

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.

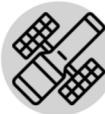


Unleash Chaos

Draw a Chaos Card and resolve its effects.

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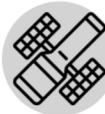


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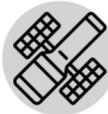


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Data Types



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.

Data Types



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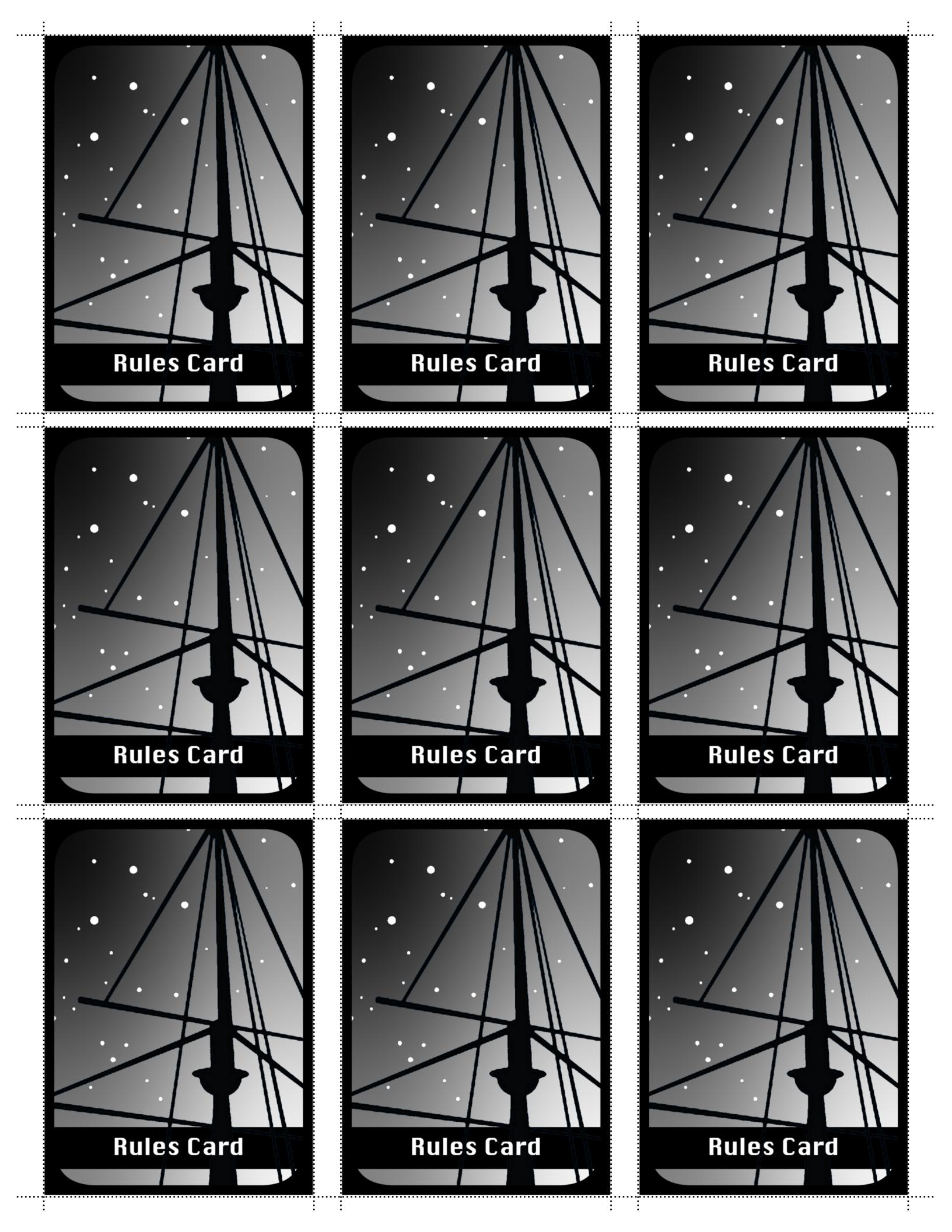
A large table of calculations and other properties taken from astronomical data.

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.



Rules Card

How to Play



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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.

