Pourquoi la Lune ne tombe-t-elle pas sur la Terre?

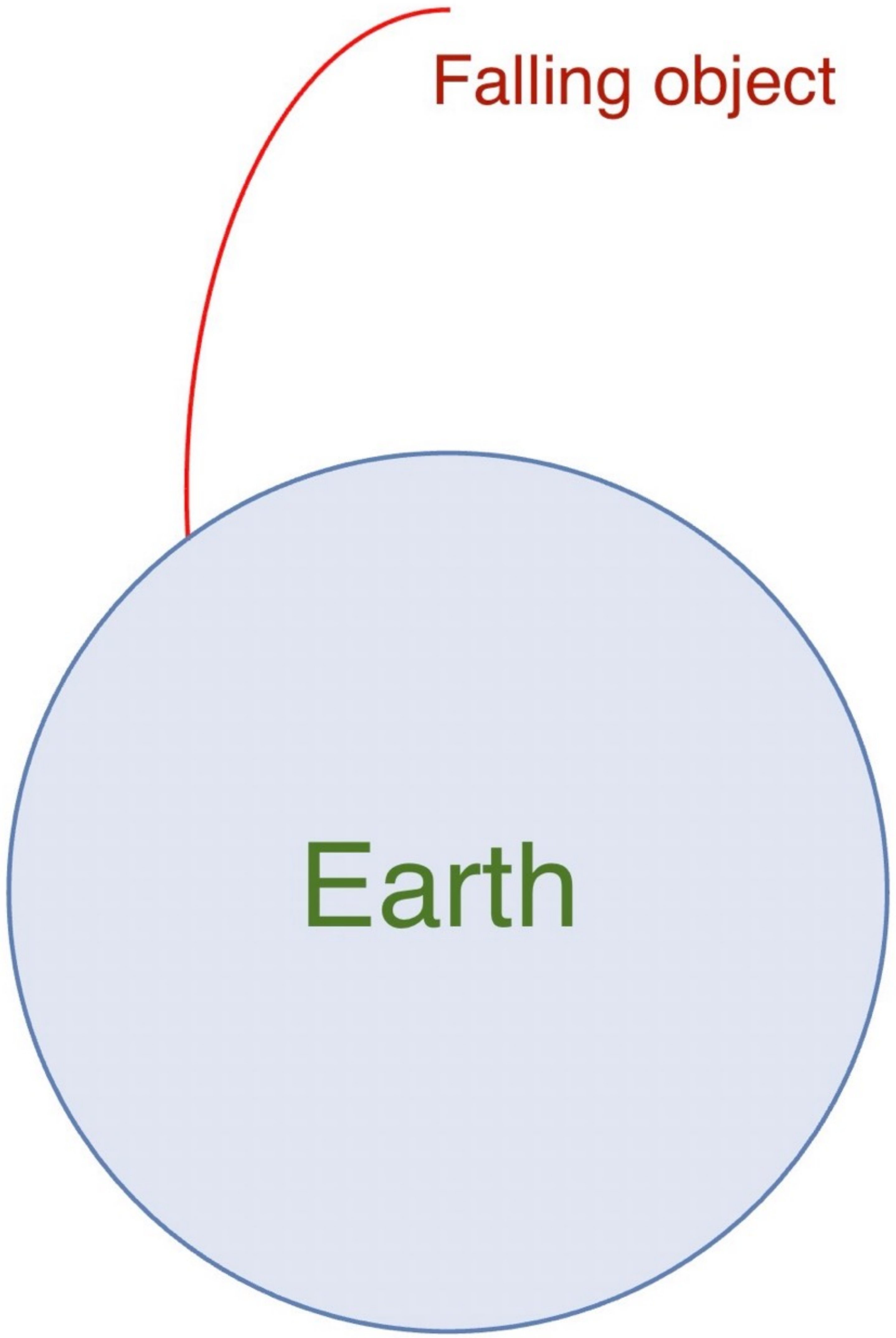
Sashwat Tanay, Gaël Servignat

Le plan

La lune

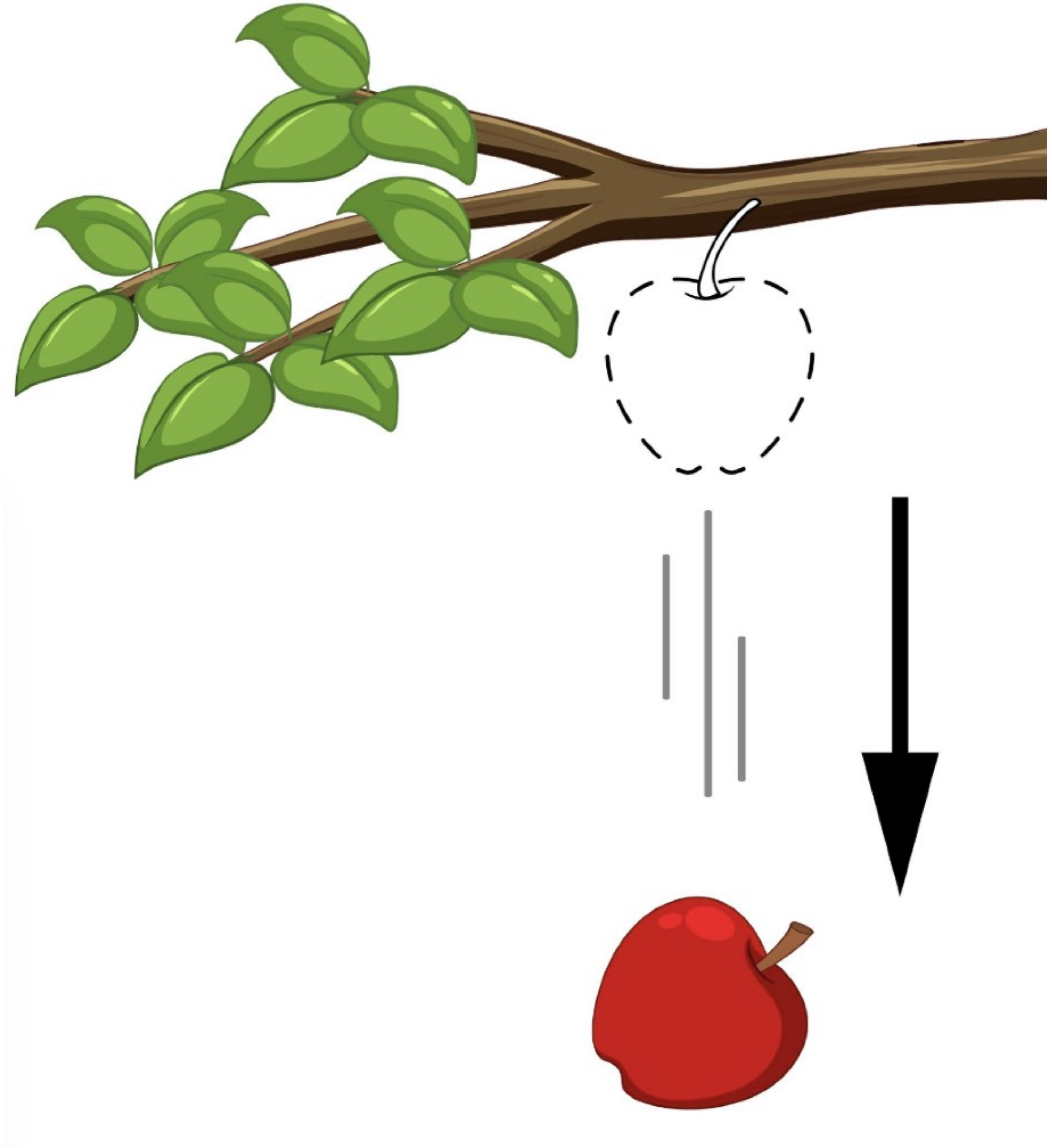
