
VSSEC
Victorian Space Science Education Centre
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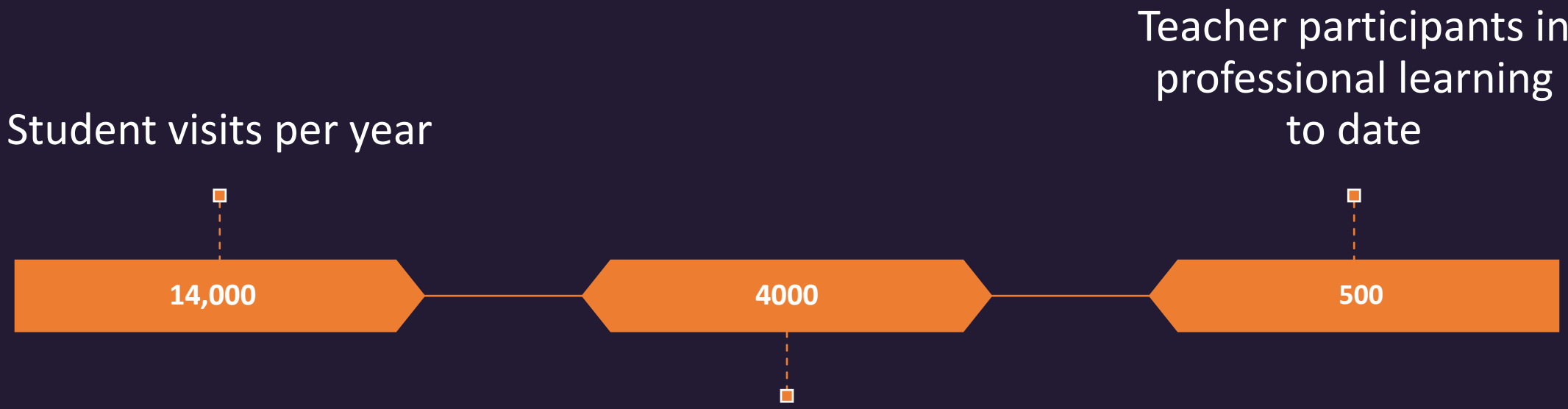
Supporting Victorian students and teachers in STEM education



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Mission to Mars

- Year 8-10
- Scenario Based Learning

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Teacher Professional Development

- 2000 Traditional Programs
- Every teacher in every visiting school
- Pedagogical focus
- “The science of teaching to teach science”

