

On Your Turn

On your turn, you can do one of three actions:



Pick Telescope

Choose a Telescope Card from the center and add it to your hand.



Observe Data

Use a Telescope Card to pick up any Observation from the center and add it to one of your Science Goals.



Unleash Chaos

Draw a Chaos Card and resolve its effects.

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Data Types



Image

A picture captured through a telescope.



Spectrum

The brightness of an object as measured over a range of wavelengths (colors).



Timeseries

A series of measurements which shows how an astronomical object changes over time.



Catalog

A large table of calculations and other properties taken from astronomical data.

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How to Play



<https://github.com/spacetelescope/mast-match/>

Scan the QR Code above to read the rules and learn how to play MAST Match.



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Target Types



Galaxy

A huge collection of gas, dust, and billions of stars all held together by gravity.



Star

Giant spheres of hot plasma, mostly made of hydrogen and helium.



Nebula

Giant clouds of dust and gas in space.



Planet

A celestial body that orbits around a star.

Target Types



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Planet

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GALEX - SPACE TELESCOPE -



Ultraviolet Telescope

Hubble - SPACE TELESCOPE -



Ultraviolet Telescope

Optical Telescope



James Webb

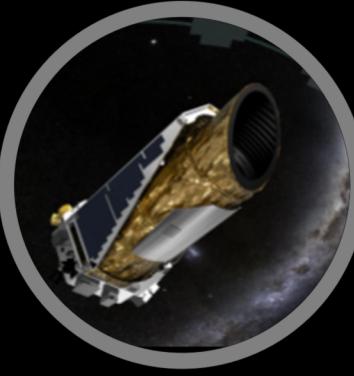
- SPACE TELESCOPE -



Infrared Telescope

Kepler

- SPACE TELESCOPE -



Optical Telescope

IUE

- SPACE TELESCOPE -



Ultraviolet Telescope

TESS

- SPACE TELESCOPE -



Optical Telescope

Spitzer

- SPACE TELESCOPE -



Infrared Telescope

Roman

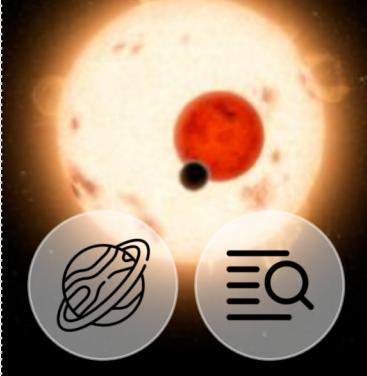
- SPACE TELESCOPE -



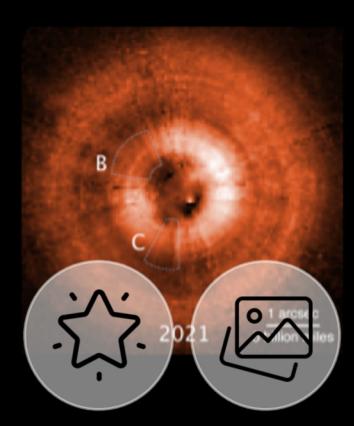
Optical Telescope

Infrared Telescope

Exoplanet Kepler-16b



TW Hydrae



2021

Stephan's Quintet





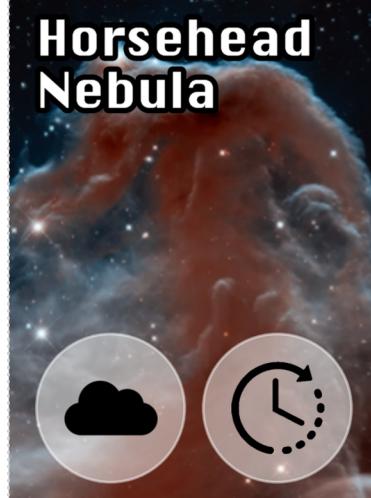
Butterfly Nebula



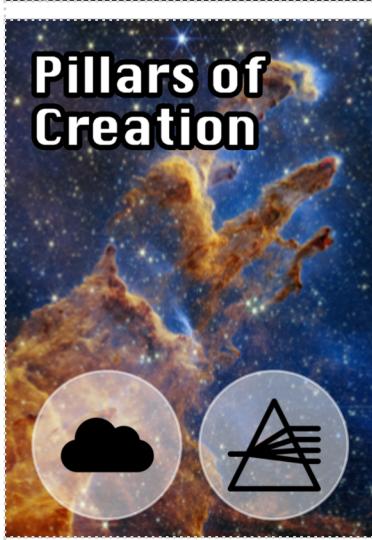
Andromeda Galaxy



Horsehead Nebula



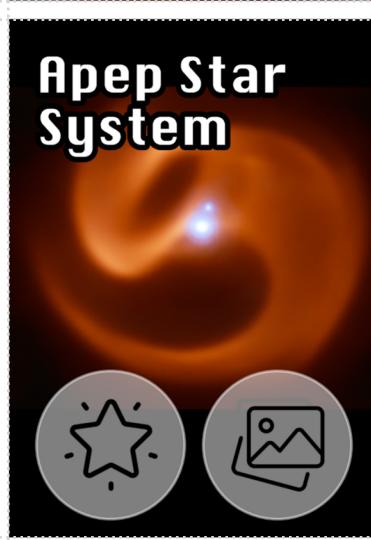
