

Séjour star-finder :

Does life exist out of earth? Could we live there?

*Objectif Sciences International
St. Luc (Suisse)*



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Organisation Internationale Non Gouvernementale

1. Objectives

Questions

During our stay in St. Luc we worked on the following questions:

- Is there any life outside of the earth?
- Could we live outside of the earth?

Activities

1. Revision of our solar system:

- a) Walk on the planets trail in St. Luc
- b) Observation of sun, Jupiter, Saturn, Mars and Venus by telescope

1. Beyond our solar system:

- a) 5 Methods of the for exoplanets detection and their suns
- b) The conditions for extraterrestrial life
- c) Redaction of a story of an imagined exoplanet conquest based on scientific discoveries

2. The exoplanets – what are they?

Exoplanets are planets out of our solar system.

As the next star - alpha centauri - is about 4 light years away, these planets are very difficult to detect. So only in the 1990s first exoplanets were found.

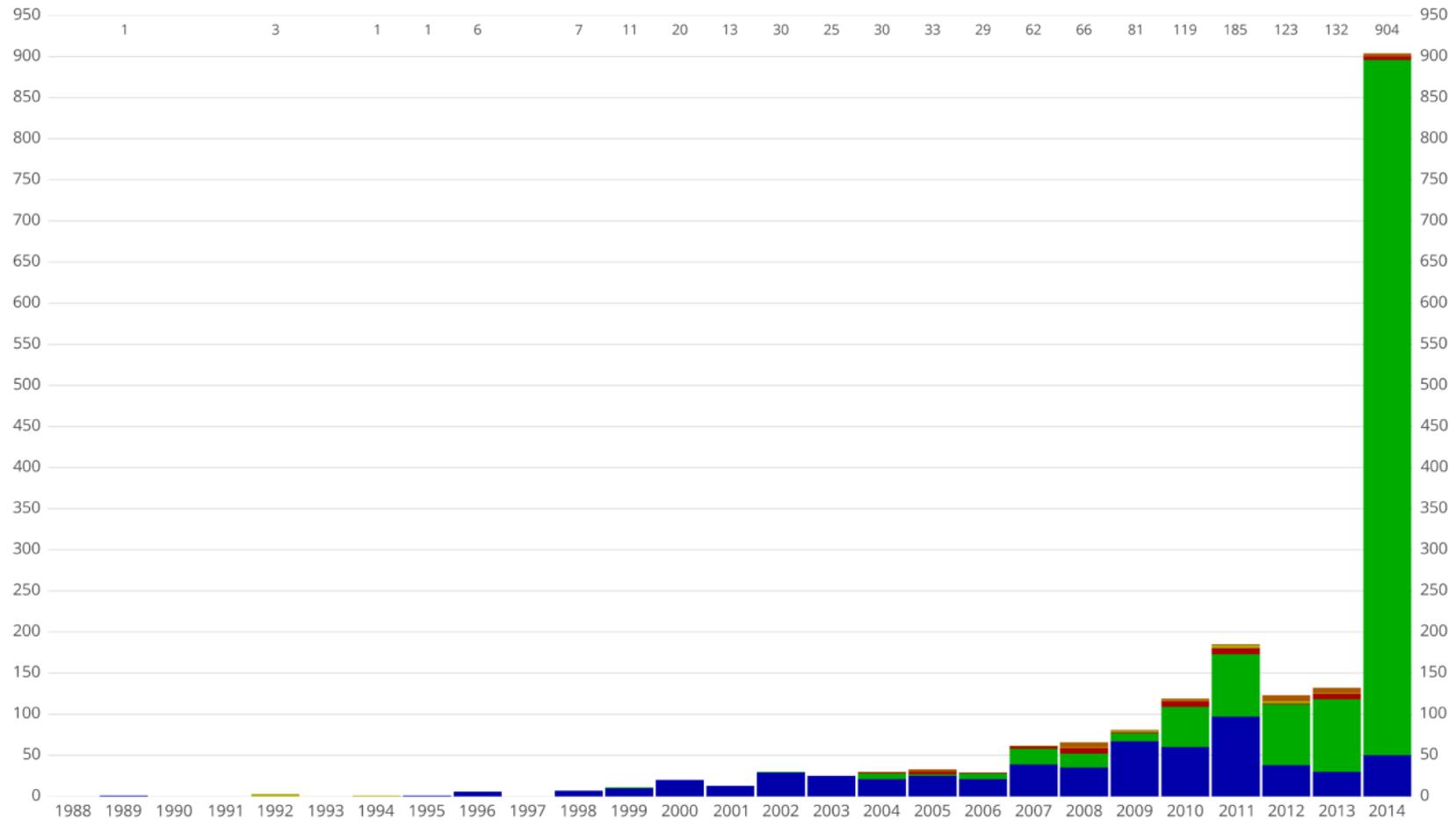
During our holiday project, we learned that there are different methods to detect exoplanets.