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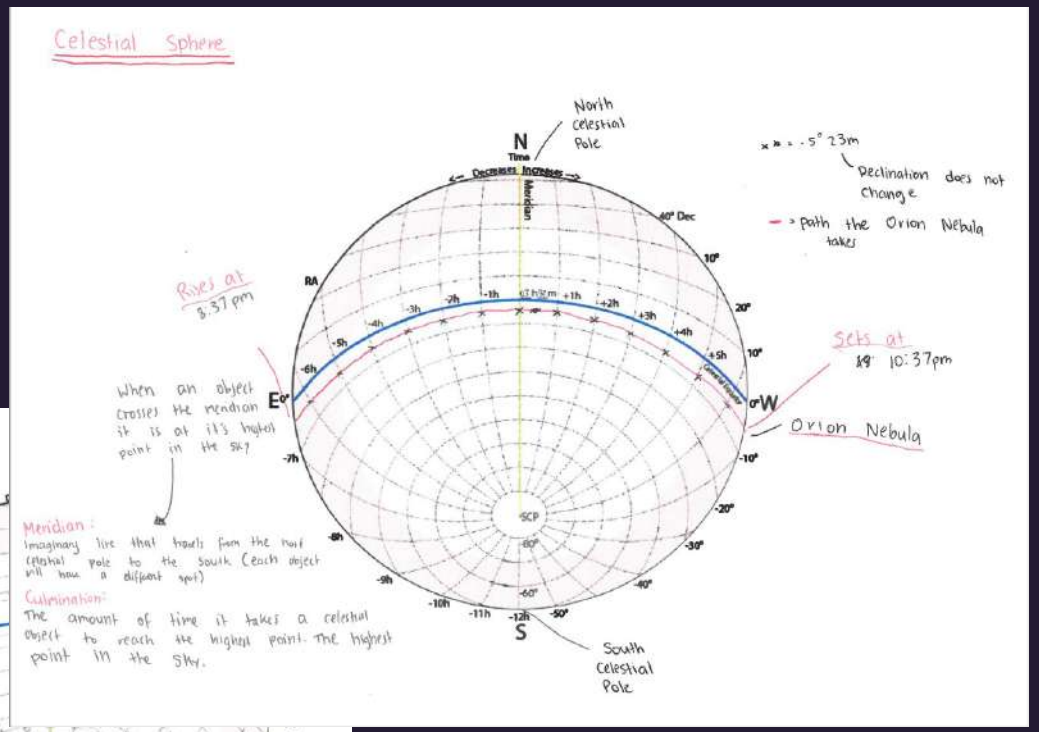
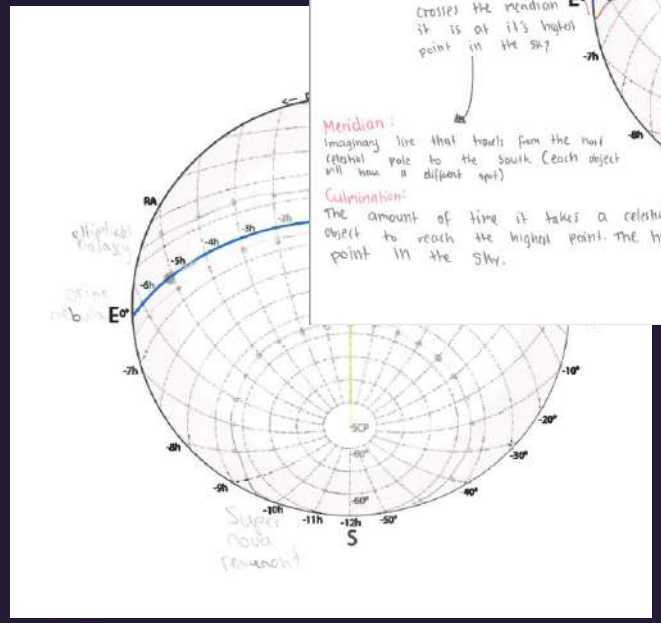
International partnerships

- Associate member of the International Space Education Board (ISEB)
- VSSEC represents Australia in the international space education community
- Involvement in the International Aeronautics Conference (IAC), as participants and presenters

What





Tracking objects: *Right Ascension and Declination*

Of the two coordinate systems to track objects Right Ascension and Declination uses time to locate objects.
Below is a list of the 10 brightest radio objects from the Parkes Radio Telescope using RA/Dec.
You can use this table, or move to a larger table with more objects here

Note: If you are in a class, choose an object that has not been selected by the majority. We will come together as a class to determine the most ideal object to view.

Name PKS Catalogue Number	Flux	Right Ascension (Time)			Declination (Degrees)			Culmination (Wait Time)			Time of Highest Point		
		h	m	s	d	m	s	h	m	s	h	m	s
Orion Nebula (PKS J0535-0523)	410000	05	35	18.40	-05	23	06.0	16	02		03	37	
RRF 207 (PKS J1847-0202)	330000	18	47	18.10	-02	02	40.0	24	14				
Radio-Source (PKS J0859-4345)	260000	08	59	28.30	-43	45	44.0						
Supernova Remanent (PKS J0859-4731)	250000	08	59	07.30	-47	31	23.0	19	26		36		
Elliptical Galaxy (PKS J1230+1223)	220000	12	30	49.42	+12	23	28.0	22	57		10	32	
NA (PKS J1634-4735)	87000	16	34	36.40	-47	35	56.0	05			14	55	
NA (PKS J1346-6022)	79000	13	46	57.60	-60	22	58.0						
Pictor A (PKS J0519-4546)	66000	05	19	44.30	-45	46	40.0	16	86		4	19	
SNR Milne 23 (PKS J1211-5309)	62000	12	11	56.00	-53	09	37.0						
Active Galactic Nuclei (PKS J1720-0058)	54000	17	20	30.40	-00	58	38.0	3	52		14	22	
NA (PKS J1639-4651)	53000	16	39	48.60	-46	51	01.0						

