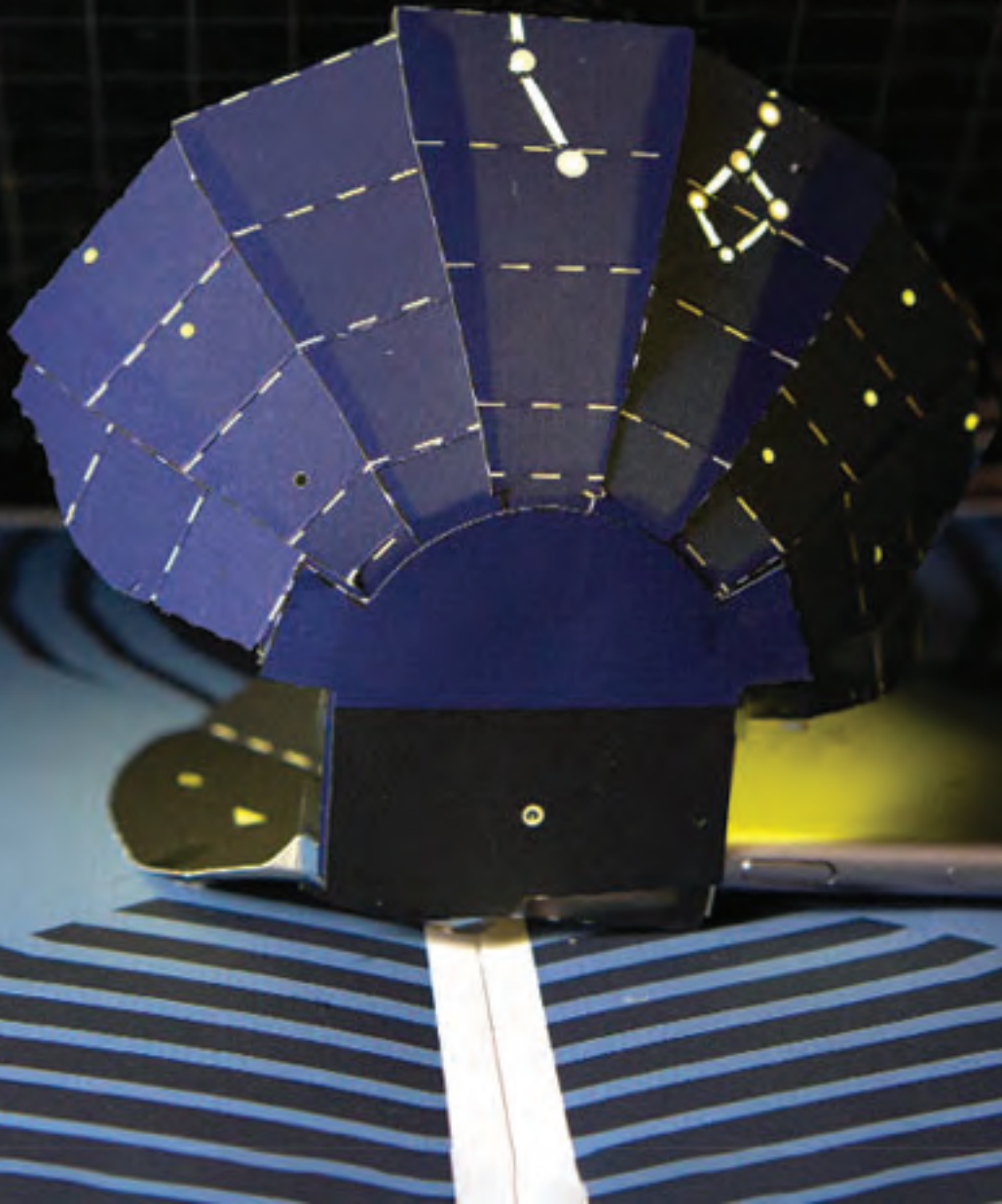
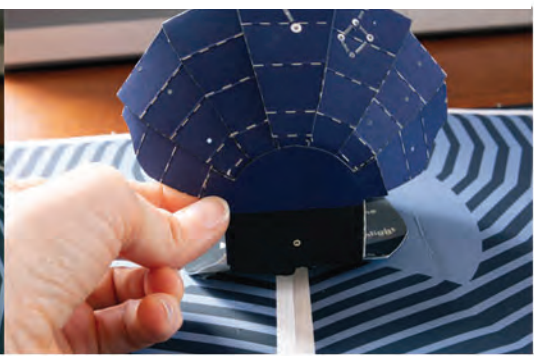
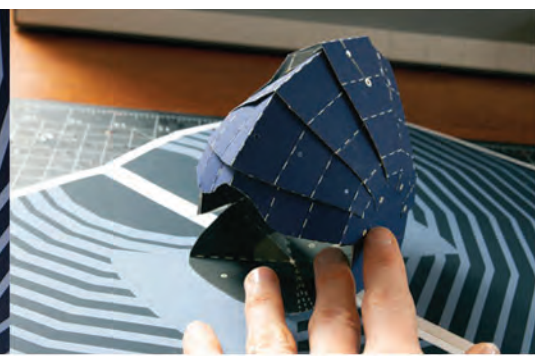
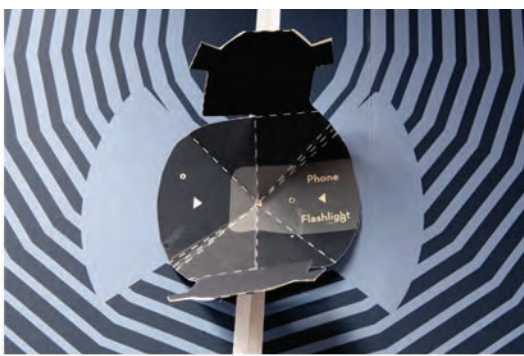
