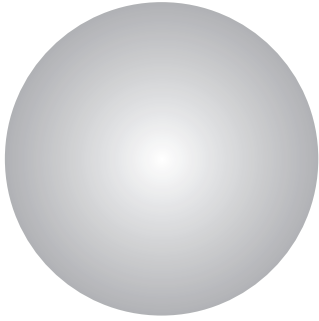



What Do You Know



We hope you have enjoyed learning about astronomy using your Horizon Globe. If you have done and understood the exercises in this book, you know more about observational astronomy than most people, even some who know a lot about deep-space astronomy.

Enjoy your new knowledge of the sky. There is great joy to be had from the basics of astronomy. You don't need telescopes or sky maps to enjoy these things on a daily basis. There is always something fun to watch, the sun changing through the seasons, the monthly Moon cycle, nightly stars and planets.

You can tell time by the Sun. Any time you see the Sun, you can notice how its position relates to the time of day. At night you can estimate how far below the horizon the Sun must be. Noticing where the Sun rises and sets and which direction it is highest at noon can help you find directions. Enjoy noticing how the direction of sunrise and sunset relate to the day of the year.

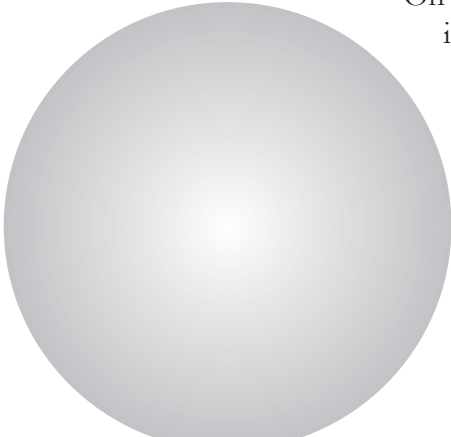


Moon watching will never be the same. You know the Moon follows the Sun, but is lazy and falls behind by almost an hour per day. Notice how the angle between the Sun and Moon determine the shape, or phase of the Moon. It's fun to see the Moon and know where it will be tomorrow.


But that's not all. Any time you see the Moon you can try to imagine where it is on the ecliptic. It may be much farther north or south than the Sun, or it may be the same. Don't try to explain it to your friends without a Horizon Globe!

When the Sun goes down, watch for planets. Is Venus out? In the evening or in the morning? Jupiter shines bright on most nights, but check the calendar, he may not appear until the wee hours of the morning. Try finding Saturn. Are you sure it's not a star? When Mars gets super bright for a few months every two years, you will know what is going on.

Any time you see stars in the sky, feel the confidence of knowing at least one important constellation, whichever guidepost is high. You know the significance of the Zodiac and their order on the ecliptic. Tell your friends what makes them a Leo or a Scorpio!



On the following page is a summary of some of the things we've covered in this book. In the next installment of the series we'll talk more about constellations and great ways to remember how to find them. Stay tuned!



*Astronomy compels the soul to look upwards and
leads us from this world to another.*

-Plato

THE SUN

HOW TO TELL TIME BY THE SUN

HOW TO TALK ABOUT WHERE CELESTIAL BODIES ARE: ANGLES, HOURS

THE MOON

FULL MOON IS OPPOSITE THE SUN

CRESCENT MOONS ARE NEAR THE SUN

QUARTER MOONS ARE 90 DEGREES FROM SUN

GIBBOUS MOONS ARE FAR FROM SUN, BUT NOT YET FULL

WAXING AND WANING MOONS

HOW TO USE A MOON CALENDAR TO FIND THE CURRENT PHASE

HOW TO MAP THE ECLIPTIC BY WATCHING THE MOON

CONSTELLATIONS

HOW TO FIND A GUIDEPOST CONSTELLATION.

HOW TO FIND ORION, DAY OR NIGHT

ZODIAC CONSTELLATIONS, NAMES AND LOCATIONS

PLANETS

WHICH PLANETS ARE EASILY VISIBLE: VENUS, MARS, JUPITER, SATURN

HOW THE MOTION OF VENUS DIFFERS FROM THE REST

HOW TO USE THE MOON AND PLANET CALENDARS TO FIND ANY PLANET

SEASONS

WHAT CAUSES SEASONS

HOW TO AVOID SUNBURN

HOW THE MOON CHANGES WITH SEASONS

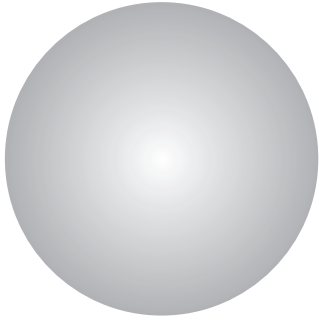
EVERYTHING IN THE SKY MAKES ONE COMPLETE TURN EVERY DAY

THE SUN, MOON, AND PLANETS TRAVEL ON THE ECLIPTIC

OVER LONGER PERIODS OF TIME, WE CAN NOTICE THINGS MOVING AT DIFFERENT SPEEDS:

Object	Speed
Sun	Makes one turn in 24 hours or 1 day
Moon	Lazy. Lapped by the Sun every 30 days
Stars (Orion)	Laps the Sun in 1 year
Saturn	Laps the Sun in 1 year, 2 weeks
Jupiter	Laps the Sun in 1 year, 1 month
Mars	Laps the Sun in 2 years, 2 months


What's Next?



If you have learned the contents of this book you have an excellent foundation in basic astronomy.

At this point you may be surprised at what was not in this book. We did not talk about planets going around the Sun, or about galaxies or black holes. We purposely left those things out. A proper start in astronomy requires that you know the basic workings of the sky: the daily turning and the complexity caused by the angled plane of the ecliptic. All more advanced study of astronomy depends on this.

Hopefully, after studying the material in this book you are eager to learn more. Here is what we recommend to do next:



Learn the shapes of the major constellations and how to find them. Your Horizon Globe gives you the general layout of the sky and how it moves, but actually finding stars and constellations is another skill.

Work hard to find something that fascinates you. When you find it, you will know your lifework.

-Richard P. Feynman

Horizon Globe will be publishing a guide to finding stars and constellations in 2018. In the meantime we have two books to recommend that we think are the best resources out there for stargazing.

THE STARS: A NEW WAY TO SEE THEM, by H.A. Rey

This book was a major influence on getting us into astronomy and showing us how to do it. It makes a great sky encyclopedia, but does not offer a guidepost-type way to systematically learn the constellations.

THE STARS: LEARN THE BRIGHT STARS AND IMPORTANT CONSTELLATIONS by Tom VanDamme and David Harriman

This book is available through Amazon. It outlines an easy way to learn the major constellations based on the Guidepost system. We believe the book shows a great way to learn the stars and constellations, but the production quality may interfere with ease of use.

If you wish to advance into applying math to astronomy, Falling Apple Science Institute has published two more books that show step-by-step how to measure the Earth, understand sundials, measure the sky, understand and predict solar and lunar eclipses, and other mathematical astronomy.

EARLY ASTRONOMICAL MEASUREMENT I by Tom VanDamme and David Harriman

EARLY ASTRONOMICAL MEASUREMENT II Tom VanDamme and David Harriman

both of these books are available through Amazon.

Moon and Planet Calendars 2017-2030

The Moon and Planet Calendars are easy to use.

- Place the Sun on your Horizon Globe on the day of interest and turn the Sun to noon.
- Check the date to find the Moon phase.
- Hold the calendar over the North Pole and place each planet according to its clock position. Use the Zodiac, Guideposts, Solstice and Equinox lines to confirm positioning.

The Moon and Planet Calendars provide a snapshot of where the planets are on the 21st of each month. We chose the 21st to align with the Solstices and Equinoxes. Of course the planets don't jump from month to month, they move continuously. For greater accuracy, use the adjacent months to interpolate planet positions.

Year

Start by finding the year of interest

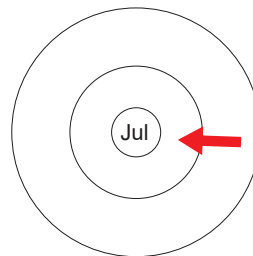
1969



Year is listed at the top of the page

Month

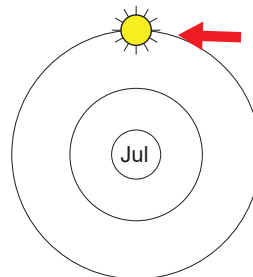
Next, find the month of interest



Month is in the center of the circles

Day & Hour

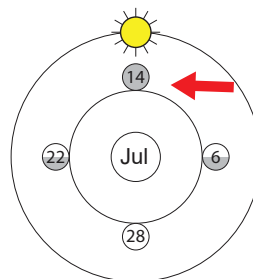
Place the Sun on your Horizon Globe on the day of interest. Turn it to noon.



The Sun is always shown at noon on the ecliptic ring. You are looking down at the Ecliptic Ring from the North Pole.

Moon Phase

Find the phase of the Moon for the day of interest. Interpolate to find the dates of Crescent and Gibbous Moons. (see page 60).

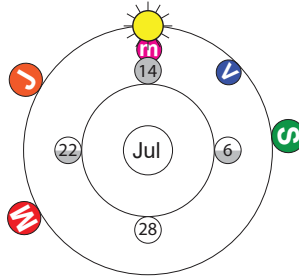


Moon phases. New Moon near the Sun, Full Moon opposite. Numbers indicate the date of each phase.

Planets

Planets are shown as colored circles with letters inside. As you look down from the North Pole, place each planet in its clock position from the noon Sun.

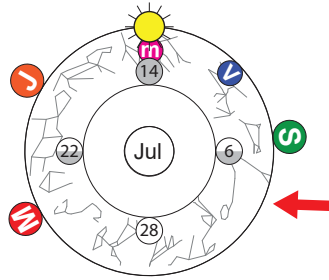
- J** Jupiter
- M** Mars
- S** Saturn
- m** Mercury
- V** Venus



If a planet seems to be missing, it may be covered up, or *occulted*, by another planet. Check adjacent months to confirm.

Zodiac

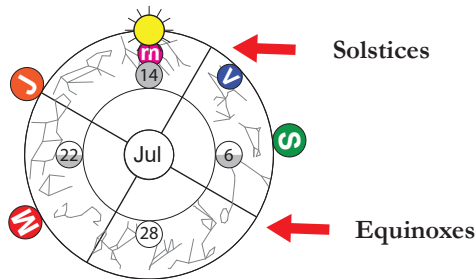
Notice that the Zodiac constellations are shown for reference. You don't need a chart to know where these are, they are the same every year.



Zodiac constellations in order.

Solstice and Equinox

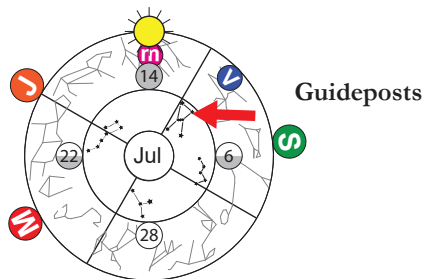
The straight lines mark the Solstices and Equinoxes. They are not labeled, but you can tell which is which by the month and the Zodiac.



Solstice and Equinox lines rotate from month to month along with the Zodiac.

Guidepost Constellations

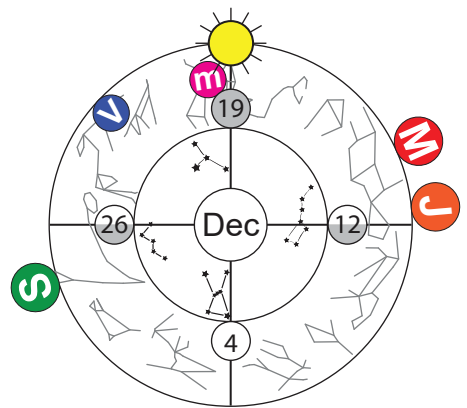
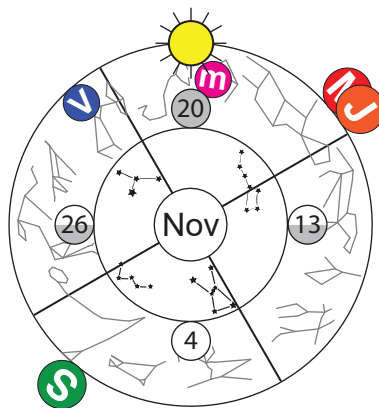
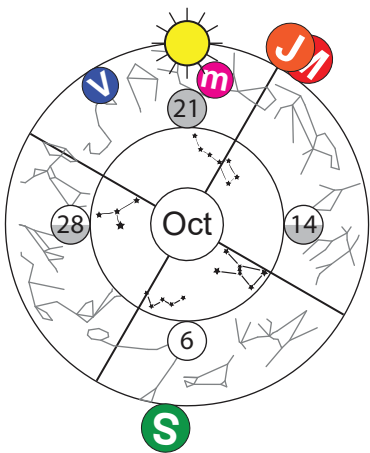
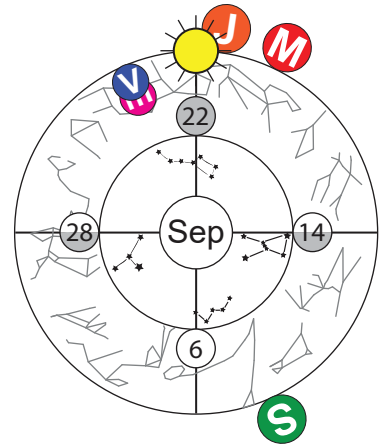
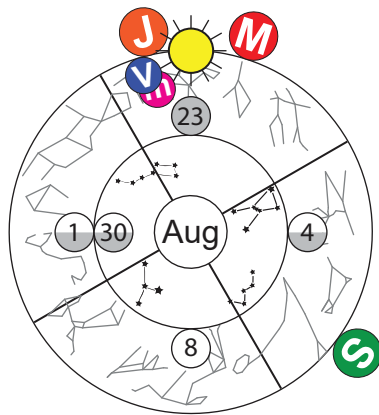
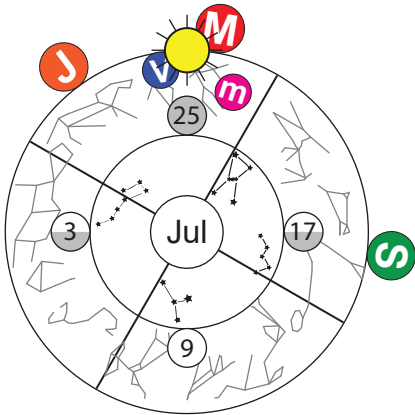
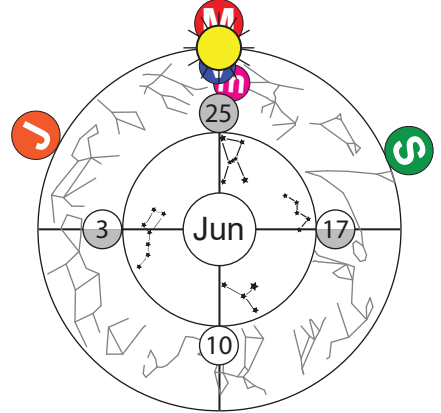
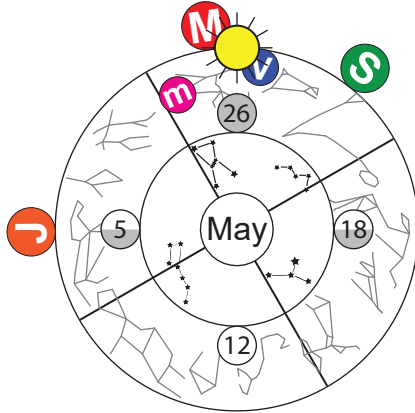
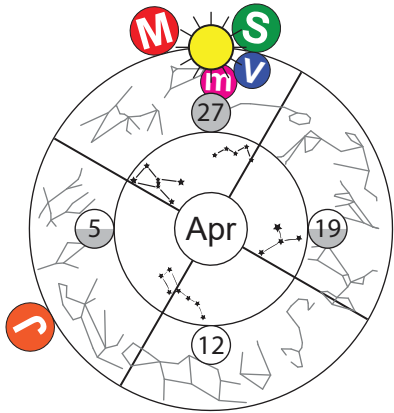
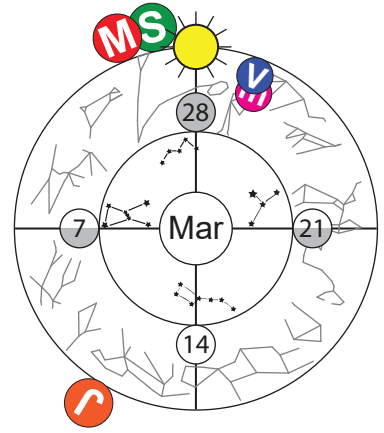
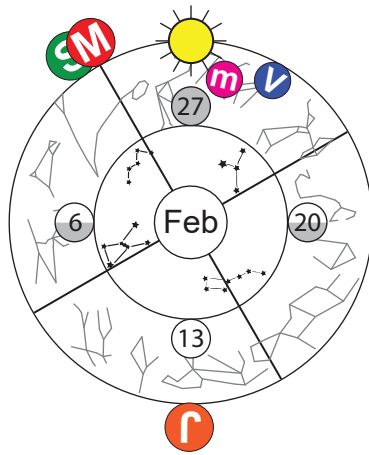
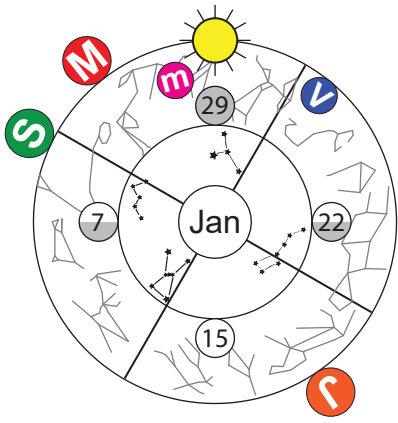
Guidepost Constellations are included for reference. Only the clock position of these is correct, they are north or south of the ecliptic.