Preparation (Finding our time and place)

To track an object using time, we must use a fixed reference of time called the **Local Apparent Sidereal Time.** This time is calculated based on the **Longitude** of your position on Earth, and the **First Point of Aries** (Where the Sun crosses the Celestial Equator, Historical name).

Tallarook Observatory Longitude: 145.124938 E

DJR Hosted Calculator

Question 1. Determine the Local Sidereal Time (LAST) using the link above, and entering the Longitude

Local Sidereal Time (LAST) = 11 hours 35 minutes 26 seconds

Current Time = 11 hours 35 minutes 26 seconds

Which object is visible during your observation window? *Let's find out...*

For your selected object we will determine the current Right Ascension and Declination to determine its place in the sky

11:35 : 22 Sec

Right Ascension

The Culmination of your object is the time it will take to reach the highest point in the sky, the telescope's **meridian.**
Note: If RA < LAST add 24 hours to RA of object.

Remember, RA operates in a Sidereal Day (one rotation of the Earth) in 23 hrs 56 mins 4 secs... not 24 hours...

Question 2: Calculate the Culmination of your chosen object, show your working.
An approximate calculation is good enough!

Culmination = RA (Object) − LAST

24.17 (Orion A) − 15.38 = 15.85

Orion: 5:35:18.4 (Orion Nebula) − 11:38:36 (32:38)
Supernova Remnant: 8:59:07.3 − 15:53:36 = 19.25 hr

Add your calculated **Culmination** to the previous table, and share with the class

Is your object close to **Culmination** during your observation time?

Time of Highest Point = Current Time + Culmination (24 hour time)

Orion 11.35 + 16.02 = 27.37 → 27.37 − 24 = 3:37
Supernova 11.35 + 19.25 = 30.61 → 30.61 − 24 = 6.61 = 7.01
Pictor A 11.35 + 15.86 = 27.21

Declination

When will the object rise? Will it be high enough above the horizon to be observed?
There is no easy answer..... consider tracking the object in Stellarium with the Equatorial grid to investigate why

Declination	Notes...
-80°> - 90°	These objects are high enough all the time. But there are no interesting objects that close to the South Celestial Pole unfortunately...
-55°> - 80°	These objects will disappear below the horizon at some time but they are always to the south of the telescope.
-34°> + 15°	These objects are observable provided all of the observation is done either before they reach culmination or all is done after culmination because this point passes to the North of the telescope.
DEC = + 15°	These objects are *never* high enough above the horizon for long enough to be useful targets from the Tallarook Observatory. (View these from the Northern Hemisphere.)

As a class

In the table on the first page, add the classes calculations for Culmination and a Time of Highest Point of each object.

It is **recommended** to observe the object that is the closest to your booked observation session.