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GALEX - SPACE TELESCOPE -



Ultraviolet Telescope

Hubble - SPACE TELESCOPE -



Ultraviolet Telescope

Optical Telescope



Rules Card



Rules Card



Rules Card



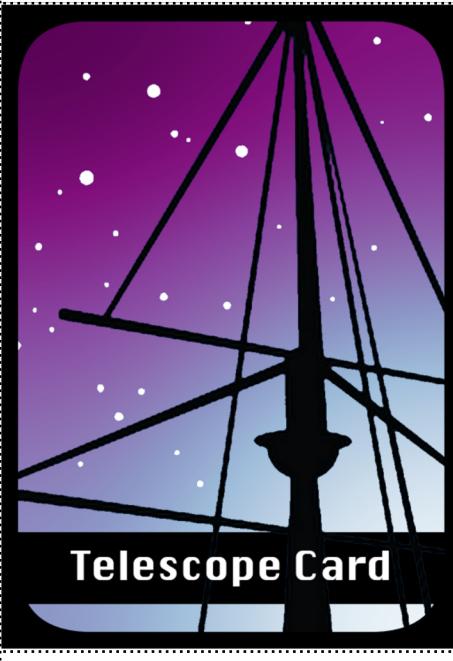
Rules Card



Rules Card



Rules Card



Telescope Card



Telescope Card



Rules Card

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 -



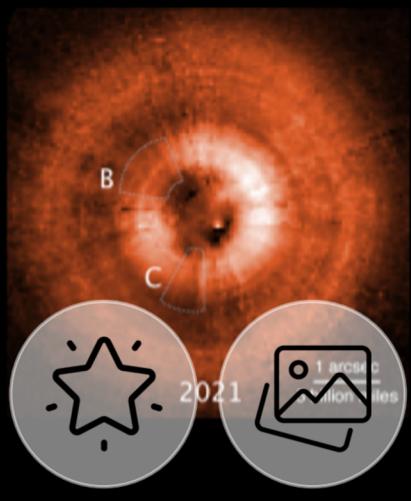
Optical Telescope

Infrared Telescope

Exoplanet Kepler-16b



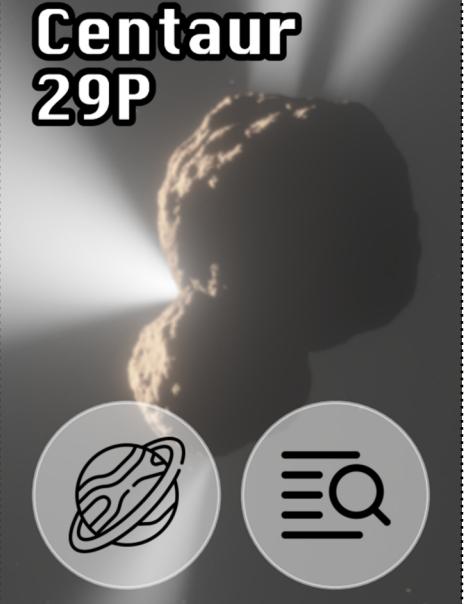
TW Hydrae



2021



Centaur 29P





Telescope Card



Telescope Card



Telescope Card



Telescope Card



Telescope Card



Telescope Card



Observation Card

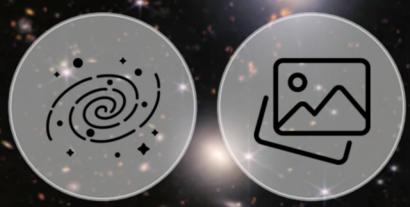


Observation Card



Observation Card

Stephan's Quintet



Serpens Cluster



Butterfly Nebula



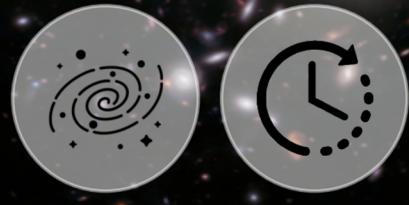
Andromeda Galaxy



NGC 1566



