

Make your own Model Astrolabe

Dominic Ford

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Astrolabes are elaborate astronomical instruments, combining a mechanical model of the sky's rotation with a simple sight, which can be used to make observations of the elevation of objects above the horizon. Put together, these tools allow the user to tell the time, identify objects in the sky, and predict when objects will rise and set.

In the Middle Ages, astrolabes were the most sophisticated astronomical instruments in widespread use, a position which they held for nearly two thousand years, from the time of their invention by Hipparchus (c. 190–120 BCE) until the turn of the seventeenth century. They only fell out of use around the time that the telescope was invented in 1609, as astronomers began to require more precise tools.

Today, the curious astronomer who wants to learn more about medieval observing practice may find it hard to find a specimen to play with. Historical examples are highly valuable, and usually found only in glass cases in museums. To solve this problem, I have created a cardboard cut-and-glue kit which you can download and print to make your own model astrolabe.

The design presented here is based upon one described by the English poet Geoffrey Chaucer in his *Treatise on the astrolabe*, published in 1391. In a series of three papers published in 1975–6, American historian Sigmund Eisner provided detailed geometric instructions for recreating Chaucer's astrolabe, which I follow closely.

The design of an astrolabe depends on the geographic location where it is to be used, since different stars are visible from different places. I have created kits for use at a wide range of latitudes, which you can download from

<https://in-the-sky.org/astrolabe/>

The astrolabe presented in this document is designed for use at a latitude of 45°N

Assembly instructions

To build the model astrolabe, you need to print, Figures 1, 2 and 3 onto separate sheets of paper, or more preferably onto thin card. Figure 4 should be printed onto a sheet of transparent acetate.

The two sides of the *mother* (Figures 1 and 2) should be glued rigidly back-to-back, perhaps sandwiching a piece of card to given them added rigidity. The *rete*, printed onto transparent acetate², should be placed over the top of the *climate*, on the

²Historically, the rete would have been made of the same material as the rest of the astrolabe and marked with arrows showing the positions of prominent stars. As much of the material of the rete as possible would then have been cut away to allow the climate below to be seen. We use transparent plastic here because it is so much more practical than the traditional form of rete.

front side of the astrolabe. For simplicity, the climate is incorporated into the front of the mother in this document, rather than as a separate component.

The *rule* and the *alidade* should be placed on either side of the astrolabe. The rule, marked out with a declination scale, should rotate over the front of the mother. The alidade should rotate over the back of the mother.

The two tabs on the side of the alidade should be folded out to form a sight used for measuring the elevations of objects above the observer's horizon. The whole construction may then finally be fastened together by placing a split-pin paper fastener through the centre.

How to use your astrolabe

For more information about your astrolabe, including step-by-step instructions in how to use it, see the author's website,

<https://in-the-sky.org/astrolabe/>

Customised astrolabes

This astrolabe kit was designed using a collection of Python scripts and the pycairo graphics library. If you would like to customise your astrolabe, you are welcome to download the scripts from my GitHub account and modify them, providing you credit the source:

<https://github.com/dcf21/astrolabe>

References

- [1] Ford, D.C., *J. Brit. astr. Ass.*, 131(1), 33 (2012).
- [2] Chaucer, G., *Treatise on the Astrolabe*, in *The Riverside Chaucer*, ed. L.D. Benson (Boston, 1987)
- [3] Eisner, S., *J. Brit. astr. Ass.*, **86**(1), 18-29 (1975)
- [4] Eisner, S., *J. Brit. astr. Ass.*, **86**(2), 125-132 (1976a)
- [5] Eisner, S., *J. Brit. astr. Ass.*, **86**(3), 219-227 (1976b)

