

Freeman Dyson, Gregory Benford: Where are we in 34 Years?

“It is characteristic of all deep human problems that they are not to be approached without some humor and some bewilderment.” (Freeman Dyson)

The following is an abbreviated excerpt of a podium discussion at the University of San Diego in February 2019 [1] paying homage to Freeman Dyson, who passed away a year later.

I am trying to capture the predictions and educated interpolations by Dyson and Benford, which are somehow related to space exploration to provide some perspectives of what we could expect (or not) in the next 34 years.



Freeman John Dyson was an English-born American theoretical physicist and mathematician known for his work in quantum electrodynamics, solid-state physics, astronomy and nuclear engineering.

Dyson saw the meaning of the universe in the "principle of maximum diversity", pushing all things towards the most interesting combination of all possible worlds. He died on February 28, 2020, Princeton [2].



Gregory Benford is an American science fiction author and astrophysicist, Professor Emeritus at the Department of Physics and Astronomy at the University of California, Irvine [3].

The topics are listed in the order they were discussed as moderated by *Professor Bryan Keating*, UC San Diego.

Planet Engineering

Planet engineering is proposed as a measure against climate change by trying to influence the effects of sun irradiation causing the melting of glaciers in the Arctic and Antarctica.

Dyson: I am against planet engineering, I would suggest instead land and ocean management on local levels. My investigations show that top soil management is more efficient to reduce CO₂ than any other measure when done on a local basis. International management is not too good for achieving quick results.

Benford: My studies for DARPA indicate that screening out sunlight in arctic summers with aerosols – which would be washed out again over time – could stop the chain reaction of more melting by exposing more dark surfaces (water) to the sun, thus absorbing yet more heat.

But I agree it has to be done on a local basis.

Artificial Intelligence (AI)

Dyson: AI activities are going on for 70 years – and it's a shame to see losing jobs to machines.

Benford: If you want human level intelligence in AI you should invent artificial stupidity, because we are “risk-takers” i.e., human sub-consciousness cannot be programmed.

Keaton: *This leads to the question, what is your creative process?*

Dyson: I was lucky to be paid for whatever I pleased to do – it's an unconscious process.

Benford: We even don't know why we can't see the unconsciousness. We never should try to consciously force the unconsciousness to do the work for us – it is done for free!

Keaton: *Kurzweil predicts machine AI speeding up towards “singularity”[4]*

Dyson: Wrong – or might be true, but I would be surprised because there are two types of intelligence: the human brain, working analog and conscious and machine electronic intelligence which works different. Machine intelligence might be good for routine and design tasks but not good for the perception of scenes or music.

Benford: A computer can compose like Bach and sound like Bach – but it's only bits and pieces, it is not the Brandenburg Concerto.

Q/Audience: *Could human brain and machine AI be on equal footing i.e., could you expect empathy from machine intelligence?*

Dyson: Could be... you never know, there are all kinds of surprises.

Benford: Interesting question, but would you use it in your personal life i.e., for personal problems?

Life Extension

Keaton: *Life extension – even permanent life extension is propagated for the future with the help of science.*

Benford: No! Aging can't be repaired because we don't know the genetic repair mechanism. Aging is the failure to "repair", and using "brute force" didn't work so far.

Dyson: I am horrified by the idea of an ever growing older population, with no chance for the young people.

Exploring our Solar System and Beyond

Dyson: If we are looking ahead to the next 34 years we will make more progress than we have done in the past 34 years. We will use machines for science exploration because they are cheaper, but we are also human beings who want to travel and pay for it. So, there are different jobs: machines for scientific exploration and humans learning how to survive.

Benford: ...in particular as we are tuning in for the "Moon Superbowl": there are so many things you can do with modified gravity, and I think it is inevitable that asteroid mining will be done – machines under AI guidance will be doing the "heavy lifting".