Johannes Kepler

Aide: simulation de chute d'objet

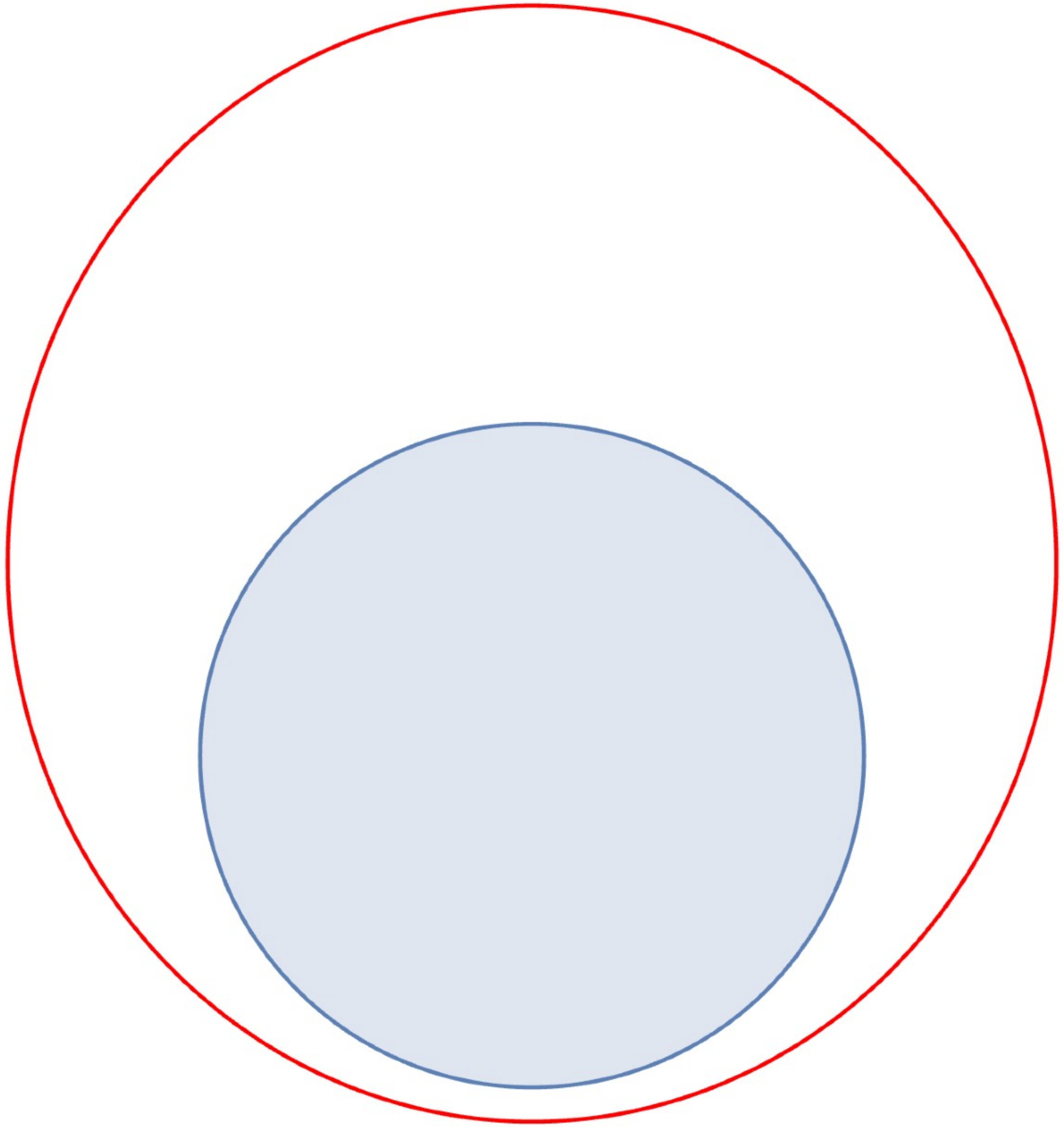


La Lune est un objet qui tombe

est



Les orbites planétaires sont des ellipses (la loi de Kepler)