Pillars of Creation



Dark Nebula



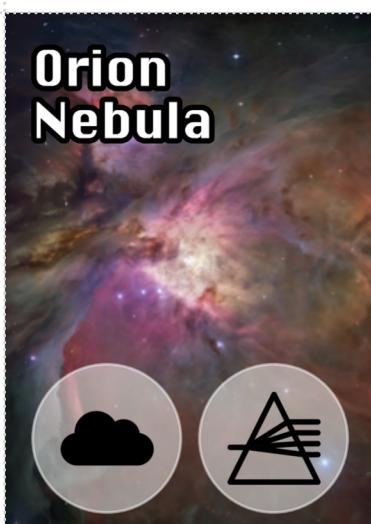
Apep Star System



Mars



Orion Nebula

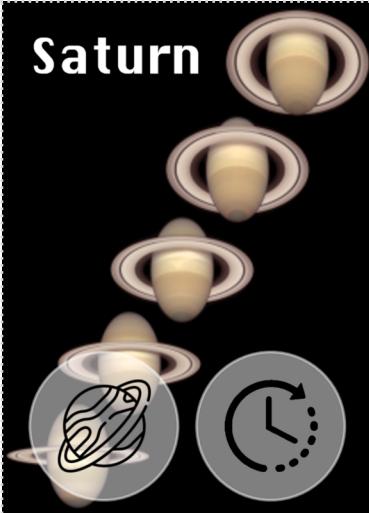


Sagittarius C





Saturn



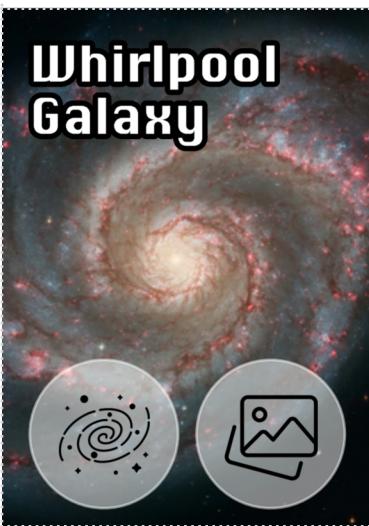
NGC 376



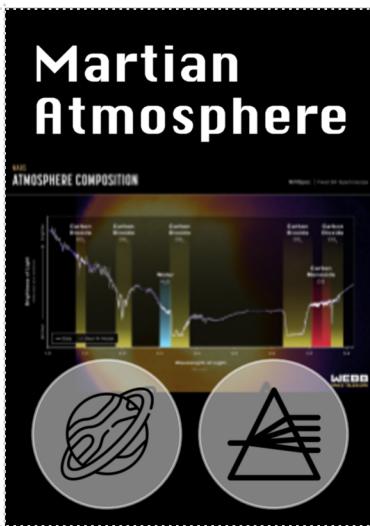
Galaxy Merger ZW-096



Whirlpool Galaxy



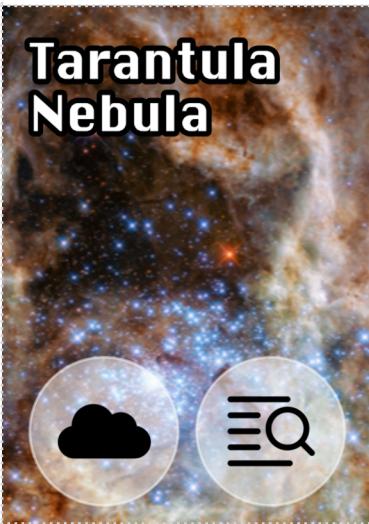
Martian Atmosphere



Wolf Rayet Star



Tarantula Nebula



Exoplanet GJ-386b



Cassiopeia A





Westerlund 2



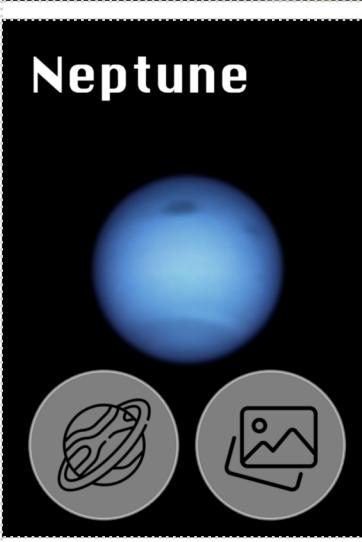
Andromeda Galaxy



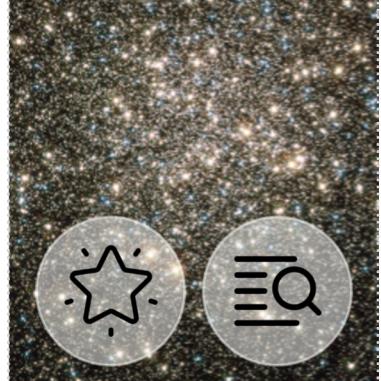
Sombrero Galaxy



Neptune



Hercules Cluster



Herbig-Haro Object



Moons of Jupiter

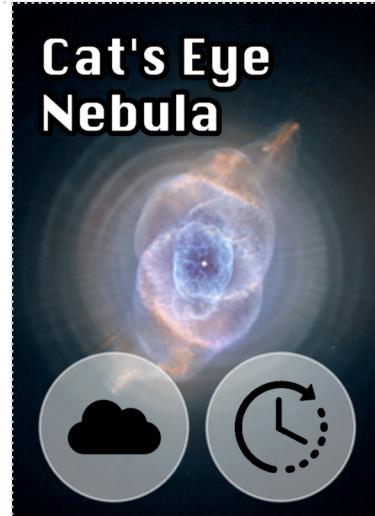


CW Leonis





Cat's Eye Nebula



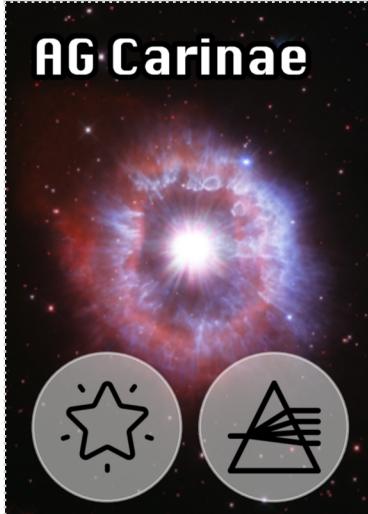
Messier 101



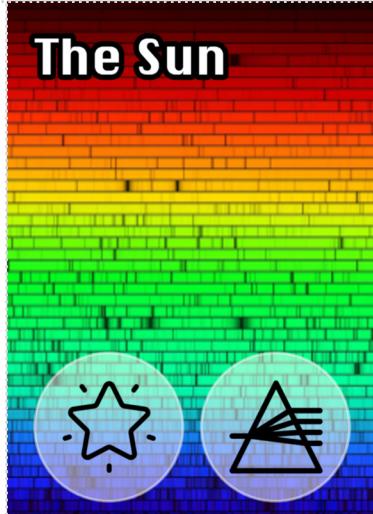
Deep Field



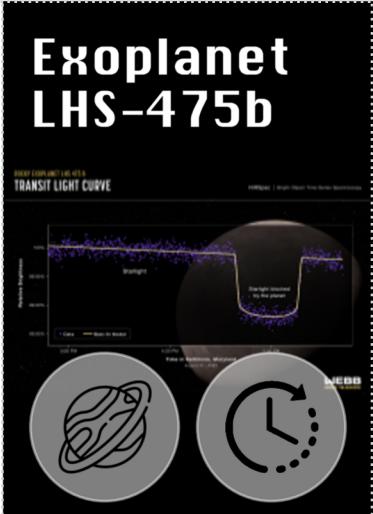
AG Carinae



The Sun



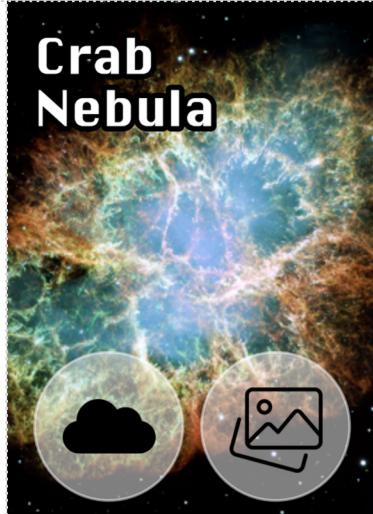
Exoplanet LHS-475b



NGC 1087



Crab Nebula



Bullet Cluster





M81 and M82

MACS-0416

Carina Nebula



Exoplanet Catalog

Cepheid Variable