You - you alone will have the stars as no one else has them...In one of the stars I shall be living. In one of them I shall be laughing. And so it will be as if all the stars were laughing, when you look at the sky at night...You - only you - will have stars that can laugh.

[*Antoine de Saint-Exupéry*](#)

3. How can we find Exoplanets? - How many findings?

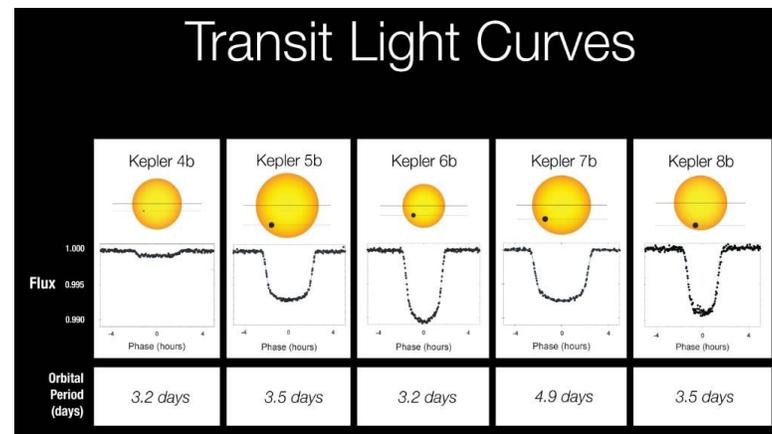
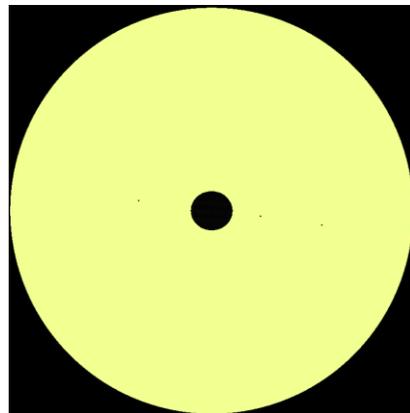
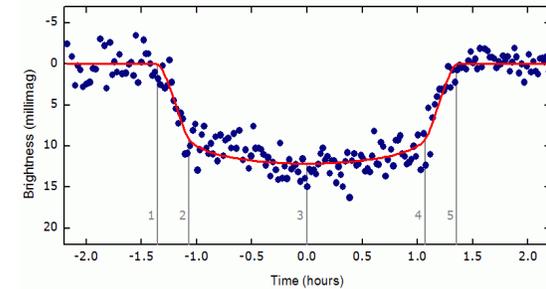
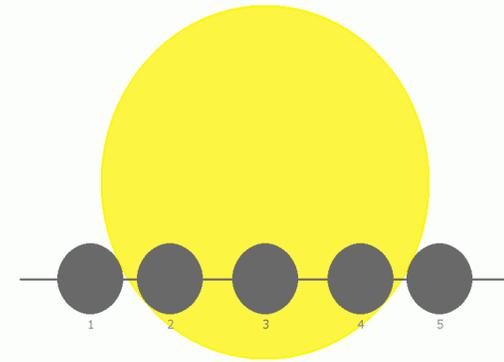
There are 5 methods to detect exoplanets. The methods leading to the most discoveries are the transit and the radial velocity methods.