Responses cannot be edited

Celestial Object

You have selected an object, you have placed it in the sky, lets conduct some research whilst we're waiting for our Radio Map to be created using the radio telescope

*Required

What object did you choose? *
Write down the type and the name of the object you are observing
Supernova remnant

What is the RA and Declination of your object? *
RA: 08h 59m 07.3s DEC: -47d 31m 23.0s

What is the Culmination of your object? *
You can calculate this again using the Local Sidereal Time and the RA of the object. Remember, Culmination is the time it will take to reach the highest point
19h 25m 32.3s

What time will it reach the highest point? *
30h 58m 12.3s

Research your chosen object *
You may want to include what the object is, why it is a strong radio source, what we already know about the object itself or the

Responses cannot be edited

Intro to Radio Astronomy

*Required

What is Radio Astronomy?

radio astronomy is a major branch of astronomy and reveals otherwise-hidden characteristics of everything in the universe. It studies celestial objects at radio frequencies.

What are some of the benefits to Radio Astronomy?

large and multiple field-of- views, rapid electronic steering, reliability, flexibility, cost and performance

How are these different to Radio Astronomy and Optical Astronomy?

Radio astronomy has some advantages over optical astronomy. Radio astronomy can be performed any time, day or night, since visible light from the sun does not interfere with radio emissions from other objects in the sky. Optical astronomy can only be done after sundown. Another advantage is that radio astronomy does not depend as much on atmospheric conditions. Radio waves are not blocked by dust or water vapor (clouds) in the atmosphere, so radio astronomy can be done in the rain. Optical astronomy requires a clear night. The only time radio astronomy cannot be performed is when there is lightning.

Why does a Radio Telescope need an Amplifier?

A receiver and amplifier to boost the very weak radio signal to a measurable level. These days the amplifiers are extremely sensitive and are normally cooled to very low temperatures to minimise interference due to the noise generated by the movement of the atoms in the meta

Answer the following True False Questions *

	True	False
Gamma Rays can reach Earth's Surface	☐	☑
All radio waves can reach the Earth's Surface	☐	☑
Satellites can be used to detect visible light	☑	☐