Exoplanet WASP-39b



Shoemaker Levy

Jupiter

Bubble Nebula





Alien Weather Report

Ultraviolet Science Goal

Measure the composition of an exoplanet's atmosphere

4



The Stars Are Born

Infrared Science Goal

Observe ongoing star formation inside of four different nebula to research star formation

6



Asteroid Impact

Ultraviolet Science Goal

Observe a meteoroid hitting a planet with time series data of our Solar System

5



Binary Stars

Optical Science Goal

Study a binary star system with a star's spectrum and light curves

4



Optical Sky Survey

Optical Science Goal

Collect one of each object type to win 3 science points

3



Exoplanet Hunter

Optical Science Goal

Collect time series data to detect exoplanets around a star

4



Photometry

Optical Science Goal

Take a lot of images!

6



Optical Data Archive

Optical Science Goal

Collect one of each data type to win 3 science points

3



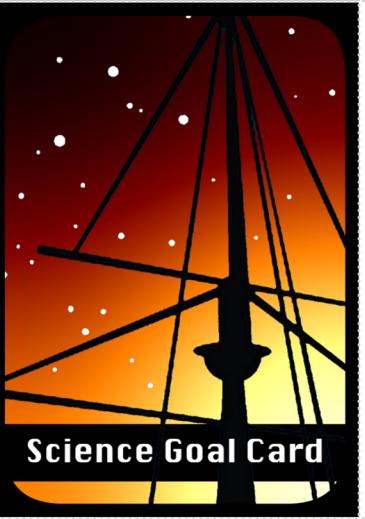
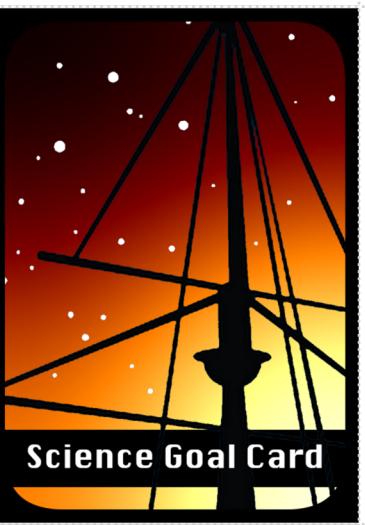
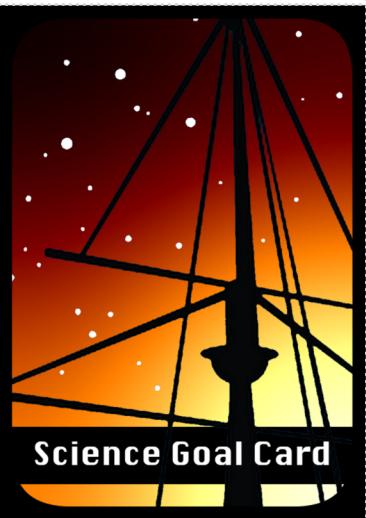
Source Catalogs

Ultraviolet Science Goal

Make a lot of catalogs!