Intelligent Aliens, Drake Equation [5]

Benford: The center of the Galaxy had probably 10 Mio years longer time to develop than we – so we should not look for intelligent transmissions to us but for "beacons". We just recently experienced tremendous progress made by the *Breakthrough Initiative* [6], acquiring and processing more data during the last 3...4 years than the entire SETI program up to now.

Dyson: Although SETI and StarShot is funded by 1...10 Mio/per year by *Breakthrough Initiatives* the problem is, we haven't seen anything by various listening programs - never found any sign, which is a big disappointment.....Aliens are very good hidden.

Origin of life is a very unlikely event, origin of life is not known nor understood and remains one of the big challenges."

Q/Audience: *Would Aliens avoid us?*

Benford: Yes, in particular if they would see our T/V shows.

Keating: *Would they avoid us because of our tendency for killing each other?*

Dyson: Quite likely – if there are intelligent aliens they would behave the same, and we might experience some accidental contacts.

Q/Audience: *Can you imagine any technical development which takes on the appearance of magic?*

Dyson: Yes – but what we can't imagine.

Benford: I believe we won't see how smart and interconnected systems and networks could be.

Time Travel:

Q/Audience *Would time travel be possible in 35 years or ever?*

Benford: I bet, never: you are asking for communication back in time, but to receive this exotic thing you need a receiver. If you haven't built the receiver, you can't receive the message.

Dyson: I agree.

Technology posing Risks to Humans (i.e. Gene manipulation)?

Q/Audience: *Should we pursue technologies which propose risks to humans (e.g. Gene manipulation)?*

Dyson: We can't avoid risks, we can try to foresee risks and mitigate them. Modern science is

international and we are one big community and it ties the whole world together. We speak the same language and agree on science facts not on politics.

China is getting rich and important and shall be welcomed in the science community – their contribution to science is important and will go on.

Most important Question in Physics to be Solved?

Q/Audience: *What are the most important questions in physics still to be solved?*

Dyson: The beauty is, that it doesn't matter much to human welfare. For humans medicine is far more important than physics. Physics is a game we love to play. Physics is not good to change things much. One big thing physicists contributed is enabling global communications for everybody.

Benford: For physics, in my opinion the most important question would be to solve the origin and meaning and true nature of both, dark energy and dark matter in the universe. I suspect those we are misinterpreting at the moment.

Keating: *Do Scientists have an obligation to solve problems within their life-time regardless of the cost (example Large Hadron Collider)?*

Dyson: No, there are reasonable and unreasonable things, and some are getting too large if driven by politics. The time for the LHC (24 km circumference) was right, but other things are more cost effective than the new \$ 15 Billion Future Circular Collider (FCC, 100 km circumference), like being done in Japan or Canada. The future is more with passive detectors than with big colliders.

Bedford: Yes, I agree. What we need is new ideas, not pressing forward with big hardware. One example is in fusion, new ideas coming out of a group at University of California, Irvine contrary to the ever delaying and more cost demanding approach in Europe [ITER].

References

[1] UC San Diego, Podium Discussion <https://www.youtube.com/watch?v=riPDQ3VJBCI&t=1391s>

[2] Freeman Dyson Wikipedia https://en.wikipedia.org/wiki/Freeman_Dyson

[3] Gregory Benford https://en.wikipedia.org/wiki/Gregory_Benford

[4] Ray Kurzweil Singularity

During the Singularity, Kurzweil predicts that "human life will be irreversibly transformed" and that humans will transcend the "limitations of our biological bodies and brain". He looks beyond the Singularity to say that "the intelligence that will emerge will continue to represent the human civilization." Further, he feels that "future machines will be human, even if they are not biological".

https://en.wikipedia.org/wiki/The_Singularity_Is_Near

[5] The Drake equation is a probabilistic argument used to estimate the number of active, communicative extraterrestrial civilizations in the Milky Way galaxy

https://en.wikipedia.org/wiki/Drake_equation

[6] "Breakthrough Initiative" https://en.wikipedia.org/wiki/Breakthrough_Initiatives