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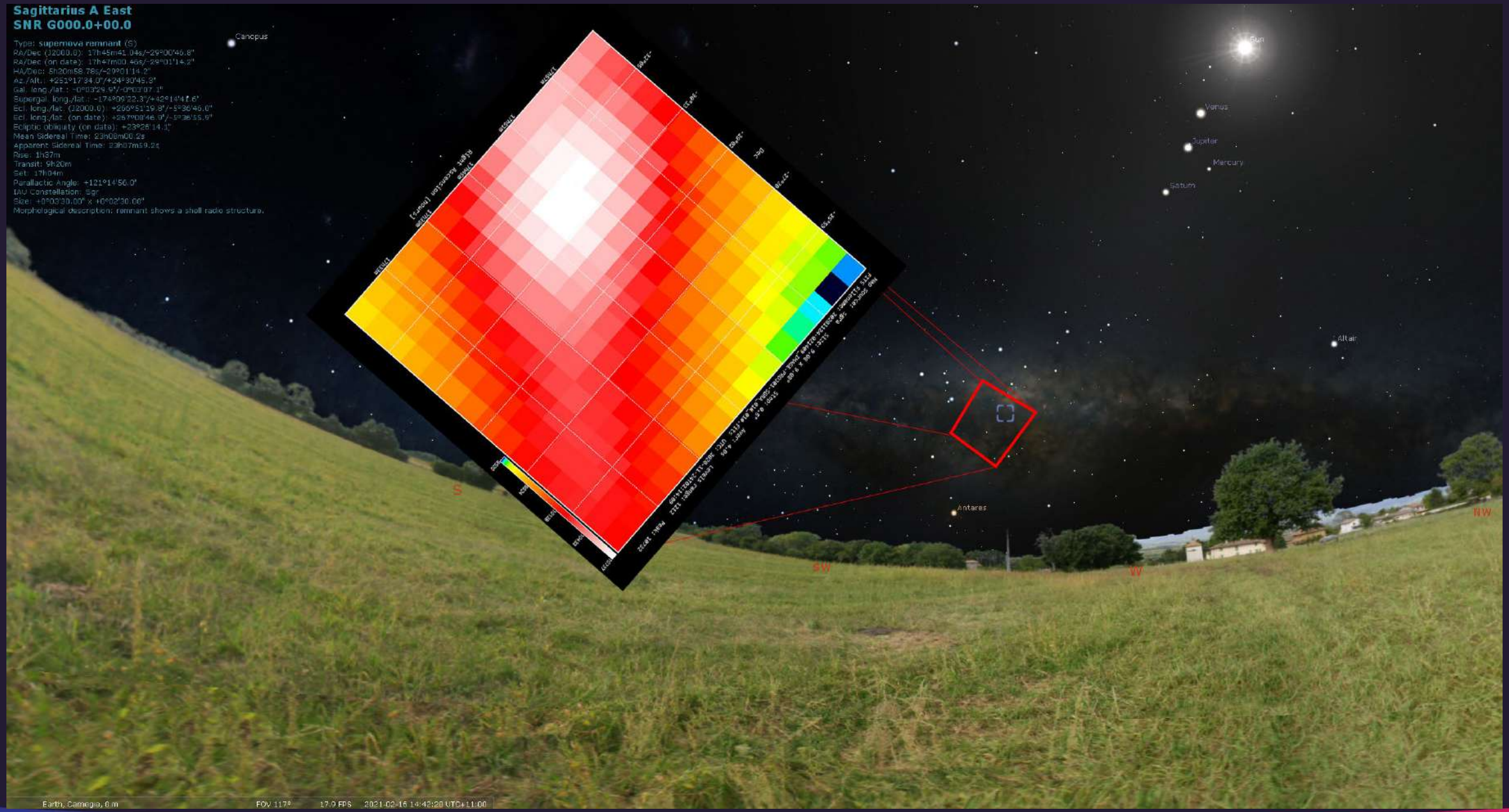
Sagittarius A East
SNR G000.0+00.0
Type: supernova remnant (S)
RA/Dec (J2000.0): 17h45m41.04s/-29°00'46.8"
RA/Dec (on date): 17h47m00.46s/-29°01'14.2"
HA/Dec: 5h20m58.78s/-29°01'14.2"
Az./Alt.: +252°17'34.0"/+24°30'45.3"
Gal. long./lat.: -0°03'29.9"/-0°03'07.1"
Supergal. long./lat.: -174°06'22.3"/+42°14'4f.6"
Ecl. long./lat. (J2000.0): +266°51'19.8"/-5°36'46.0"
Ecl. long./lat. (on date): +267°08'46.9"/-5°36'55.9"