PLCK G165.7



Horsehead Nebula



Pillars of Creation

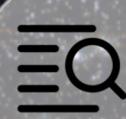


Dark Nebula





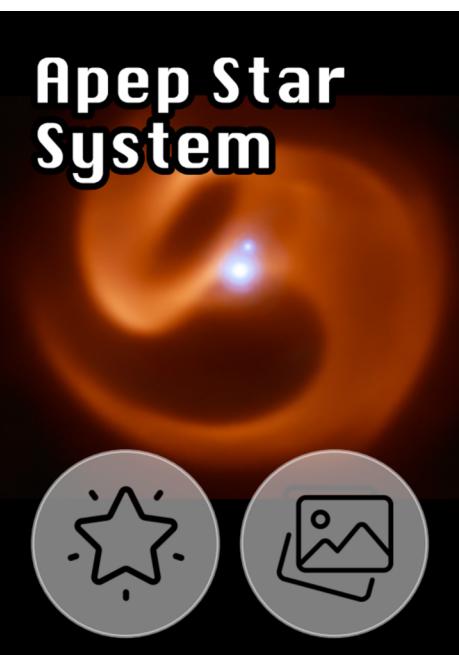
Messier 92



Exoplanet WASP 107-b



Alpep Star System



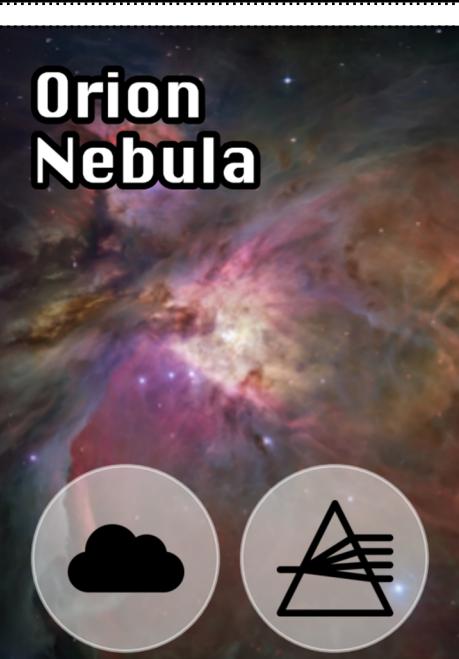
Mars



Lynds 483



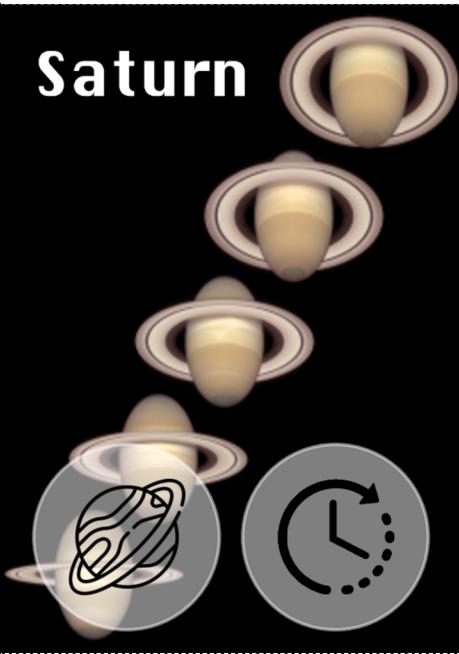
Orion Nebula



Sagittarius C



Saturn



NGC 1514





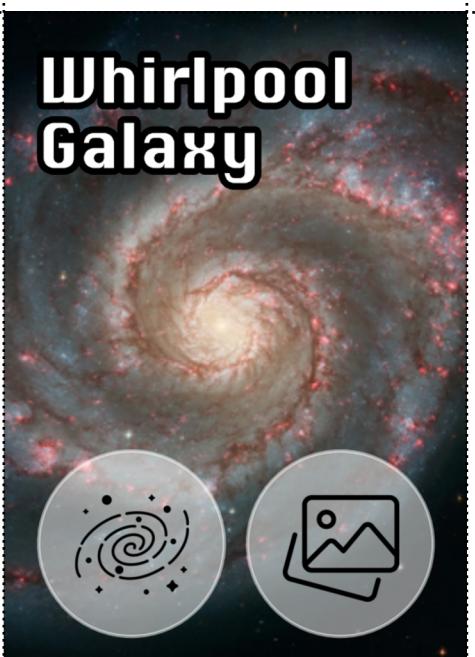
NGC 376



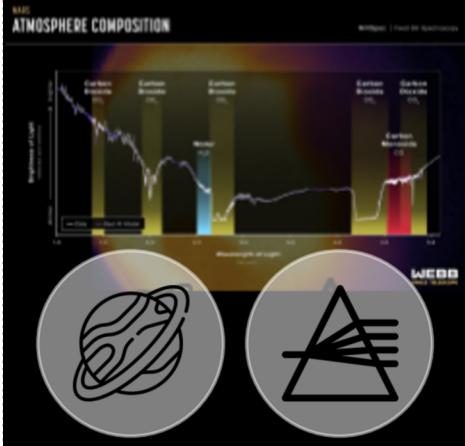
Galaxy Merger ZW-096



Whirlpool Galaxy



Martian Atmosphere



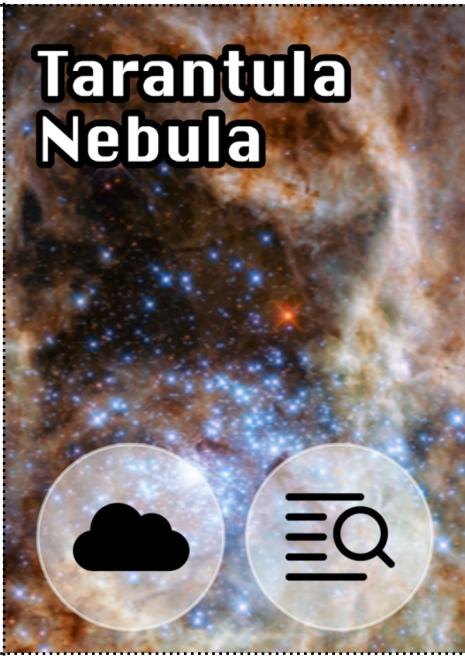
Orion Bar



Wolf Rayet Star



Tarantula Nebula



Exoplanet GJ-386b



Cassiopeia A





Westerlund 2

Andromeda Galaxy

Hercules Cluster



Sombrero Galaxy

Neptune

Ring Nebula

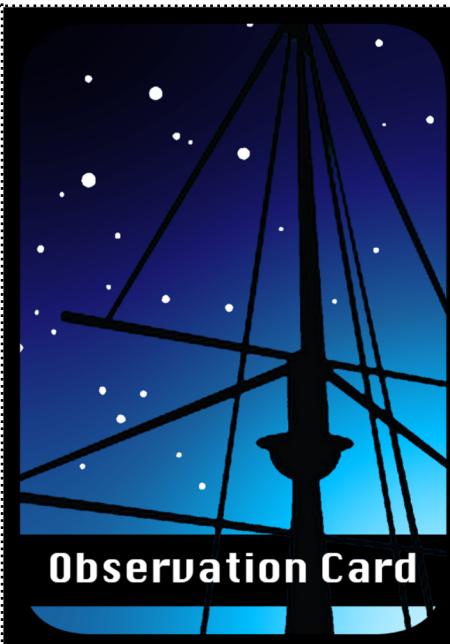


Herbig-Haro Object

Moons of Jupiter

Planetary Disk





CW Leonis

Cat's Eye Nebula

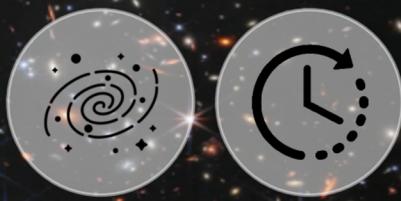
Messier 101