Remember the Guidepost story:
The Dipper stalks Orion.
Cygnus flies to the Dipper.
The Queen chases Cygnus.
Orion pursues Cassiopeia.

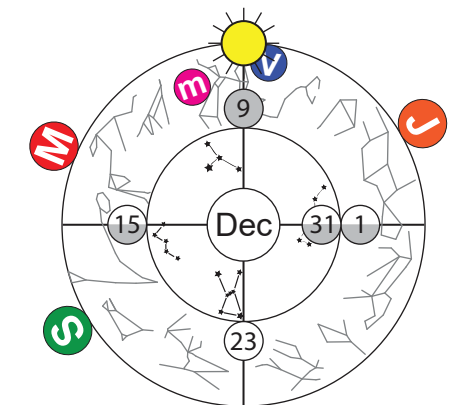
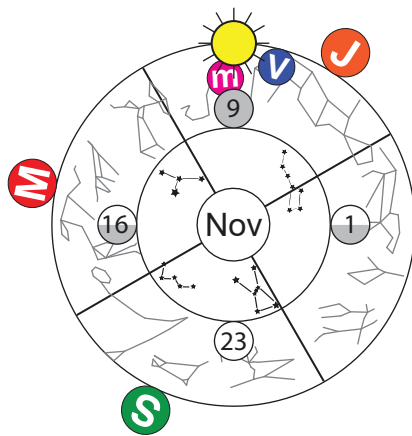
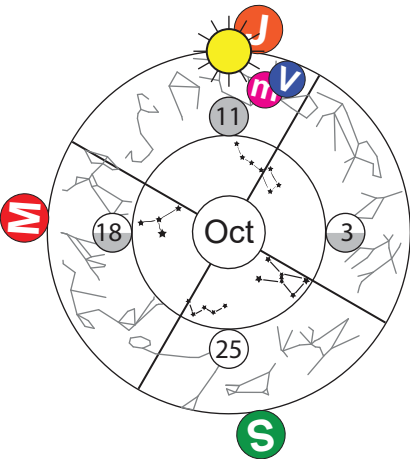
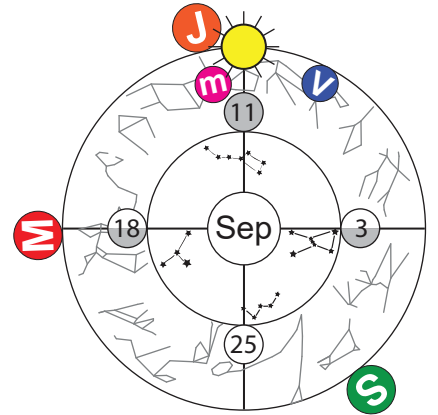
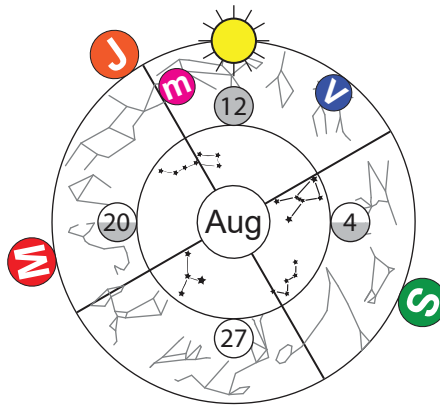
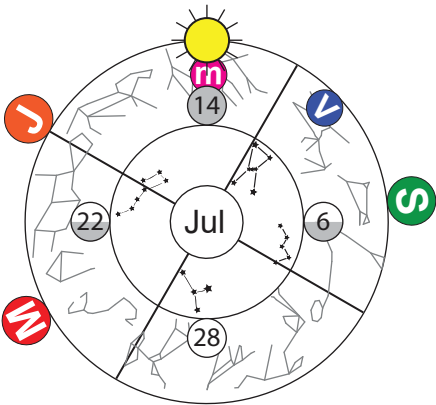
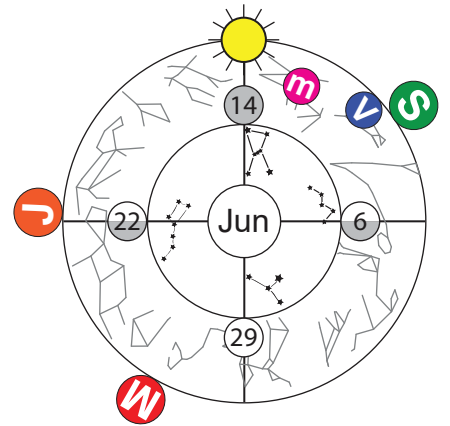
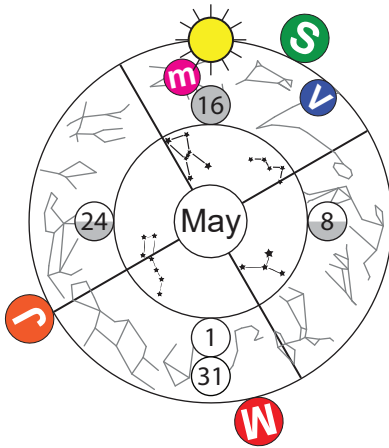
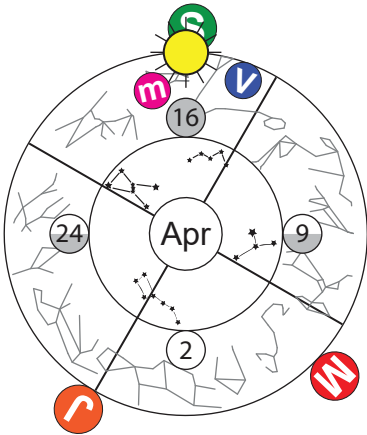
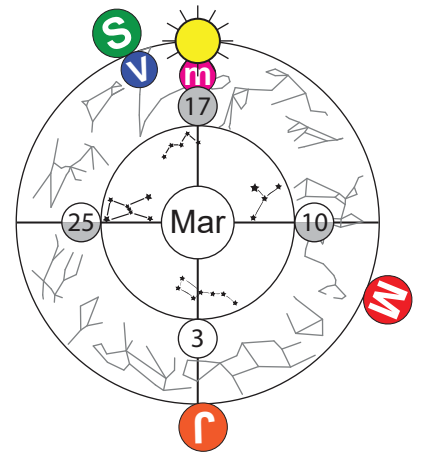
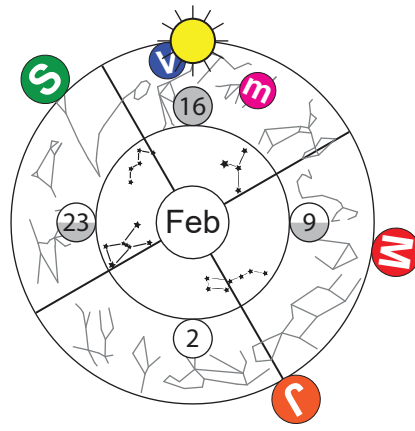
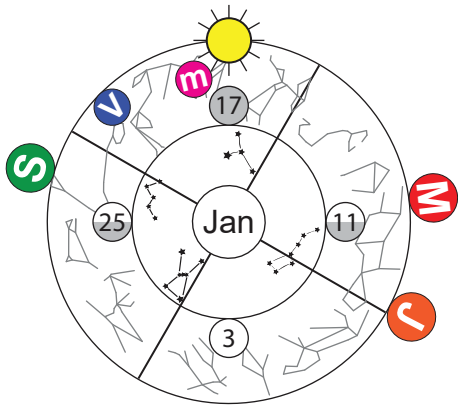
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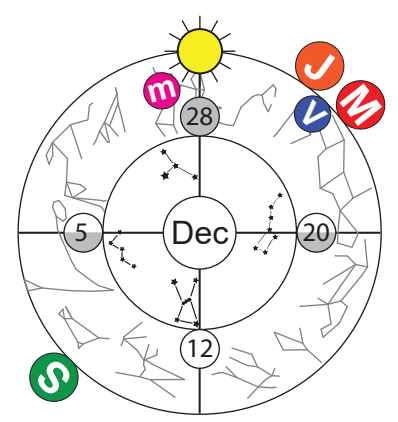
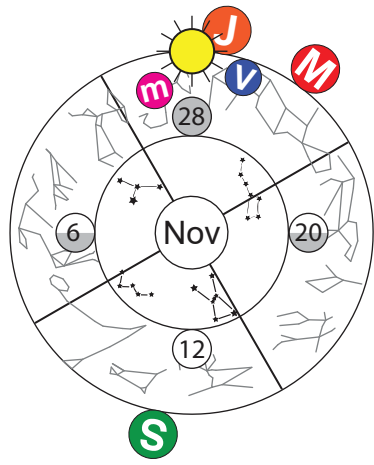
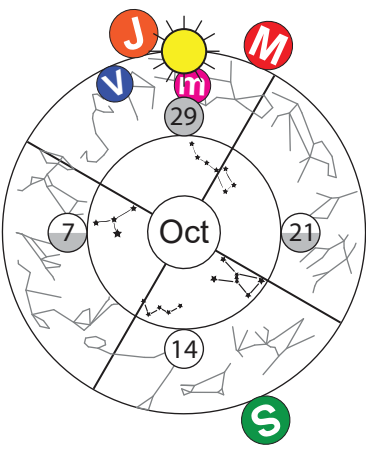
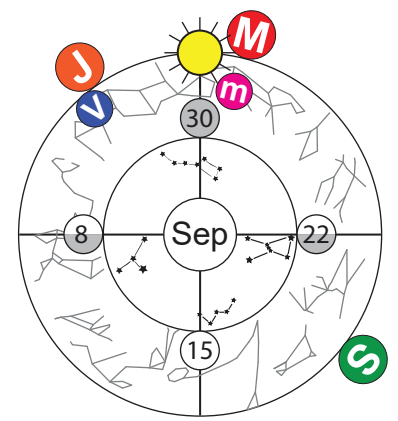
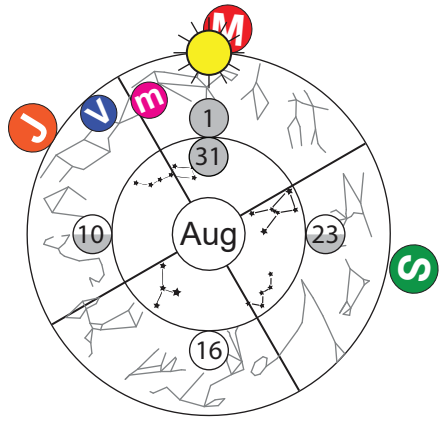
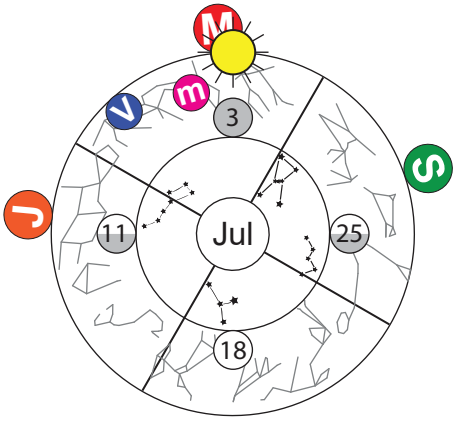
