# MISSION:

# SPACE EXPLORER

## APPS AND PROJECTS FOR SPACE EXPLORATION

SPACE awareness

# DO YOU KNOW

that it is possible to do research without (yet!) being a scientist?

In their quest to understand our Universe, astronomers need to collect large amounts of data, such as rock samples, sky observations, and pictures. They collect so much data that they can't handle it by themselves! As computers are not good enough to visually classify some of these images, scientists came up with the idea of setting up online platforms where everyone interested could help them. With thousands of eyes and hands, their research work can go faster.

## THIS IS WHAT WE CALL CITIZEN SCIENCE AND YOU CAN BE PART OF IT.

Check the activities listed in the booklet, find fun ways to learn about astronomy, or discover how you or your classroom can get involved and help future discoveries!

### LIGHT POLLUTION

| PAGE | PROJECT | DIFFICULTY | TYPE | LANGUAGE |
|---|---|---|---|---|
| 7 | GLOBE AT NIGHT | ★ | @ | EN |
| 11 | DARK SKIES ISS | ★ | @ | EN |
| 20 | LOSS OF NIGHT | ★ | | AR, CA, ZH, EN, FR, DE, IT, JA, PL, RO, ES |

### GALAXIES

| PAGE | PROJECT | DIFFICULTY | TYPE | LANGUAGE |
|---|---|---|---|---|
| 5 | GALAXYZOO | ★ | @ | EN, ES, PT, IT, RU, PL, HU, AR, HE, JA |
| 15 | RADIO GALAXY | ★ | @ | EN, ES, RU, DE, FR, PL, HU |
| 30 | MILKYWAY @HOME | ★★ | | EN |

### SOLAR SYSTEM

| PAGE | PROJECT | DIFFICULTY | TYPE | LANGUAGE |
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| 2 | COSMO QUEST | ★ | @ | EN |
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| 13 | PLANET FOUR: TERRAINS | ★★ | @ | EN |
| 19 | SUNSPOTTER | ★ | @ | EN |
| 22 | ROCK AROUND THE WORLD | ★ | @ | EN |

## EARTH OBSERVATION

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| 6 | GEOTAG-X PILOT PROJECT | ★★ | | EN |
| 9 | LOST AT NIGHT | ★ | | EN |
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| 21 | WOW | ★★ | | EN, NL |

## EXOPLANETS

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| 4 | DISK DETECTIVE | ★★★ | | EN, ES, FR, DE, RU, PL, RO, HU, ID, ZH, JA |
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| 8 | GREAT WORLD WIDE STAR COUNT | ★ | | EN, ZH, NL, FR, DE, HI, IS, IT, JA, PL, PT, RO, RU, ES, TR |
| 16 | SCOPE | ★ | | EN |
| 17 | STARDUST @HOME | ★★ | | EN |
| 18 | THE MILKY WAY PROJECT | ★★ | | EN, FR, ZH, ES, DE, ID, PL, DA |
| 23 | ISKY | ★★ | | DE, EN |

## UNIVERSE

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|---|---|---|---|---|
| 25 | FEEL GRAVITY | ★ | | EN, FR |
| 27 | NIGHT SKY TOOLS | ★ | | EN |
| 28 | EINSTEIN @HOME | ★★ | | EN |
| 29 | SKYNET | ★ | | EN, FR |

CITIZEN SCIENCE · TEACHING MATERIAL · FUN LEARNING · SOFTWARE · PHONE APP · GAME · WEBSITE · FACEBOOK

# CERBERUS

## Classify images from the Mars Reconnaissance Orbiter!

## WHAT IS CERBERUS?

With Cerberus, you are contributing to the discovery of important features on the surface of Mars. This game is in its trial phase and is part of a research thesis to investigate what is needed in a serious game and what is not. So you can helping science a great deal just by playing a game. The game will be updated with new features gradually.

## WHAT DO YOU DO?

As our neighbour, Mars has been the subject of many studies. The need to classify the surface of the red planet provides the context for this amazing science game. Images from the Mars Reconnaissance Orbiter are divided into segments. You have to classify these images into the segments according to what they show. Do they show small ridges, big dunes, honeycomb structures, or other strange objects?

## RELATION TO SCHOOL SUBJECTS

Mars, the science of astronomy

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

Citizen Science

## PLATFORM

Website/Facebook page

## GO HERE

www.cerberusgame.com

# COSMO QUEST

Spot craters and surface features in the images of Mars, the Moon, asteroids, and Mercury.

## WHAT IS COSMO QUEST?

Cosmo Quest's goal is to create a community of people who will advance the understanding of the Universe: a community of people who will participate in doing science, who can explain why their work matters, and what questions are they helping to answer. Cosmo Quest wants to create a community, and you're invited to be a part of it.

## WHAT DO YOU DO?

In this project, you mark the circumference of the craters and surface features on high-resolution images of Mars, the Moon, asteroids, and Mercury. As all impacts are almost perfect circles, you simply need to outline the crater for all the dimples on an image above a certain size. Asteroid Mappers also provide the option to map boulders on the surface and other features.