Deep Field

AG Carinae

Arp 142



The Sun

Exoplanet LHS-475b

NGC 1087





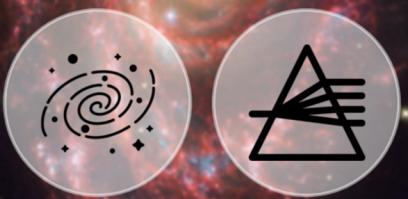
Vega



Rho Ophiuchi



NGC 2207



Crab Nebula



Uranus



Bullet Cluster



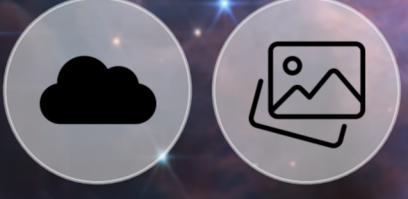
M81 and M82

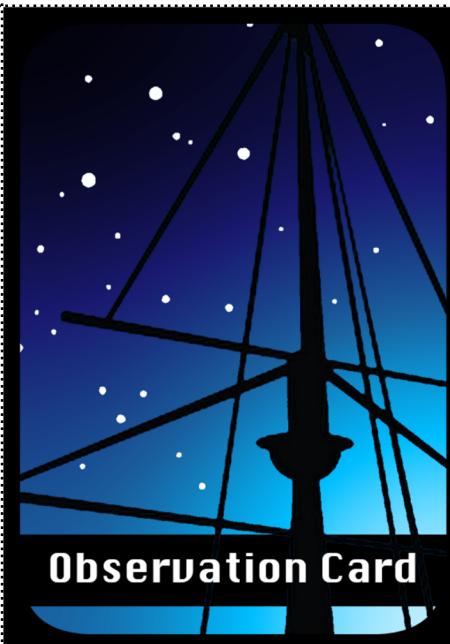


MACS-0416



Flame Nebula





Carina Nebula



Exoplanet Catalog

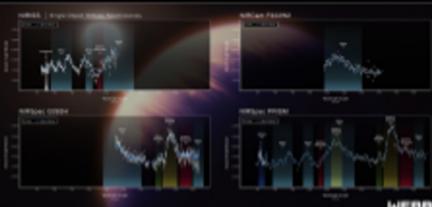


Cepheid Variable

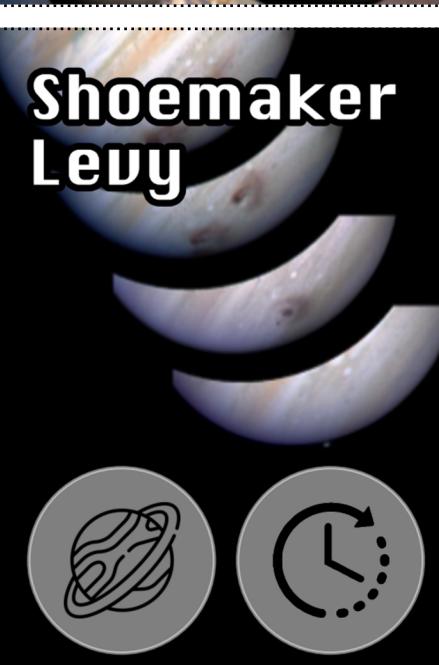


Exoplanet WASP-39b

HOT GAS GIANT EXOPLANET WASP-39b
ATMOSPHERE COMPOSITION



Shoemaker Levy



Jupiter



Bubble Nebula



Alien Weather Report

Ultraviolet Science Goal

Measure the composition of an exoplanet's atmosphere

4



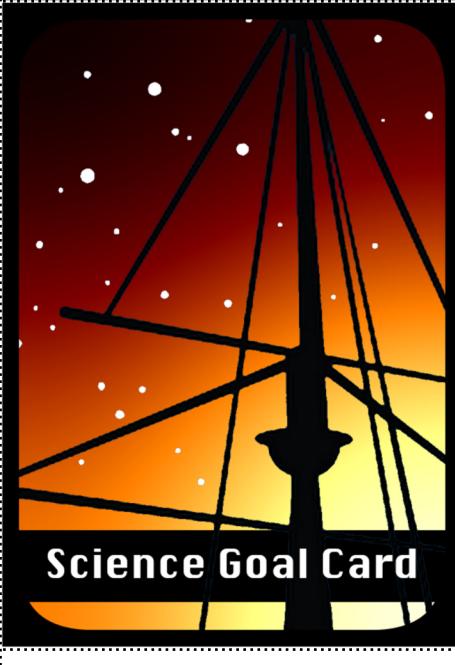
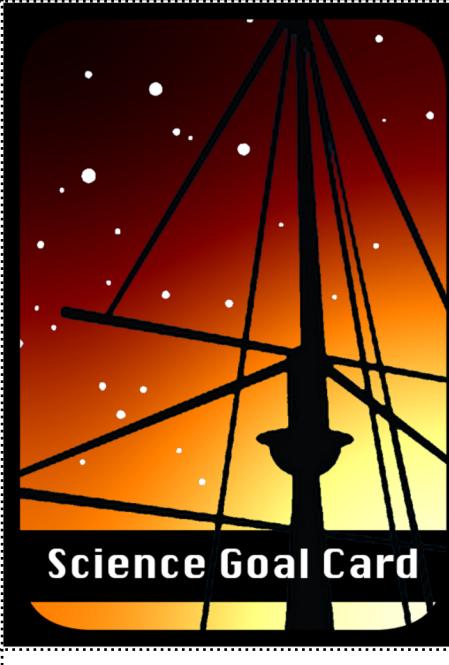
Binary Stars

Optical Science Goal

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

4





Photometry

Optical Science Goal

Take a lot of images!