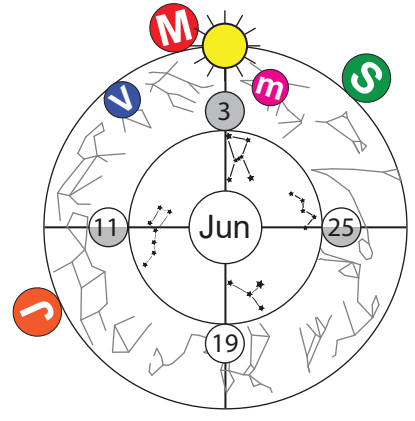
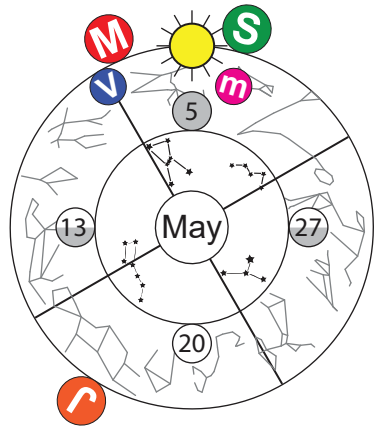
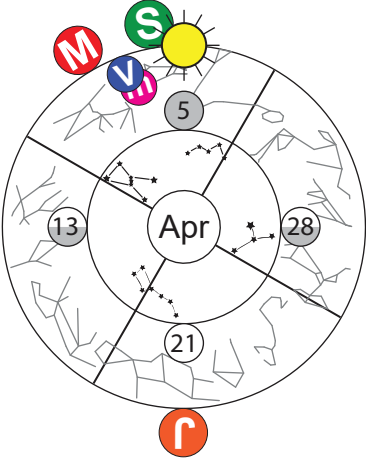
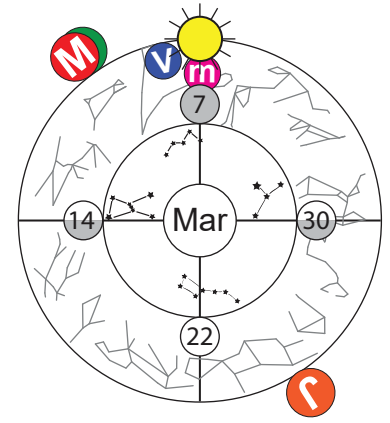
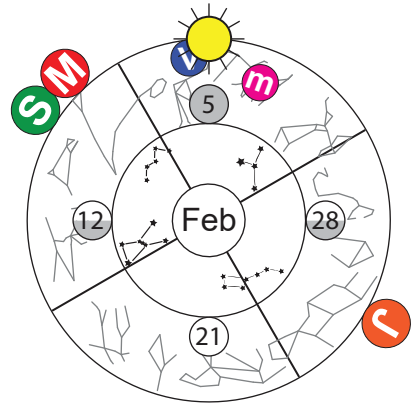
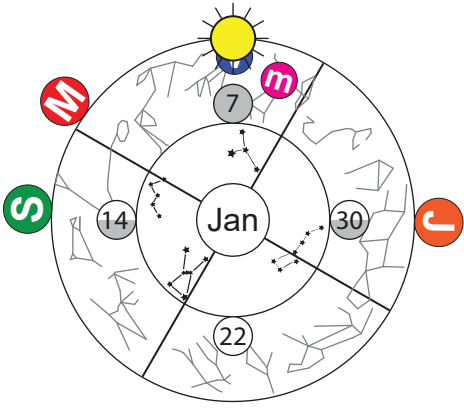
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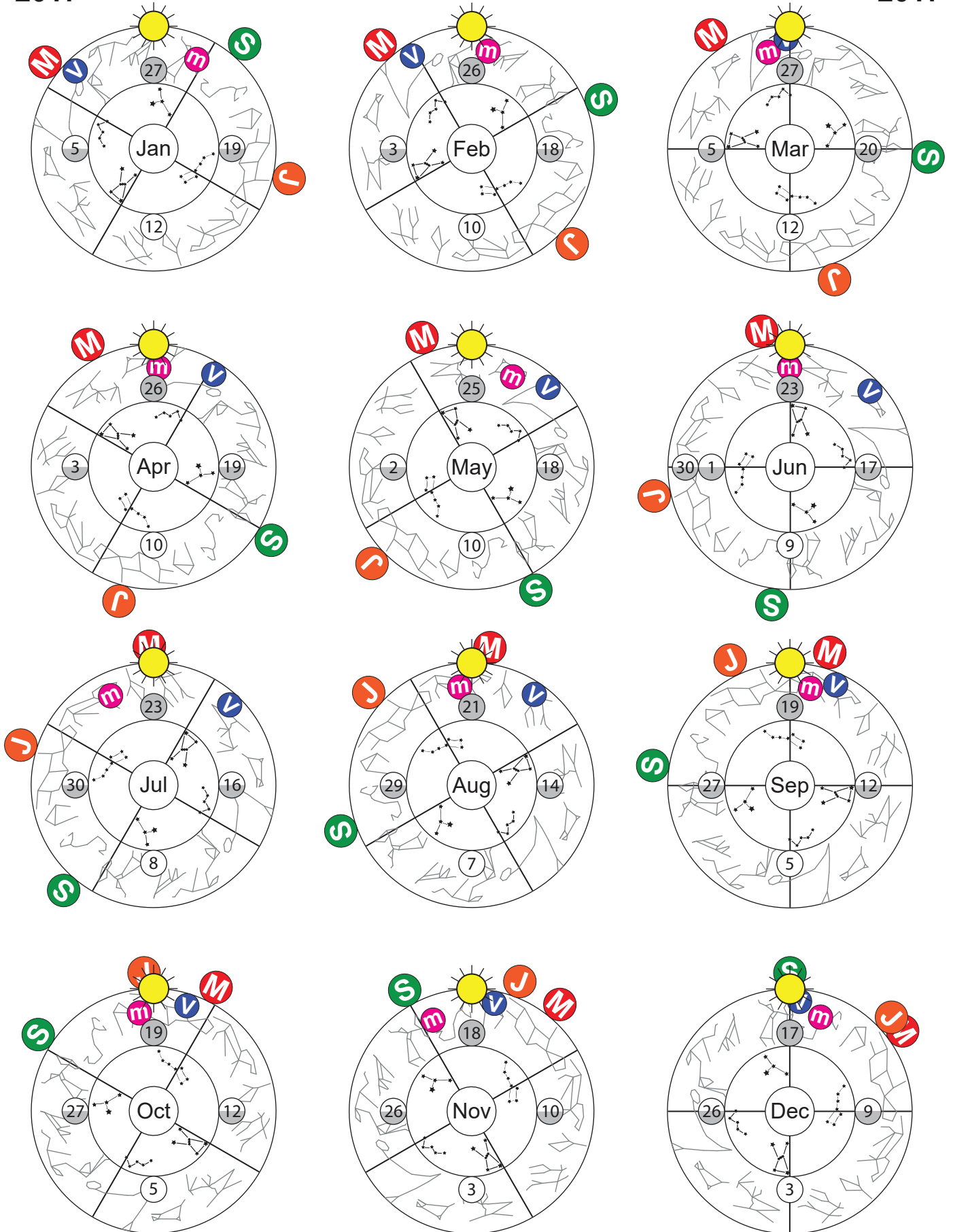
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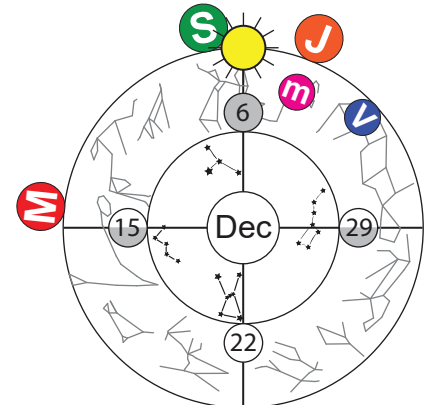
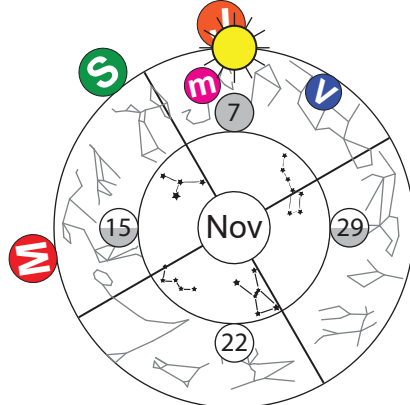
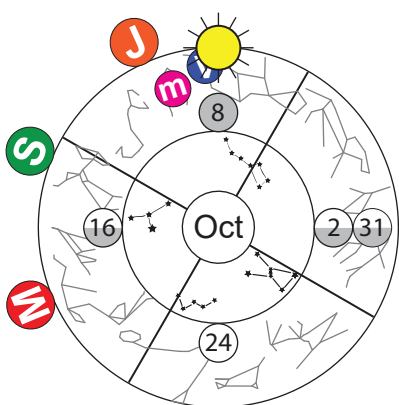
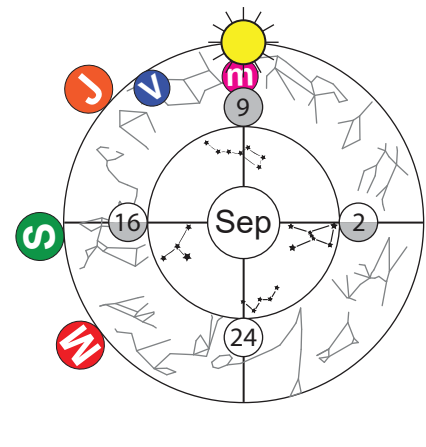
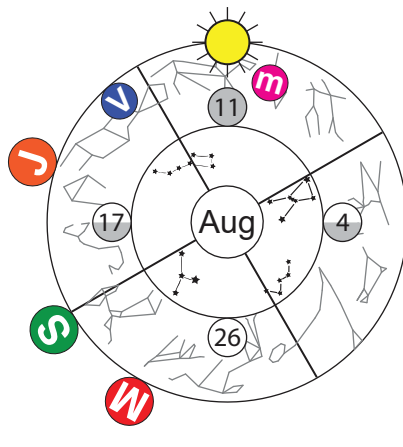
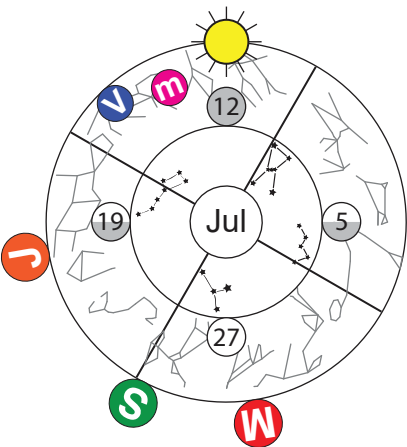
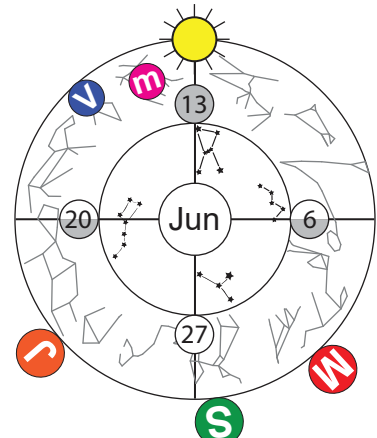
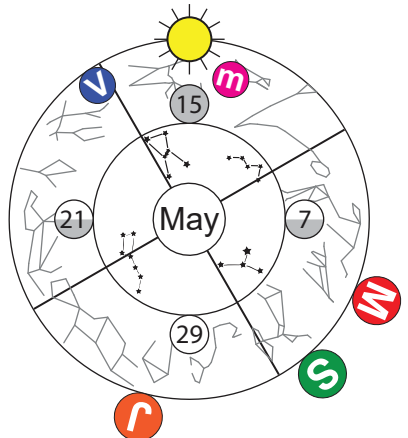
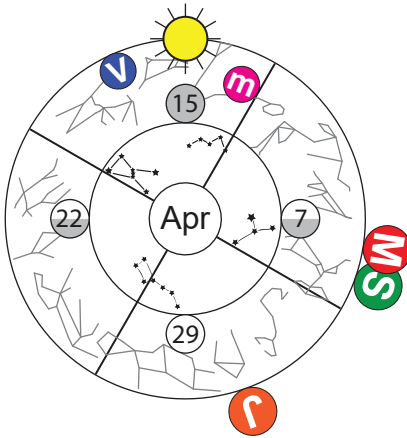
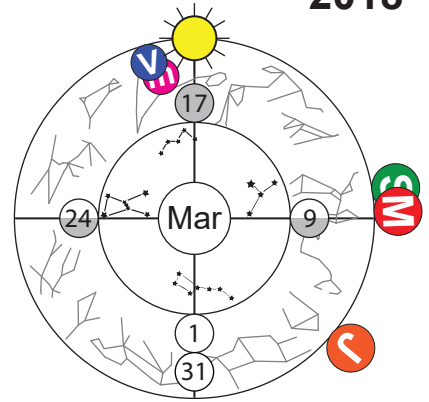
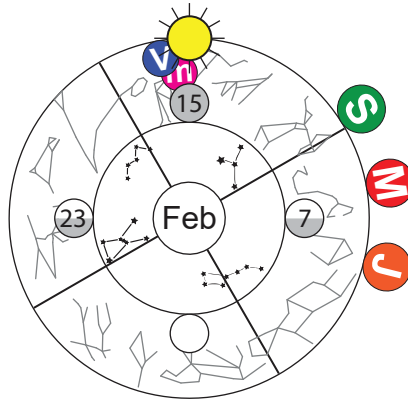
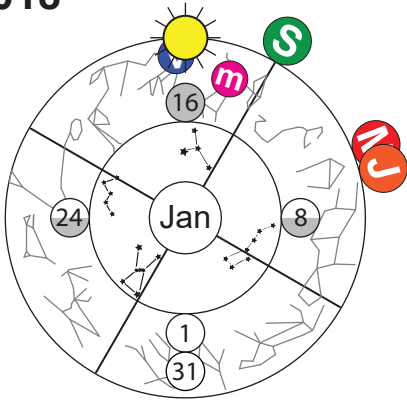
2017