6





Galactic Hotspots

Ultraviolet Science Goal

Find Where Stars Are Forming In A Nearby Galaxy

4



Stellar Graveyard

Optical Science Goal

Characterize different types of supernova by observing the remnants of dead stars in nebulae

5



Astereoseismology

Optical Science Goal

Collect two star time series to study different types of variable stars

5



Ultraviolet Data Archive

Ultraviolet Science Goal

Collect one of each data type to win 3 science points

3



Ultraviolet Sky Survey

Ultraviolet Science Goal

Collect one of each object type to win 3 science points

3



Stellar Populations

Ultraviolet Science Goal

Observe four different stars to measure their properties and learn about stellar populations

6



Stellar Jets

Ultraviolet Science Goal

Observe the jets thrown off by young stellar objects

5



Spectroscopy

Infrared Science Goal

Take a lot of spectra!

6



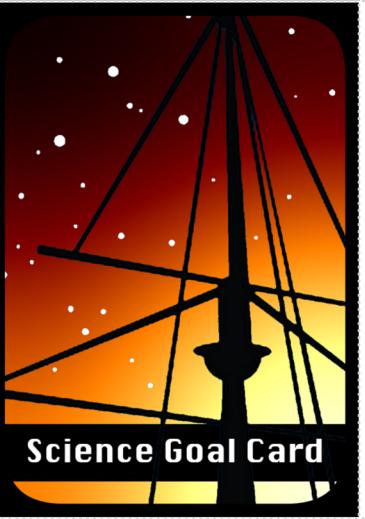
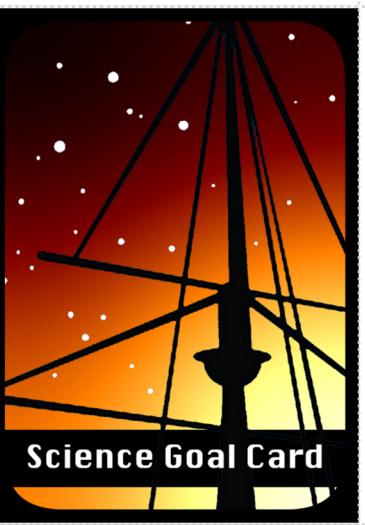
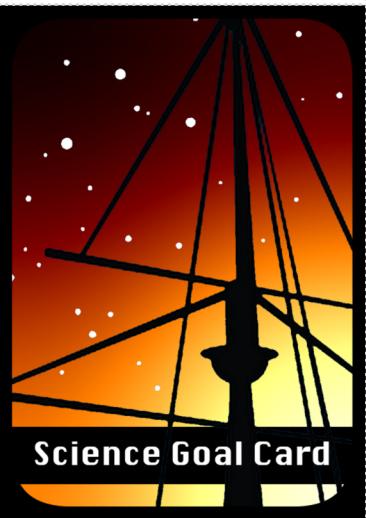
Gravitational Lensing

Infrared Science Goal

Use Gravitational Lenses To Study A Distant Galaxy's Properties

5





Black Hole Indigestion

Ultraviolet Science Goal

Monitor A tidal disruption event near the center of a galaxy

5



The First Stars

Optical Science Goal

Find the oldest stars in the galaxy to understand the history of the Milky Way

5

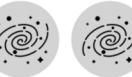


High Redshift

Infrared Science Goal

Observe four different galaxies to study the history of the Universe.

