Top 20 Confirmed Predictions of Abraham (Avi) Loeb (2020)

1. Predicted the existence and appearance of hot spots near the Innermost Stable Circular Orbit of SgrA* (as a test of General Relativity and a method to measure the black hole spin) in the following papers:

http://adsabs.harvard.edu/abs/2005MNRAS.363..353B
http://adsabs.harvard.edu/abs/2006MNRAS.367..905B
http://adsabs.harvard.edu/abs/2006JPhCS..54..448B

*This prediction was verified in the following paper,

http://adsabs.harvard.edu/abs/2018A%26A...618L..10G

Also, predicted the appearance of the base of the jet with the black hole silhouette in M87 in the paper:


*This prediction will be confirmed by the new data of the Event Horizon Telescope, to be released in February 2019.

2. Predicted a high probability of gravitational lensing for high redshift bright quasars in the following papers:

http://adsabs.harvard.edu/abs/2002Natur.417..923W
http://adsabs.harvard.edu/abs/2002ApJ...577...57W

*This prediction was verified in the papers,

http://adsabs.harvard.edu/abs/2018arXiv181011924F
http://adsabs.harvard.edu/abs/2018arXiv181012302P

3. Predicted microlensing as a method for detecting planets in the paper:


*This prediction was confirmed in many observational searches since then; see the review in,

http://adsabs.harvard.edu/abs/2018Geosc...8..365T

4. Predicted the global 21-cm signal in the papers:
5. Predicted the **thermal appearance of Tidal Disruption Events** of stars around supermassive black holes in galactic nuclei:

https://iopscience.iop.org/article/10.1086/304814/pdf

*Observations agree with a simple envelope model compared to far more complicated models that were developed subsequently.


6. Predicted the **end of reionization at redshift z~6.5** in the paper:

http://adsabs.harvard.edu/abs/2004Natur.427..815W

*The latest observations confirm this prediction, as discussed in Figure 3 of the paper:


7. Predicted **Doppler beaming signal for exo-planets** in the paper:


*Confirmed by data from the Kepler and Corot satellites in papers such as:

http://adsabs.harvard.edu/abs/2018MNRAS.480.3864E
http://adsabs.harvard.edu/abs/2015ApJ...815...26F
http://adsabs.harvard.edu/abs/2015A%26A...580A..21T

8. Predicted prominence of **CII 158-micron line from galaxies at high redshifts**:


and then forecasted **Intensity Mapping** as a method to measure the large scale distribution of galaxies without resolving them:
9. Predicted “Direct Collapse Black Holes” as the seeds of quasars in the paper:

http://adsabs.harvard.edu/abs/2003ApJ...596...34B

*Confirmed by ALMA data as summarized in the papers:

http://adsabs.harvard.edu/abs/2006ApJ...647...60N
http://adsabs.harvard.edu/abs/2013ARA%26A..51..105C
http://adsabs.harvard.edu/abs/2018A%26A...609A.130L
http://adsabs.harvard.edu/doi/10.1093/mnras/sty2969

10. Predicted detectability of afterglows from gamma-ray bursts at high redshifts:

http://adsabs.harvard.edu/abs/2003astro.ph..7231L

*Confirmed by subsequent observations as summarized in papers such as:

http://adsabs.harvard.edu/abs/2014ApJS..213...15W
http://adsabs.harvard.edu/abs/2015NewAR..67....1W

11. Predicted the correlation between mass of black holes and the velocity dispersion of stars in their host spheroids (so-called “M-sigma relation”), as summarized in section 6.2 of the review paper:


12. Predicted the use of pulsars to probe the spacetime around SgrA*:


*Confirmed with the discovery of a magnetar near the Galactic center:

http://adsabs.harvard.edu/abs/2013MNRAS.435L..29S

13. Predicted recoiled black holes from gravitational wave emission during galaxy mergers:
Confirmed with the discovery of Doppler-shifted offset quasars:

Confirmed in detailed studies to be accurate to 5%,

*Confirmed by detailed numerical simulations,

*Confirmed by the discovery of the “South Pole Wall”,

*Confirmed by the discovery of “Circular Radio Objects”,

14. Predicted the use of differential ages of stars in distant galaxies as **cosmic chronometers** to measure cosmological parameters

15. Predicted that the black hole at the center of the Milky Way galaxy (SgrA*) is fed by winds from the surrounding stars

16. Predicted the existence of a **large scale structure hidden behind the Zone of Avoidance of the Milky Way**

17. Predicted the existence of **radio halos as a result of intergalactic shocks**
18. Predicted acceleration of charged particles to high energies through the cyclotron autoresonance with electromagnetic waves


*Confirmed as a mechanism for production as ultra-high energy cosmic rays


19. Predicted feeding of SgrA* by an individual star

https://ui.adsabs.harvard.edu/abs/2004MNRAS.350..725L/abstract

*Confirmed through 3D numerical simulations


20. Predicted intensity mapping of 21cm for baryonic oscillations of galaxies at modest redshifts:

https://ui.adsabs.harvard.edu/abs/2008PhRvL.100p1301L/abstract

*Confirmed by the papers:

https://ui.adsabs.harvard.edu/abs/2021MNRAS.505.3698W/abstract
https://ui.adsabs.harvard.edu/abs/2021arXiv210602107W/abstract

21. To be tested soon: Predicted ability to measure the cosmic expansion in real time (so-called, the “Sandage-Loeb Test”):


*Planned for use with upcoming facilities as discussed in the papers:

http://adsabs.harvard.edu/abs/2018EPJC...78...11L
http://adsabs.harvard.edu/abs/2016PhRvD..94d3001M