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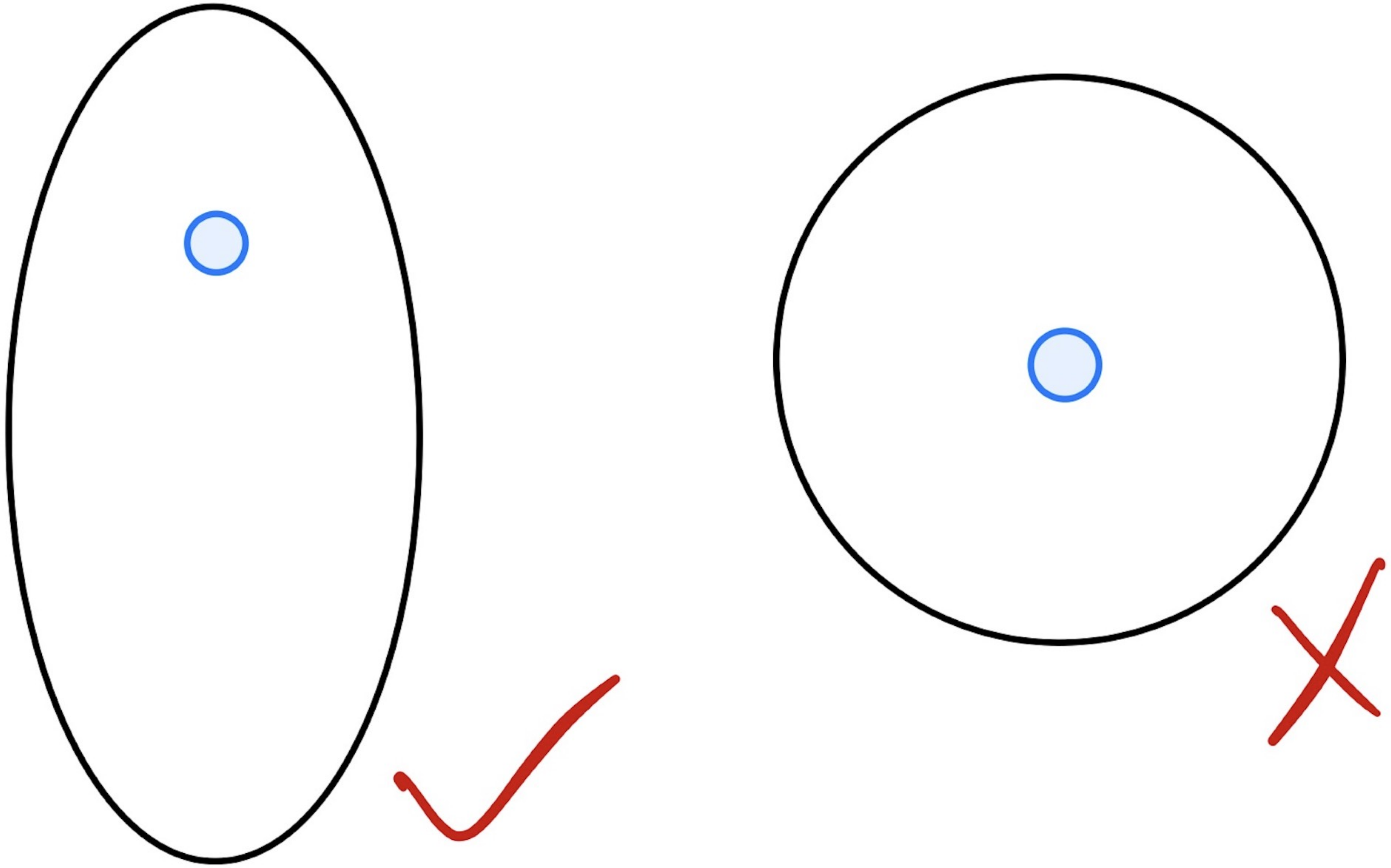
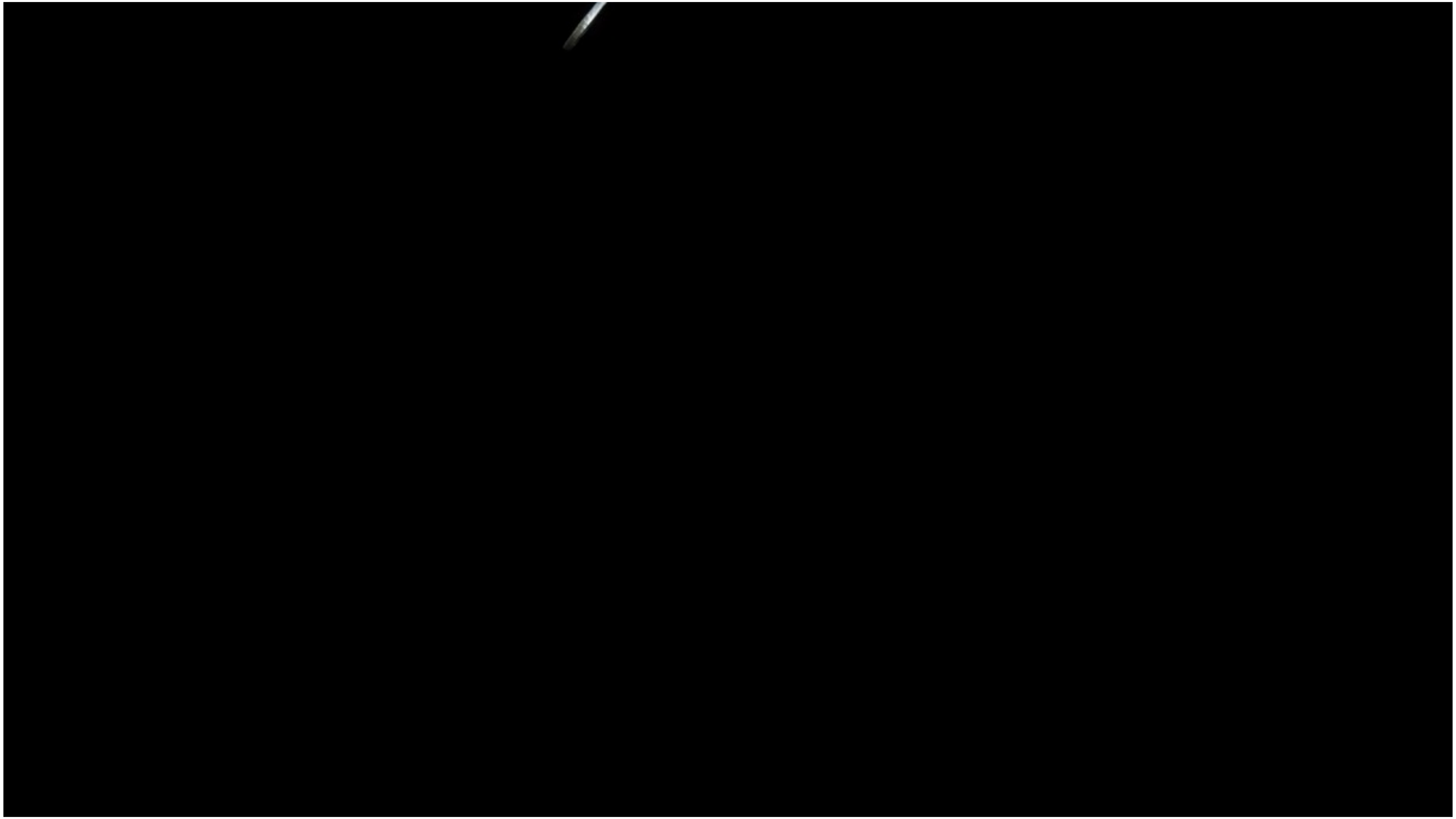


