

Workshop EAAE Monday 2nd April

First aid kit for young astronomers

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Abstract

We can acquire practice with the measurements of times and positions of celestial bodies using the devices prepared in an “ad hoc” way. We give details in order to produce a collection of devices, put them together in a bag: the minimum kit for observations. The bag and the contents are mostly made of cardboard using glue, scissors etc. The topic can offer the possibility of investigating a lot of old devices or modern instruments.

Fantasy and artistic ability can be used to obtain very good and personalised bags. It is possible to modify this activity, depending on the age of students, with more sophisticated instruments.

In particular this bag contains:

- A ruler which measures angles
- A simplified quadrant (“gun” quadrant)
- A horizontal goniometer
- A star finder
- A night timer

During the WS it will be presented different bags containing different devices.

Introduction

To observe and to measure, to collect data, to verify the most important astronomical cycles presented in the school books are the tasks requested of pupils to understand and remember astronomical phenomena. Basic observations are simple but require in any case constancy and it’s better if you have instruments (should be) ready to be used. If a student makes them, he/she understands the process better, he/she is more comprehensive regarding the difficulties of measurements made by the others, and he/she accepts the possible errors and mistakes.

We propose a bag with some very simple instruments in it. The small bag is carried around by the student in school or at holiday time, always ready to be used. It is very important that it is not big and not fragile (especially if used by young students). **We have to insist that the accuracy of the measurements is not an aim of this activity.**

Contents

Of course we can only simulate it in a courtyard during summer! The idea is to acquire practice with the devices that now we are going to make it.

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First we need a cardboard box such as those you receive by postal delivery with a big book in (this will be the bag). It is only necessary to put a handle on the narrow side and the broad side will open. Inside the box, we will place the following devices:

- ❖ A “**ruler which measures angles**” can be used to give us the angular distance between two stars in the same constellation. It is very simple to use, if we are not interested in introducing coordinates.
- ❖ A simplified **quadrant** can be used to obtain the height of the stars. When students see an object through the visor the rope indicates the angular position referring to their horizon.
- ❖ A simple **horizontal goniometer** can be used to determine the azimuth of the stars. Of course it is necessary to use a compass to orient the device according the North-South line
- ❖ A **star finder** with the constellations on a white paper sky so that photocopies have clearly made and a cardboard pocket with the latitude “hole” to put the disc of the sky in. Turning around you find the data and the time observation to recognize the most important constellations in the latitude of the “hole” used.
- ❖ A **nighth timer** is a medieval instrument that can be used to calculate the hour by means of the movement of the Ursa Major around the polar star in an anticlockwise sense.
- ❖ A **torch** (red colour), to illuminate their maps before looking at the real sky. The light disturbs observations. If our students have a torch inside the bag, it is necessary that they put a “red cellophane paper” over the lamp fixed by “scotch tape”. A set of students with torches non-red colours can produce a lot of “light pollution” hindering the observation.
- ❖ A **compass** to orient several devices.
- ❖ And of course all the accessories pupils like to put in: paper, a pencil, a watch...

Following the instructions and the pictures we make our devices in a very simple way and we use them in the open air. During the day we measure, for example, with the quadrant the position of the top of a tree, a hill etc... For instance, during the night we measure the position of different stars or the Moon in order to understand the periodical cycle of the moon phases. Students are invited to register the data.

Aims and Conclusions

To observe how the sky moves during the night, during the day... along the year,

It is very important that the students understand how basic has been the introduction of several devices: the clock by pendulum, the chronometer for navigation, astrolabes, sextants...

In fact time measurements, velocity of the ship and position of celestial bodies were fundamental not to loose the way during long navigation. The adventure of John Harrison to obtain the prize of 20000 pounds from the Board of Longitude in 1760 for his invention of pendulum for navigation is very well told in the best seller book of Dava Sobel “Longitude”. Astrolabes from Arabian countries and the old sextants used by Cristoforo Colombo and other navigates are fascinating and artistic masterpieces. The sextants with two mirrors, one fixed and the other movable directed to the star, were very precise; otherwise the navigates could not arrive anywhere but a great ability and a good knowledge were requested. The double reflection is not so easy to determine if we try to practice it with the students; that’s why we propose our simple devices.

Of course it is very useful that students make their devices, use their devices and also collect all of them in their bags. With this kind of project it is possible:

- To lead the students to get confidence with measurements;
- To be responsible of their own instruments;
- To develop creativity and manual ability;
- To let them understand the importance of the continuous registration of data;
- To facilitate the comprehension of more sophisticated instruments;
- To underline the importance of naked eye observation both in ancient times and nowadays.