6



The Stars Are Born

Infrared Science Goal

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

6



Optical Sky Survey

Optical Science Goal

Collect one of each object type to win 3 science points

3



Optical Data Archive

Optical Science Goal

Collect one of each data type to win 3 science points

3



Asteroid Impact

Ultraviolet Science Goal

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

5



Exoplanet Hunter

Optical Science Goal

Collect time series data to detect exoplanets around a star

4



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



Ultraviolet Data Archive

Ultraviolet Science Goal

Collect one of each data type to win 3 science points

3





Stellar Jets

Ultraviolet Science Goal

Observe the jets thrown off by young stellar objects

5



Ultraviolet Sky Survey

Ultraviolet Science Goal

Collect one of each object type to win 3 science points

3



Spectroscopy

Infrared Science Goal

Take a lot of spectra!

6



Astereoseismology

Optical Science Goal

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

5



Stellar Populations

Ultraviolet Science Goal

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

6



Gravitational Lensing

Infrared Science Goal

Use Gravitational Lenses To Study A Disant Galaxy's Properties

5



Black Hole Indigestion

Ultraviolet Science Goal

Monitor A tidal disruption event near the center of a galaxy

5



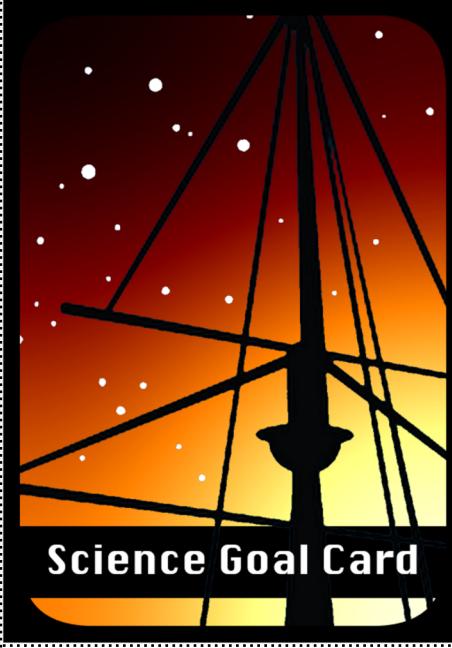
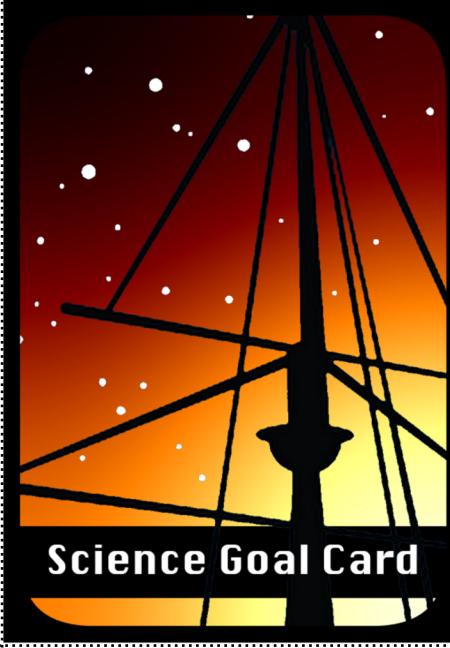
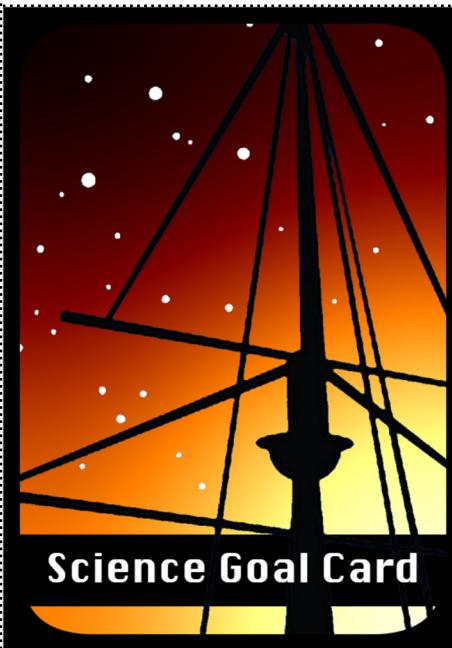
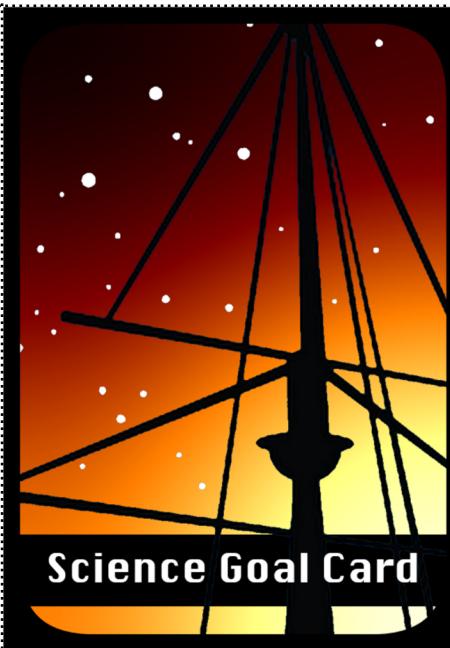
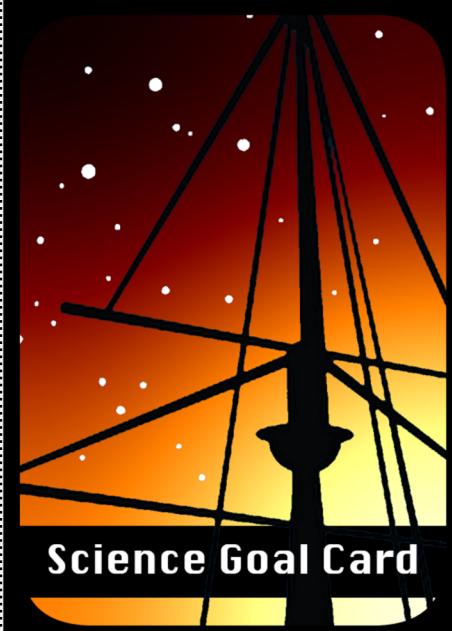
Solar System