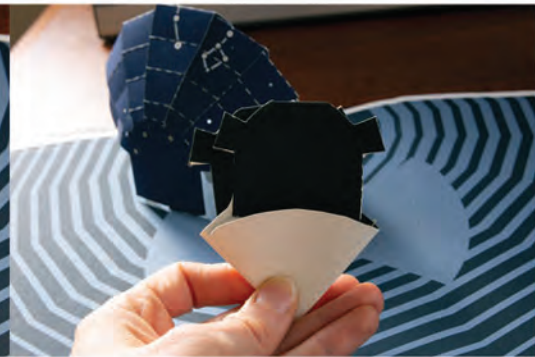
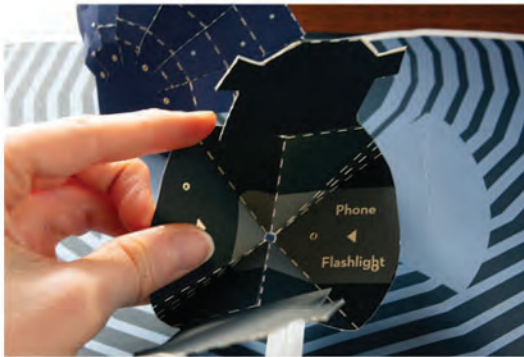
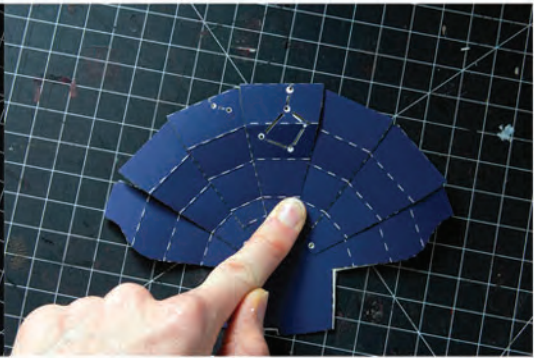
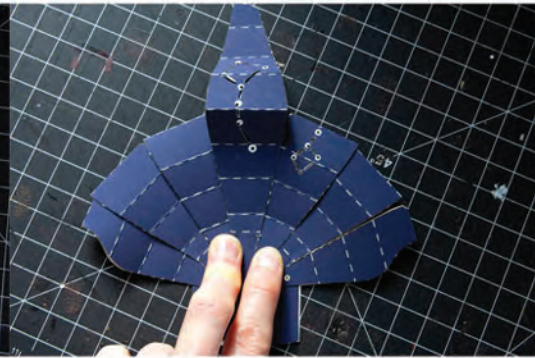