2017



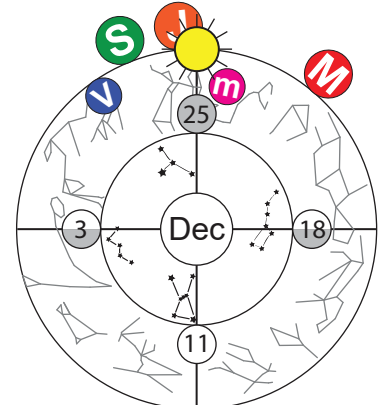
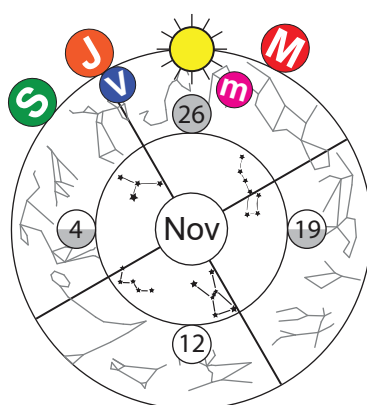
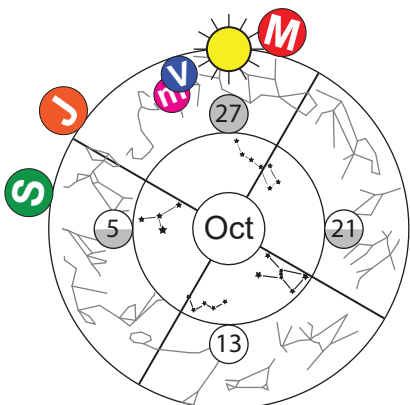
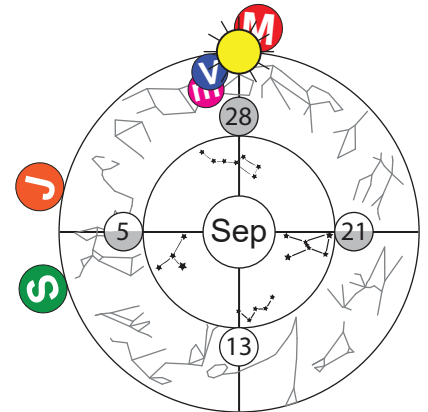
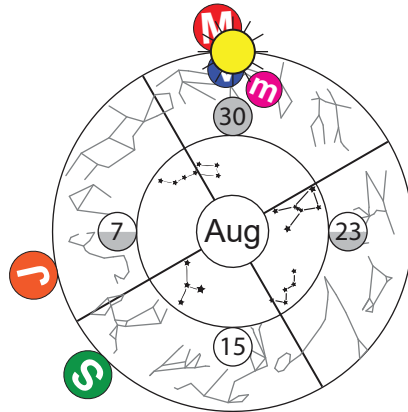
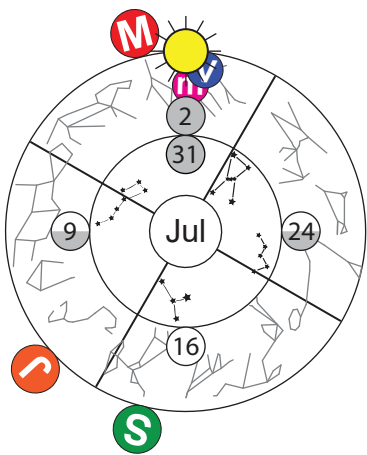
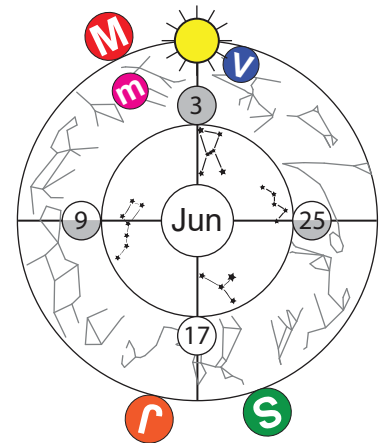
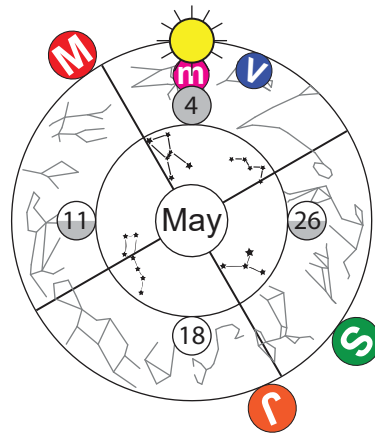
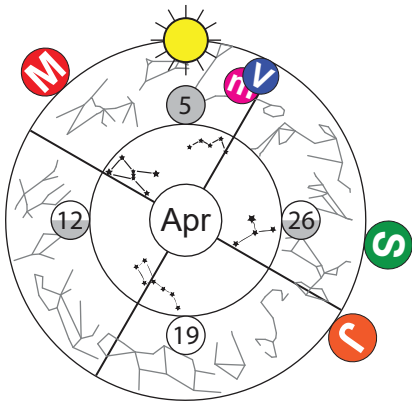
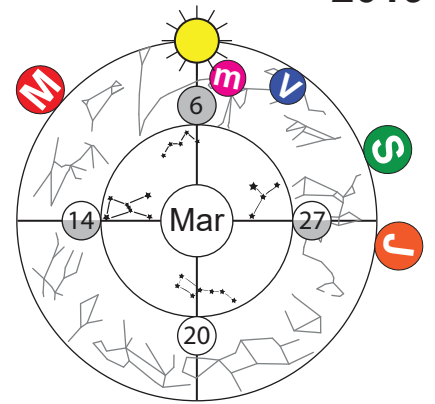
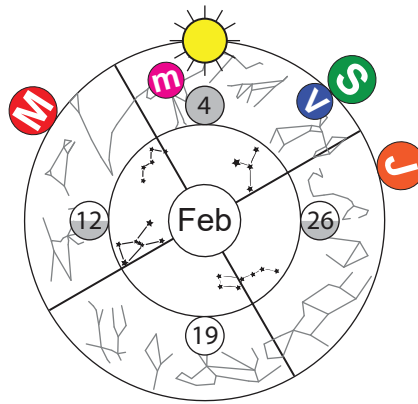
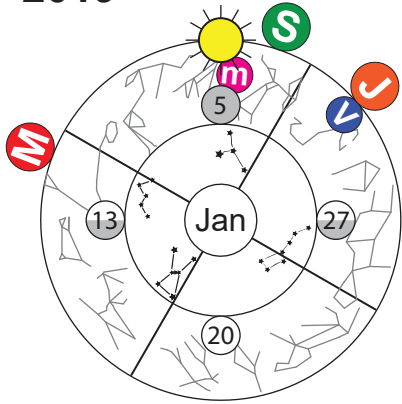
2018

2018



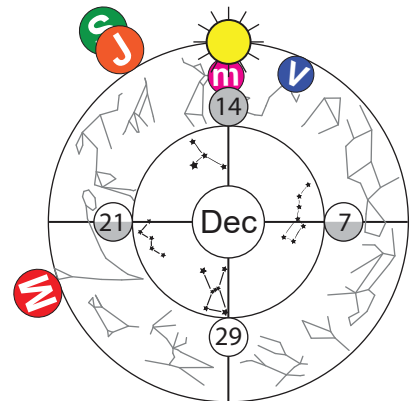
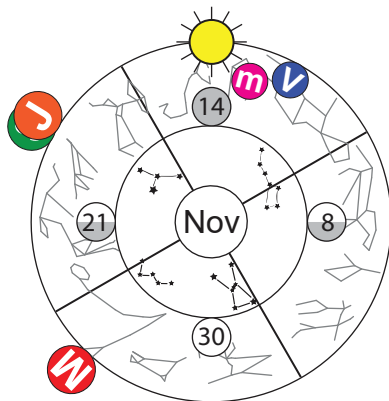
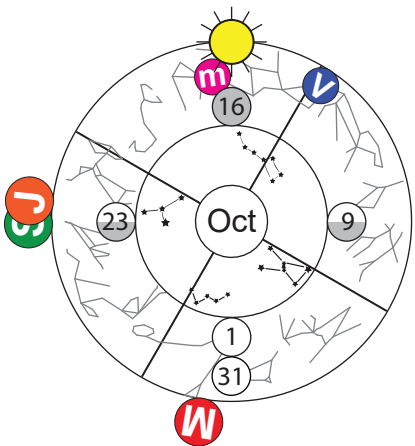
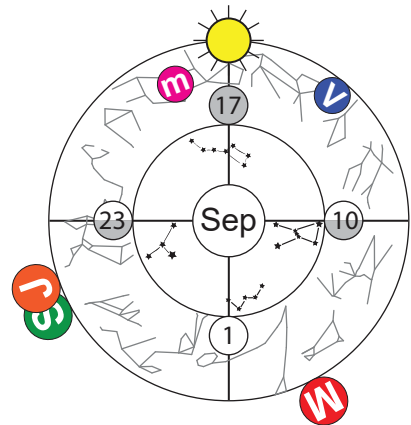
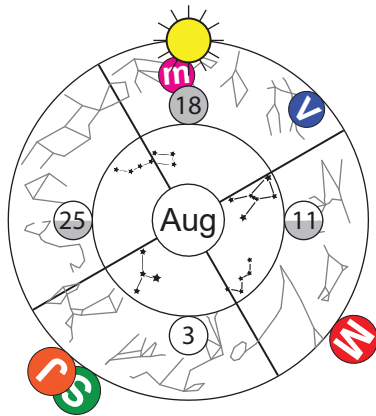
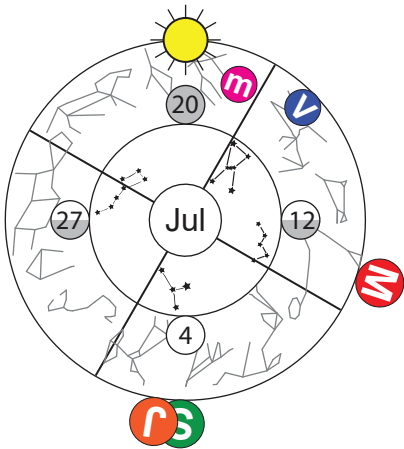
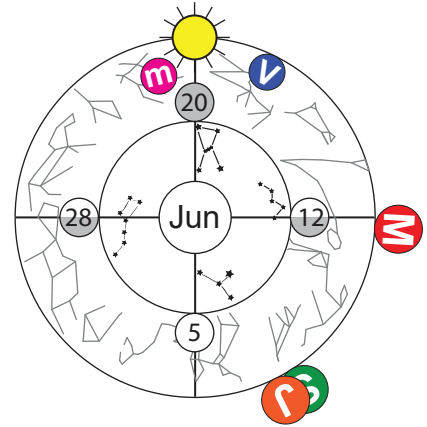
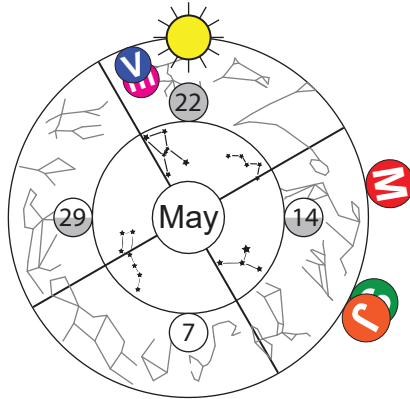
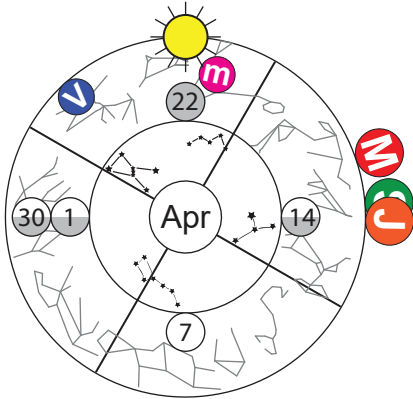
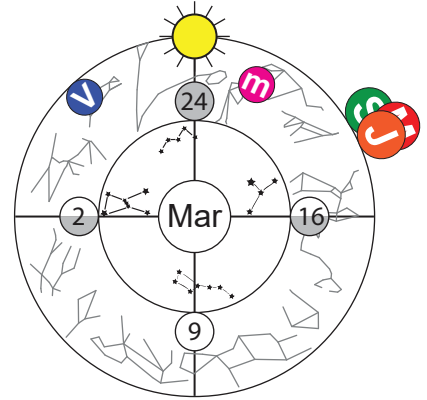
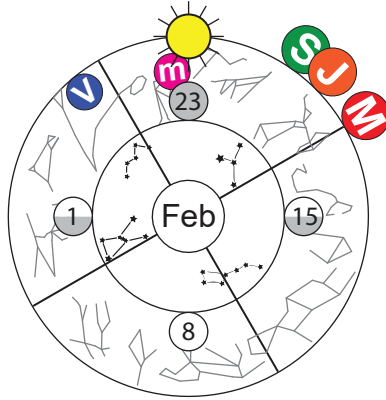
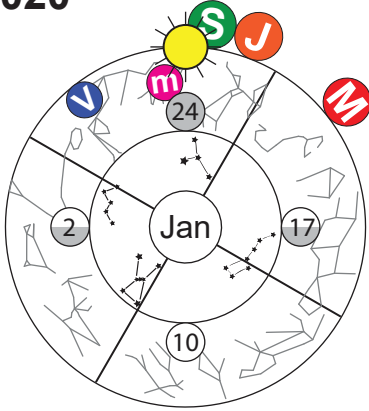
2019

