

## **Top Twelve Confirmed Predictions of Abraham (Avi) Loeb (2018)**

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/2006ApJ...636L.109B>

<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:

<http://adsabs.harvard.edu/abs/2009ApJ...697.1164B>

\*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:

<http://adsabs.harvard.edu/abs/1992ApJ...396..104G>

\*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:

<http://adsabs.harvard.edu/abs/2008PhRvD..78j3511P>  
<http://adsabs.harvard.edu/abs/2010PhRvD..82b3006P>  
<http://adsabs.harvard.edu/abs/2012RPPh...75h6901P>

\*An experimental detection of this signal was reported by the EDGES experiment in the paper:

<http://adsabs.harvard.edu/abs/2018Natur.555...67B>

5. Predicted the **end of reionization at redshift  $z \sim 6.5$**  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:

<http://adsabs.harvard.edu/abs/2015ApJ...802L..19R>

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

<http://adsabs.harvard.edu/abs/2003ApJ...588L.117L>

\*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>

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

<http://adsabs.harvard.edu/abs/1993ApJ...404L..37L>

\*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>

8. Predicted “**Direct Collapse Black Holes**” as the seeds of quasars in the paper:

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

\*Tentatively confirmed by recent observations as described in papers such as:

<http://adsabs.harvard.edu/abs/2016MNRAS.460.3143S>  
<http://adsabs.harvard.edu/abs/2019RPPh...82a6901M>

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

<http://adsabs.harvard.edu/abs/2000ApJ...540..687C>  
<http://adsabs.harvard.edu/abs/2003astro.ph..7231L>  
<http://adsabs.harvard.edu/abs/2006ApJ...642..382B>

\*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>

10. 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:

<https://arxiv.org/pdf/1304.7762.pdf>

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

<http://adsabs.harvard.edu/abs/2004ApJ...615..253P>

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

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

12. Predicted **recoiled black holes** from gravitational wave emission during galaxy mergers:

<http://adsabs.harvard.edu/abs/2007PhRvL..99d1103L>

\*Confirmed with the discovery of Doppler-shifted offset quasars:

<http://adsabs.harvard.edu/abs/2018ApJ...861...51K>  
<http://adsabs.harvard.edu/abs/2017ApJ...840...71K>  
<http://adsabs.harvard.edu/abs/2017A%26A...600A..57C>  
<http://adsabs.harvard.edu/abs/2015MNRAS.447.1282N>

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

<http://adsabs.harvard.edu/abs/1998ApJ...499L.111L>

\*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>