

Frontier Astronomy. Activities from the Perimeter Institute and the ICTP-SAIFR for the secondary classroom

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“Frontier Astronomy” and “Frontier Physics” are a series of activities for the highschool classroom that aim to share teaching techniques and strategies for the inclusion of modern and contemporary astronomy topics in the classroom, both in face-to-face classes and online. The activities are designed to be easily attached to regular physics or astronomy courses, without the need to change the curriculum, including motivating topics for students, addressing current issues such as dark matter, exoplanets, the expansion of the universe, cosmology, black holes, gravitational waves, among others.

The almost 100 activities, included in 18 books, were developed by the renowned Perimeter Institute for Theoretical Physics of Canada, and translated and adapted into Portuguese and Spanish by the ICTP-SAIFR (South American Institute for Fundamental Research), a physics center associated with Abdus Salam ICTP (Trieste, Italy) and associated with the Institute of Theoretical Physics of the University of São Paulo, Brazil (IFT-UNESP).

Each activity includes: a sequence of practices and related questions for discussion of activities in small groups; and an evaluation to consolidate learning.

The activities translated into Spanish began to be disseminated in March 2021 to physics teachers from Latin America through virtual workshops (Figure 1), organized by the ICTP-SAIFR and coordinated by Ana Luiza Serio. Since then, 47 virtual meetings lasting more than 2 hours have been held, reaching a total of 1339 participant entries from 20 countries.

Although the activities were adapted to virtuality, they were originally designed and are ideal to be carried out in face-to-face activities. Figure 2 shows an example of an activity on gravitational waves carried out in Montevideo for physics and astronomy teachers.

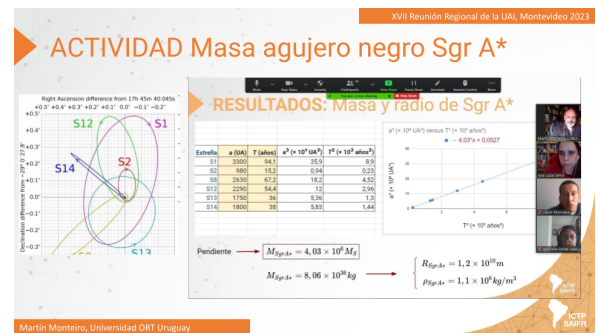


Figure 1. Screenshot of one of the virtual activities on black holes, in which the mass of Sgr A* is determined from the orbits of some of its satellite stars.

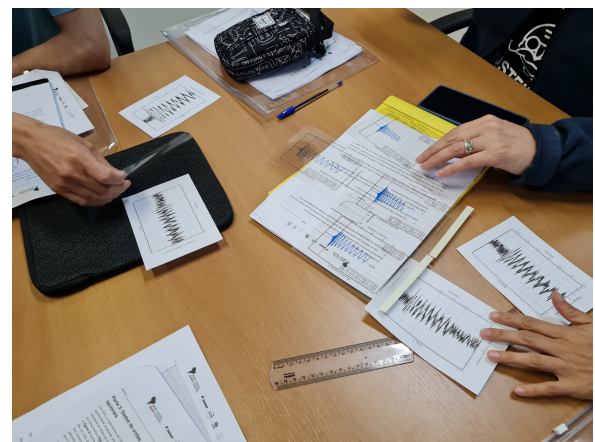


Figure 2. An in-person activity on gravitational waves. Students use transparent templates with different waveforms to compare them with theoretical models.

Finally, we encourage teachers to join the workshops and adapt the activities to the needs of their own classes.