2019



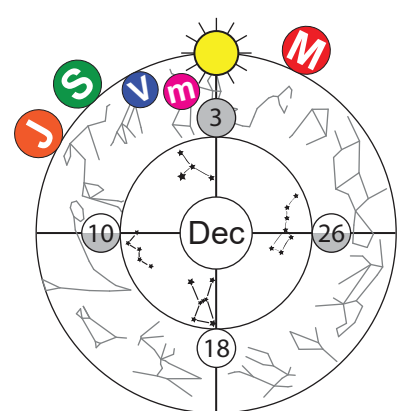
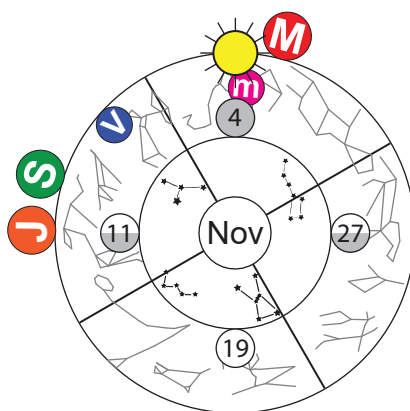
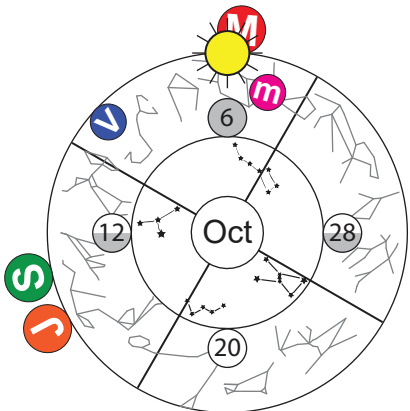
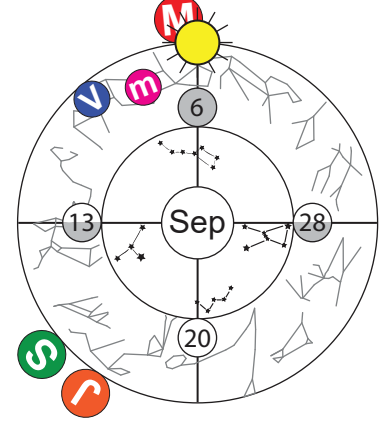
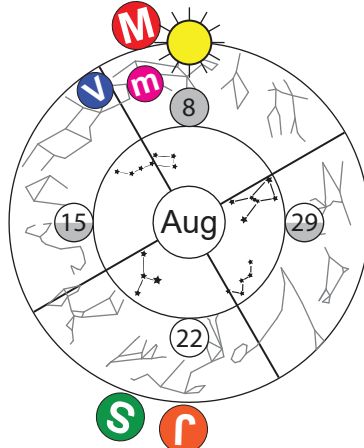
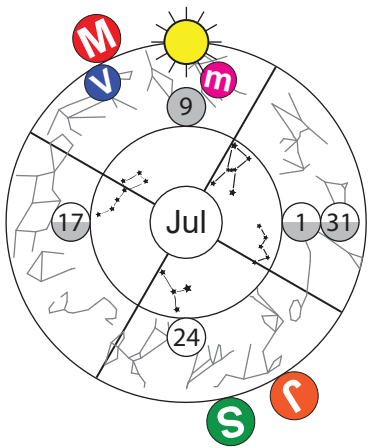
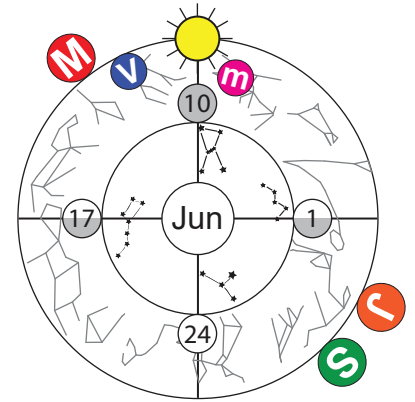
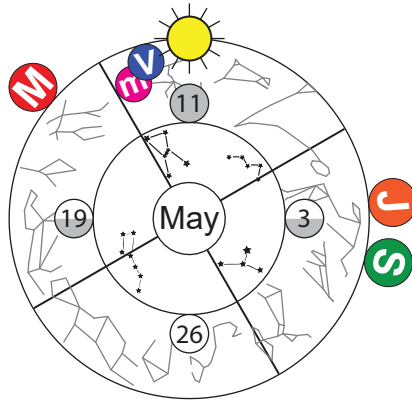
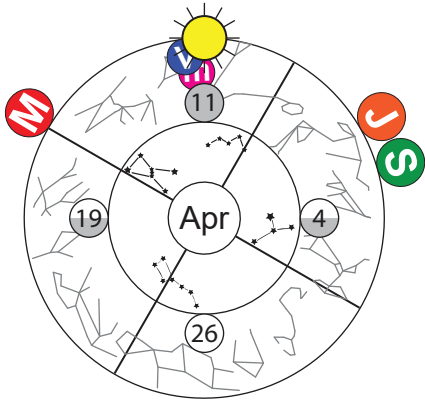
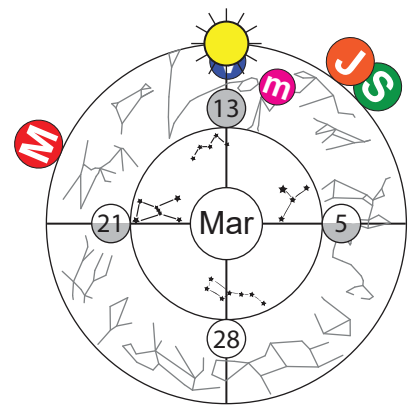
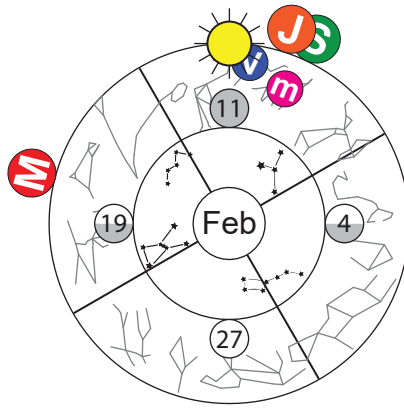
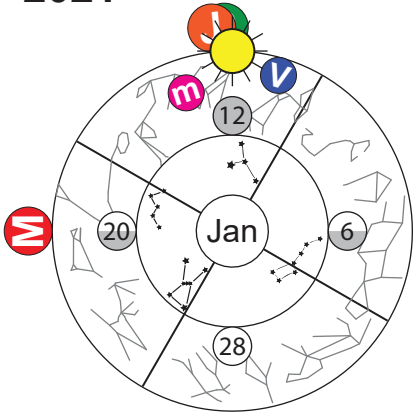
2020

2020



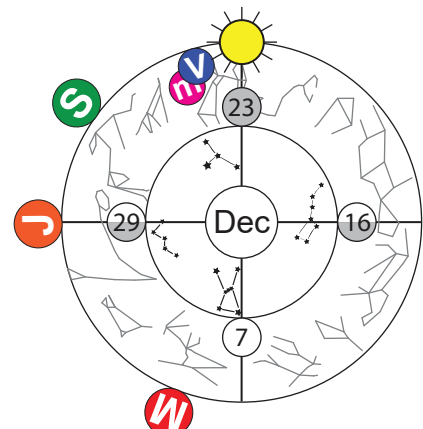
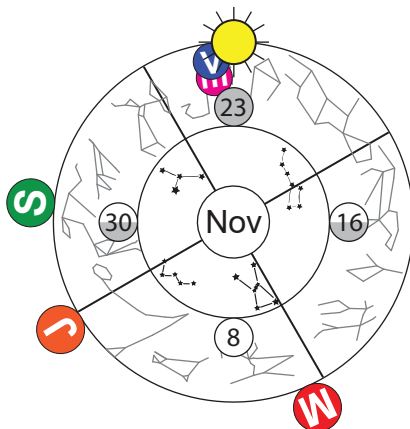
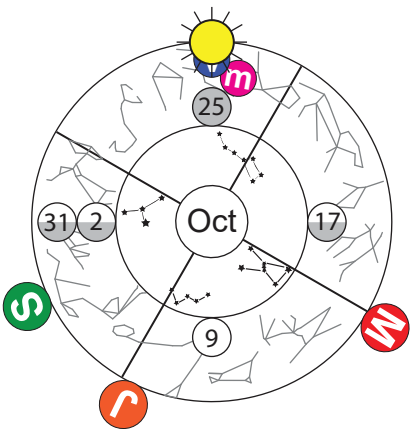
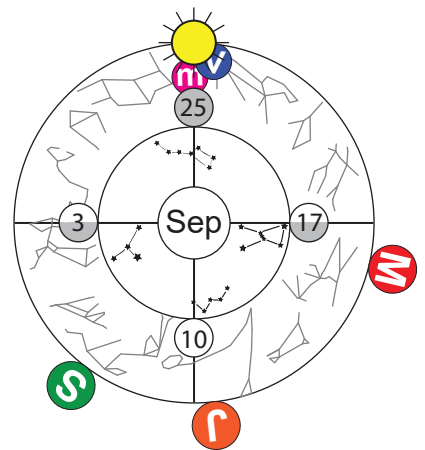
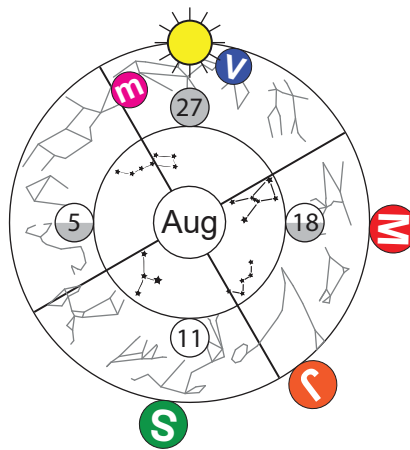
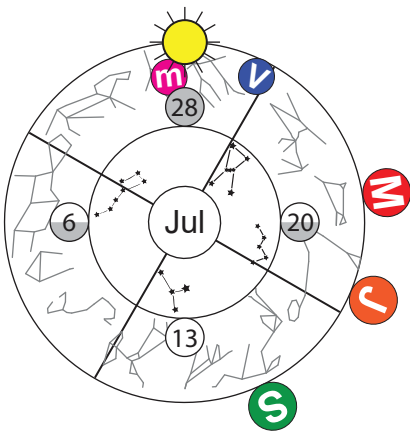
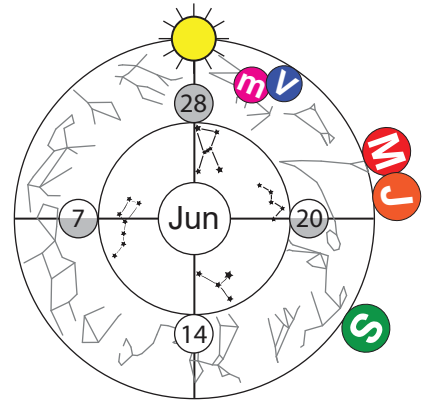
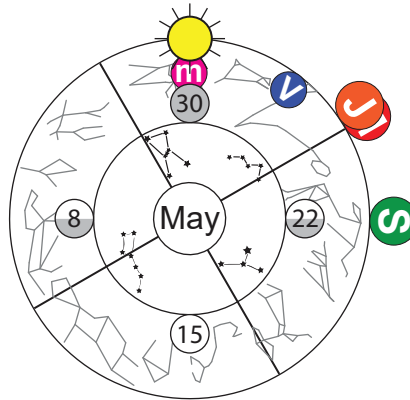
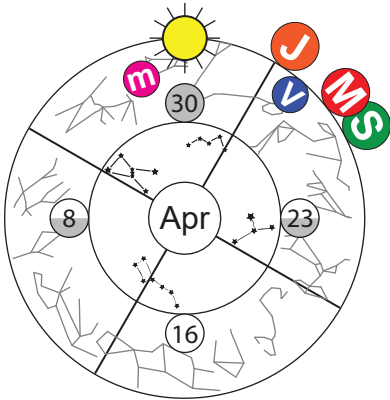
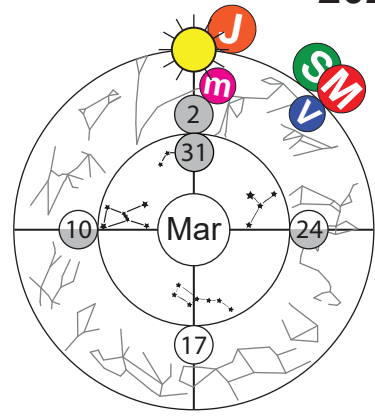
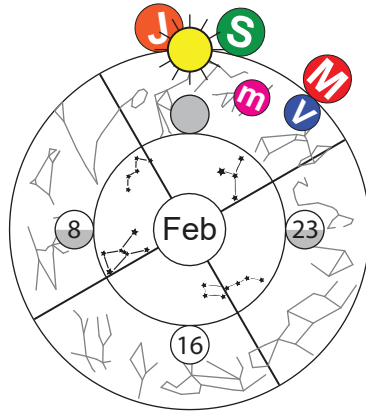
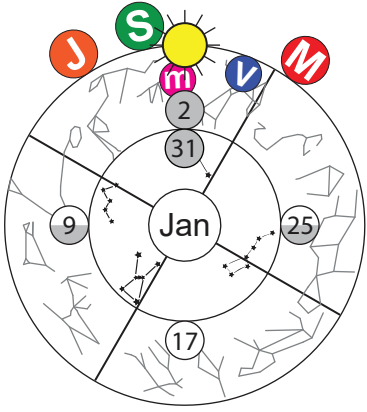
2021

2021



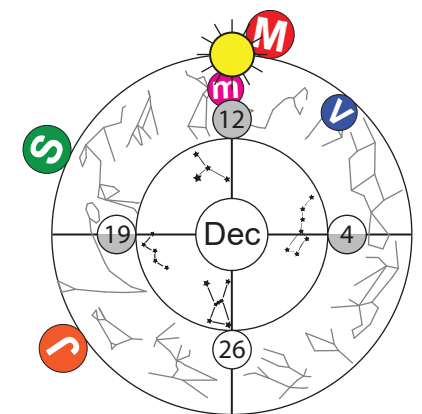
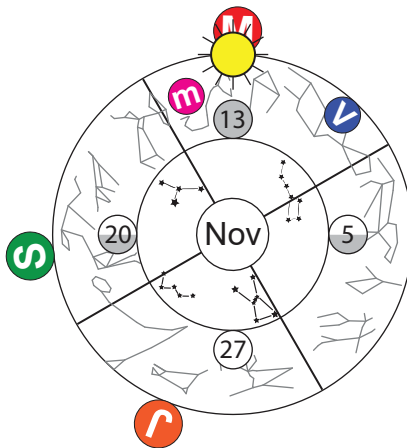
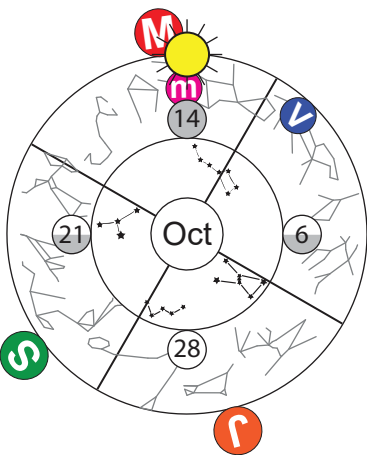
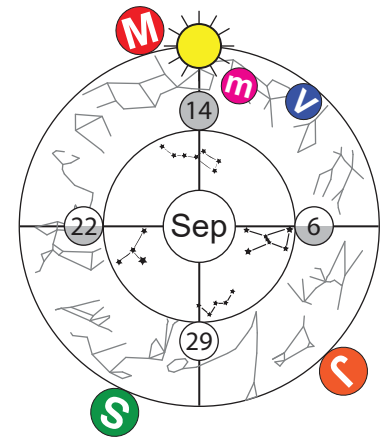
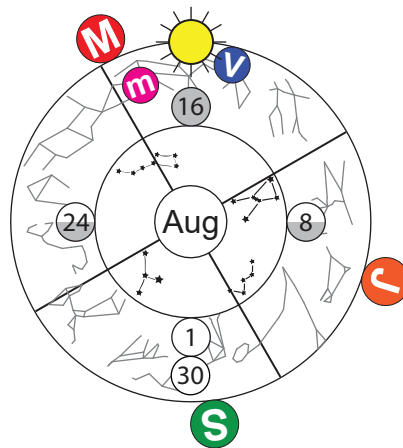
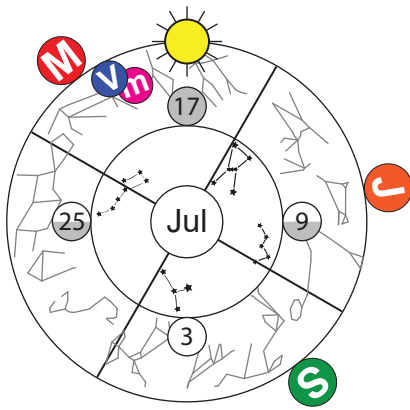
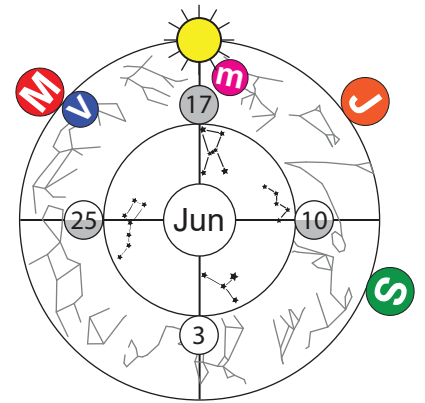
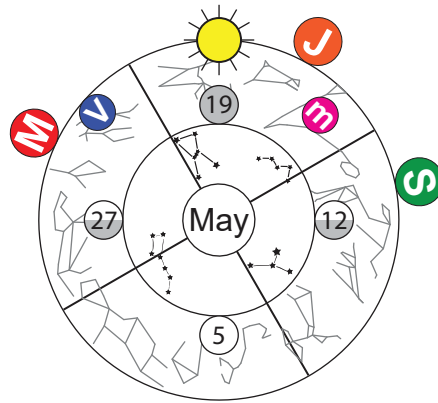
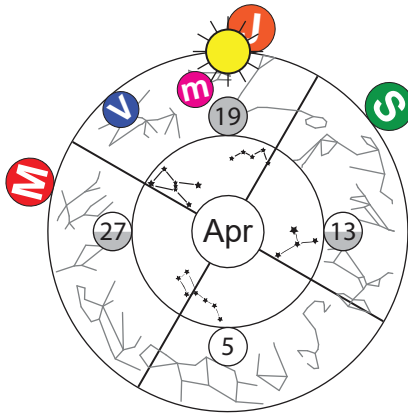
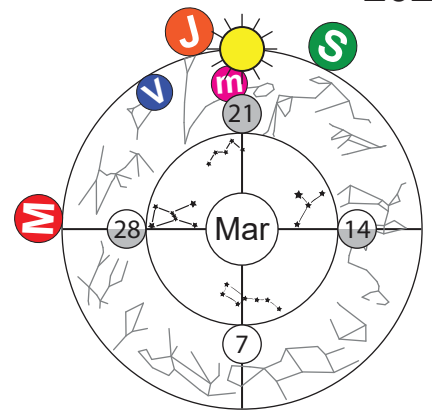
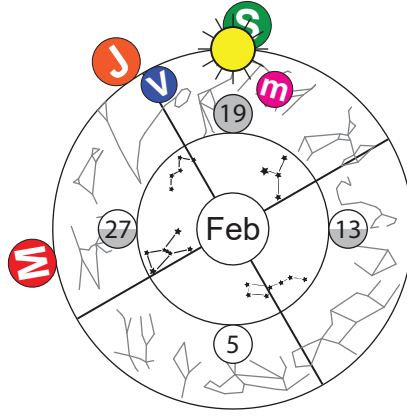
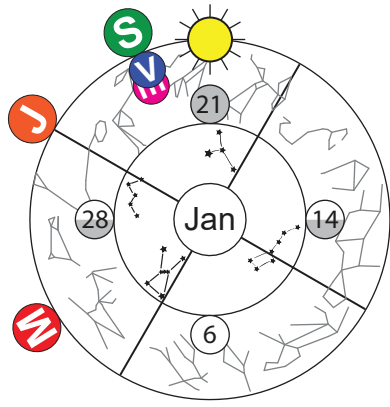
2022