3. How can we find Exoplanets? - a. Transit photometry

Passing in front of the star the planet is shadowing a part of the star light.

The small dip of light from this star can be measured. We chose this method because exoplanets of hot Jupiters type are easier to get detected with less sophisticated tools.



Simulation of Jupiter passing in front of the sun – seen from another star.

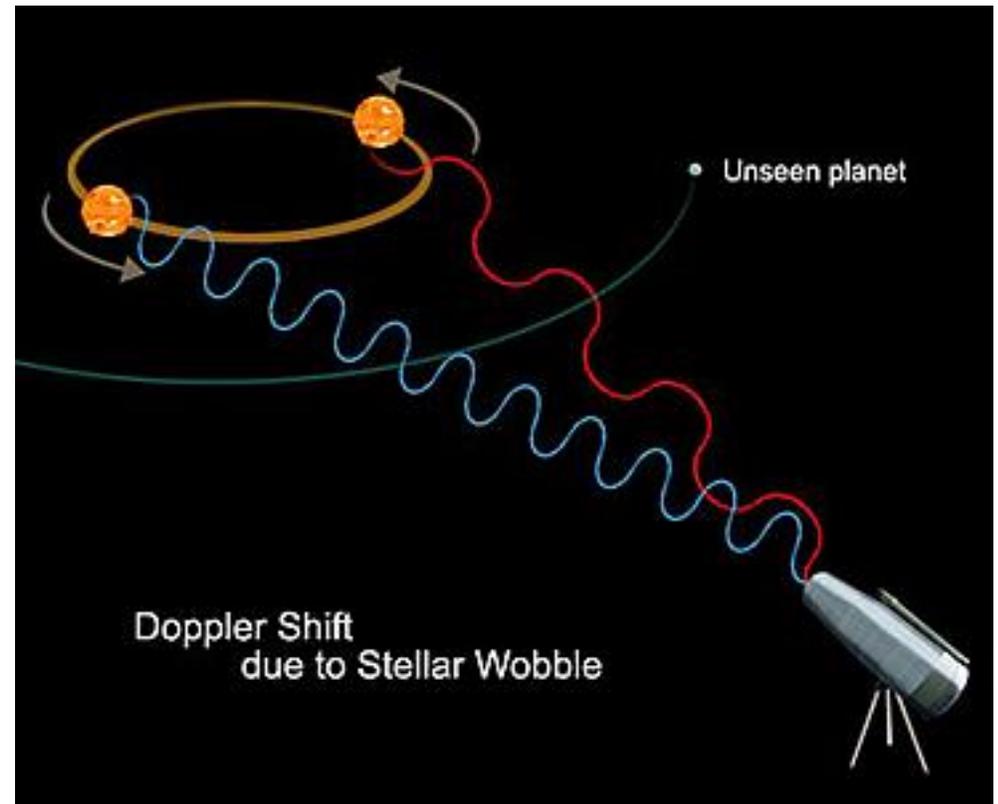
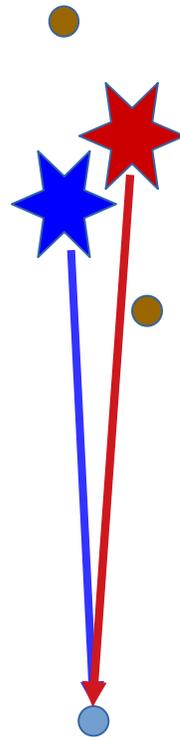
(Wikipedia)

3. How can we find Exoplanets? -

b. Radial velocity - (Doppler Effect)