Universalité des lois de la physique



Mon lien personnel avec Kepler

Generalized quasi-Keplerian solution for eccentric, non-spinning compact binaries at 4PN order and the associated IMR waveform

Gihyuk Cho,[1,*] Sashwat Tanay,[2,†] Achamveedu Gopakumar,[3] and Hyung Mok Lee[4]

[1] *Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 Hamburg, Germany*
[2] *Department of Physics and Astronomy, The University of Mississippi, University, MS 38677, USA*
[3] *Department of Astronomy and Astrophysics, Tata Institute of Fundamental Research, Mumbai 400005, India*
[4] *Department of Physics and Astronomy, Seoul National University, Seoul 151-742, Korea*

(Dated: April 19, 2022)

We derive fourth post-Newtonian (4PN) contributions to the Keplerian-type parametric solution associated with the conservative dynamics of eccentric, non-spinning compact binaries. The solution has been computed while ignoring certain zero-average, oscillatory terms arising due to 4PN tail effects. We provide explicit expressions for the parametric solution and various orbital elements in terms of the conserved energy, angular momentum and symmetric mass ratio. Canonical perturbation theory (along with the technique of Padé approximant) is used to incorporate the 4PN nonlocal-in-time tail effects within the action-angles framework. We then employ the resulting solution to obtain an updated inspiral-merger-ringdown (IMR) waveform that models the coalescence of non-spinning, moderately eccentric black hole binaries, influenced by Ref. [I. Hinder *et al.*, Phys. Rev. D 98, 044015 (2018)]. Our updated waveform is expected to be valid over similar parameter range as the above reference. We also present a related waveform which makes use of only the post-Newtonian equations and thus is valid only for the inspiral stage. This waveform is expected to work for a much larger range of eccentricity ($e_t \lesssim 0.85$) than our full IMR waveform (which assumes circularization of the binaries close to merger). We finally pursue preliminary data analysis studies to probe the importance of including the 4PN contributions to the binary dynamics while constructing gravitational waveform templates for eccentric mergers.