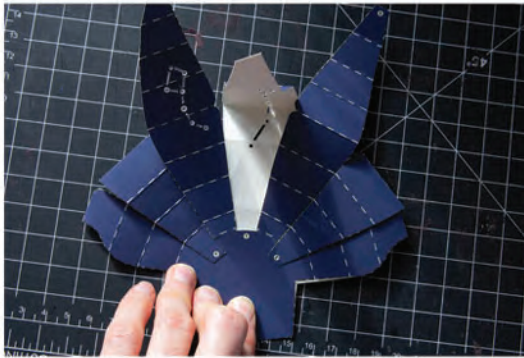
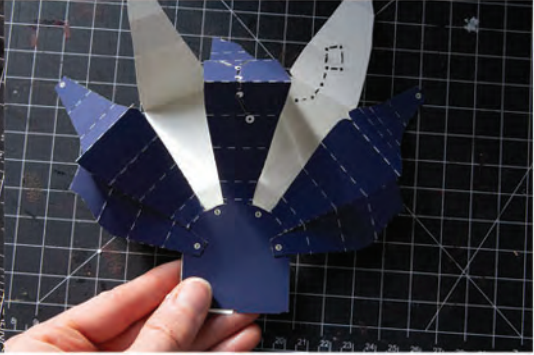
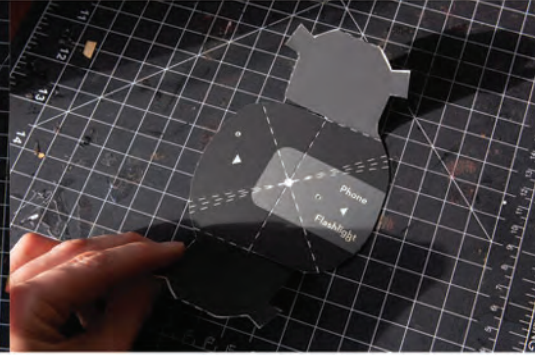
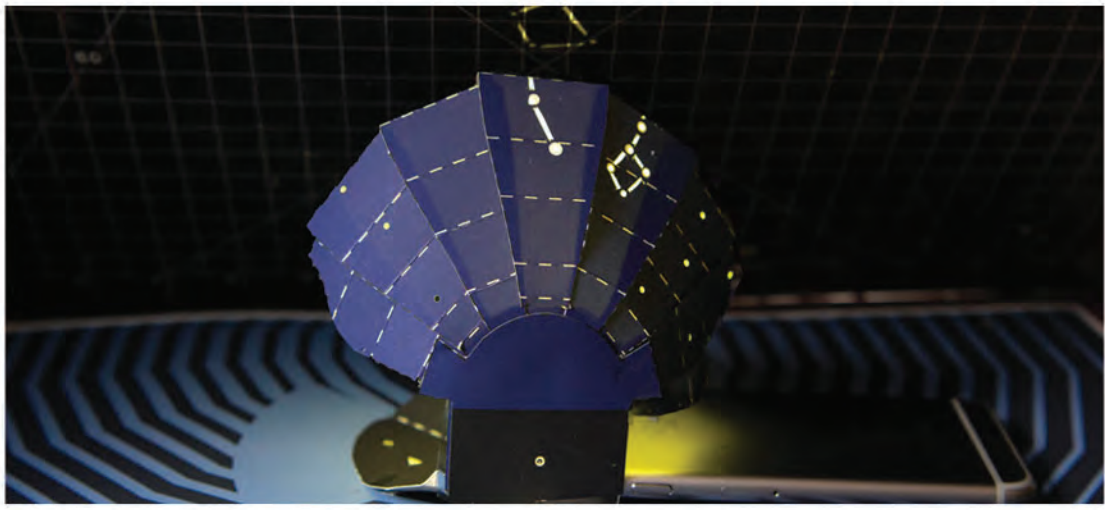