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



Eye of The Storm

Ultraviolet Science Goal

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

5



Messier Catalog

Optical Science Goal

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

4



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



Dust Maps

Infrared Science Goal

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

5



Cosmic Web

Infrared Science Goal

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

5



Infrared Sky Survey

Infrared Science Goal

Collect one of each object type to win 3 science points

3



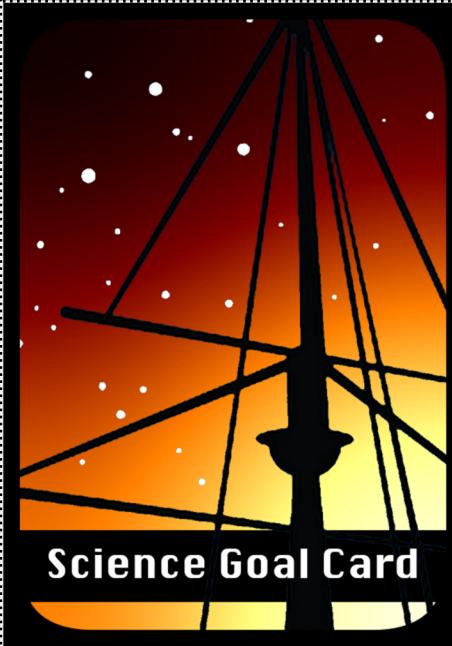
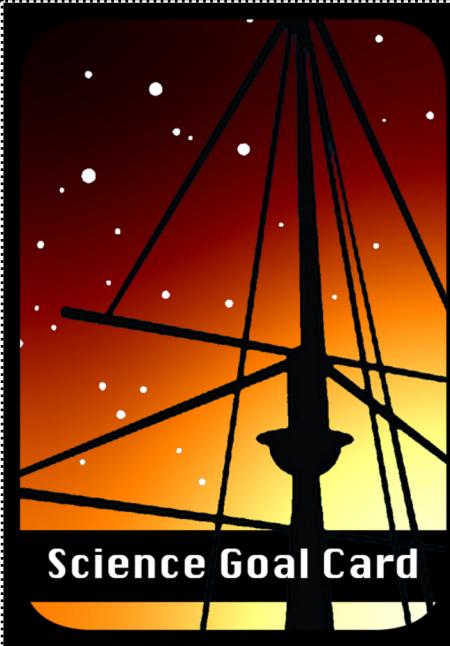
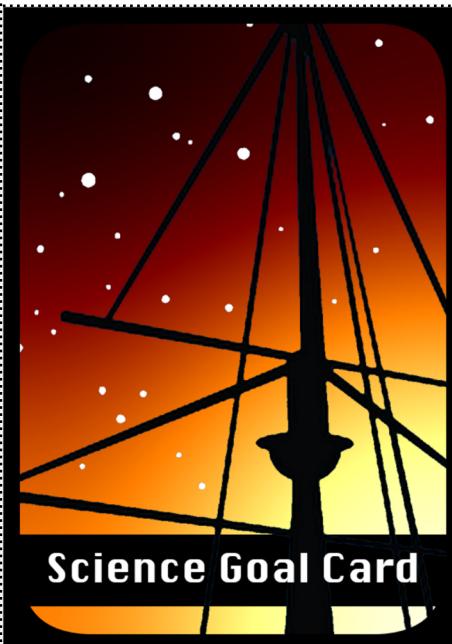
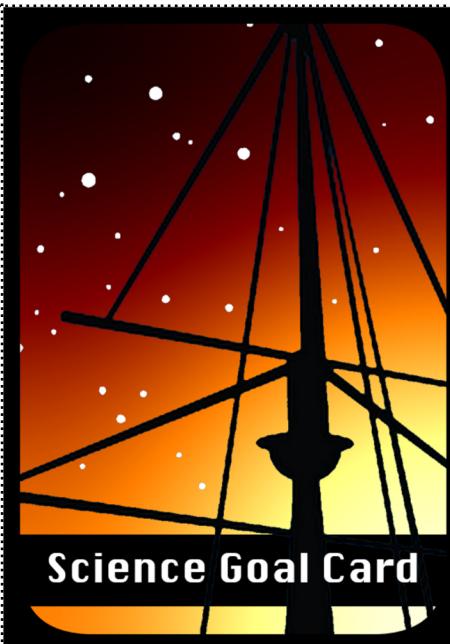
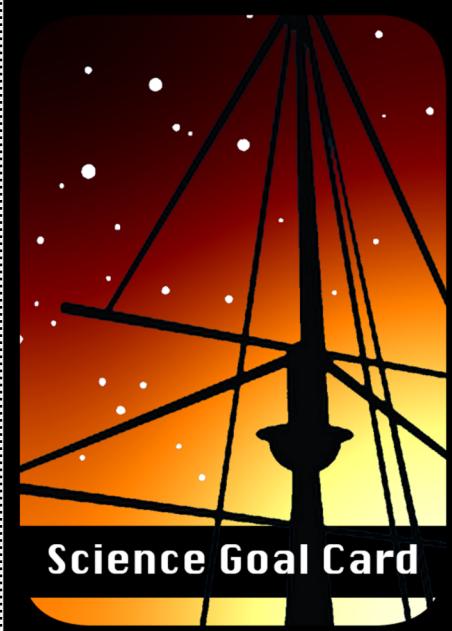
Infrared Data Archive