6



Solar System

Optical Science Goal

Observe four different planets to research how the Solar System was formed

6



Galaxy Mergers

Optical Science Goal

Study two galaxies that are merging together

5



Dust Maps

Infrared Science Goal

Catalog different nebula to determine where the dust is in the Milky Way

5



Eye of The Storm

Ultraviolet Science Goal

Find out what's at the center of a planetary nebula

5

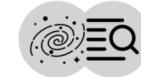


Cosmic Web

Infrared Science Goal

Study the large scale structure of the Universe with catalogs of galaxies

5



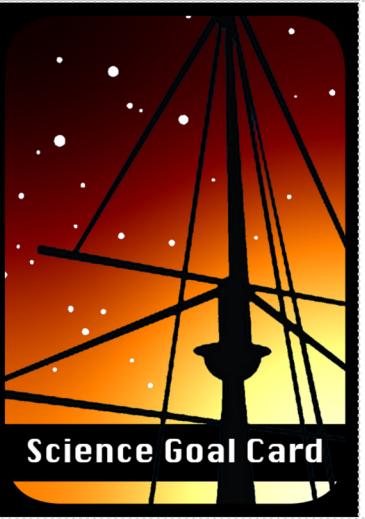
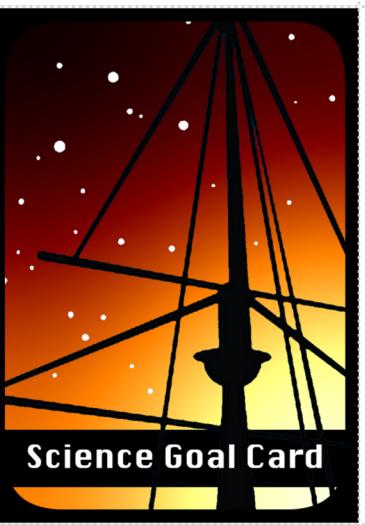
Messier Catalog

Optical Science Goal

Build a list of Messier objects by taking images and cataloging nebula

4





Infrared Sky Survey

Infrared Science Goal

Collect one of each object type to win 3 science points

3



Build-a-Galaxy

Ultraviolet Science Goal

Study the star formation history of a galaxy by determining what kinds of stars it is made of

4



Infrared Data Archive

Infrared Science Goal

Collect one of each data type to win 3 science points

3



Interstellar Dust

Infrared Science Goal

Study the gas between galaxies by observing galaxies and nebula

4



Brown Dwarfs

Infrared Science Goal

Study star formation inside nebulae to characterize brown dwarfs - are they planets or stars?

4



Mapping the Galaxy

Infrared Science Goal

Map the Milky Way with large catalogs of stars

5



Light Curves

Optical Science Goal

Take a lot of light curves!

6



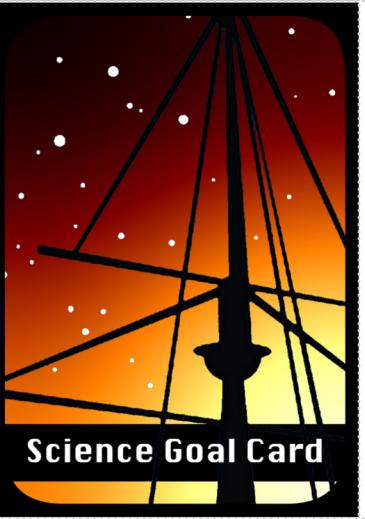
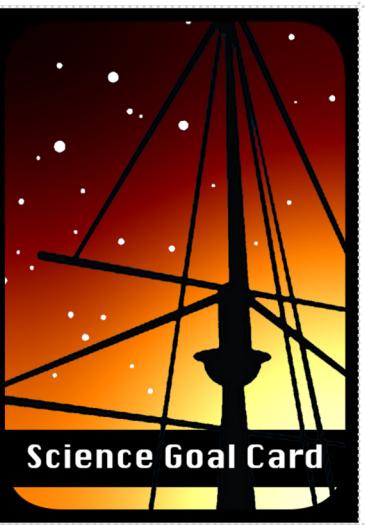
The Dark Side

Infrared Science Goal

Darkness here and nothing more. Study massive, cold dark nebulas.

5





Methane Clouds

Infrared Science Goal

Cloudy with a chance of Methane! Study the chemical composition of clouds on other planets

5



Proposal Deadline

Play Immediately

A big observing proposal is due this week! You skip your next turn. Keep this card in front of you as a reminder, and discard it at the end of your next turn.