## RELATION TO SCHOOL SUBJECTS

Geology, the science of astronomy, the Solar System

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

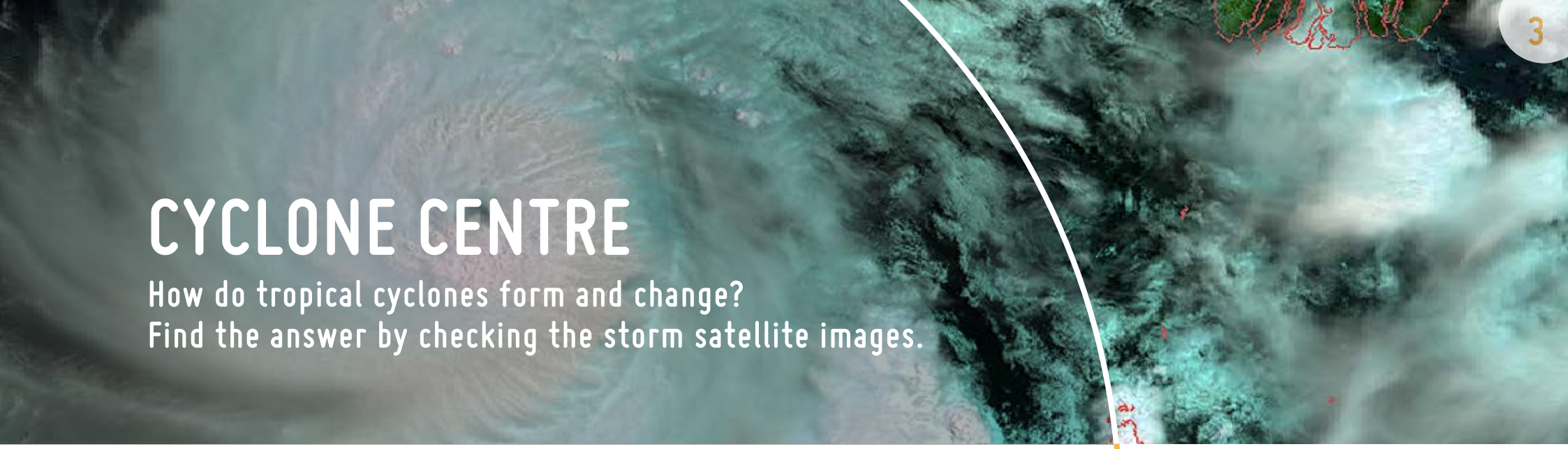
Citizen Science

## PLATFORM

Website /Phone App

## GO HERE

cosmoquest.org



# CYCLONE CENTRE

How do tropical cyclones form and change?
Find the answer by checking the storm satellite images.

## WHAT IS CYCLONE CENTER?

This project aims to better understand how tropical cyclones form and change. By answering a few simple questions about these satellite images, you can help climatologists predict future storm behaviour.

## WHAT DO YOU DO?

You will be given two satellite images and asked to select the strongest storm. Next, you have to answer a few simple questions. You will be given additional information, and you will have the opportunity to chat with Cyclone Centre volunteers to learn more about what you see!

## RELATION TO SCHOOL SUBJECTS

Earth observation, climate change, satellite

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

www.cyclonecenter.org

# DISK DETECTIVE

Discover new planetary systems!

## WHAT IS DISK DETECTIVE?

In Disk Detective, you look at stars to find dusty debris disks, which are similar to our asteroid field. These disks suggest that the related stars are in the early stages of forming planetary systems. Learning more about these stars can tell us how our Solar System was formed.

## WHAT DO YOU DO?

Planets are formed from vast clouds of gas, dust, and chunks of rock clouds that take the shape of disks with stars in the centre. It is possible to tell where planets are forming and where planets probably exist by searching for specific stars surrounded by these types of disks. Computers often confuse debris disks around stars with other astronomical objects. Your help is needed to find the stars that actually have these disks around them in galaxies or nebulae.

## RELATION TO SCHOOL SUBJECTS

The Solar System, stars, satellites, the science of astronomy

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English, Spanish, French, German, Russian, Polish, Romanian, Magyar, Bahasa Indonesian, Chinese, Japanese

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

www.diskdetective.org

# GALAXY ZOO

Compare galaxies to understand their evolution.

## WHAT IS GALAXY ZOO?

In their quest to find all the stars in the Universe, researchers have to go through a vast number of images. But with the help of millions of people, the task can go much faster! Galaxy Zoo compares the galaxies of the past with the galaxies of the present, giving us a clear understanding of what affects their growth – mergers, active black holes, or basic star formation.

## WHAT DO YOU DO?

In this project, you classify the shapes of galaxies from the images taken by telescopes. You have to observe a picture and run through a few options to fully classify the shape that you see. To help you, there are examples at each step.

## RELATION TO SCHOOL SUBJECTS

The Solar System, galaxies

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English, Spanish, Portuguese, Italian, Russian, Polish, Magyar, Arabic, Hebrew, Japanese

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

www.galaxyzoo.org

# GEOTAG-X PILOT PROJECT

**Recognise important information from a photograph and create datasets that could become essential tools for predicting disasters.**

## WHAT IS GEOTAG-X?

Scientists want to know if Geo-Tag-X can be a useful tool in case of disasters. Therefore, they have set up a series of pilot projects covering different related disaster events, such as earthquakes, floods, and hurricanes as well as slow-moving events such as drought, climate change and pollution. The analysis can cover topics as diverse as environmental conditions, health, agriculture, and engineering.

## WHAT DO YOU DO?

GeoTag-X is a research project that asks you to recognise the important information in a photograph and create relevant, structured datasets. You can contribute in two ways. The main way is to answer specific questions about images. The other way is to find photographs for active projects. Without photographs, the applications on this website will not give important information. To help you do this, an add-on for the Firefox browser is available, and it allows you to send photos directly to the server while you are browsing the web.

## RELATION TO SCHOOL SUBJECTS

Weather, climate change

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

www.geotagx.org

# GLOBE AT NIGHT

**Measure the brightness of your night sky and share your observations with other citizen scientists.**

## WHAT IS GLOBE AT NIGHT?

Globe at Night is an international campaign to raise public awareness about the impact of light pollution. The programme invites citizen scientists to measure their night sky brightness and submit their observations from a computer or a smartphone. Light pollution threatens not only our 'right to starlight,' but can also affect energy consumption, wildlife, and health. Over the last 9 years, people in 115 countries have contributed to more than 100,000 measurements, making Globe at Night the most successful light pollution awareness campaign to date!

## WHAT DO YOU DO?

Explore the last 9 years of data in our interactive data map or see how your city performed with our regional map generator. The Globe at Night website is easy to use and contains abundant background information. The database can be compared with other databases, to know, for example, how light pollution affects the foraging habits of bats. You can learn about observing the sky and share your observations with the scientists.

## RELATION TO SCHOOL SUBJECTS

Atmosphere, biodiversity, habitability

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

www.globeatnight.org

# GREAT WORLDWIDE STAR COUNT

**Every year in October, everyone in the world is invited to observe the sky and share their observations.**

## WHAT IS GREAT WORLDWIDE STAR COUNT?

Star Count is an international event that occurs every year in October. Anyone in the world is invited to observe the night sky and share their observations through the website. A global map of the stars from Earth can be edited using all observations. You can see last year's results on the website and contribute to the next event.

## WHAT DO YOU DO?

Participating in the Great Worldwide Star Count is fun and easy! You can join thousands of other students, families, and citizen scientists from around the world in counting stars this October! Five simple steps to Star Count: decide which constellation to observe, find that constellation at night an hour after sunset, match your night time sky with one of our magnitude charts, report what you see online, and view the results of this international event.

## RELATION TO SCHOOL SUBJECTS

Stars, the invisible Universe

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English; Guidelines in Chinese, Dutch, French, German, Hindi, Icelandic, Italian, Japanese, Polish, Portuguese, Romanian, Russian, Spanish, Turkish

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

www.windows2universe.org/citizen_science/starcount

# LOST AT NIGHT

**Find the exact location of a place on Earth from a picture taken by the International Space Station!**

## WHAT IS LOST AT NIGHT?

Having high-resolution images of the Earth from the International Space Station (ISS) is particularly good when you want to identify what the image represents! By helping scientists find the exact location of a picture, you assist them in their research on light pollution.