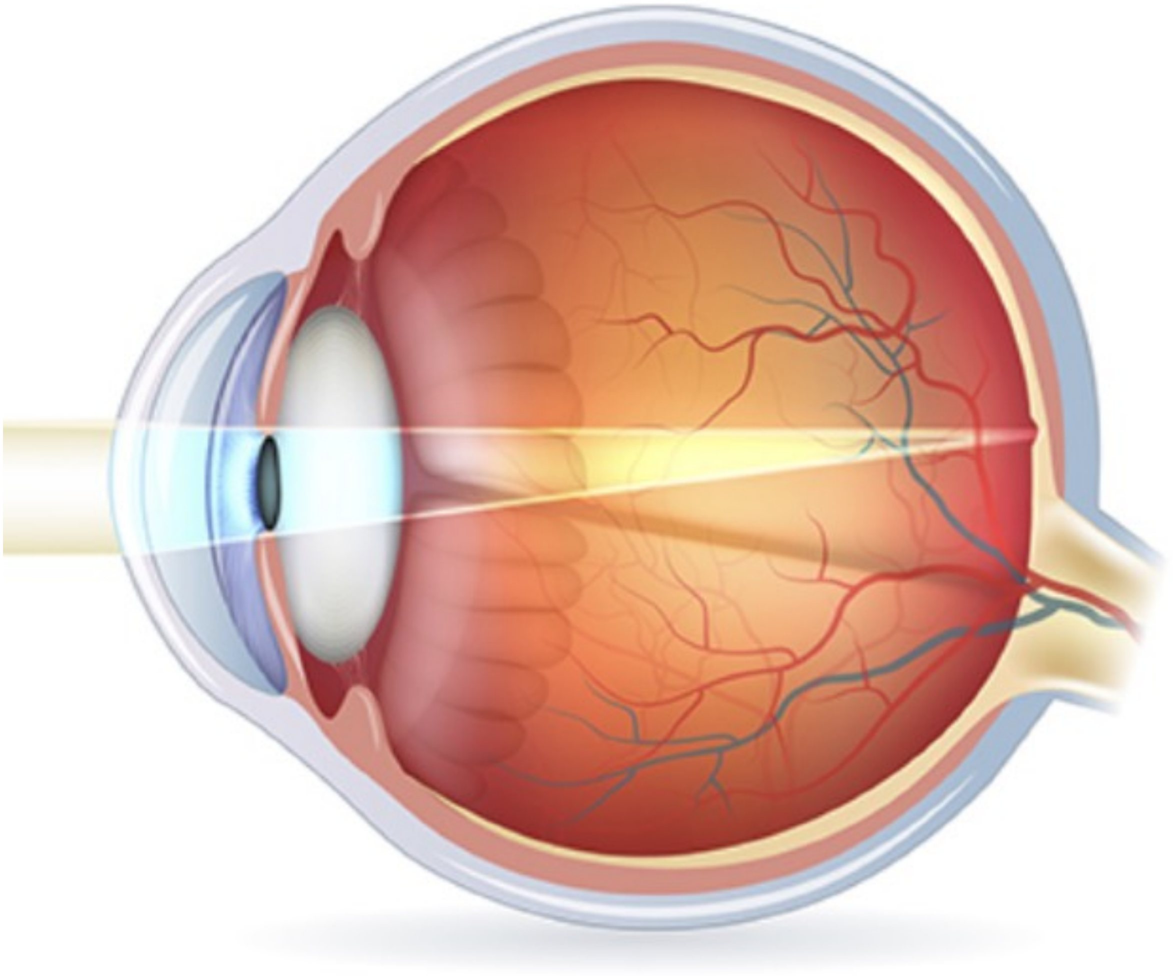
I. INTRODUCTION

The routine detection of transient gravitational waves

windows should allow us to constrain their likely formation channel as dynamical formation scenarios tend to support non-zero orbital eccentricities [18, 24, 25].