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



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



Brown Dwarfs

Infrared Science Goal

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

4



Drake Equation

Optical Science Goal

Estimate The Number of Habitable Earth-like Planets In The Milky Way by cataloging planets

5



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



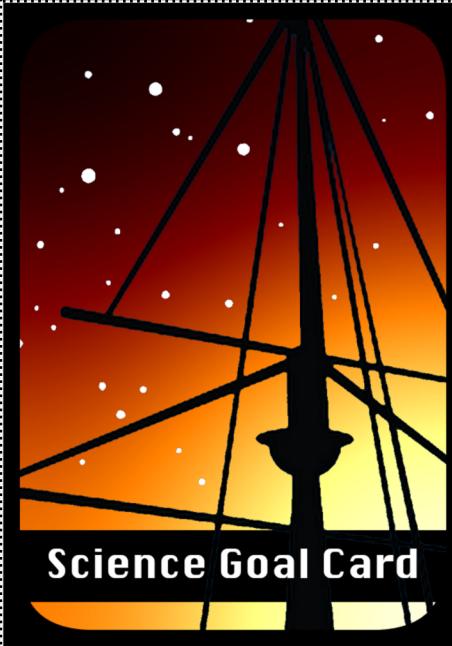
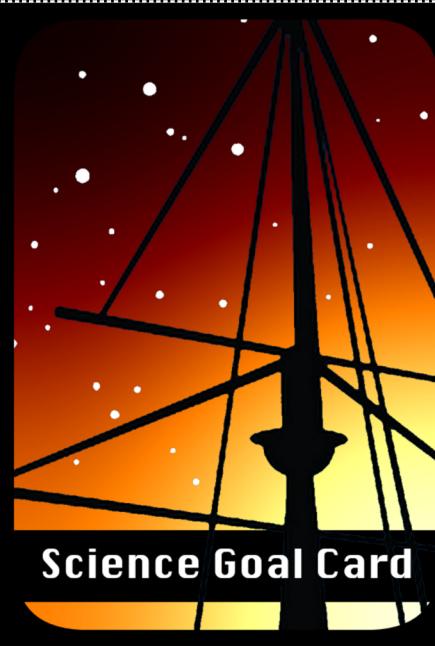
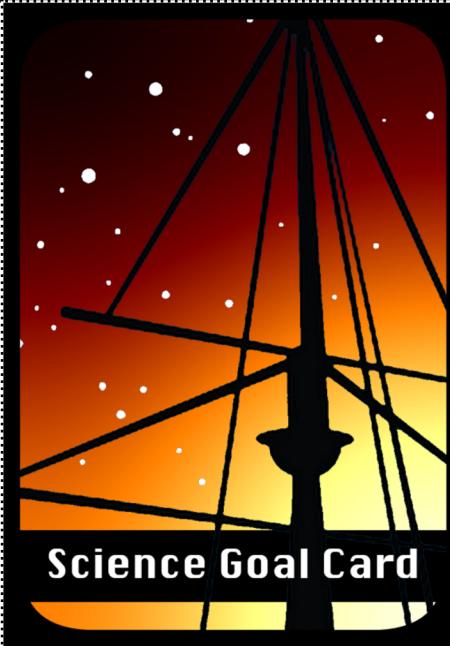
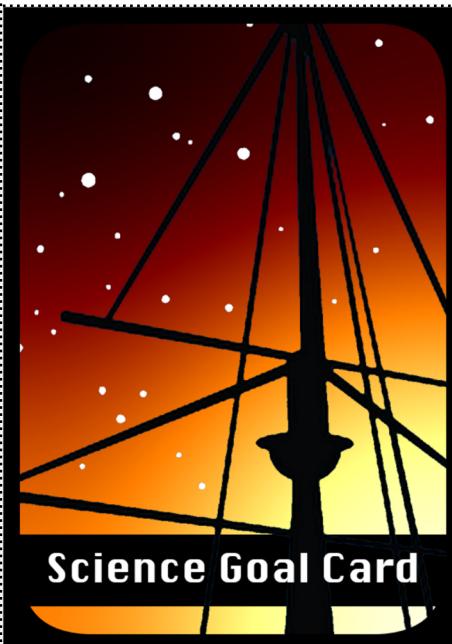
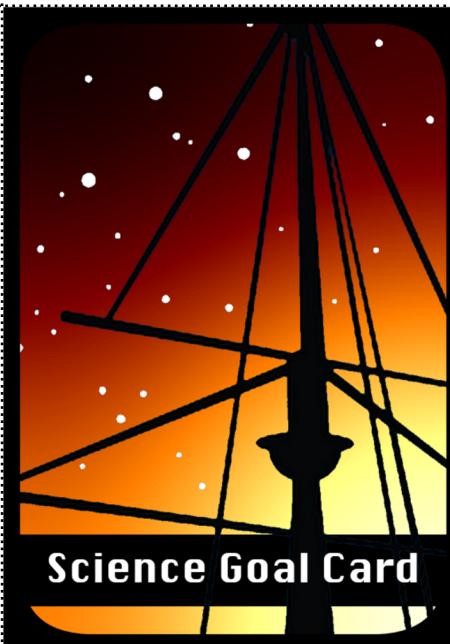
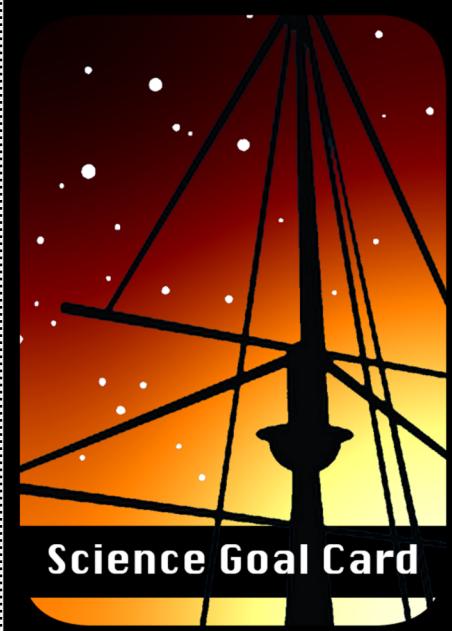
Planet Formation