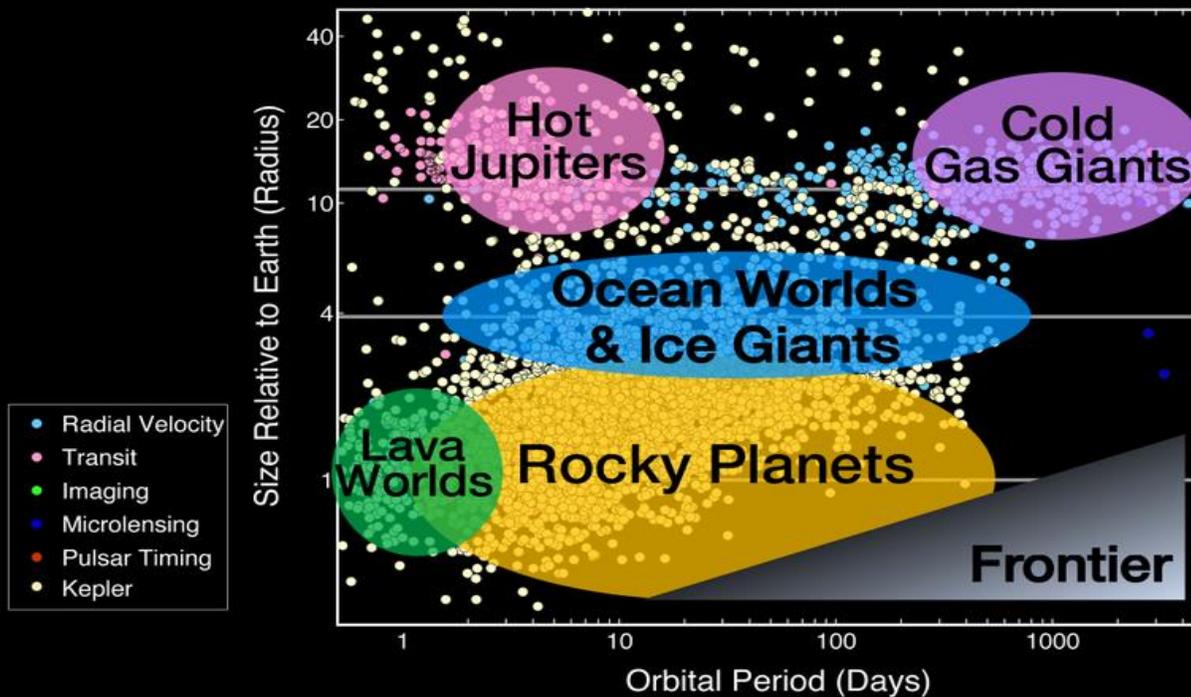
The planet and its star are orbiting around their common center of gravity. That causes the star to move towards and away from earth. That's why the stars light periodically changes color (frequency) according to the Doppler effect.

This periodical color change is measured by spectroscopy.



4. Are there different categories of exoplanets?

Exoplanet Populations



The exceptions are the extreme neutron stars.

2. *Mid-Size Stars*

Like our Sun (yellow dwarf)

3. *Giants*

Red giant, blue giant. We found out, that the bigger the stars are - the hotter they are and the more unstable they are – in general.