Ecliptic obliquity (on date): +23°26'14.1"
Mean Sidereal Time: 23h08m00.2s
Apparent Sidereal Time: 23h07m59.2s
Rise: 1h37m
Transit: 9h20m
Set: 17h04m
Parallactic Angle: +121°14'56.0"
IAU Constellation: Sgr
Size: +0°03'30.00" x +0°02'30.00"
Morphological description: remnant shows a shell radio structure.
Canopus
Sun
Venus
Jupiter
Mercury
Saturn
Altair
Antares
S
SW
W
NW
Earth, Camegia, 0 m
FOV 117°
17.9 FPS
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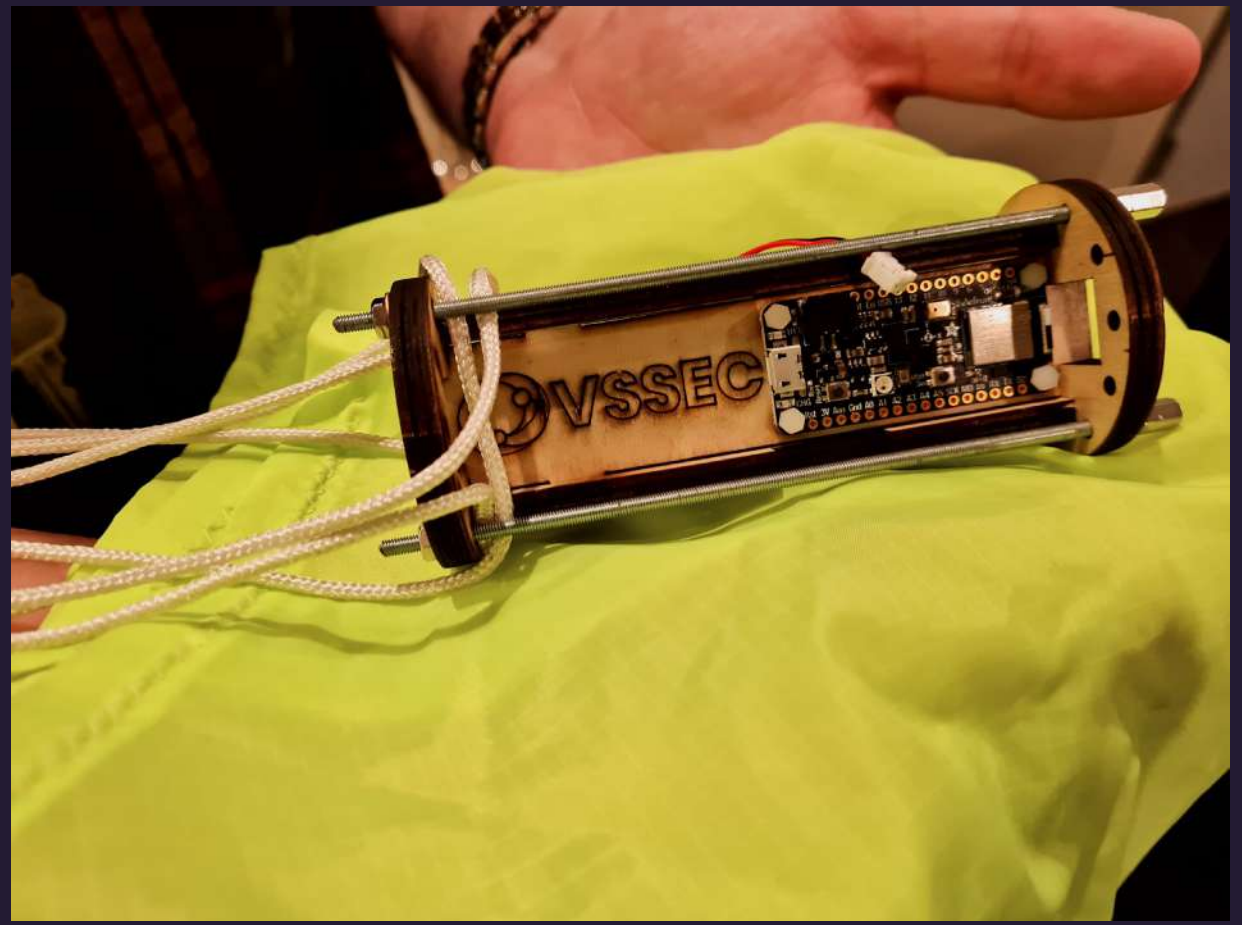
VSSEC CanSAT's in Schools