## WHAT DO YOU DO?

With Lost at Night, you have to identify a city from night images taken from the ISS. You use simple tools, including zooming in and out, dragging, and even rotating the image.

## RELATION TO SCHOOL SUBJECTS

Earth observation, satellites, the science of astronomy

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

crowdcrafting.org/project/LostAtNight

# NIGHT CITIES ISS

Help identify some features of pictures taken from the ISS and connect them using a map.

## WHAT IS NIGHT SKIES ISS?

Scientists from the Universidad Complutense de Madrid GUAIX study light pollution and the related energy consumption. They use images taken from the International Space Station (ISS), but they need to localise every picture to be able to compare the images with the different light sources on Earth. Because of a large number of images, they don't know all locations, and it is very difficult to identify features on the picture. However, several people worldwide know the cities and can connect the images with a point on the map.

## WHAT DO YOU DO?

Your role is to observe a picture and identify some features you know. You have some simple tools such as zooming in and out as well as dragging the picture. When you identify one, you just have to click on it, and a pair of XY coordinates will appear. Now, you have to identify the same feature on the map and click on it. The longitude and latitude pair of coordinates will appear and identify the picture.

## RELATION TO SCHOOL SUBJECTS

Atmosphere, biodiversity, the science of astronomy

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

crowdcrafting.org/app/nightcitiesiss

# DARK SKIES ISS

Classify night-time images to help study light pollution originating from cities.

## WHAT IS DARK SKIES ISS?

Currently, the Johnson Space Center database contains around 1,800,000 images. However, the number of classified images is significantly smaller, and there is no efficient technique for classifying night-time images. This is where you can help. The main objective is to study light pollution originating from cities for eliminating energy wastage and as well as the destruction of our mighty ecosystem.

## WHAT DO YOU DO?

This is a really simple application. It loads a photograph taken from the ISS and asks you to classify it. This way, you help researchers in sorting out patterns that a computer cannot recognise.

## RELATION TO SCHOOL SUBJECTS

Atmosphere, biodiversity, the science of astronomy

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

crowdcrafting.org/project/darkskies

# MOON ZOO

Help study the lunar surface in detail.

## WHAT IS MOON ZOO?

Moon Zoo aims at studying the lunar surface in great detail.

## WHAT DO YOU DO?

You can help scientists explore the lunar surface by answering a series of questions about what you see. The most important thing is that the selected tasks are best done by human beings rather than a computer, so don't spend more than a minute on any single image. You can mark craters, see which of the two images has the most boulders, and on the Live page, you can see all the people working on the classifications around the world.

## RELATION TO SCHOOL SUBJECTS

Moon, the solar system, satellites, the science of astronomy

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

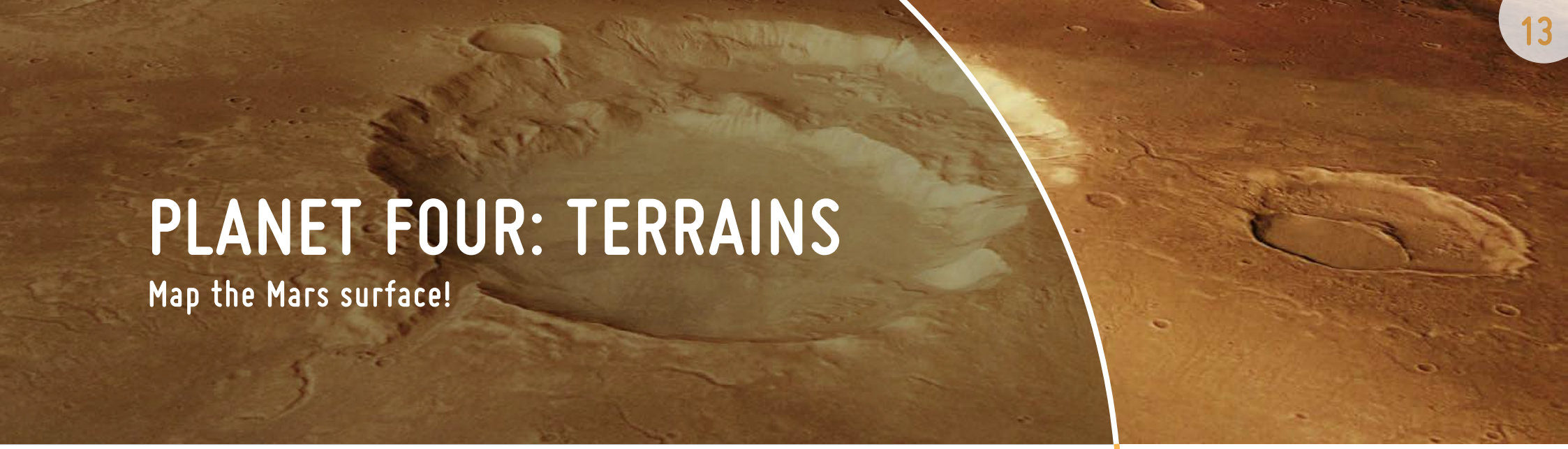
Citizen Science

## PLATFORM

Website

## GO HERE

www.moonzoo.org



# PLANET FOUR: TERRAINS

Map the Mars surface!

## WHAT IS PLANET FOUR: TERRAINS?

The exotic terrains of Mars' south pole have several forms, unlike anything on Earth. The science team would like your help to map images taken by the Context Camera aboard the Mars Reconnaissance Orbiter. Researchers will use the locations you identify as targets for detailed study using the HiRISE camera, which is the highest-resolution camera ever sent to a planet!

## WHAT DO YOU DO?

Your help is needed to map the surface of Mars. You will be looking for terrain types, informally called 'spiders', 'baby spiders,' 'channel networks' and 'Swiss cheese.' You will contribute by locating craters. You will analyse images from the Context Camera orbiting Mars, and the locations you identify will be used as targets for higher-resolution observations.

## RELATION TO SCHOOL SUBJECTS

Mars, satellites, composition and structure, the Solar System

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

www.zooniverse.org/projects/mschwamb/planet-four-terrains

# PLANETHUNTERS

**With PlanetHunters, you may become the first to know that a star has a companion, just as our Sun does.**

## WHAT IS PLANETHUNTERS?

NASA's Kepler spacecraft is one of the most powerful tools for searching exoplanets. Approximately every 30 minutes, Kepler monitors the brightness of several thousands of stars simultaneously. Computers sift through the data obtained by Kepler to look for a repeating signal of a planet, but there are planets that can only be found by the human ability of pattern recognition. No training is required! All you need is your eyes and a web browser to join the hunt. It's possible that you may be the first to know that a star somewhere in the Milky Way has a companion. Fancy giving it a try?