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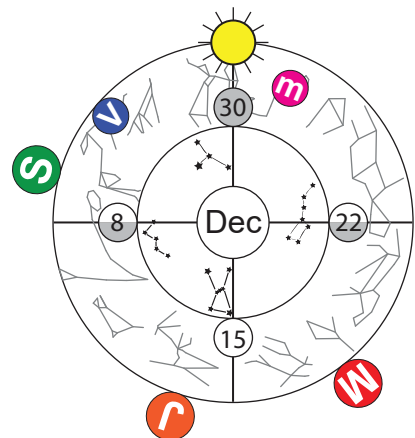
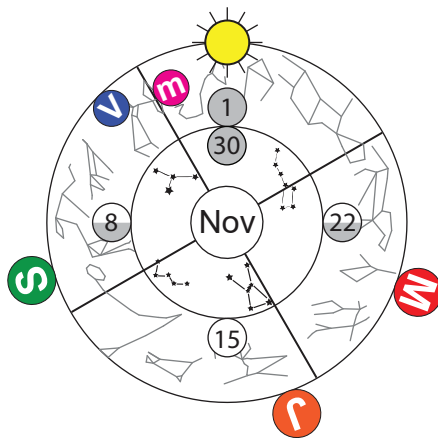
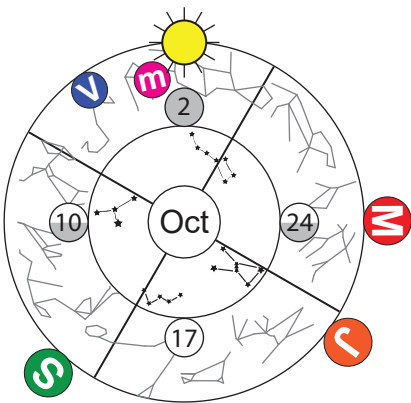
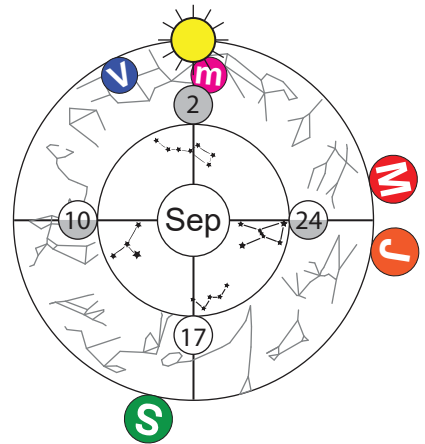
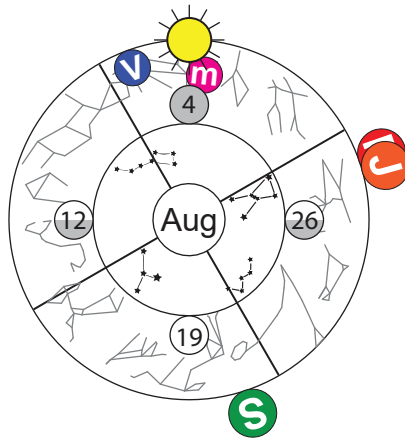
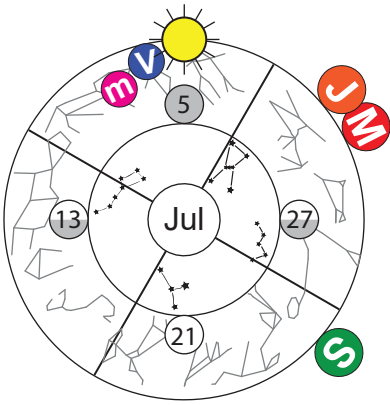
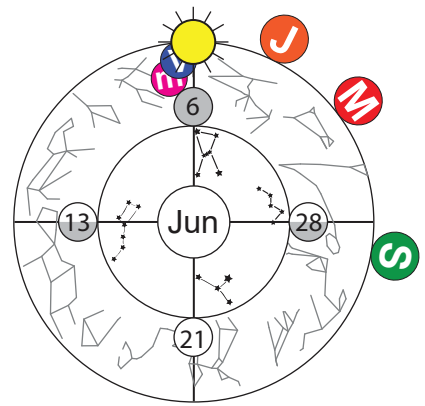
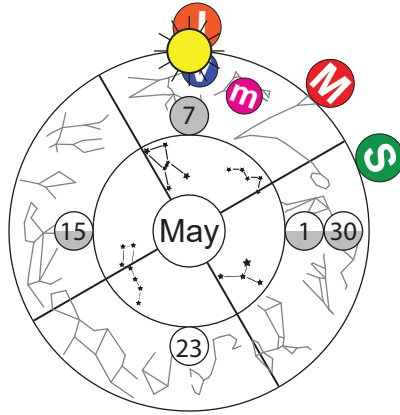
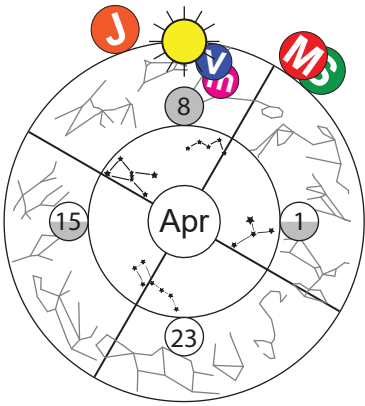
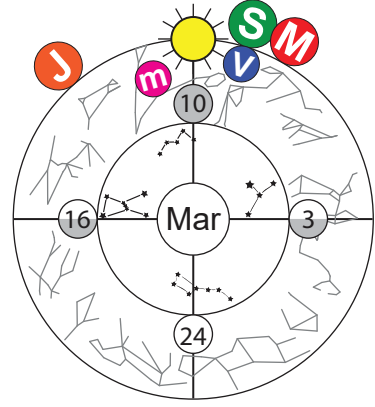
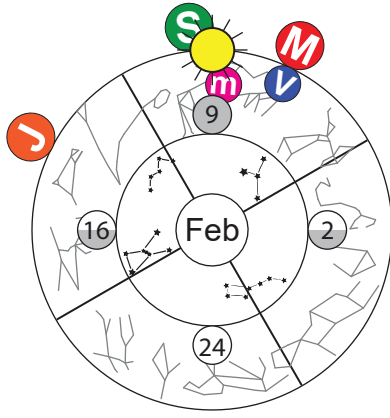
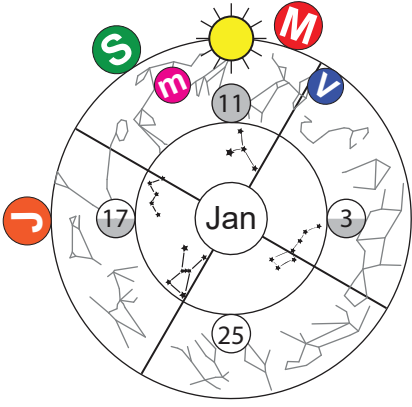
2023

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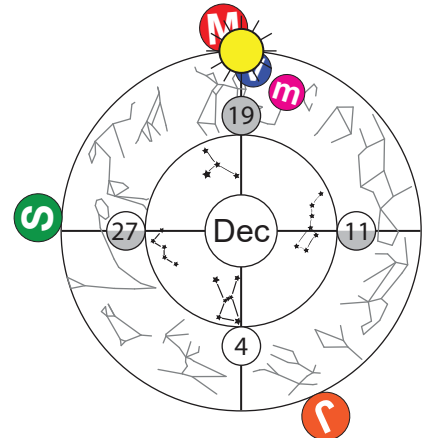
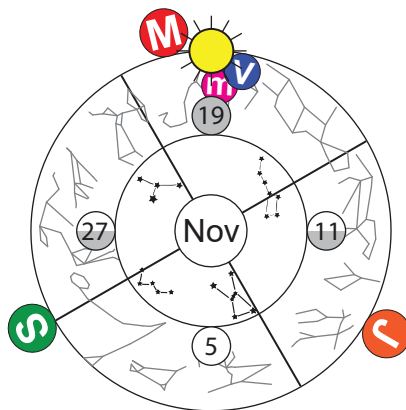
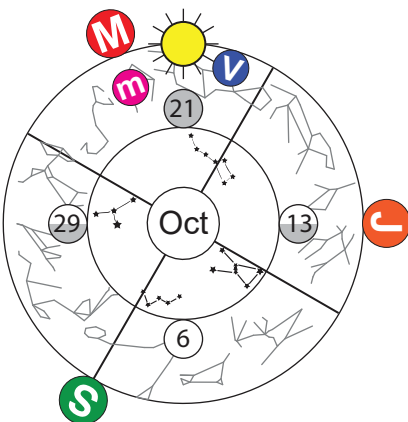
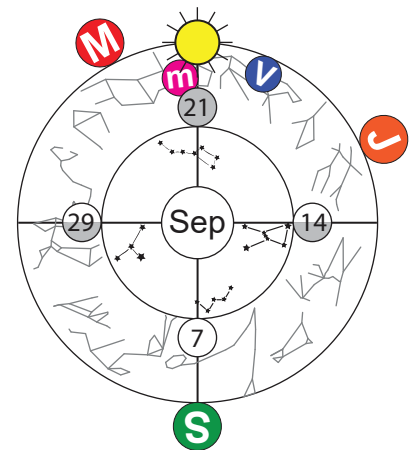
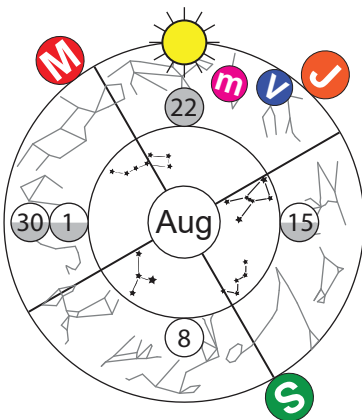
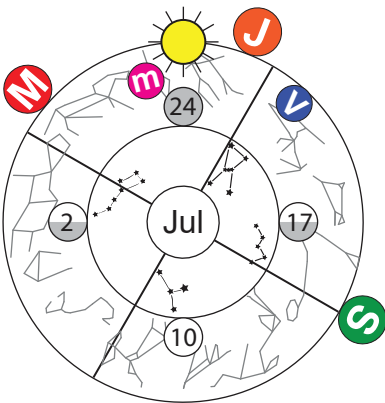
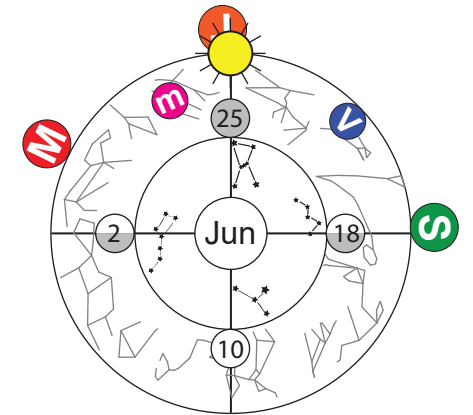
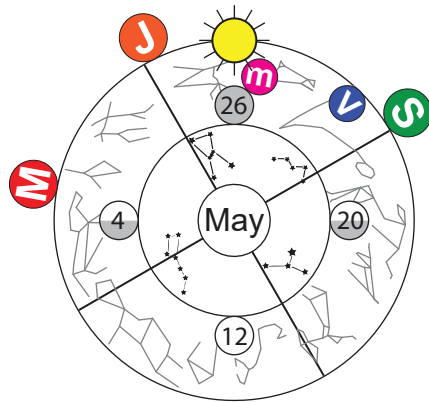
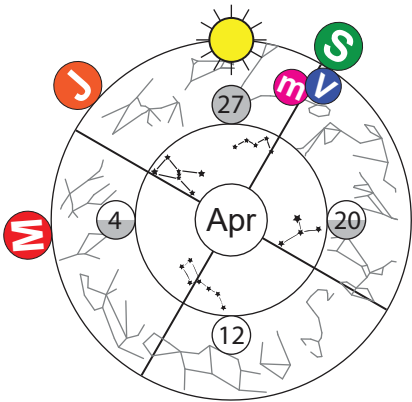
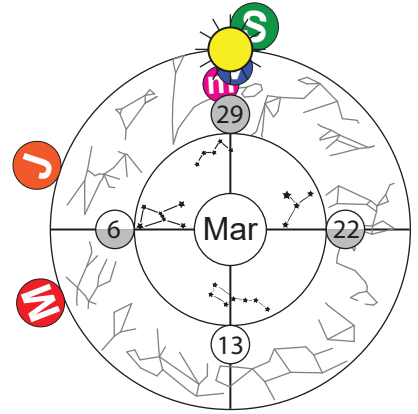
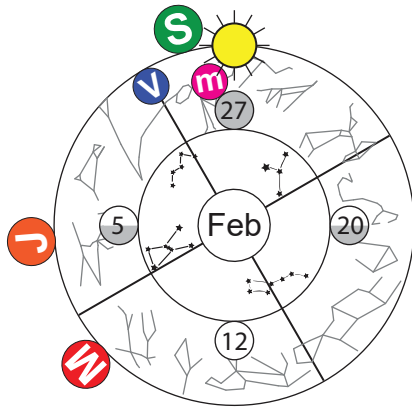
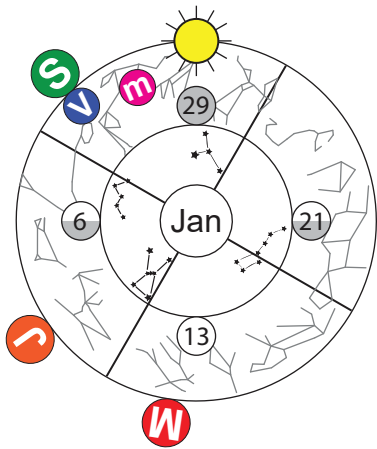
2024