Servicing Mission

Play Later

Your telescope gets an upgrade! When you play this card during an Observing Action, you can pick two cards from the Observation Row instead of one.

Planet Formation

Ultraviolet Science Goal

Study planet formation by observing planets in our solar system

5



Deprecated Code

Play Immediately

Choose one of your Science Goals and place this card next to it. You need one more card than usual to complete this Science Goal (for example, if you need 4 cards to complete the goal, you now need 5)

Micrometeoroid Strike

Play Immediately

A telescope's mirror was just hit by a micrometeoroid! Place this card on top of one of the telescopes in the Telescope Row. No one can use this telescope until this card is discarded, which happens at the end of your next turn.

New Discovery

Play Immediately

You make a new discovery! The next observation card you collect can be added to any of your Science Goals, ignoring all requirements for object type, target type, or wavelength.

Follow-up Observation

Play Later

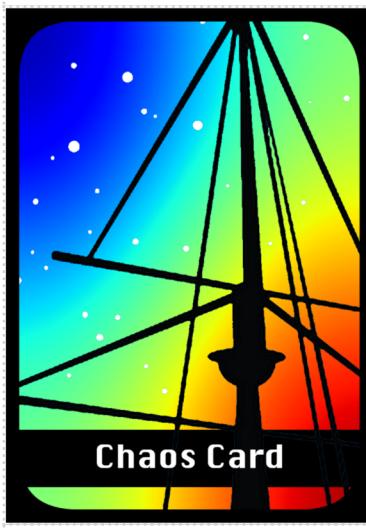
Play this card when you take the Observation Action to play the Observation Card you collect on someone else's Science Goal. When you do, you earn 1 science point for helping them out.

1

Long Exposure

Play Later

When you play this card during an Observing Action, choose two observations from the Visible Sky row using the same telescope, and then skip your next turn.



Not Enough Coffee

Play Immediately

You do not have enough coffee to get your work done: skip your next turn. Keep this card in front of you as a reminder, and discard it at the end of your next turn.

Proposal Deadline

Play Immediately

A big observing proposal is due this week! You skip your next turn. Keep this card in front of you as a reminder, and discard it at the end of your next turn.

Extra Cup of Coffee

Play Later

You found an extra cup of coffee! Play this card at the beginning of one of your turns. You may take one additional action on your turn, for a total of two actions.

Conference Meeting

Play Later

You present your results at a conference. Play this card on a Science Goal Card of your choice. That Science Goal is now worth 1 extra point.



1

Target of Opportunity

Play Immediately

This card is a wildcard. Treat this as any target type, data type, and wavelength, and immediately play it towards one of your Science Goals.



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High Solar Winds

Play Immediately

High radiation caused by solar winds causes your observation to be rescheduled; Discard all cards currently in the Visible Sky Row and replace them with new cards.

Jupyter Notebook

Play Immediately

Choose one of your Science Goals, and place this card on top. You need one less card than usual to complete this Science Goal. For example, if you need 4 cards to complete the goal, you now only need 3.



2

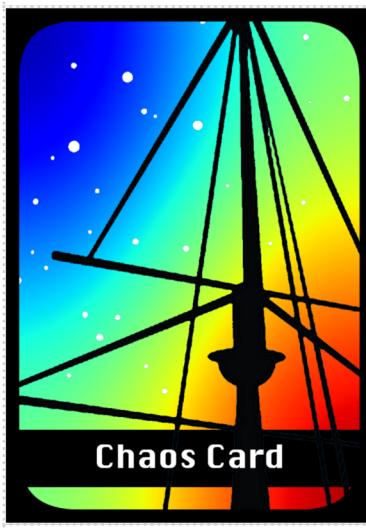
Inspiration Strikes

Play Immediately

You have a great idea for a new project! Draw a new Science Goal Card and place it face-up in front of you, adding it to your active Science Goals.

Play Later

Host a press release to tell the world about your new result! When you complete your next Science Goal, reveal this card to immediately score an additional 2 points.



Public Data

1

Play Later

Choose any Observation Card that another player has on one of their Science Goals. Take that card from them, and play it on one of your own goals. In exchange, give them this card to replace the old observation, which still counts towards their Science Goal. They gain extra 1 science point for sharing their data!