## WHAT DO YOU DO?

You have to draw boxes to mark the locations of the dips on a star's light curve, which correspond to the measurements of the star's brightness over time. The depth of the dip and how often it repeats tells about the relative size of the planet and its orbital period (how long the planet year is).

## RELATION TO SCHOOL SUBJECTS

Exoplanets, stars, the science of astronomy

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

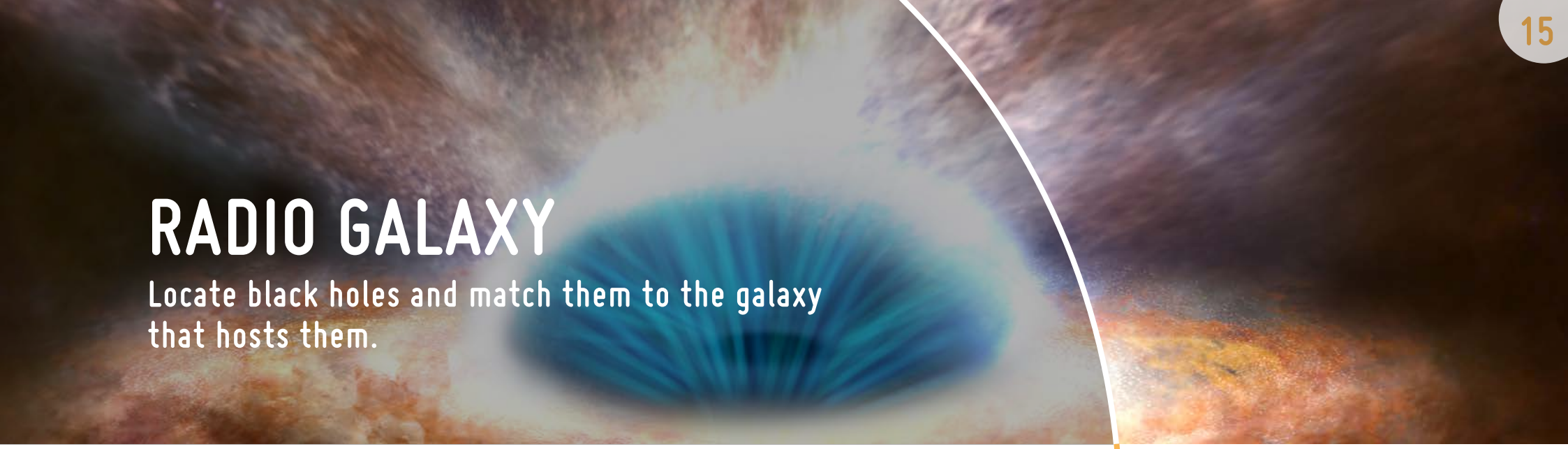
Citizen Science

## PLATFORM

Website

## GO HERE

www.planethunters.org



# RADIO GALAXY

Locate black holes and match them to the galaxy that hosts them.

## WHAT IS RADIO GALAXY?

Black holes are found at the centre of most, if not all, galaxies. The bigger the galaxy, the bigger the black hole, and the more strong the effect it can have on the host galaxy. These supermassive black holes drag in nearby material, grow to billions of times the mass of our Sun and occasionally produce spectacular jets of material. Often, these jets cannot be detected by visible light, but can be seen using radio telescopes. Astronomers need your help to find these jets and match them to the galaxy that hosts them.

## WHAT DO YOU DO?

Using a slider, you can see infrared and radio images from galaxies. Your task is to find the galaxy plumes from the radio telescope and match them to infrared image of the galaxy. There are examples to help you out, and the discussion feature might even make you famous!

## RELATION TO SCHOOL SUBJECTS

The science of astronomy, galaxies, infrared

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English, Spanish, Russian, German, French, Polish, Magyar

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

radio.galaxyzoo.org

# SCOPE

**Become the very first person to measure the temperature of an unknown star!**

## WHAT IS SCOPE?

Are all stars like the Sun? The answer to this question has interested the field of astronomy and astrophysics for nearly 100 years. At SCOPE, you can explore this topic by observing stars, comparing their features to those of the Sun, and classifying them. Many of these stars have never been classified; you can be the very first person to measure the temperature of a star! This is discovery in the purest sense of the word.

## WHAT DO YOU DO?

After registration, you select one star from a collection of stars. Your mission is to classify the star according to the different spectra. You can classify several stars and see the overview in the section 'Your Scope '.

## RELATION TO SCHOOL SUBJECTS

Physics, stars

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

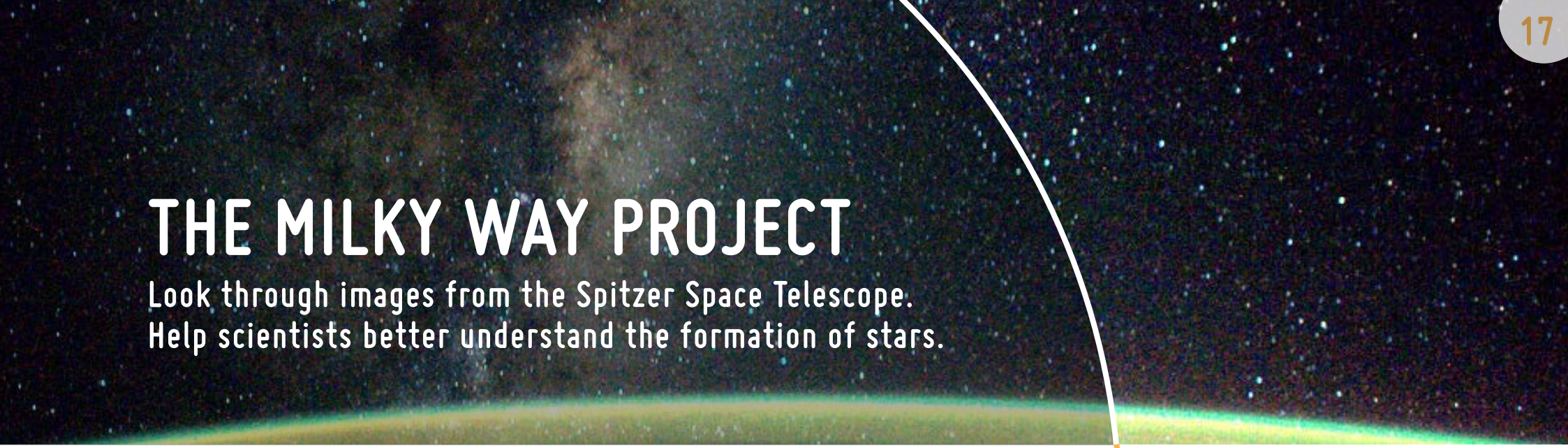
Citizen Science

## PLATFORM

Website

## GO HERE

scope.pari.edu



# THE MILKY WAY PROJECT

Look through images from the Spitzer Space Telescope.
Help scientists better understand the formation of stars.