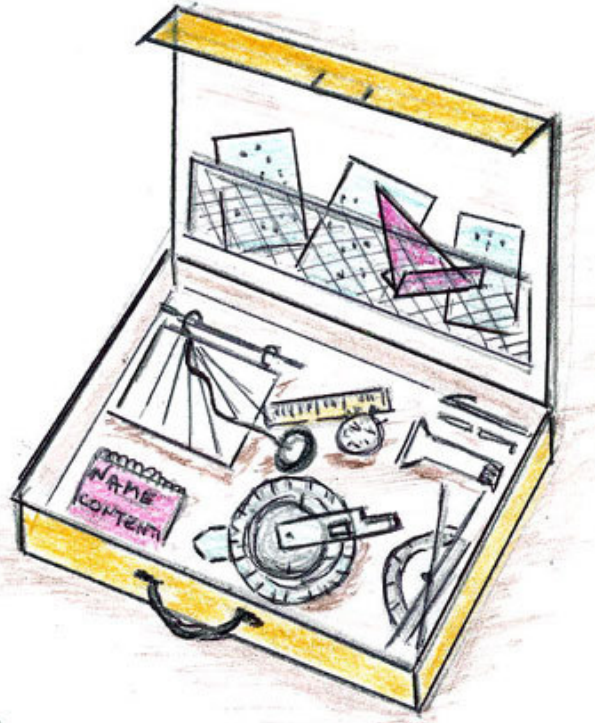


Fig. 1 The bag!!!!

References

- Palici di Suni, C., First Aid Kit. What is necessary for a good astronomer to do an Observation in any moment?, *Proceedings of 9th EAAE International Summer School*, 99, 116, Barcelona, 2005
- Rochat, C., “Le misure del tempo”, Ed Franco Panini, Modena 1995.
- Ros, R.M., Capell, A., Colom, J., “El planisferio y 40 actividades más”, Antares, Barcelona, 2005
- Schroeder, W., “Practical Astronomy”, Ed. Longanesi, Milano 1967

Internet References

- www.polare.it
- <http://www.pd.astro.it/othersites/english/education.html>

The “Night Timer” simplified paper version has been prepared by Angela Turricchia from Bologna Planetarium in 1999 for a common event with Italian EAAE section.

We propose one of the device; if you are interested you can contact the national representative EAAE in Italy C Palici di Suni cristina.palicidisuni@unito.it

Night Timer

This is an instrument used to gauge the time passing during the night. We will use the straight line linking α and β Ursa Major stars (Dubhe and Merak) as the hand of a big clock with the centre in the polar star. We observe a 23 hours and 56 minutes revolution in an anticlockwise direction (Fig. 2). The device presented (Fig. 3) was set according to the day time counting system with the revolution time of the sky, so that no calculation is needed.

To make the device: Cut the external circle and the rectangles named A and B (Fig. 3). Make sure you cut out the little window in A. In order to make the device, please follow this order: firstly placing rectangle B, then put the circle on it and on top of everything rectangle A. The three parts will be fixed by a little rivet introduced into the centre of the circle and the small crosses on A and B.

How to use:

- At first, move B on the date of the day of the observation; and turn the entire device so that the DATE is at the bottom and keep it by your left hand. (Fig. 2)
- Look at the North in the sky. Move A in a way that the direction of part marked with * is in the same direction as the two stars of Ursa Major that we normally use to find the polar star (the α and β stars). The centre of the device corresponds to the polar star.
- In the little window, in rectangle A, you can read the time: you must remember that the sky does not use legal time!

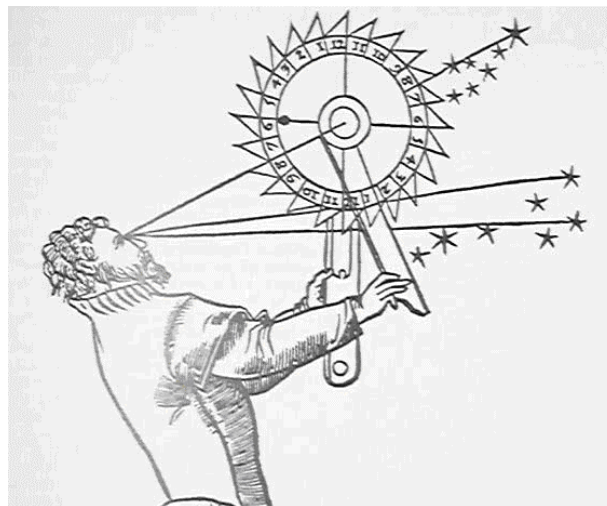


Fig. 2: How to use the night timer

Proposed exercise:

Comparing night timer and star finder during a night time observation. Choose a date with the night timer (for example 5th July at certain time of the night e.g. 22 pm). Compare the position of the α and β stars of Ursa Major so that you can “see” from the part of A marked with the *, with the position of this constellation in the star finder device (same date and time).