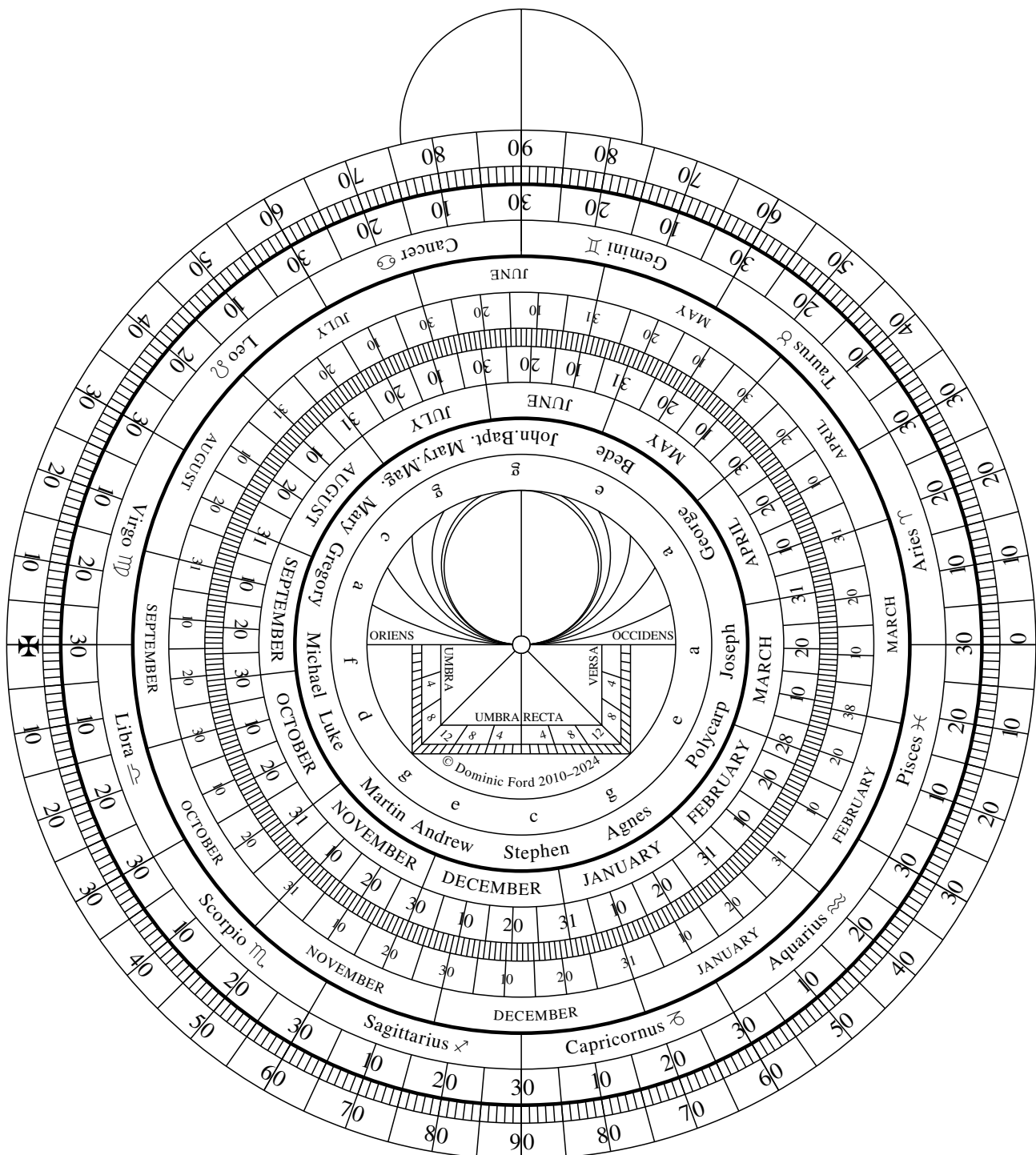


Figure 1: The back of the mother of the astrolabe.

