sense of monotony which implies predictability and non-randomness. This individual, surface level non randomness can be directly juxtaposed to the randomness of our actual significance – the particles around us moving randomly – once again bringing into question the difference between external and individual existence and randomness. However, while we may believe everyday is the same in terms of the consistency of our actions and routines, it can be argued that we are in a constant state of change, which is somewhat oxymoronic. As Heraclitus, a Greek Philosopher, said some 2500 years ago: 'There is nothing permanent except change', everyday is different and therefore random and unpredictable. This highlights the different levels of randomness: we can control the day-to-day, but maybe beyond that what happens is random, based on chance, or beyond our understanding.

The 1998 movie *Sliding Doors*, featuring Gwyneth Paltrow, perfectly highlights how one decision can impact the entire trajectory of our life. Helen is fired from her job and while returning home, she misses the train, but in a parallel universe, she catches the train which triggers a completely different turn of events, showing the impact one decision can make. There are a multitude of outcomes for how our life can turn out – one

decision can greatly impact where we end up. Is our decision random? Is it influenced by our desires, impulses or peers? Right or left; forward or backward; that job or this job. These binaries define our lives; simply turning the other way could change our entire existence and livelihood. But how do we decide what to do? Does a higher being give us some sort of 'urge'? Do we feel it instinctively? Should we take the risk and go the other way for once and live spontaneously and unpredictably and randomly? But how much of this is actually random? Fate could have possibly determined this all along; maybe we were always destined to go the other way at some point. You could analyse this using existential philosophy, which is inherently based on the individual. In the search for our own purpose in life, we make conscious decisions through our journey so does our purpose find us through this process or do we find our purpose. Was our purpose predetermined or can we decide what it is based on our life experiences? Is it completely random; do we find it randomly? Do we even have a purpose in life (an essay for another time)?

How can randomness exist when human life is interconnected? The effect we have on other people directly influenced their existence: if you are rude to someone, they most likely will feel sad and despondent. Their feelings are in direct relation to how they have been treated and so are not random. This can be linked to quantum entanglement which is the phenomenon of a group of particles being generated, interacting, or sharing spatial proximity in such a way that the quantum state of each particle of the group cannot be described independently of the state of the state of the others, including when the particles are separated by a large distance. In a similar way humans are connected, our actions cannot necessarily be defined individually, but rather as a whole, as our own existence impacts others. In this way, it is possible to find a pattern in human behaviour, suggesting predictability and thus non-randomness. Each particle interacts with the other, just as each human interacts with another, directly impacting them and thus influencing their existence which is therefore not random as it is based on something else— cause and effect once again. The noun *sonder* perfectly describes this: it is the profound feeling of realising that everyone's including strangers passing in the street, has a life as complex as one's own, which they are constantly living despite one's personal lack of awareness of it. We are all existing, living, breathing at the same time, affecting and influencing others, both purposefully and 'on accident'. If we are aware of this it could be considered non-random as we can observe the cause and effect but if we are not, possibly due to limited human knowledge then maybe this can be considered random and unpredictable. The 6 degrees of separation highlights the inter-connectivity of human existence: it is the idea that all people are six or fewer social connections away from each other. Therefore, is it truly random that if we meet a friend's friend, that we already know them? If we are all connected, then things could be less random as there are more 'ways'/'inputs' for things to happen that we can predict due to our knowledge of human behaviour. As an extra note, can this knowledge extend

to our knowledge of death? If we know our inevitable end is to die, then is our existence really random? Or maybe, is the existence of eternal life random?

In conclusion, life is both random and non-random; it can be predicted in some cases, but not in others. The possible existence of a higher being can influence our perception of life's randomness – does God have a plan for us that we are unaware of and therefore life appears random but really it is God's plan all along? Science, especially the quantum world, highlights the fluidity between randomness and non-randomness especially within the juxtaposition of the individual and external (microscopic and macroscopic levels). The way we as individuals are directly linked to other individuals to create humanity as a whole emphasises that our impact on other people creates a sense of predictability, pattern and reason and so therefore is not random. There are many different interpretations to consider and different means of analysing life, pointing to the fact that maybe there is not only randomness and not only non-randomness, both, and everything in between, exist at the same time, just as people's different interpretations contribute to our understanding of life. Like wave particle duality, our existence is both predictable and not, random and not.

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