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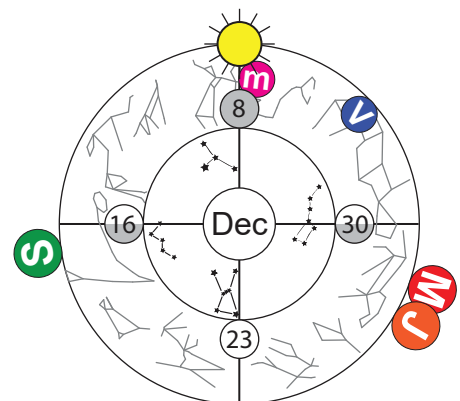
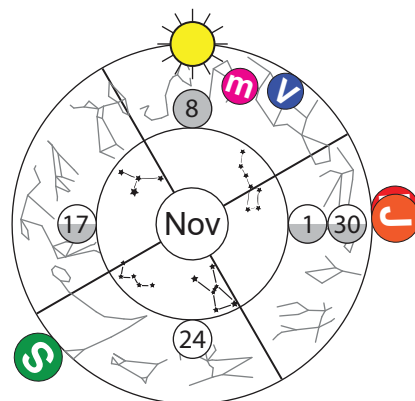
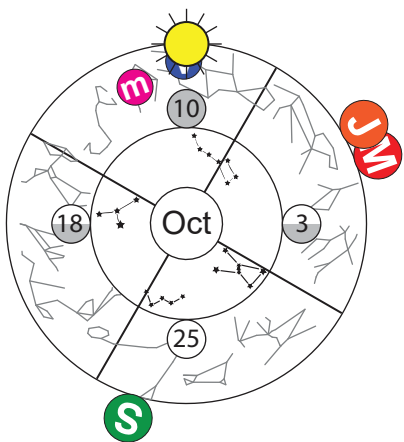
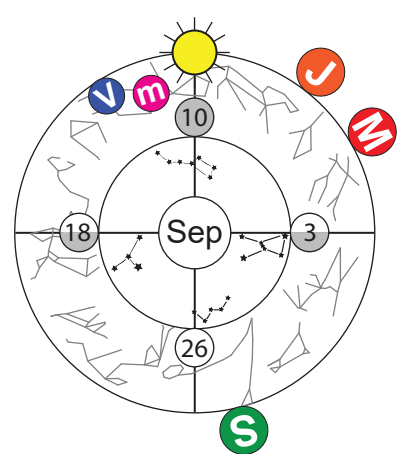
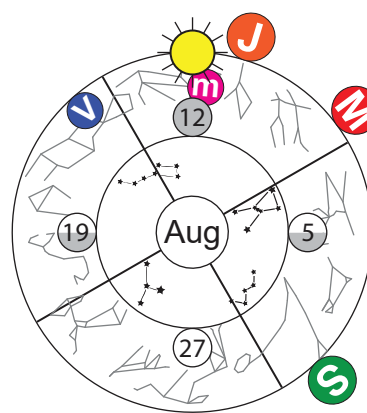
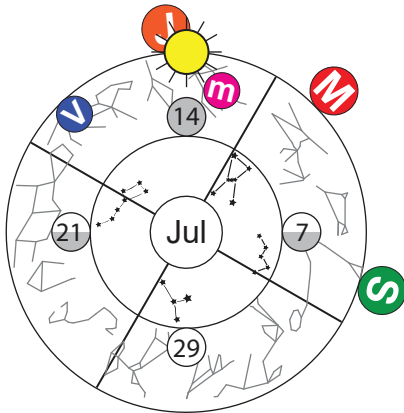
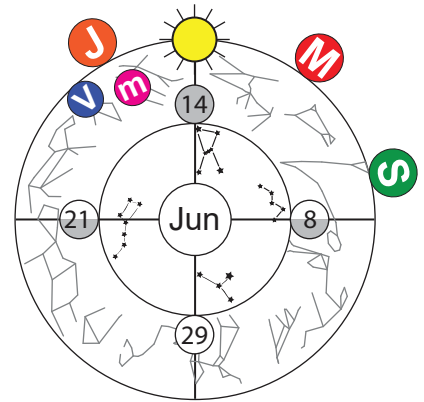
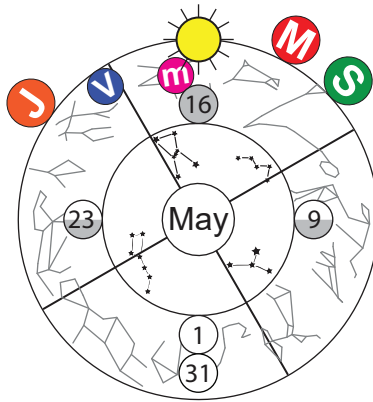
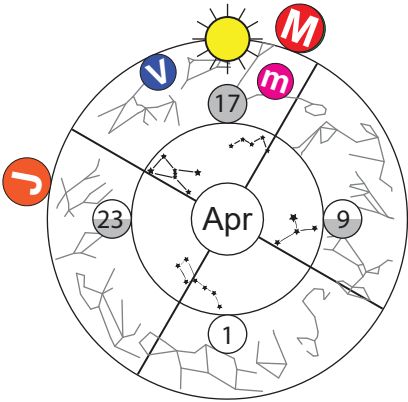
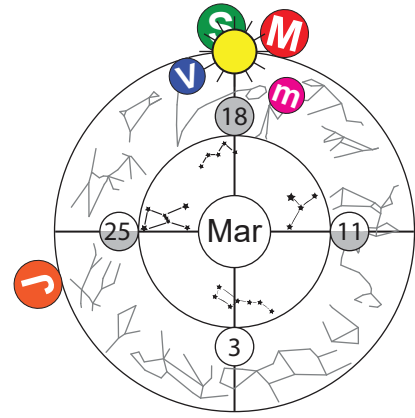
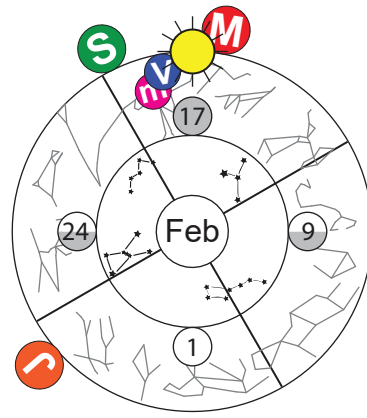
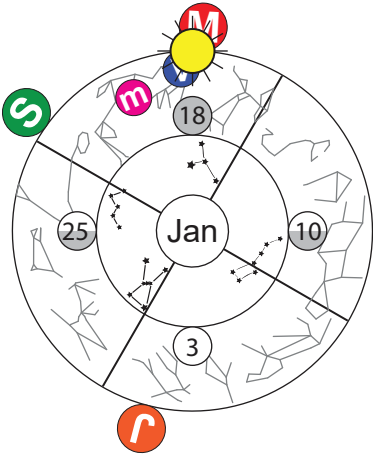
2025