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)

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.

Micrometeroid Strike

Play Immediately

A telescope's mirror was just hit by a micrometeroid! 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.

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.

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

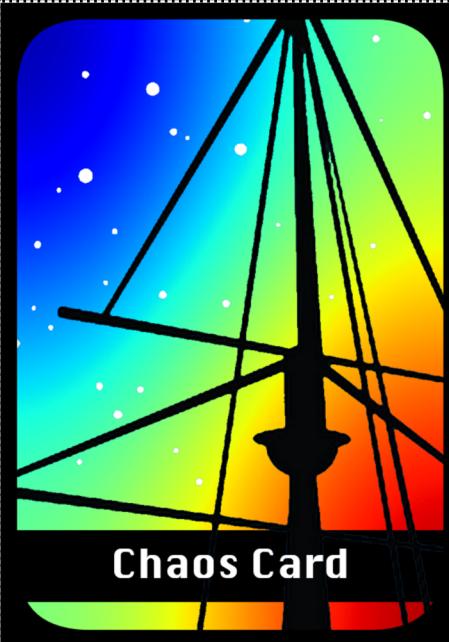
You do not have enough coffee to get your work done: skip your next turn. Keep this card in front of you as a reminder, and discard it at the end of your next turn.

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



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.

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.

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.



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.

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.

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.

Press Release

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

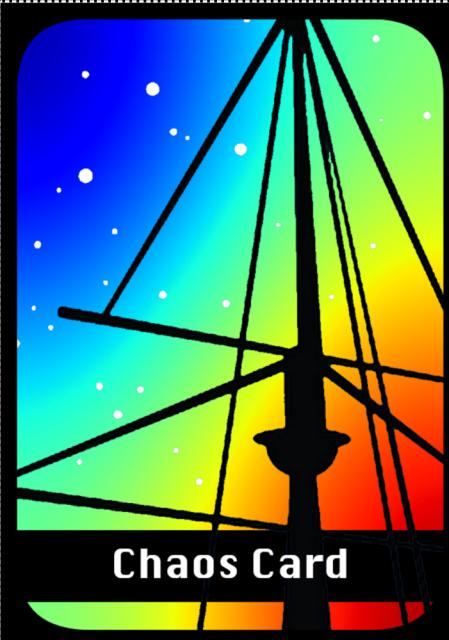
Play Later

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!

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.



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

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.



Public Data



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!

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.

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.





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.



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

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.



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.

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.

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.



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.



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.



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.