## WHAT IS THE MILKY WAY PROJECT?

Scientists need your help for looking through tens of thousands of images from the Spitzer Space Telescope. By telling them what you see in the infrared data, the formation of stars can be better understood.

## WHAT DO YOU DO?

In the Milky Way project, you need to observe images of the sky, identify, and mark the different objects you see.

## RELATION TO SCHOOL SUBJECTS

Galaxies, the science of astronomy, the origin and structure of the Universe, the invisible Universe, infrared

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English, French, Chinese,
Spanish, German,
Bahasa Indonesia, Polish, Danish

## TYPE

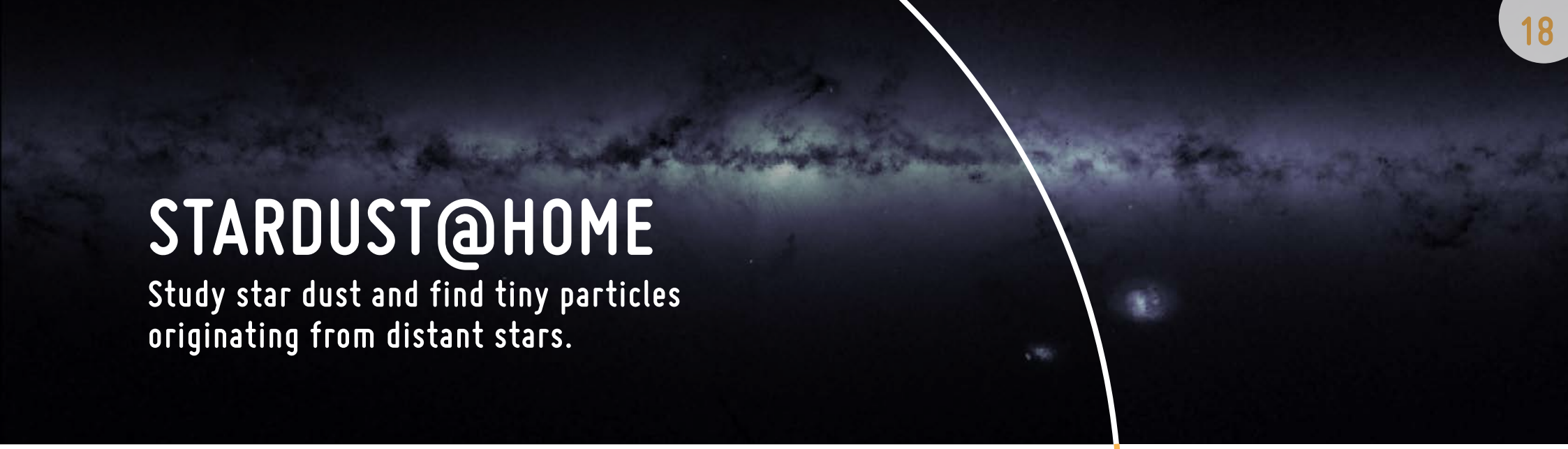
Citizen Science

## PLATFORM

Website

## GO HERE

www.milkywayproject.org



# STARDUST@HOME

Study star dust and find tiny particles originating from distant stars.

## WHAT IS STARDUST@HOME?

In 2006, the sample return capsule from the Stardust spacecraft gently parachuted onto the Utah desert. The capsule contained precious particles collected during Stardust's dramatic encounter with a comet in 2004.It had something else, even rarer and no less precious: tiny particles of interstellar dust that originated from distant stars. They are the first such contemporary interstellar dust particles ever collected in space and returned to Earth. Before they can be studied, these tiny grains have to be found. The particles are so tiny that it would require several years if done by scientists only! As scientists cannot do this by themselves, they are asking for help from talented volunteers like you from all over the world.

## WHAT DO YOU DO?

After going through a web-based training session, you have to pass a test to register and participate. After passing the test and registering, you will search each field for interstellar dust impacts. A virtual microscope downloads and displays these images for you so that you can do exactly what someone looking into an actual microscope would do: focus up and down in each movie to look for tracks.

## RELATION TO SCHOOL SUBJECTS

The Solar System, stars, the origin and structure of the Universe, the invisible Universe

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

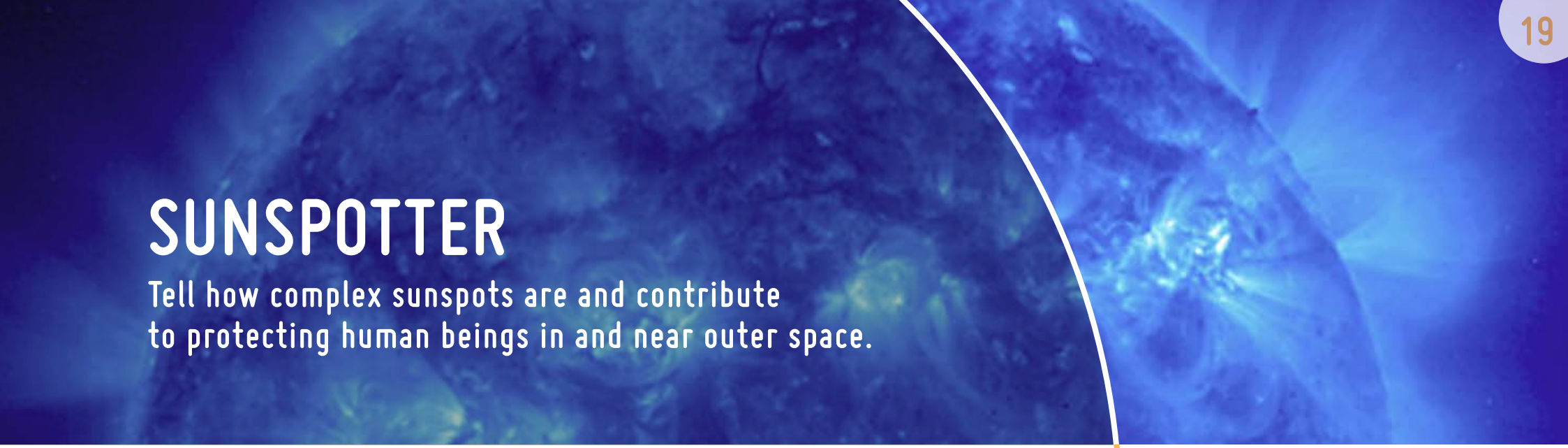
Citizen Science

## PLATFORM

Website

## GO HERE

stardustathome.ssl.berkeley.edu



# SUNSPOTTER

**Tell how complex sunspots are and contribute to protecting human beings in and near outer space.**

## WHAT IS SUNSPOTTER?

Although the Sun is 150 million km away, its activity affects us. Eruptions from sunspot groups can coat the Earth with X-rays and high-energy particles, endangering astronauts and the ISS, interrupting GPS signals, damaging our satellite infrastructure, exposing high-altitude and high-latitude aircrafts to radiation, and even disrupting the electrical grid. The Sunspotter project aims to expand human knowledge about the Sun and more effectively protect human beings in and near outer space.