Pop-up Planetarium





a paper tech
printable lesson

1

Cut out all parts and score/pre-bend all of the fold lines. The constellations are tricky to cut out, but it's worth it! Use a hole punch or an x-acto knife (be careful!) or tiny scissors. Feel free to punch out additional stars if you wish.

2

Pre-glue the reinforcement panels on the rotator base, as indicated on the sheet. Now glue the end of each planetarium frond onto its corresponding place on the opposite hemisphere. (i.e. glue ① to ①, ② to ②, etc.)

3

On the rotator base, the pink dotted line is a mountain and all of the rest are valley folds. Fold all of those lines until they collapse together and you can crease flat. Bind the left and right pages of the book together with a piece of tape.

4

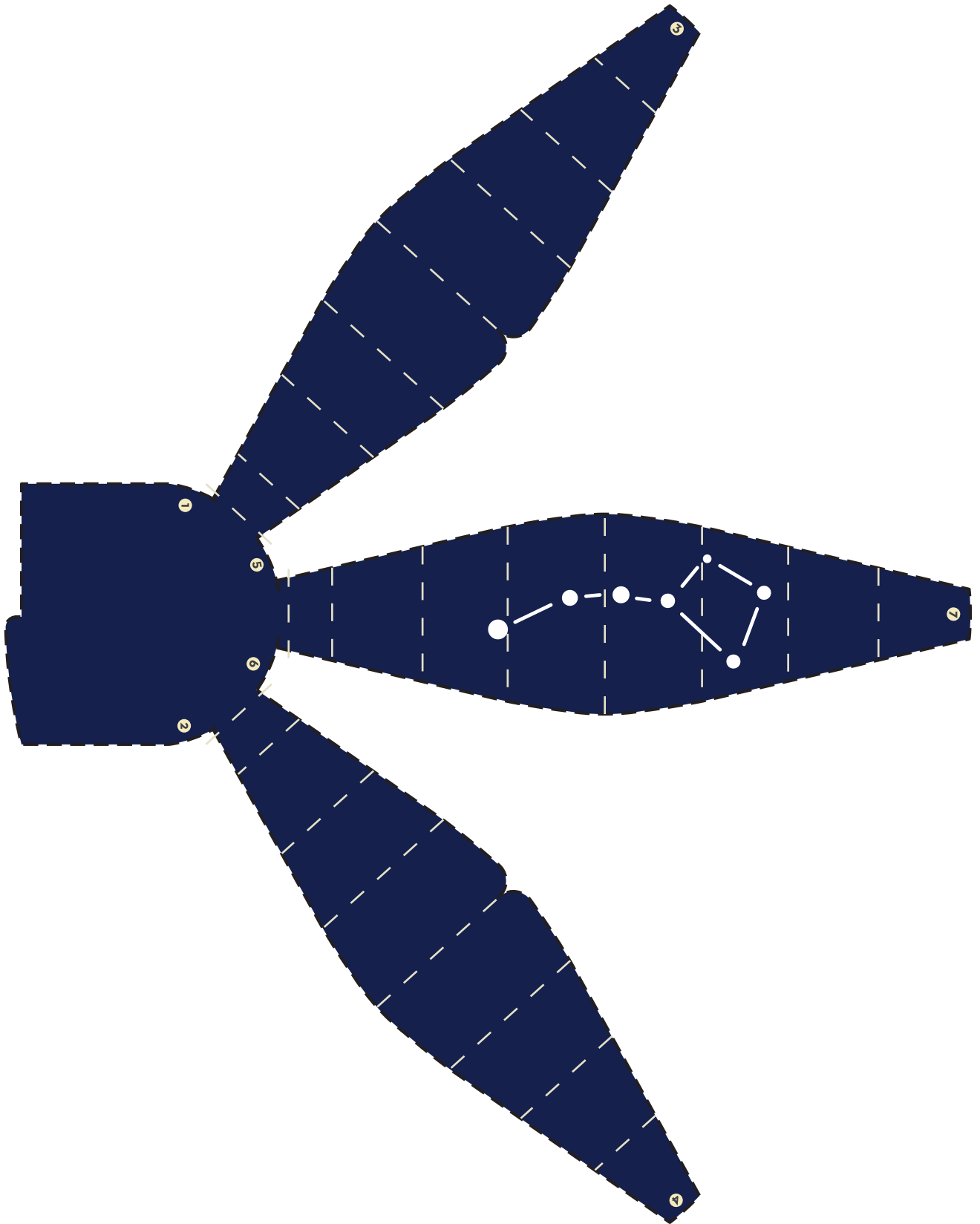
Finally- glue the triangle of ③ to the triangle printed on the page for ③. Do the same for ④. Make sure the book opens and closes and pops up. Sometimes it helps to reinforce the cover with cardstock or book board. Finally, attach the planetarium's sides to the same shape on the rotator base, and reinforce (on the outside) with the final layer of rotator base shapes (⑤).



