Twitter Thread by Paras Chopra

Paras Chopra
@paraschopra

We may be alone in the ■ ENTIRE UNIVERSE.

(a thread on this bold conjecture)

■ It's also my 1st podcast episode https://t.co/7u2FskrhHi



1/ For my inaugural podcast episode, I interviewed @anderssandberg who is a senior research fellow at the @fhioxford.

I highly recommend listening to the entire episode. It's full of gems and insights.

But if you want key ideas, keep reading this thread

https://t.co/7u2FskrhHi

2/ Before we get to that, here's what we talk about in the hour-long conversation.

1:42 - How to predict the future using history and science-fiction
13:00 - Why talking about probabilities is tricky
17:45 - How to make people care about very distant future
21:10 - Existential risks for humanity
26:45 - Why we may be alone in the observable universe
31:35 - Why the emergence of life is a rare phenomenon
32:25 - What evolutionary transitions need to happen for intelligent life to emerge
35:35 - Do observers evolve first or do the stars burn out first?
40:00 - Humans arrived relatively late in Earth's history
41:10 - Prediction #1: There's no life on red dwarf stars
45:25 - Prediction #2: If we find life on Mars, it'll share a common descendent with life on Earth
47:20 - Why does the Future of Humanity Institute care about alien life?
48:15 - How long does the intelligent life last?
50:57 - Maybe we're the first intelligent life in the universe?
56:07 - What should we do if we're the only ones in the universe?
57:00 - Humans matter because we may be alone

3/ Both history and science fiction shows us how the world can be dramatically different than what it is today.

4/ But exponential curves (like Moore's law) make it hard to predict the future because early on they look like linear curves.

https://t.co/wt9lecgtEU

5/ While you can still model laws like Moore's laws, predicting when a world leader will launch a nuclear attack is impossible.

6/ Hence, predicting the long-term future of humanity is intractable and that is why you must resort to using probabilities for describing the likelihood of different types of futures that can unfold.

7/ Laws of physics are the most reliable factors in predictions (like nothing could go faster than light).

These laws place an upper bound on predictions like how fast can an intelligent species spread across the entire universe.

8/ When it comes to predicting the future, Hollywood movies distort our perception because they're made for excitement, not for exploring the truth.

9/ What is the consensus among philosophers about the future of humanity?

@anderssandberg: Existential risks are a top priority in the community.

10/

== Why we may be alone in the observable universe ==

Fermi paradox: where are all the intelligent species in-universe? We don't see them.

https://t.co/Ew0OOQU29N

11/ Drake equation multiplies various factors together for estimating how many intelligent species should we find in our galaxy.

https://t.co/H7nr35xO6L

12/ For the Drake equation, we have a good idea about astrophysical factors (like planet formation rate) but for other factors like life formation, we have no idea about its probabilities.

13/ Traditional approaches of Drake equation input a number, but we should put in ranges of numbers.

Hence, the output of the Drake equation should be a probability distribution, not one number.

14/ When you put reasonable numbers for the Drake equation, you get a wide range of possibilities with a high chance that we may be the only intelligent species around.

15/ If you want to avoid the conclusion that we may be alone, you have to claim to know the probability of life formation and the probability of emergence of intelligence with rather high precision (which we don't).

16/ Ultimately, the rareness of intelligent life comes from high uncertainty about how likely life is.

17/

== Why the emergence of intelligent life is a rare phenomenon ==

Life on Earth could indicate life is common OR that Earth was incredibly lucky.

18/ However, even if life is common in the universe, it could be the case that most life doesn't go beyond single-celled organisms.

19/ Many evolutionary transitions need to happen before intelligent life could emerge.

This is what @anderssandberg and his colleagues explore in their latest paper: https://t.co/sPAAbXL7RA

20/ Evolutionary transitions that need to happen before we get intelligent life:

- abiogenesis,
- prokaryotes -> eukaryotes,
- sexual reproduction,

- multi-cellularity,
- and then culture/intelligence.

21/ Some steps are easy (e.g. multi-cellularity is not a difficult step in evolution because it evolved multiple times independently).

However, some steps are hard. Eukaryotes evolved just once because lots of things have to go right for it to happen.

22/ @anderssandberg asks: assuming these evolutionary transitions take time, what are the chances that observers emerge before a star (like our Sun) burns out?

23/ To answer it, you have to take observer selection effects into consideration.

That is, even if this probability is low, on lucky planets like Earth, you will find observers who conclude life emerged early on.

https://t.co/NdkWyOzyM3

24/ LINCHPIN OF THE PAPER -> Harder the steps, more evenly you find the steps to be distributed.

And we find multiple steps in our evolutionary history pretty evenly distributed, which suggests each of the steps is highly improbable.

25/ Because life took a billion years to emerge on Earth and intelligence took 4 billion years, while the life span of our Sun is 10 billion years, we should expect the probability of abiogenesis or transition to intelligence to be really hard...

26/ .. and when you combine multiple hard steps, chances of intelligence life emerging anywhere in the universe becomes minuscule.

27/ More reasons to believe intelligent life is rare:

- History of Earth is not good evidence of intelligent life being common in the universe but works as evidence as it being rare.

28/

- If intelligent life was easy, we should expect it to emerge very early in Earth’s history (yet we took 4 billion years)

- If intelligent life showed up early in Universe’s history, we should imagine our galaxy to be full of such life (yet we don't find it)

29/

== Prediction 1 of the theory: There’s no life on red dwarf stars ==

https://t.co/BNkIkA5oen

30/ Given red dwarf stars are more in number and exist for much longer, why do we find ourselves around a star with a lifespan of 10 billion years and not around a red dwarf star that will keep on shining for trillions of years?