## WHAT DO YOU DO?

Sunspotter aims to construct a reliable measure of sunspot group complexity. For this, you have to take pictures of a sunspot group, and tell how complex the group is on a scale from 1 to 10. This will help answer the following questions: are sunspots born complex or do they evolve to become complex? Do complex sunspot groups produce more eruptions?

## RELATION TO SCHOOL SUBJECTS

Sun, the Solar System

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

www.sunspotter.org

# LOSS OF THE NIGHT

**How bright is your sky? Report the sky where you live and compare it with other locations.**

## WHAT IS LOSS OF THE NIGHT?

In many parts of the world, the night sky shines with poor artificial light. Sky glow outshines the stars in the skies and dramatically changes the natural night environment. Scientists are concerned that light pollution might have a big impact on nocturnal ecosystems, but they have very little information about how bright the sky is worldwide or how the sky glow is changing over the years.

## WHAT DO YOU DO?

'The Loss of the Night app turns your eyes into a light metre, allowing you to become a citizen scientist and report how bright the night sky is where you live!' By using this app, you can see the entire star system as an augmented reality. This means that your phone turns into a window to observe the night sky. The app asks you to point the camera to a specific star and take a picture. You can do this several times, which will improve the precision of measurement or introduce a new place you have been to.

## RELATION TO SCHOOL SUBJECTS

Light pollution, atmosphere, biodiversity

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

Arabic, Catalan, Chinese, English, French, German, Italian, Japanese, Polish, Romanian, Spanish

## TYPE

Citizen Science

## PLATFORM

Phone App

## GO HERE

lossofthenight.blogspot.de

# WOW

Share your local weather observations.

## WHAT IS WOW?

The Weather Observations Website (WOW) reflects recent advances in technology and how weather observations can be made. At the same time, the growing world of social networking makes it relatively easy for anyone to get involved and share their weather observations.
The Met Office wants to grow the weather-observing community by asking anyone to submit observations. This can be done using all types of equipment, so there are no cost restrictions.

## WHAT DO YOU DO?

Watch how to submit data to WOW, learn how to make your own weather observation equipment from household items, and explore weather for kids.

## RELATION TO SCHOOL SUBJECTS

Seasons, climate change

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English, Dutch

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

wow.metoffice.gov.uk
wow.knmi.nl

# ROCK AROUND THE WORLD

Find and send Earth rocks to help explore Mars.

## WHAT IS ROCK AROUND THE WORLD?

To analyse rocks on Mars, scientists need to have them in hand, as not all experiments can be easily done with a robot. But having a robot on Mars is already very difficult... By analysing all different types of rocks on the Earth, scientists compare them to the rocks the robots see on Mars. By gathering all types of rocks from around the world, they create a huge database and use it to explore the red planet.

## WHAT DO YOU DO?

All you need to do if you find a special rock is to send it to the team of scientists based in the USA. They will analyse the rocks and send you a certificate, listing the components of the rock. Later, you will be able to find your rock in the online database and see all its details.

## RELATION TO SCHOOL SUBJECTS

Geology, composition and structure, surface

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

Citizen Science

## PLATFORM

Website

## GO HERE

ratw.asu.edu

# iSKY

## Get inspired to investigate the stars.

### WHAT IS ISKY?

We see the stars every night and know they are far away, but it is difficult to understand what a light year actually means. The teaching unit 'iSKY: Smart Measurements of the Heavens' inspires you to investigate the stars.

### WHAT DO YOU DO?

Using various apps on your smartphone, you learn how to orientate based on the night sky, how to measure the altitude of the Sun, or how to calculate the circumference of the Earth.

### RELATION TO SCHOOL SUBJECTS

The science of astronomy, the Solar System, stars, mathematics

### DIFFICULTY LEVEL

★★★★★

### LANGUAGES

English, German

### TYPE

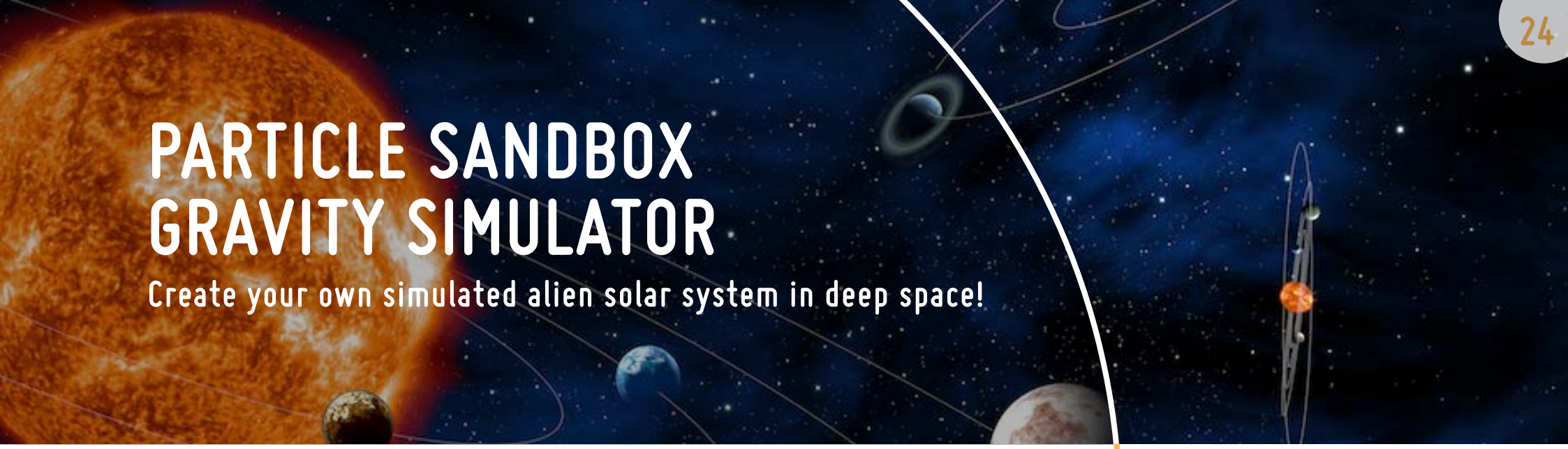
Citizen Science

### PLATFORM

Phone App

### GO HERE

space-awareness.org/games/isky



# PARTICLE SANDBOX GRAVITY SIMULATOR

Create your own simulated alien solar system in deep space!

