**ASSIGNMENT 2**

Given 4 papers are

1. "Transit Light curve Signatures of Artificial Objects"
2. "Searching for GEMS: Confirmation of TOI-5573 b..."
3. "Parallax Effect in Microlensing Events due to Free-Floating Planets"
4. "Earth as an Exoplanet: Investigating the Effects of Cloud Variability..."

After skimming through these 4 papers, this is the outcome I have understood

**Paper 1: "Transit Light curve Signatures of Artificial Objects"**

This paper proposes that advanced civilizations might build planet-sized artificial structures designed to produce unique transit light curves as a method of interstellar communication. These objects—such as triangles, multi-screen structures, or louvers—would create transit signatures distinguishable from those of natural planets, especially with upcoming high-precision missions like Kepler and COROT. The study shows how such light curves differ from those caused by rings or oblateness and suggests that repeated or rotating patterns could serve as attention-getting signals. The author argues that this method has sky coverage comparable to laser pulses and would be detectable as a byproduct of ongoing astronomical surveys, aligning with the idea that intelligent signals might be embedded in normal observational data. This offers a compelling alternative approach to traditional SETI methods (e.g., radio or laser signals), focusing instead on indirect, photometric communication using artificial transits.

**Paper 2: "Searching for GEMS: Confirmation of TOI-5573 b..."**

This study confirms the existence of TOI-5573 b, a cool, Saturn-sized exoplanet orbiting an M-dwarf star. Using TESS photometry, radial velocity data, and ground-based observations, the authors provide precise measurements of the planet's mass, radius, and equilibrium temperature. The planet is part of the rare population of giant exoplanets around M-dwarfs (GEMS), which challenge existing models of planetary formation. The team discusses formation scenarios, particularly core accretion and gravitational instability, and the implications of the host star’s metallicity. The paper contributes to the statistical understanding of GEMS occurrence and supports further characterization for comparative planetology. However, the study is focused entirely on exoplanet detection and formation, not on communication with extraterrestrial intelligence.

**Paper 3: "Parallax Effect in Microlensing Events due to Free-Floating Planets"**

This research explores how parallax effects can distort microlensing lightcurves from free-floating planets (FFPs), particularly those detected by the Roman Space Telescope. The authors simulate over 9,000 short-duration microlensing events, showing how uncorrected parallax leads to significant deviations in inferred physical parameters like lens mass and source radius. The paper emphasizes the need for simultaneous, multi-observer campaigns to properly interpret such events and improve FFP statistics. While the findings are critical for refining microlensing models, the work is technical and observationally focused. It does not propose any method—novel or otherwise—for communicating with extraterrestrial intelligence.

**Paper 4: "Earth as an Exoplanet: Investigating the Effects of Cloud Variability..."**

This paper uses real-time Earth satellite data to simulate Earth-like exoplanets and assess how cloud variability affects their spectral signatures in direct imaging. The authors model a dynamic, 3D Earth analog using NASA’s MERRA-2 and MODIS datasets and evaluate how varying cloud cover impacts detectability of biosignature gases like O₂, O₃, and H₂O. The study is highly relevant for future missions like the Habitable Worlds Observatory and informs how exoplanet atmospheres might be misinterpreted due to cloud interference. While it presents a novel approach to atmospheric modeling, it does not discuss strategies for actively attracting attention from extraterrestrial civilizations or communication.

**Conclusion: Paper 1 is the correct choice.**

***Paper 1*** by Luc F. A. Arnold is the only one who proposes a novel method—using artificial planetary transits—to attract attention from and communicate with extraterrestrial intelligence. This method is designed to produce unusual light curve patterns that stand out from natural phenomena and could be interpreted as intentional signals by other civilizations monitoring exoplanet transits.