Cloud Computing

Play Later

Thanks to the power of cloud computing, you are able to complete your research more quickly. All of your Science Goals are now worth one additional point.



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Play Later

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Corrupted Data

Play Later

When another player tries to collect an Observation Card, play this card to immediately make them discard it. They do not get any points for that Observation Card, and must still return the Telescope they used to the Telescope Row.

Long Exposure

Play Later

When you play this card during an Observing Action, choose two observations from the Visible Sky row using the same telescope, and then skip your next turn.

Too Much Coffee

Play Later

You have had too much coffee, and are feeling extremely productive but will crash later. Play this card at the beginning of one of your turns. You may take one additional action on your turn, for a total of two actions. Then skip your next turn.

All-Nighter

Play Later

You decide to sacrifice sleep to get extra work done. Play this card at the beginning of one of your turns. You may take one additional action on your turn, for a total of two actions.

Nobel Prize

Play Immediately

You win the Nobel Prize for your research. When you play this card, immediately score 5 points.



Code Doesn't Compile

Play Later

Play this card on another player to make them skip their next turn. They can keep this card in front of them as a reminder, and discard it at the end of their next turn.



Chaos Card



Chaos Card



Chaos Card



Chaos Card



Chaos Card



Chaos Card



Chaos Card



Chaos Card



Chaos Card

Dual Telescopes

Play Later

Play this card while Picking a Telescope; you may pick two telescopes instead of one during this turn, and use them both for observations on subsequent turns.



Coauthor Request

Play Later

When another player completes a Science Goal, play this card to become a Coauthor on their paper and earn 1 extra science point for yourself.

1

Grant Funding Ending

Play Immediately

Your grant funding runs out, forcing you to start on a new project. Discard one Science Goal of your choice (and any observation cards linked to it), and draw a new Science Goal to replace it.

Target of Opportunity

Play Immediately

This card is a wildcard. Treat this as any target type, data type, and wavelength, and immediately play it towards one of your Science Goals.

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Open Source Collaboration

Play Later

Trade one Science Goal Card with another player. All observation cards (and points) associated with that goal are also traded.

Hire a Student

Play Later

Hire a graduate student to get more work done! Look through the draw pile and choose any card you want. Add the selected card to one of your Science Goals (regardless of wavelength), and then discard this card and reshuffle the draw pile.

Target of Opportunity

Play Immediately

This card is a wildcard. Treat this as any target type, data type, and wavelength, and immediately play it towards one of your Science Goals.

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Proprietary Data

Play Immediately

Look through the Observation Card draw pile and choose any card you would like. Play it towards any one of your Science Goals, but hide it underneath this card so the other players can't tell what it is. Re-shuffle the deck once you're done

Too Many Tabs Open

Play Immediately

You have too many tabs open and can't find where you saved your data! Choose one observation card from any of your Science Goals, and return that card to the bottom of the draw pile.



Chaos Card



Chaos Card



Chaos Card



Chaos Card



Chaos Card



Chaos Card



Chaos Card



Chaos Card



Chaos Card

High Solar Winds

Play Immediately

High radiation caused by solar winds causes your observation to be rescheduled; Discard all cards currently in the Visible Sky Row and replace them with new cards.

Guiding Failure

Play Immediately

The telescope failed to acquire guide star. If you have a telescope card currently in your hand, return it to the telescope row immediately without collecting an observation.

Target of Opportunity

Play Immediately

This card is a wildcard. Treat this as any target type, data type, and wavelength, and immediately play it towards one of your Science Goals.



Conference Meeting

Play Later

You present your results at a conference. Play this card on a Science Goal Card of your choice. That Science Goal is now worth 1 extra point.

A large number 1 inside a light blue circle.

Telescope Malfunction

Play Later

When another player tries to collect an Observation Card, play this card to immediately make them discard it. They do not get any points for that Observation Card, and must still return the Telescope they used to the Telescope Row.

Coauthor Request

Play Later

When another player completes a Science Goal, play this card to become a Coauthor on their paper and earn 1 extra science point for yourself.

A large number 1 inside a light blue circle.