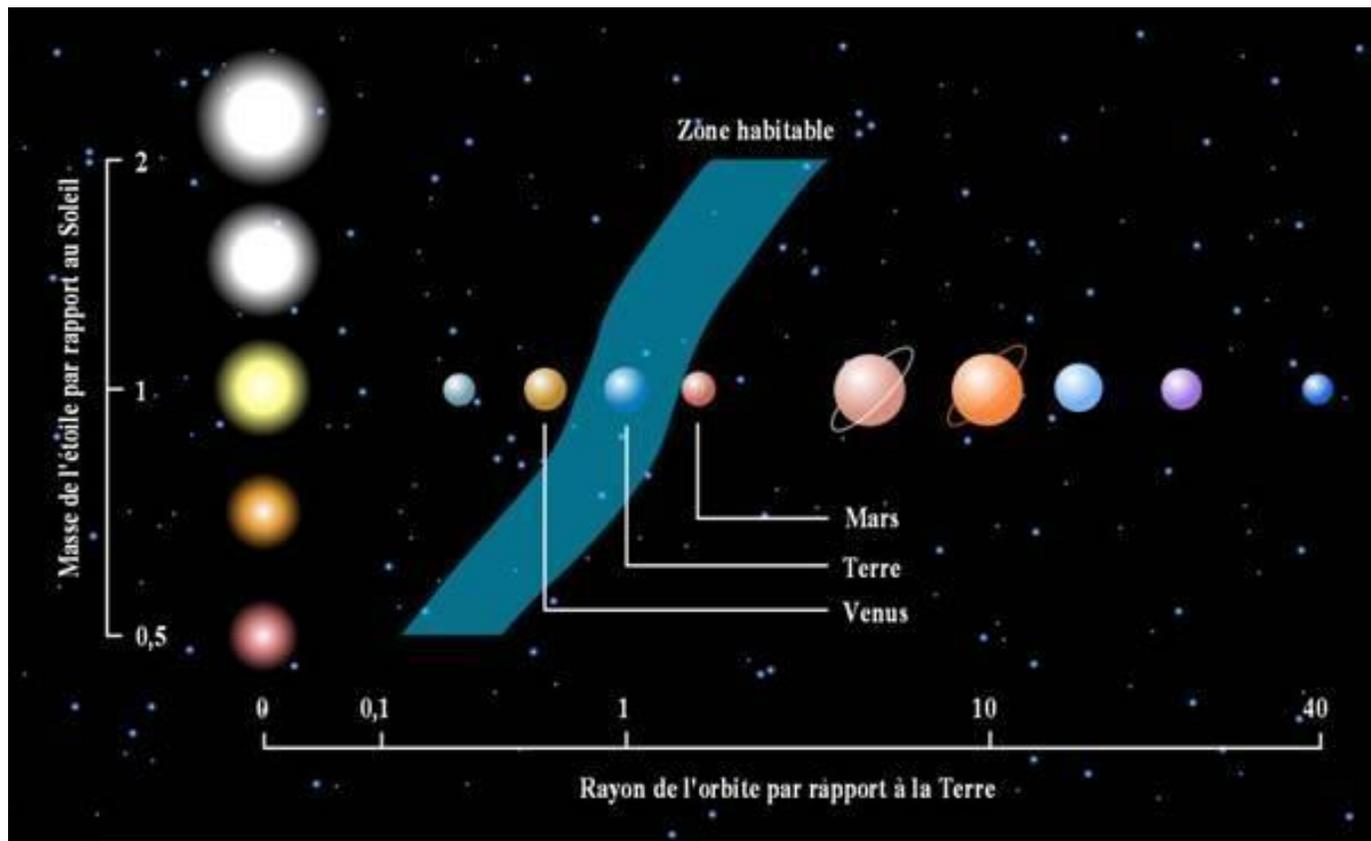


5. The Zones around Stars – conditions required for life

There are different spherical zones around stars. But only one is interesting for life: the circumstellar habitable zone or Goldilocks zone.

In this zone temperature is neither too hot nor too cold for liquid water, which is essential for life as we know it.

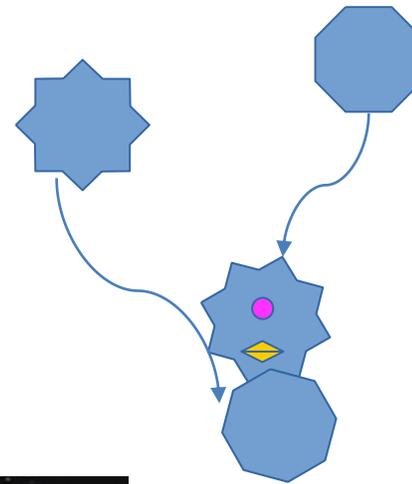
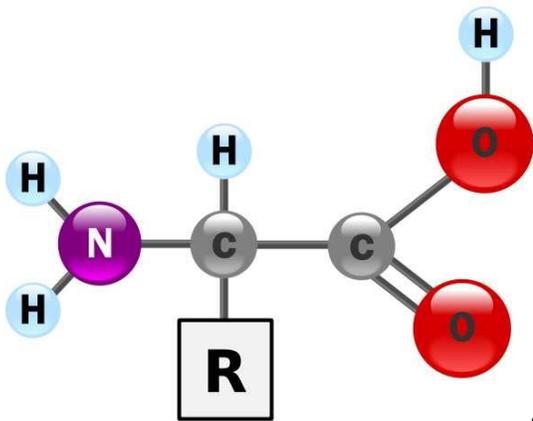
The size of the zones varies as a function of the star size and temperature.