31/ The theory predicts that the fact we don't find ourselves around red dwarf stars suggests that the conditions around them are not conducive hence we shouldn't find any life on such stellar systems.

32/

== Prediction 2 of theory: If we find life on Mars, it'll share a common descendent with life on Earth ==

33/ Solar system shared a lot of material in the early period, so it is not unlikely that we may find life on other planets. https://t.co/wBtBqytWRq

34/ So, discovering a different type of life on Mars will suggest the emergence of life is fairly easy but not finding it or finding it similar to Earth's will suggest that it is pretty hard to kickstart abiogenesis.

https://t.co/N7lp6AjUWB

35/

== Once it emerges, how long does an intelligent life last? ==

Lower bound: in several decades of splitting the atom, civilizations destroy themselves.

However, if you spread in the space, your existence becomes robust. You're harder to destroy.

36/ Even at a speed slower than the speed of light, we can spread in the galaxy within a few tens of millions of years.

This again suggests that an empty galaxy is very strong evidence of rarity of intelligent life.

37/

== Maybe we're the first intelligent life in the universe? ==

It could be a case where intelligent life has just begun in the universe and will spread out across the universe in trillions of years.

38/ Laws of physics allow intelligence to do rearrangement of enormous scales of matter (like galaxies)

We should look at such rearrangements of matter in the universe as evidence of life (technosignatures) but so far we haven't found any

https://t.co/2AyW2Olv9o

39/ @anderssandberg suggests that even though we haven't found a definitive conclusion, there are some unresolved mysteries like the Tabby's star

https://t.co/tu0njGogRj

40/ We could look for Dyson spheres too, which are structures that harness the energy of a sun.

But we haven’t found any Dyson spheres so far. Maybe we’re early and maybe we get to build a Dyson sphere.

https://t.co/NsC6hfM7mf

41/

== What should we do if we’re the only ones in the universe? ==

We’re self-replicators capable of building technology, which can overshadow normal physical processes.

42/ So the most IMPORTANT thing is to -> take the future seriously as we’re unique, just arrived on the scene recently but may have a future that spans trillions of years.

43/ We can do several things to ensure we have a future:

- We can start building tools and institutions that are better than what came before.

- We can work on reducing (existential or progress-halting) risks that are foreseeable

- We can work on uncovering unkown risks

44/ LOVED this by @anderssandberg

Humans matter because we may be alone in the universe.

If someone describes the universe, they better include us in the description because otherwise, the description will be incomplete

Because of this, humans have intrinsic value.

45/ That's it! Hope you enjoyed listening to the podcast.

If you make notes from the podcast, tag me and I'll include it in this thread and on the podcast page:

https://t.co/uSZtI6hMyV

46/

== Other threads on the episode ==

https://t.co/cW4vlsBE3o

> Got a chance to listen to @paraschopra's first episode of the podcast, and it was full of insights and things that we may not often think of: https://t.co/JAi3qww0de <1>
>
> — Nitansh Rastogi (@nitanshr) January 11, 2021

47/ https://t.co/n8I7Ak7bf8

> THREAD: Notes on the podcast "Bold Conjectures with Paras Chopra".
> The topic was "We may be alone in the universe" with guest Dr Andres Sandberg and host @paraschopra
>
> — Pratick (@pratickk_) January 10, 2021

48/ Some wonderful passages from this paper: https://t.co/kQgn2MmZm7

Thanks @anderssandberg for pointing it out.

When we are impressed by our tiny size, by the vastness of the space that envelopes us, and conclude that we must be very unimportant, this may be because we forget to consider just how empty this immensity is. An observer might take a very long time to find us in this immensity, but besides us, he might find in it little or nothing to care about.

49/

In another famous passage, Pascal wrote that

> “Man is but a reed, the most feeble thing in nature; but he is a thinking reed... if the universe were to crush him, man would still be more noble than that which killed him, because he knows that he dies and the advantage which the universe has over him; the universe knows nothing of this.[38]”

50/

But if God exists, then surely if anyone is in the centre, in this sense, it's obviously *God*, not us. If God exists, then trivially we *couldn't* be the most valuable entities in the universe, indeed we would be of absurdly negligible value compared to His perfect goodness—even if the sun and the moon revolved around us. Actually, we would probably be far lower down the ranks, for there may be angels, and numerous other wondrous beings in between. We would also, by the way, be far less significant than Satan.[66]

51/

If we feel insignificant as *individuals*, then this feeling is appropriate. But our insignificance is due to a terrestrial truism. It has little to do with nihilism or metaethics, or the vastness of the universe, or any other grand cosmological discovery.

To paraphrase Sartre, insignificance is other people.[76]

52/

If anything, this should be sobering. It is not a cause for elation, but a burden, a great responsibility. If we are alone in the universe, the only thing of value, then this gives our continuing existence, and our efforts to avert disaster, a cosmic urgency, on top of whatever self-interested, anthropocentric reasons we have to stay around.[82] That is to say, we might be *far more* important than we take ourselves to be. We humans are after all careless in numerous familiar ways, we fail to safeguard the future, or kick off pernicious habits. From a cosmic point of view, the problem wouldn't be that we suffer from an inflated sense of importance. It is that that we don't take our existence seriously enough.[83]