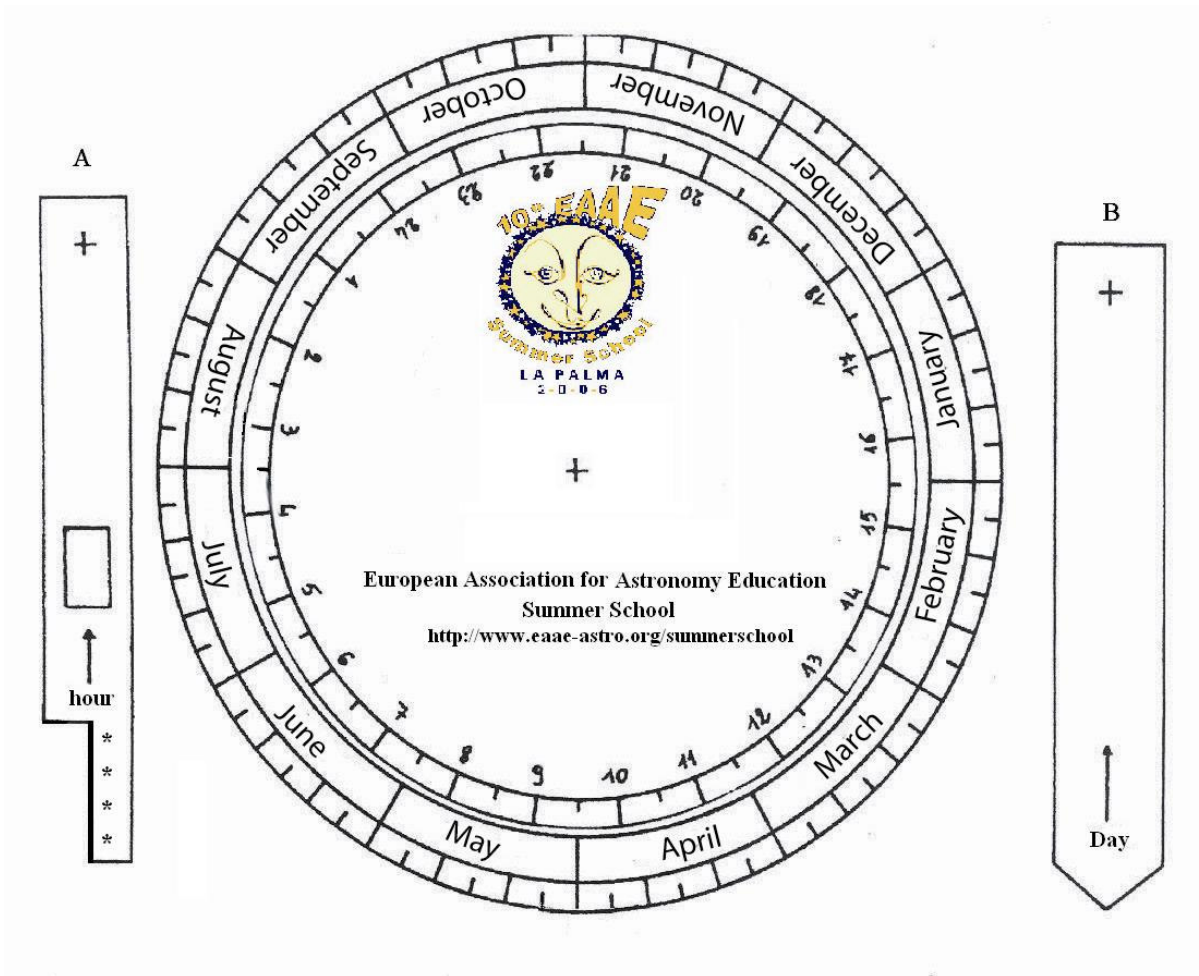


Fig. 3: Different parts of the night timer