



# Why stars have different colours?

## Evolution of Stars. Activity 2

### Classroom Activity

#### Overview

**Age Range:**

14 – 17 years

**Prep. Time:**

15 min

**Lesson Time:**

40 min

**Cost per activity:**

Printing of student's worksheets

**Includes the use of:**

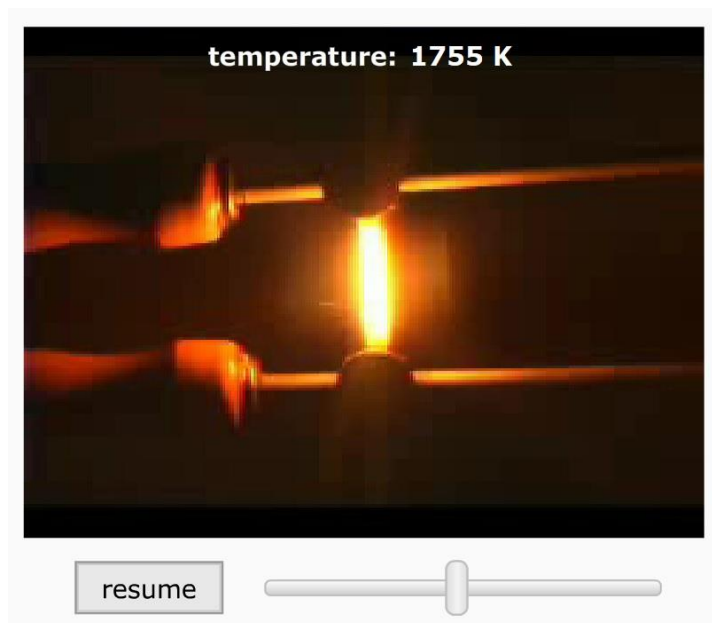
Computer for each group of students

#### Outline

By using a computer animation students will explore the colour of heated nail and will compare the observed colours with the colours of some flames and stars to draw the conclusion that the colour of the star depends from its temperature.

#### Pupils will Learn:

- That colour of the light emitted by heated bodies has different colours.
- That stars have different colours corresponding to their temperature.
- That heated bodies emit light at different wavelengths.



Screenshot of the animation used for this activity

## Lesson Plan:

Description	Time	Notes
Before the lesson	15 min	Go to the download's page at <a href="http://astro.unl.edu/downloads">http://astro.unl.edu/downloads</a> to get the free <i>ClassAction</i> software. The software is courtesy of the Astronomy Education at the University of Nebraska-Lincoln Web Site ( <a href="http://astro.unl.edu">http://astro.unl.edu</a> ). Download and run the appropriate files for your system and follow the prompts to install the software on the teacher and students computers.
Pre-activity step	2 min	Divide students in groups
Introduction to the subject	3 min	Dialogue with the students
Activity 1	5 min	Students work with the animation <i>Light &amp; Spectra/Blackbody Curves of Melting</i> and fill the worksheet
Activity 2	15 min	Students watch the <i>Powerpoint</i> presentation <i>Star Colours</i> , discuss the answers, fill the worksheet, discuss with the teacher
Activity 3	10 min	Students continue to work with the animation <i>Light &amp; Spectra/Blackbody Curves of Melting</i> and fill the worksheet
Assessment	5 min	Students answer the questions

## Pre-activity step:

Divide students in groups according the number of computers.

The Online Observatory collaboration consists of the following partners:

Baldone Observatory, Brorfelde Observatory, Cardiff University, Harestua Solar Observatory, Helsinki Observatory

## Introduction to the subject:

The purpose of this lesson is to find answer to the question: “Why stars have different colours?” by students themselves. To achieve this goal, students will watch the heated nail and different flames first.

### Activity 1:

Students run in groups the *ClassAction* software and open the animation *Light & Spectra/Blackbody Curves of Melting*. They watch the animation, stop at temperatures mentioned and fill the first part of worksheet Table 1.

Table 1 (filled)

Object	Temperature, K	Colour
Heated nail	1000	red
Heated nail	1100	orange
Heated nail	1300	yellow
Heated nail	1800	yellowish white
Burning magnesium flame	≈3000	white
Burning acetylene flame	3770	blue

### Activity 2:

Students watch the *Powerpoint* presentation *Star Colours*, about temperature and colour of flames and continue to fill the Table 1. After the slide about different star colours using the acquired knowledge that colour of the light emitted by heated bodies has different colours (red colour corresponds to lowest temperature and blue colour – to the highest) students arrange star colours in the sequence from the lowest temperature to the highest:

red, orange, yellow, yellowish white, white, blue white, blue.

**The goal of this lesson is that students make this conclusion by themselves.** They discuss their results between groups and with the teacher. Then teacher shows them the slide of presentation with stars arranged in colour/temperature sequence and explains that temperature range of stars is higher than that of heated nail or flames (about 3000 – 30 000 K) because stars consist of other chemical elements (hydrogen and helium mostly).

### Activity 3:

Students continue with the animation *Light & Spectra/Blackbody Curves of Melting*. They watch the animation, stop it at temperatures mentioned and fill the Table 2.

Table 2

Light (colour)	Emitted or not?
Violet	No
Indigo	No

Blue	Yes
Green	Yes
Yellow	Yes
Orange	Yes
Red	Yes

It is important for students to understand that the combined (final) colour of the heated nail actually consists of light emitted at different wavelengths (light of different colours), just some colours are more intense.

## Assessment:

Students answer the questions at the end of *Powerpoint* presentation in groups or all together.

1. What is the colour of the hottest stars? Blue.
2. What is the temperature of red stars? About 3000 K.
3. Sun is a yellow star. What is the approximate temperature of the Sun? About 5500 K.

## Further Activities:

You may continue with the *Evolution of Stars. Activity 3*.

## Background Material/Knowledge:

Wikipedia: [https://en.wikipedia.org/wiki/Stellar\\_classification](https://en.wikipedia.org/wiki/Stellar_classification)