

## EDUCATIONAL TOOLS AND ACTIVITIES IN ASTRONOMY ON-LINE

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**Abstract.** For several years, the outreach team of the educational office of the Observatoire de la Côte d'Azur has developed several tools and activities to disseminate knowledge in astronomy. Our pedagogical contents and activities are initially conceived for a school use, to be led in the classroom by scientists and members of our team. However, we have made them available on-line, for a larger use. With this aim, we have developed several sheets defined by the target audience (age and school level) that are available on our Observatory website. Thanks to them, it is now possible for everyone (other outreach professionals, scientists, teachers, parents and so on) to download our contents and carry out our activities in total autonomy. Activity-explanation and communication videos will be soon available.

Keywords: outreach, education, teaching skills, astronomy activities

### 1 Introduction

Outreach is one of the four missions of the Observatoire de la Côte d'Azur (OCA) and is the core of the work done by the educational office team. Each year, we develop projects with several schools and we provide many astronomy sessions in the classes. We also host stands during public science events. The projects developed with the teachers, offer a progression in astronomy knowledge. Some of them conclude by the participation in a real research project, with an observation with a professional telescope that provides data to professional astronomers (Suarez et al. 2019).

This work has allowed us to develop and improve many activities to deal with different topics in astronomy and especially those related to the research work at the OCA. To make public profit from these educational contents, we decided to make them available on-line. Thus, our outreach team adapted the activities to be used independently and developed a series of educational sheets intended for a large audience.

### 2 Description of the activities

Each activity contains a sheet for teachers or any kind of tutors, and a sheet for pupils or any kind of learners. A corrected sheet and annexes can also be found.

For all activities, teacher's sheets follow the same pattern:

- A first page (Fig. 1) indicating the activity title, the objectives, the target audience, the duration of the activity, the material, links with school programs and connected activities. A colour-code, following a gradient of " star-temperature colours ", is used to define the level of the activity (red for 6-10-year-olds, orange for 8-13-year-olds, yellow for 12-16-year-olds, blue for 14-17-year-olds and purple for 16-18-year-olds).
- Contents combining objectives, timing and background information for each exercise or construction.

The student's sheet contains the title, objectives, exercises and construction statements.

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### 3 List of activities

For the time being, eight/nine activities have been completed and are available on our website:

<http://www.oca.eu/materiel-pedagogique>

- **White light and coloured light.** (*Construction activity for 6-10-year-olds – 1 sheet and 1 annex*): The white light is a combination of several coloured lights, from purple to red (rainbow colours). How is it possible to decompose white light and observe each colour radiation? Furthermore, how could we recombine colours to make white?
- **Construction of a spectroscope with a CD.** (*Construction activity for 8-13-year-olds 2 file and 1 annex*). This device enables users to disperse light and observe the spectrum of a luminous source.
- **Invisible light.** (*Exercise for 12-16-year-olds – 2 sheets and 1 correction*). Is visible light the only type of radiation used in astronomy? Is it possible to become invisible?
- **Discover the sky with Stellarium.** (*Exercise for 14-17-year-olds – 2 sheets and 1 correction*). An activity with Stellarium software that makes everyone understand the sky and want to observe it night and day.
- **Constellation machine.** (*Construction activity for 14-17-year-olds – 2 sheets and 2 annexes*). A construction activity to understand that constellations are human-mind compositions and to see the 3D positions of stars in three very-known constellations: Orion, Cassiopeia and the Lion.
- **Sky chart.** (*Exercise activity for 14-17-year-olds – 2 sheets and 1 correction*). The most useful device to get your bearings in the night sky!
- **From bulbs to stars.** (*Exercise activity for 14-17-year-olds – 2 sheets and 1 correction*): What information can we get from the light provided by stars and nebulae? A parallel with different light bulbs might be helpful to understand it!
- **Solar spectrum.** (*Exercise activity for 16-18-year-olds – 2 sheets and 1 correction*). The solar spectrum gives us information to determine the chemical components of our star.
- **Importance of precision.** (*In development, exercise activity for 16-18-year-olds – 2 sheets and 1 correction*). How critical is precision in astronomy?

### 4 Hyperlinks

To download our activities, get information about all our actions and contact us:

<https://www.oca.eu>

To discover on the web other contents and activities developed by our team:

<http://medites.fr/parcours-pedagogiques/observation-univers>

### 5 Conclusions

We have made available on-line several educational activities about astronomy. They will help us to fulfil our main goal: the dissemination of astronomy knowledge to a large audience. We have also made short videos to promote our activities and to help with their understanding.

The development of new contents is on-going, and for this reason we will be grateful to anyone who shares experiences and gives us a return about our activities led in classroom or anykind of event. (For any return, please contact [eduoca@oca.eu](mailto:eduoca@oca.eu)).

### References

Suarez, O., Branchereau, Q., Abe, L., et al. 2019, in Proceedings of the Société Française d’Astronomie et d’Astrophysique (SF2A) 2019, ed. P. Di Matteo, O. Creevey, A. Crida, G. Kordopatis, J. Malzac, J.-B. Marquette, M. N’Diaye, & V. O. (SF2A)

Activity title

Color of targetted public

## DES AMPOULES AUX ÉTOILES

Main objectives


Connected activities

L'objectif de cette activité est de comparer le rayonnement de diverses sources lumineuses pour comprendre ensuite l'information que l'on peut obtenir à partir des spectres des étoiles et des nébuleuses.

Time

Materials

FICHE ENSEIGNANT



50 min

Collège, Lycée

Notions de lecture et de construction de graphique


\* Fiche de l'élève

Activités complémentaires

- Construction d'un spectroscopie avec un CD
- Lumière invisible
- Spectre du Soleil
- Analyse spectrale pour la détection des exoplanètes
- Loi de Wien

Liens avec le programme scolaire

Cycle 4	Seconde	Première
<p>Thème : organisation de la matière dans l'univers</p> <ul style="list-style-type: none"> <li>• La matière constituant la Terre et les étoiles.</li> <li>• Les éléments sur Terre et dans l'univers.</li> <li>• Constituants de l'atome, structure interne d'un noyau atomique.</li> <li>• Thème : Des signaux pour observer et communiquer</li> <li>• Sources de lumière.</li> </ul>	<ul style="list-style-type: none"> <li>• Savoir qu'un corps chaud émet un rayonnement continu, dont les propriétés dépendent de la température.</li> <li>• Repérer, par sa longueur d'onde dans un spectre d'émission ou d'absorption une radiation caractéristique d'une entité chimique.</li> <li>• Utiliser un système dispersif pour visualiser des spectres d'émission et d'absorption et comparer ces spectres à celui de la lumière blanche.</li> <li>• Savoir que la longueur d'onde caractérise dans l'air et dans le vide une radiation monochromatique.</li> <li>• Interpréter le spectre de la lumière émise par une étoile : température de surface et entités chimiques présentes dans l'atmosphère de l'étoile.</li> </ul>	<ul style="list-style-type: none"> <li>• Distinguer une source polychromatique d'une source monochromatique caractérisée par une longueur d'onde dans le vide.</li> <li>• Connaître les limites en longueur d'onde dans le vide du domaine visible et situer les rayonnements infrarouges et ultraviolets.</li> <li>• Exploiter la loi de Wien, son expression étant donnée.</li> <li>• Expliquer les caractéristiques du spectre solaire.</li> </ul>



Links with school programs

Fig. 1. Pattern for the first page of a teacher's sheet