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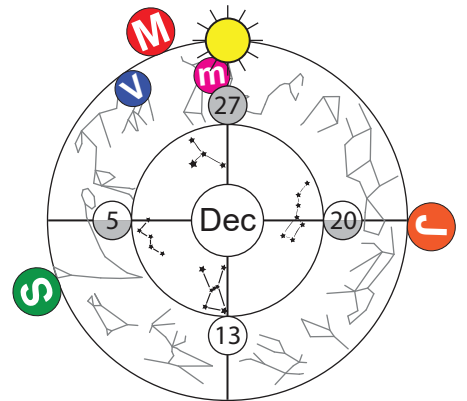
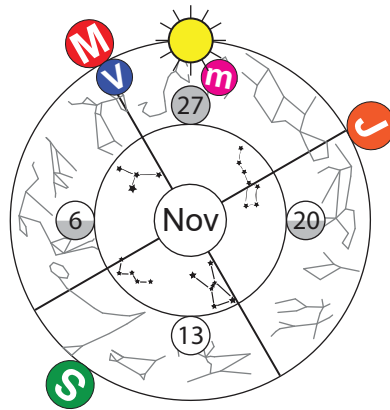
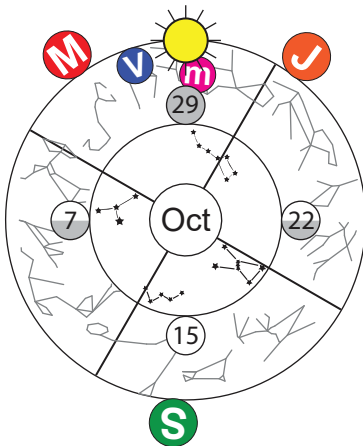
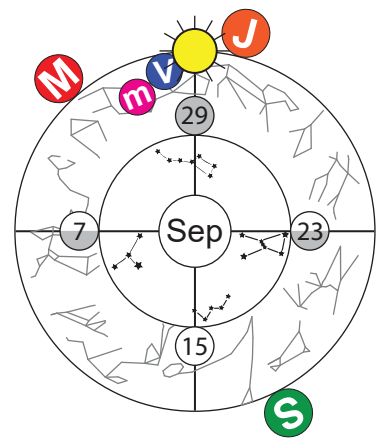
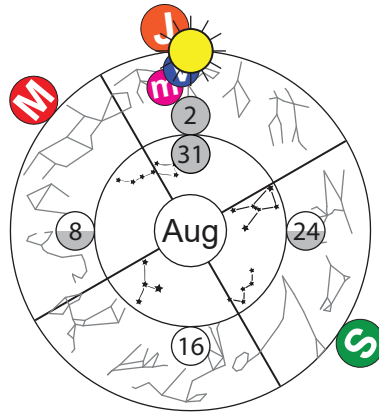
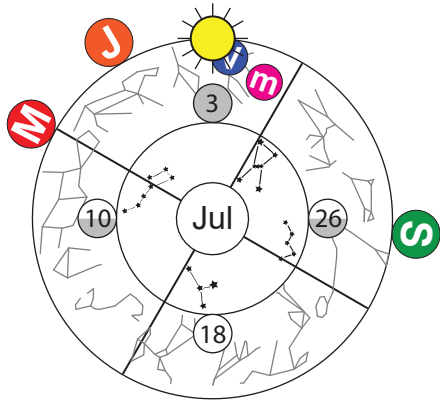
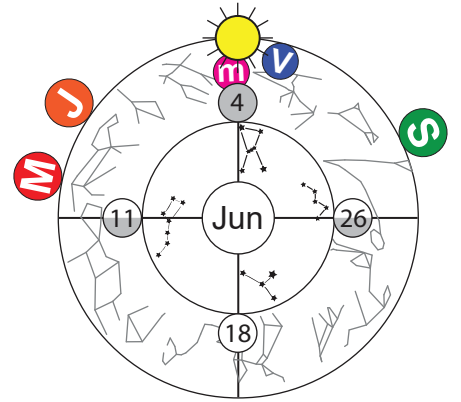
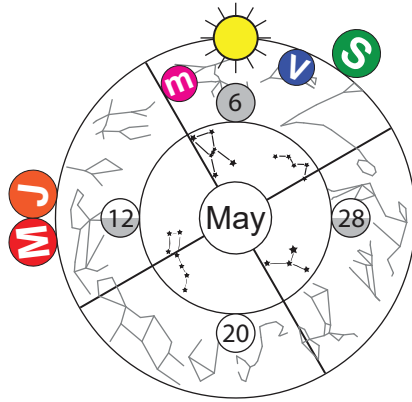
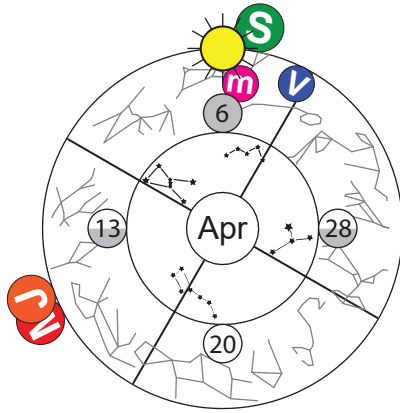
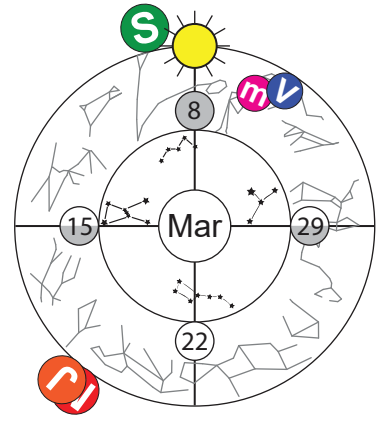
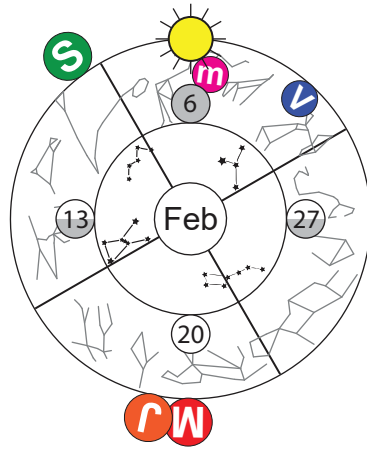
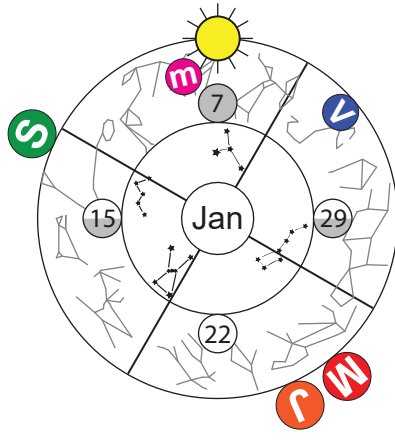
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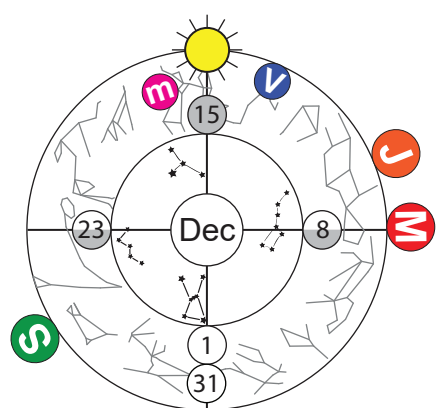
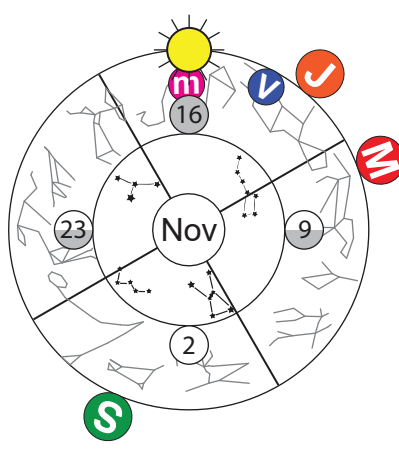
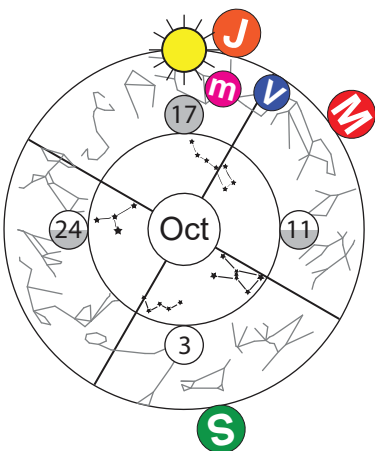
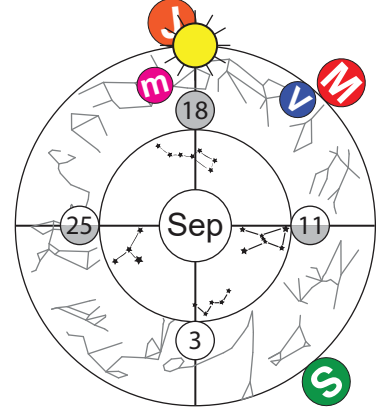
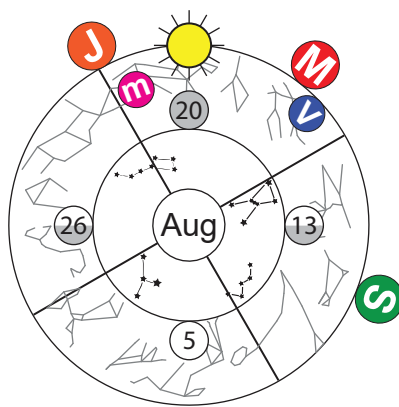
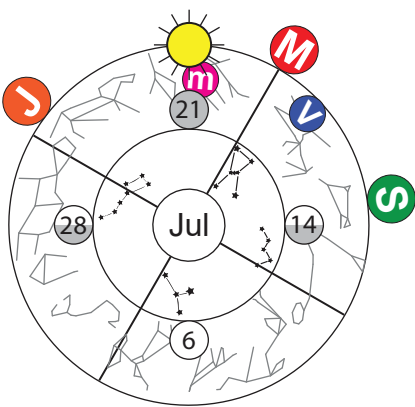
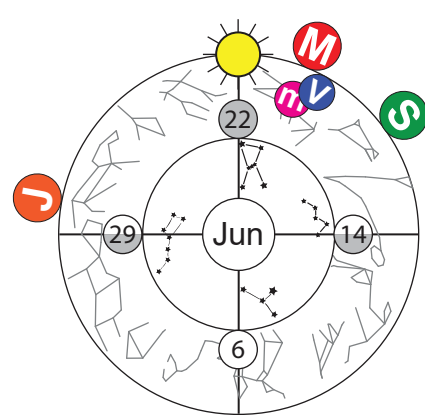
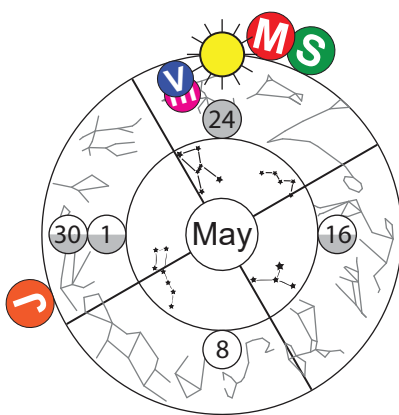
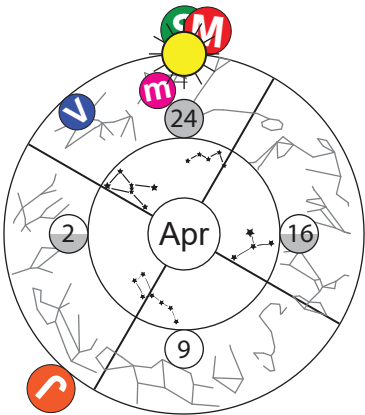
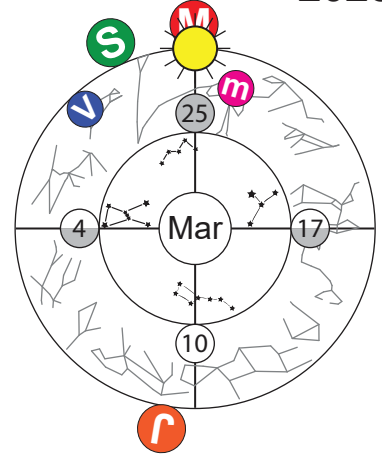
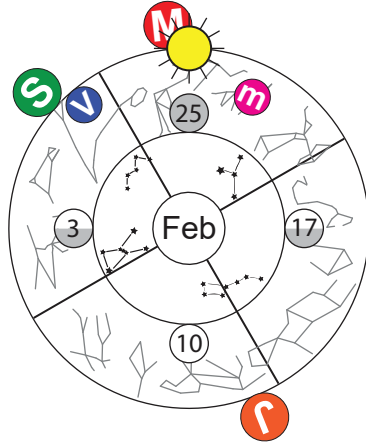
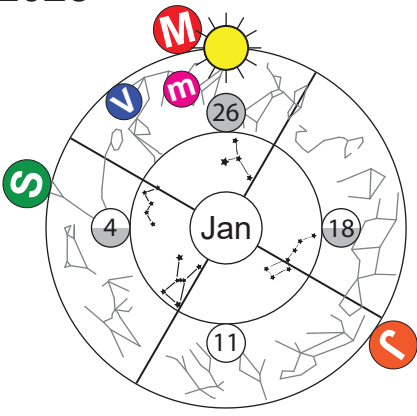
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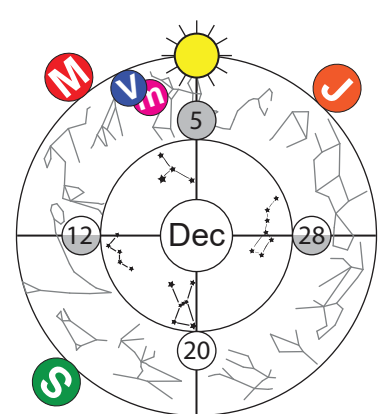
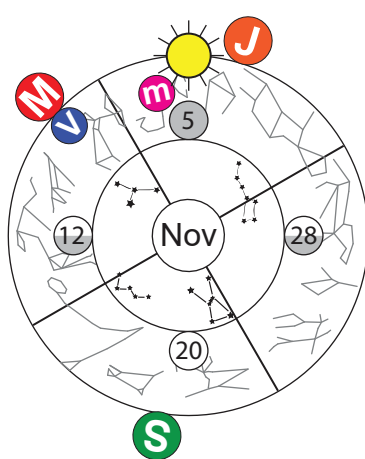
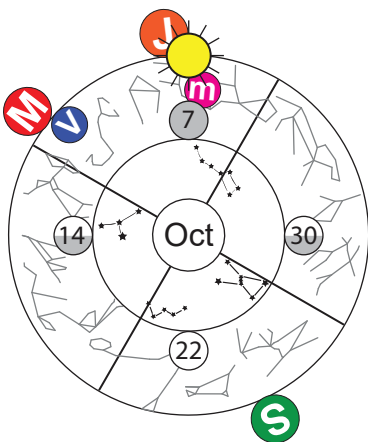
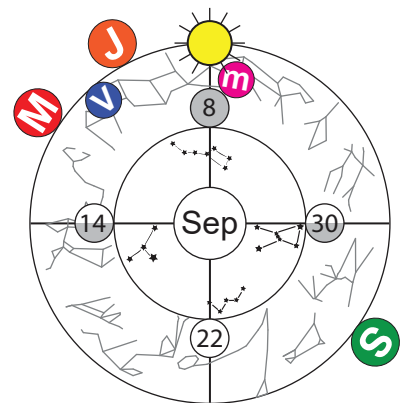
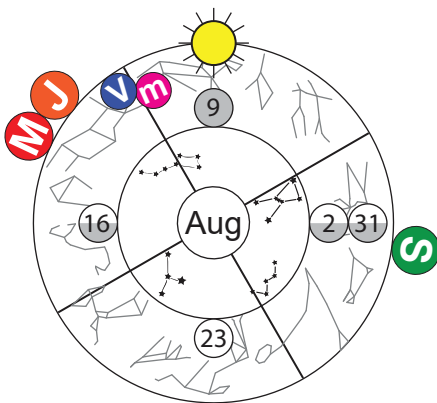
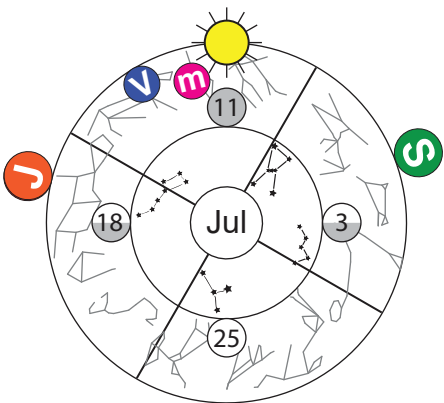
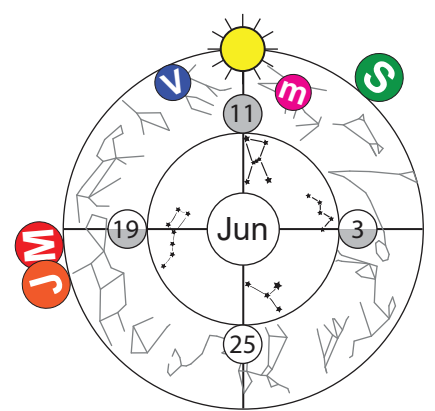
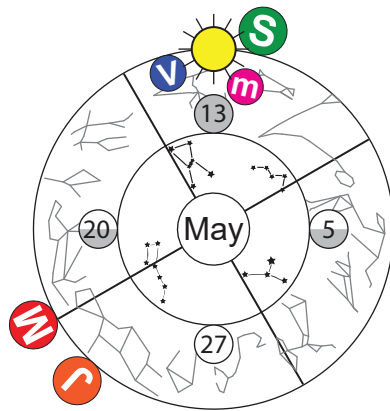
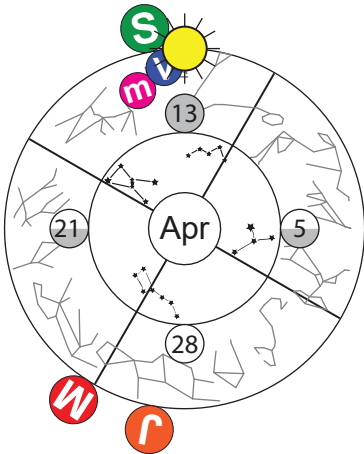
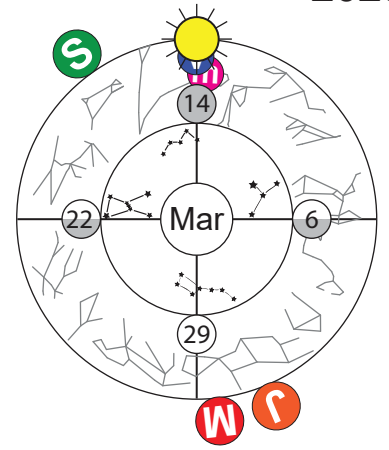
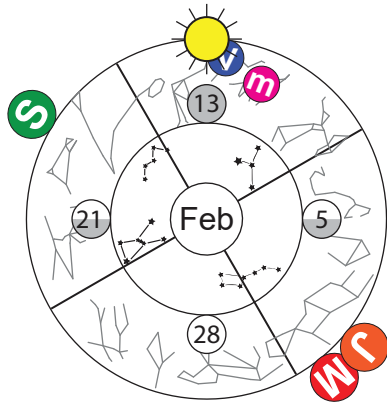
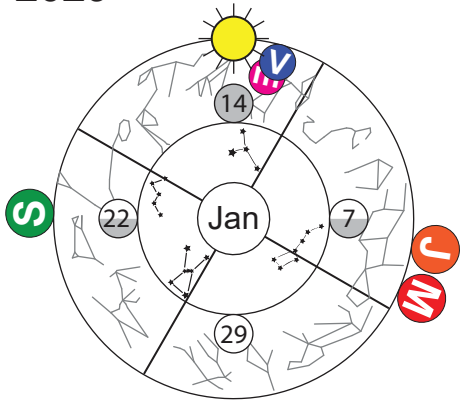
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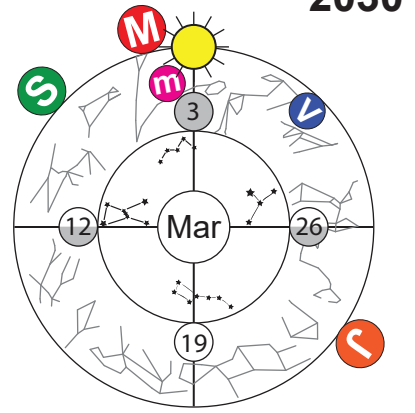
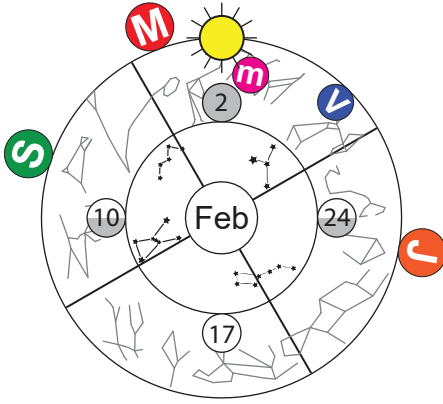
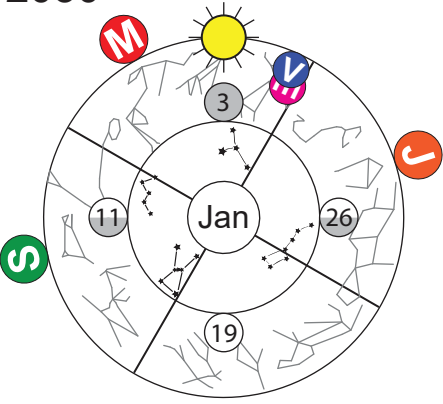


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