## WHAT IS PARTICLE SANDBOX GRAVITY SIMULATOR?

Have you ever wanted to create your own alien solar system in deep space? Now is your chance with this fascinating sandbox simulation! Using real world physics, you can design, construct, and even destroy your own solar system model!

## WHAT DO YOU DO?

Build complete solar systems with suns, planets, moons, and asteroids, spinning and twirling in space, held together by gravity. When you introduce a rogue planet, watch the mayhem unfold as its gravity disrupts your carefully balanced particle model!

## RELATION TO SCHOOL SUBJECTS

The Solar System, exoplanets, gravity, galaxies, fundamental laws, stars

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English, Polish, Spanish, Portuguese, German, French

## TYPE

Game

## PLATFORM

Phone App

## GO HERE

space-awareness.org/games/particle-sandbox-gravity-simulator

# FEEL GRAVITY

Clean space of all its debris to save humanity!

## WHAT IS FEEL GRAVITY?

As a member of the interstellar organisation DarkCleaner, you have been recruited for a secret mission: clean space of all its debris to save humanity. Use different missiles and climb the grades to discover new worlds through this exciting adventure! The survival of our planets is in your hands.

## WHAT DO YOU DO?

Your ultimate goal is to remove all debris if you want to save the Earth and humanity. Through this game, you can unlock new missiles and use them to boost your scores! Agility and quick reflexes will help you accomplish your different spatial missions.

## RELATION TO SCHOOL SUBJECTS

The science of astronomy, space debris, the Solar System

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English, French

## TYPE

Game

## PLATFORM

Phone App

## GO HERE

feelgravity.com

# SOLAR SYSTEM EXPLORER 3D

Fly in the Universe and learn a lot about its solar systems.

## WHAT IS SOLAR SYSTEM EXPLORER 3D?

Solar System Explorer 3D is an interactive encyclopaedia of planetary systems. With wonderful graphics, it allows you to fly within the Universe and learn a lot about it.

## WHAT DO YOU DO?

Use the tools to fly through the Universe and explore planets, moons, and stars! This is a great simulator for amateur astronomers.

## RELATION TO SCHOOL SUBJECTS

The Solar System, exoplanets, moons, stars

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English, Polish, Spanish, German, Portuguese, French

## TYPE

Fun learning

## PLATFORM

Phone App

## GO HERE

space-awareness.org/games/solar-system-explorer-3d

# NIGHT SKY TOOLS

Want to learn about the sky, planets, and other spatial objects?
This might be the app for you!

## WHAT IS NIGHT SKY TOOLS?

Night Sky Tools is a collection of astronomy-based tools perfect for anyone interested in astronomy.

## WHAT DO YOU DO?

Observe the sky and read detailed information about the planets, constellations, comets, exoplanets, meteor showers, near-earth asteroids, and satellites.

## RELATION TO SCHOOL SUBJECTS

The Solar System, Moon, stars, exoplanets, the origins and structure of the Universe

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

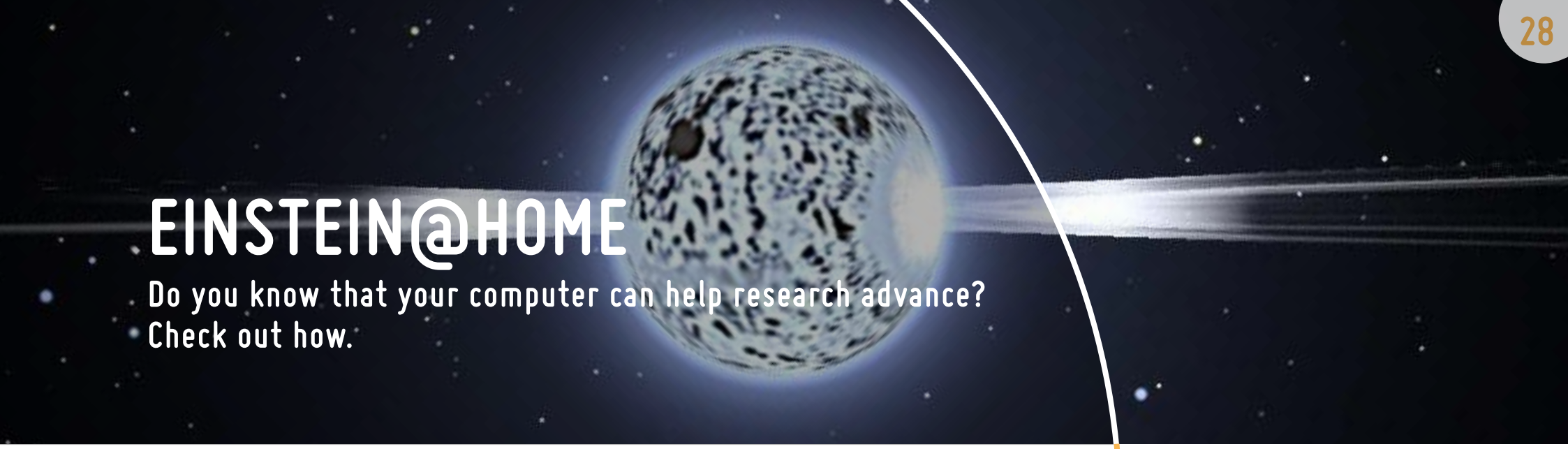
Fun learning

## PLATFORM

Phone App

## GO HERE

www.nightskytools.com



# EINSTEIN@HOME

**Do you know that your computer can help research advance? Check out how.**

## WHAT IS EINSTEIN@HOME?

Einstein@Home uses your computer's idle time for research. Einstein@Home volunteers have already discovered more than three dozen new neutron stars. In September 2015, gravitational waves were detected for the first time since Einstein's prediction a century ago. Einstein@Home searches for continuous gravitational waves and detects binary black hole mergers.

## WHAT DO YOU DO?

If you want to participate, you need to follow the 'Join Einstein@Home' instructions. It takes only a minute to register, and little or no maintenance is needed for running Einstein@Home. It is available for Windows, Linux, and Macintosh OS X computers. Read about the progress made in research in the reports.