The CanSAT Continuum

Building Classroom Culture

Satellite Investigation Evolution of Technology

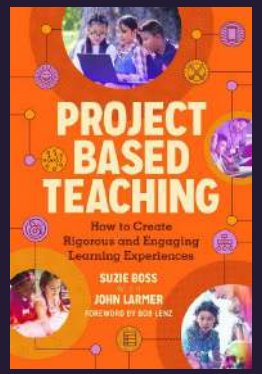
Parachute Design and Testing

Chassis Design and Testing

Coding and Electronics Development and Testing

Launch!

Data Analysis and Presentation



European Space Agency
Agence spatiale européenne

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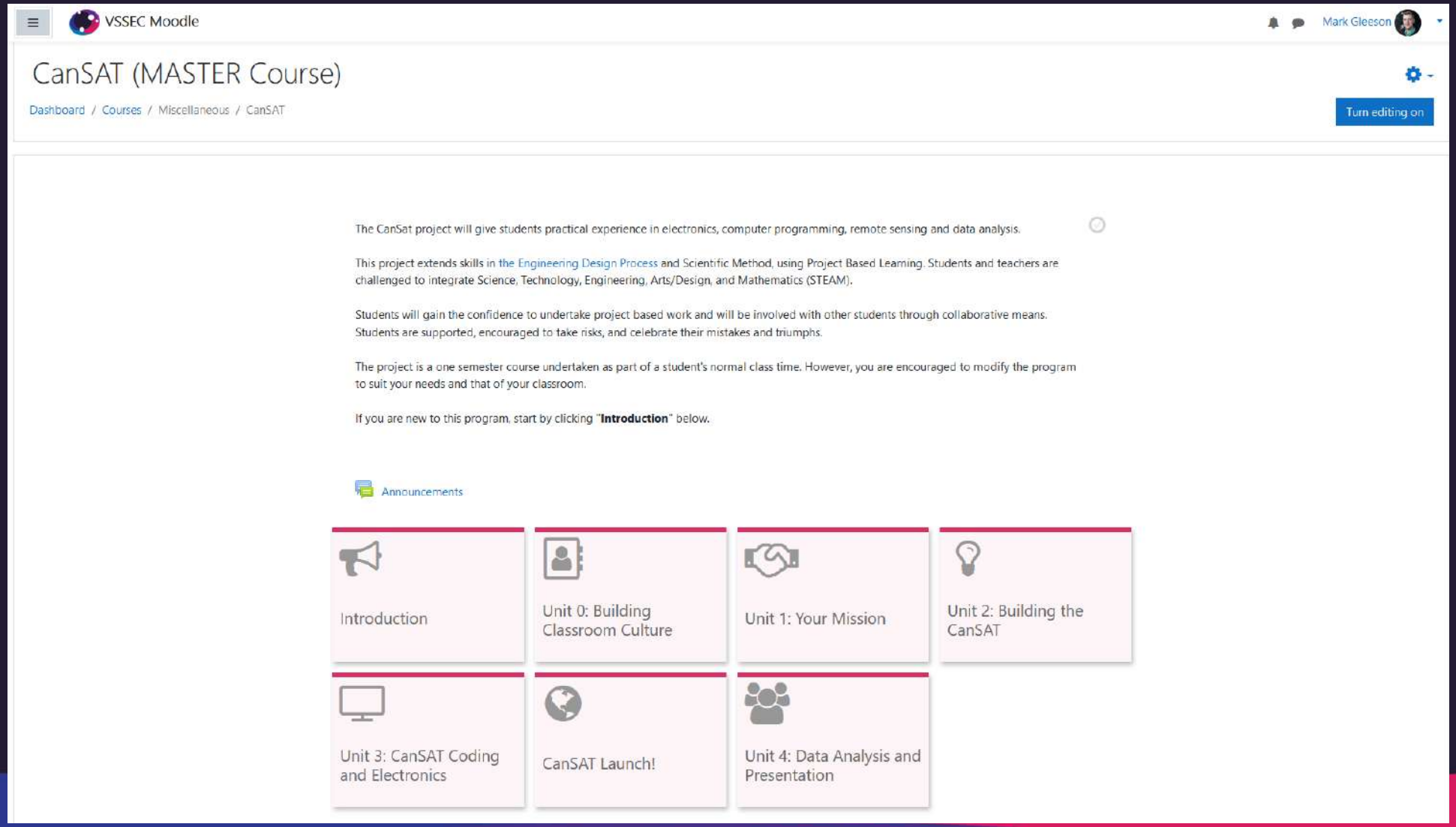
Learning Management System



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