6. Bricks of Life

If all physical conditions for life on an exoplanet are fulfilled, we could live there.

But to survive independently from external resources, there must already be life on the planet before we come. Therefore we also need the bricks of life like amino acids, proteins... in place. Then they need to be assembled correctly.



Now we can go there...



7. Complex Life Forms – Close Encounters of the Third Kind

Simple life has appeared and we have colonized a new planet. We discover a more developed living form in a cave. We deduct, that life has existed for a long time on this planet. How could this creatures look like? Are they docile or malicious? If we encounter an intelligent malicious living form, it could force us to stop this colonization mission, leave the planet again and search for other coasts.



"If the butterfly wings its way to the sweet light that attracts it, it's only because it doesn't know that the fire can consume it." Giordano-Bruno

8. Tools

1. Program Stellarium

The Stellarium software reproduces the actual aspect of the sky.

2. Telescope

A telescope is an awesome instrument to observe extreme far objects. The first telescopes from Galileo were lens-systems with a magnifying factor of about 10. We used Newton mirror telescopes of factors over 50.

A boost in the detection of exoplanets was the start of the Kepler space-telescope 2009.

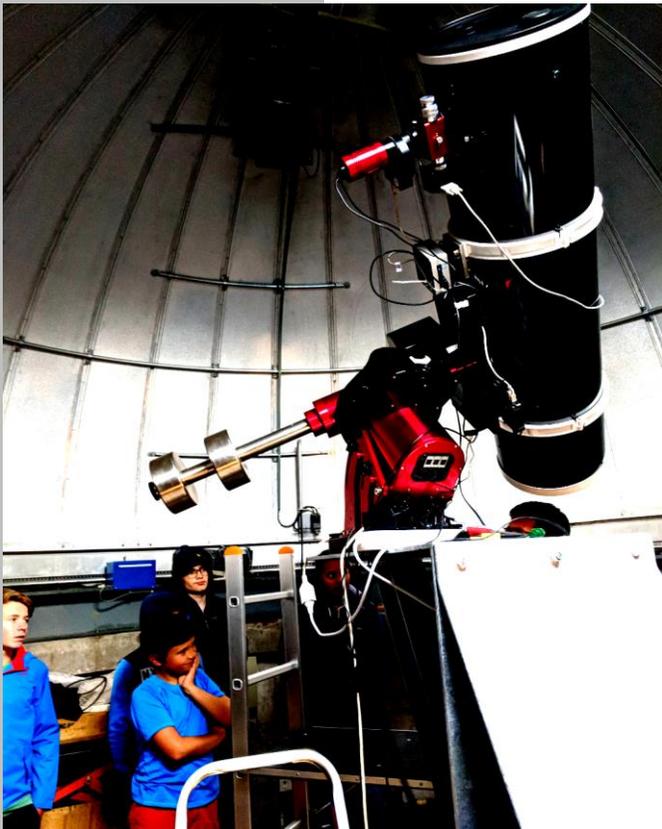
3. François Xavier Bagnout Observatory

This is the observatory at St Luc where the camp was.



9. Feedbacks

Good	Bad
<ul style="list-style-type: none">• To discover the stars• To learn how to use the telescope• To sleep in the open contemplating the stars.	<ul style="list-style-type: none">• Nothing special



Favorite Part of the journey

My preferred part was to go to the observatory of St. Luc. This is a wonderful building with an immense Dobson telescope T610 which was installed in 2016. I had the great privilege to get close to it and I had the impression, that with this device we could watch the borders of the universe.

10. Perspectives

During this summer camp we were not able to detect a transit because this kind of observations needs several conditions unified:

- evening at the observatory
- clear sky
- visible transit at this time

The challenge consists of unifying these conditions in time-frame of 4 weeks.

*Thank you for
listening!*

Do you have questions?

Détails