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(pop-up adapted from *This Book is a Planetarium*)

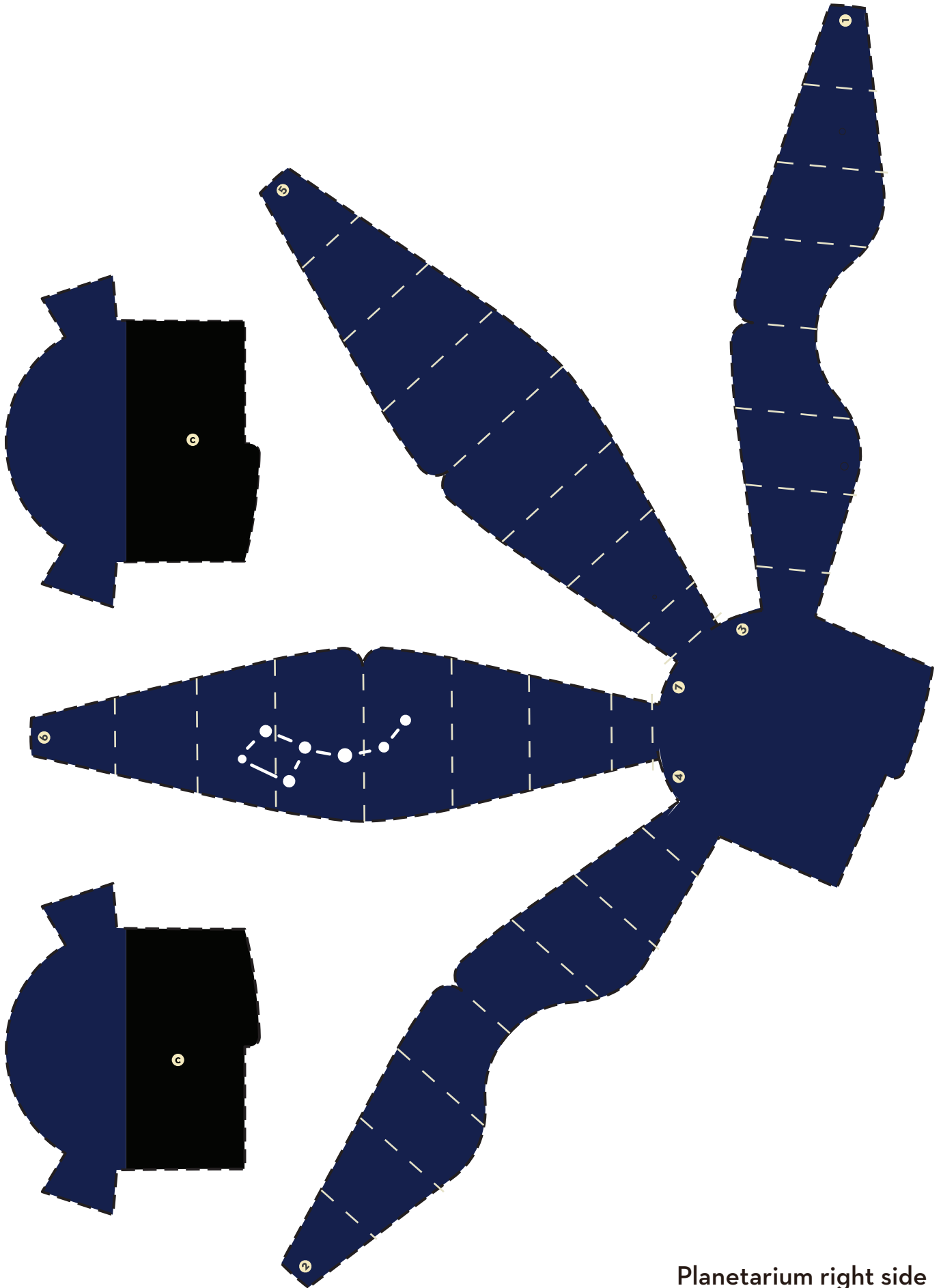
diy planetarium
to use with a flashlight