## RELATION TO SCHOOL SUBJECTS

Stars, the science of astronomy, gravity

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

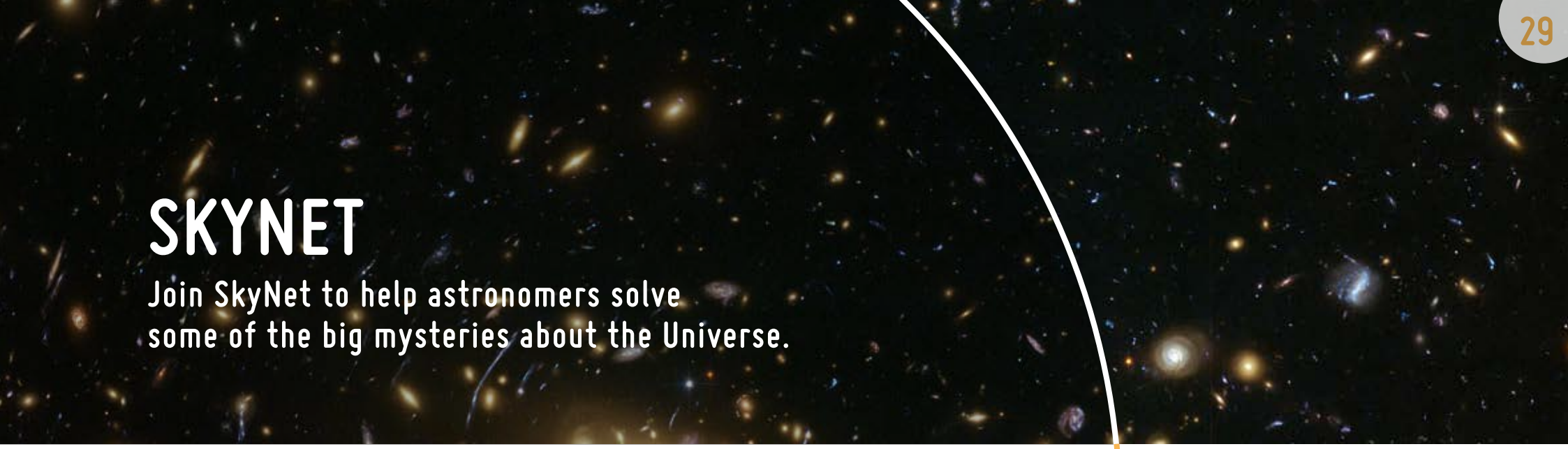
Citizen Science

## PLATFORM

Software

## GO HERE

www.einsteinathome.org



# SKYNET

Join SkyNet to help astronomers solve some of the big mysteries about the Universe.

## WHAT IS SKYNET?

When you join SkyNet, your computer helps astronomers process information and solve some of the big mysteries about the Universe. Data collected by one of several radio telescopes is sent to your computer as a small data packet ready for processing. Once the data packet is processed, it is sent back, and the process begins all over again. By repeating this process across thousands of computers, it is possible to simulate a single powerful machine capable of doing relevant scientific research!

## WHAT DO YOU DO?

'Your computer is bored. It has spare computing power nearly all the time that could be used to do something cool. So, why not let it?' To participate, you need to create an account and install software. Then, you just let your computer do the work during its downtime, like a screensaver, or just keep it open in your internet browser.

## RELATION TO SCHOOL SUBJECTS

Astroinformatics, the science of astronomy, the origin and structure for the Universe

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English, French

## TYPE

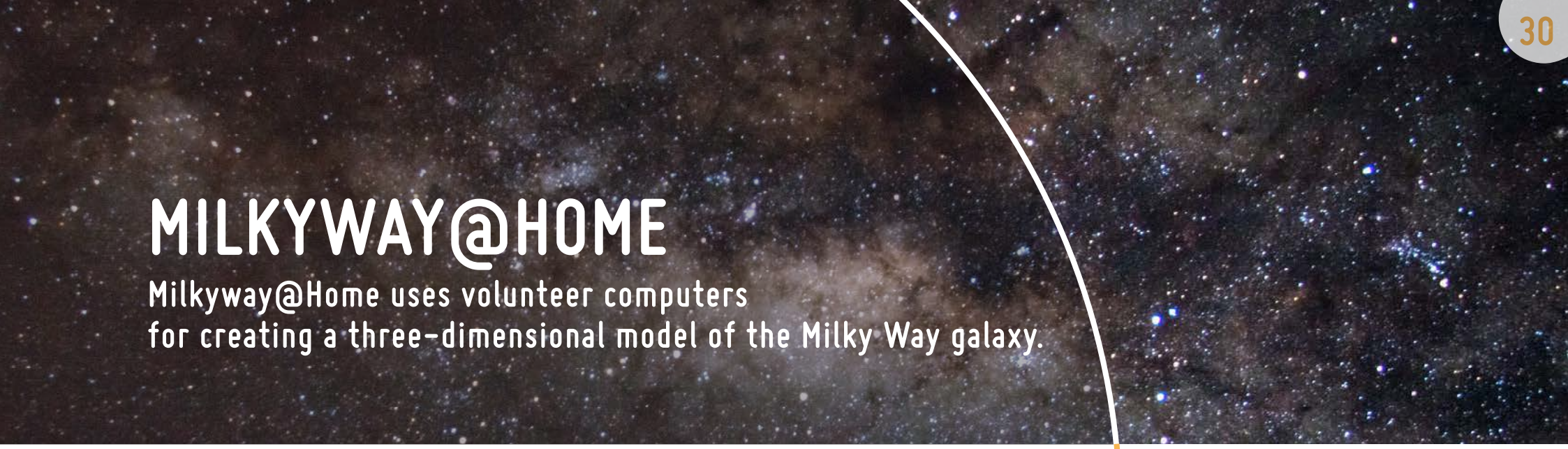
Citizen Science

## PLATFORM

Software

## GO HERE

www.theskynet.org



# MILKYWAY@HOME

**Milkyway@Home uses volunteer computers for creating a three-dimensional model of the Milky Way galaxy.**

## WHAT IS MILKYWAY@HOME?

Milkyway@Home uses volunteered computing resources and creates a highly accurate three-dimensional model of the Milky Way galaxy. These models tells us how the Milky Way galaxy was formed and how tidal tails develop when galaxies merge. This project enables research in both astroinformatics and computer science.

## WHAT DO YOU DO?

Follow the instructions given on the webpage for installing the software and registering. Then, let your computer work towards advancing science!

## RELATION TO SCHOOL SUBJECTS

The origins and structure of the Universe, the science of astronomy, astroinformatics

## DIFFICULTY LEVEL

★★★★★

## LANGUAGES

English

## TYPE

Citizen Science

## PLATFORM

Software

## GO HERE

milkyway.cs.rpi.edu

# IMAGE CREDITS

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