Johannes Kepler

astronome allemand (1571-1630).



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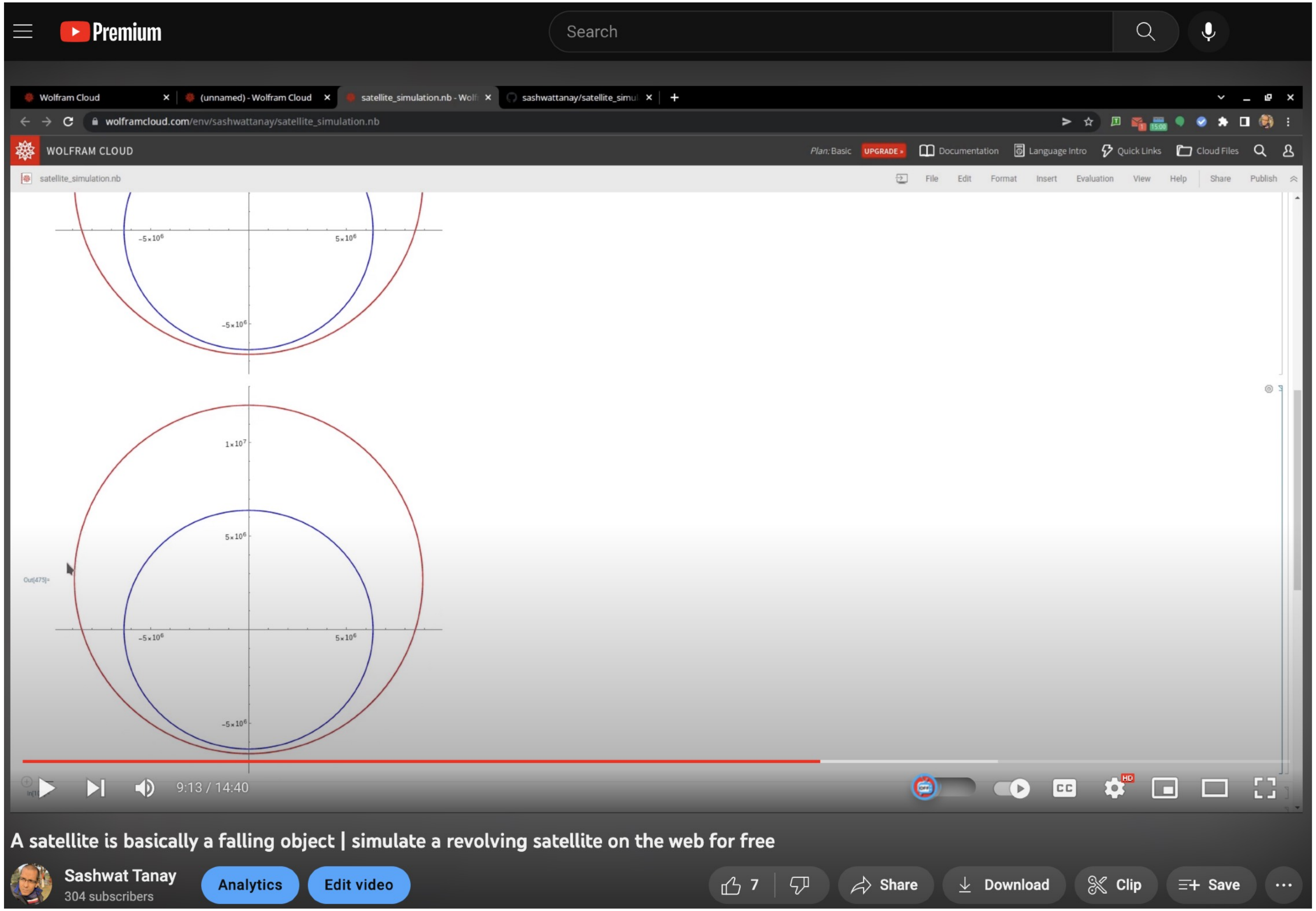

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(sashwat.tanay@obspm.fr)

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