Planetarium



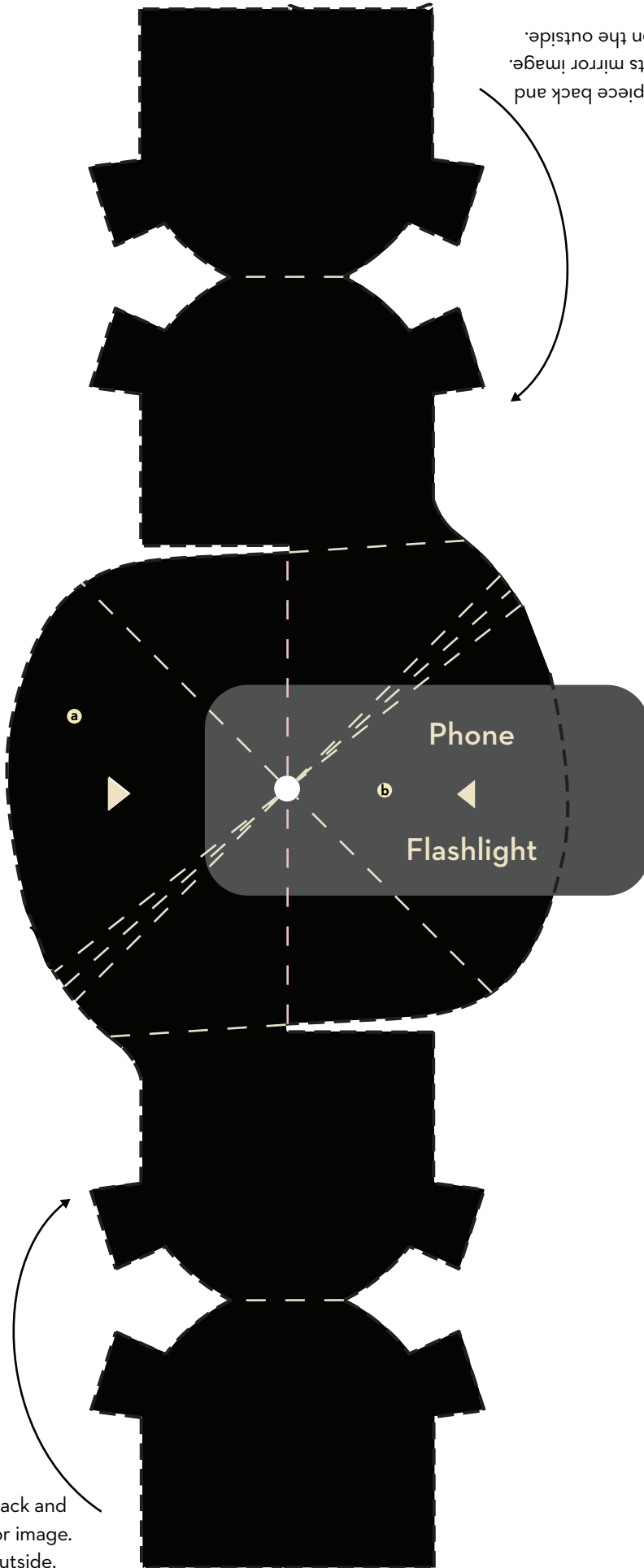
..... Fold
----- Cut

Planetarium left side

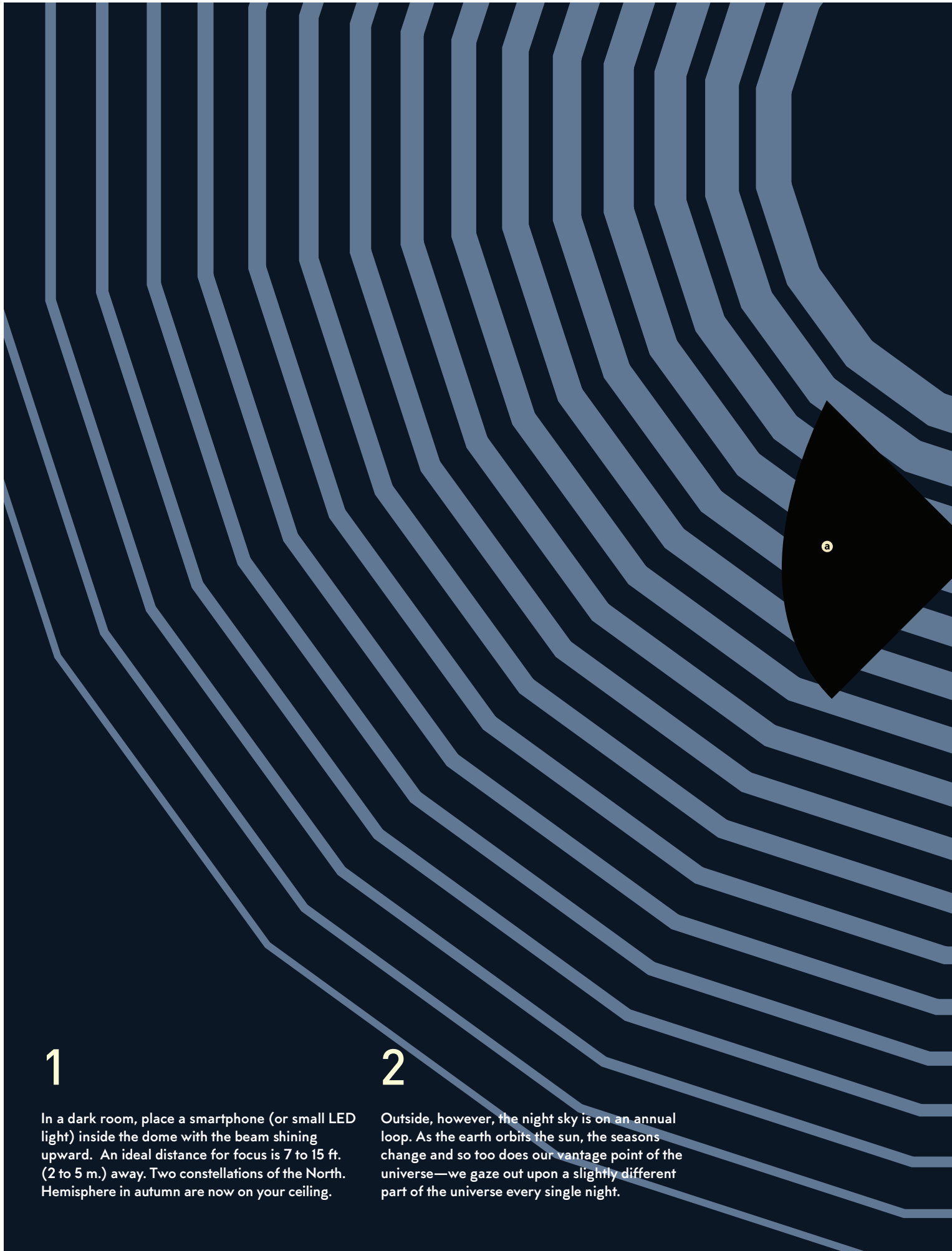


Planetarium right side

Bend this piece back and
glue it to its mirror image.
It will be on the outside.



Bend this piece back and
glue it to its mirror image.
It will be on the outside.

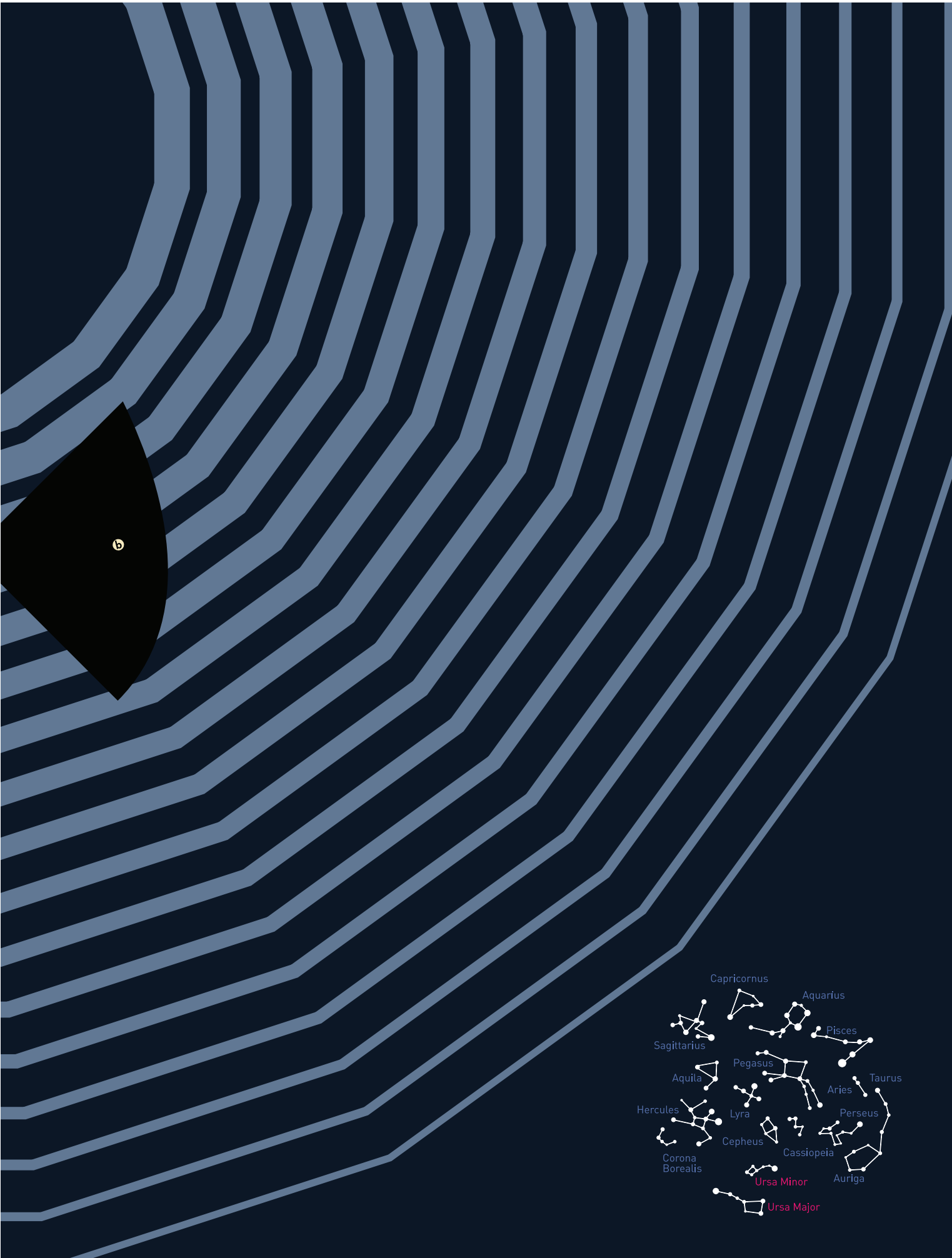


1

In a dark room, place a smartphone (or small LED light) inside the dome with the beam shining upward. An ideal distance for focus is 7 to 15 ft. (2 to 5 m.) away. Two constellations of the North Hemisphere in autumn are now on your ceiling.

2

Outside, however, the night sky is on an annual loop. As the earth orbits the sun, the seasons change and so too does our vantage point of the universe—we gaze out upon a slightly different part of the universe every single night.



b

- Capricornus
- Aquarius
- Pisces
- Sagittarius
- Pegasus
- Taurus
- Aquila
- Aries
- Hercules
- Lyra
- Perseus
- Cepheus
- Cassiopeia
- Corona Borealis
- Auriga
- Ursa Minor
- Ursa Major

a | paper tech
printable lesson

Why it works

To successfully magnify and project the constellations, the planetarium's structure takes advantage of a few universal qualities of light: Light rays travel through transparent materials, bounce off of reflective surfaces, and are stopped by nonreflective objects. Here, most of the light is blocked by the paper walls, which reflect the light back into the glowing dome. However, the unobstructed pinhole of each star funnels the light into a discreet pinpoint beam, which projects outward in a straight line toward the ceiling.

Like all light in earth's atmosphere, these beams can't move outward in a straight line forever—eventually they dissipate back into darkness. The rays, collected and powerful at the source, begin spreading out laterally as they move away from the pinhole—resulting in a larger, but weaker and blurrier circle of light. (Shadow puppets exhibit this quality of diffuse magnification.)

These principles of light are the basis of the functioning of many familiar tools—from a camera's tiny, sharp aperture to the unlikely and incredible power of a laser beam.

Understanding it even more...

Go outside and find Ursa Major and Ursa Minor (otherwise known as the Big Dipper and Little Dipper.) Ursa Minor is important in navigation as its brightest star, Polaris, also known as the North Star, reveals the location of the North Celestial Pole.



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diy planetarium
to use with a flashlight

Planetarium