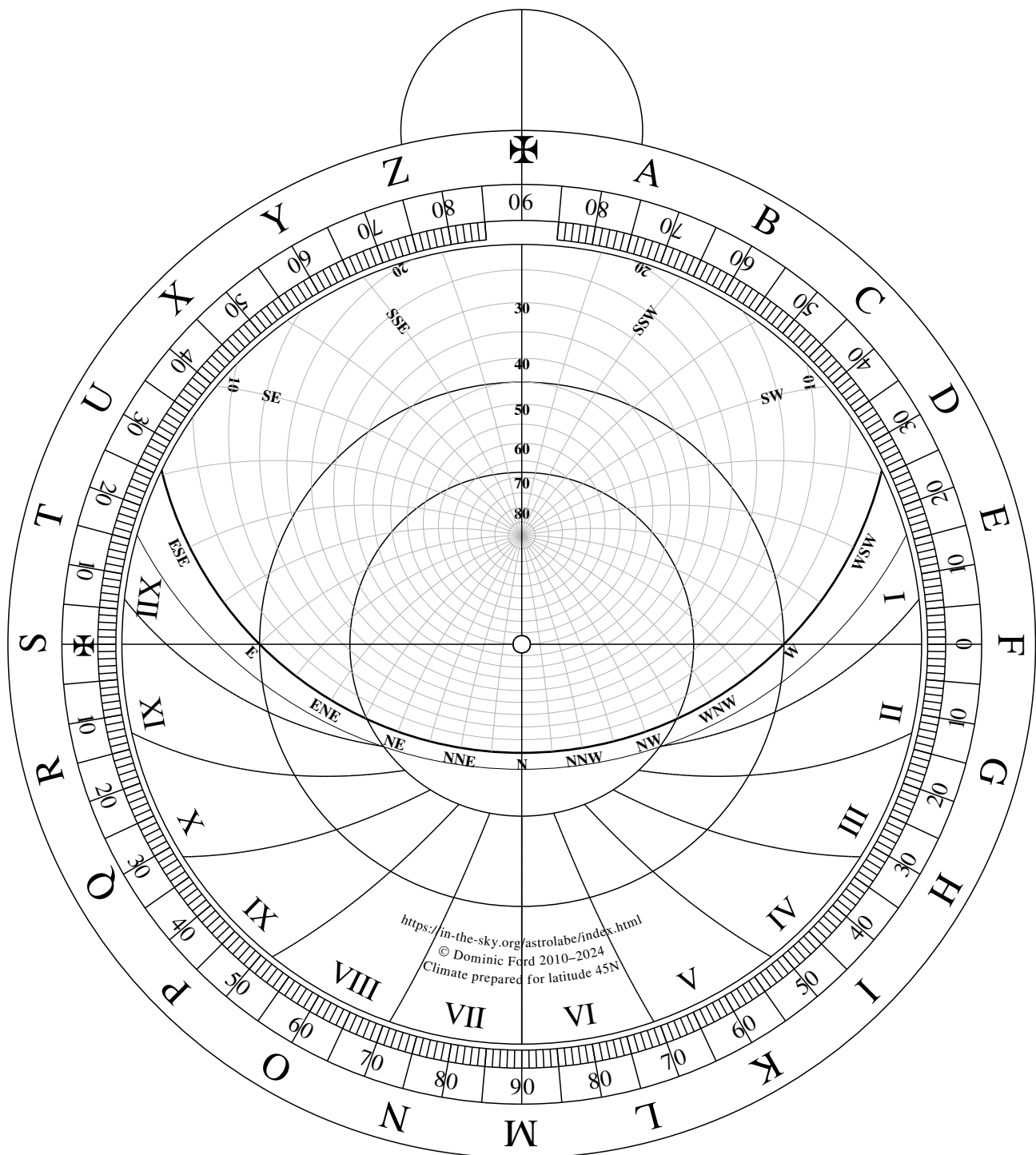


Figure 2: The front of the mother of the astrolabe, with combined climate. Should a climate for a different latitude be required, you should download an alternative kit from the author's website.

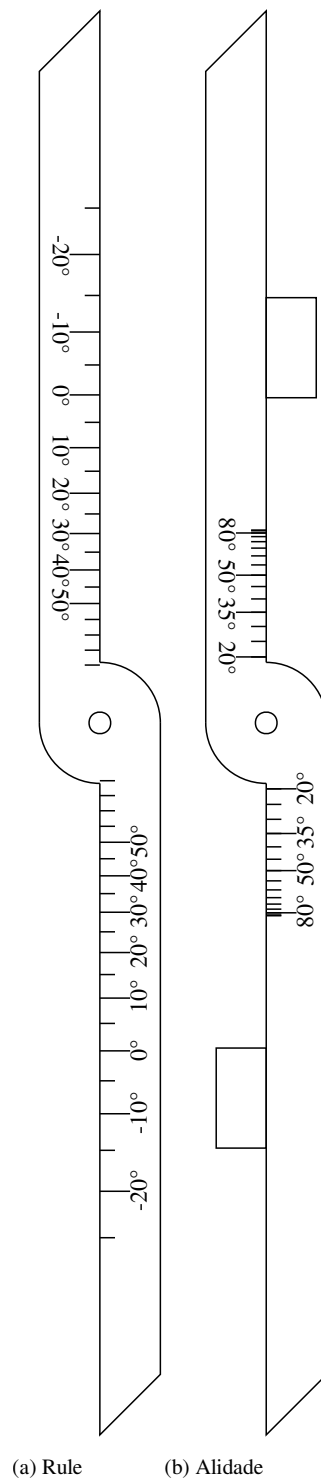


Figure 3: Left: The rule, which should be mounted on the front of the astrolabe. Right: The alidade, which should be mounted on the back of the astrolabe.

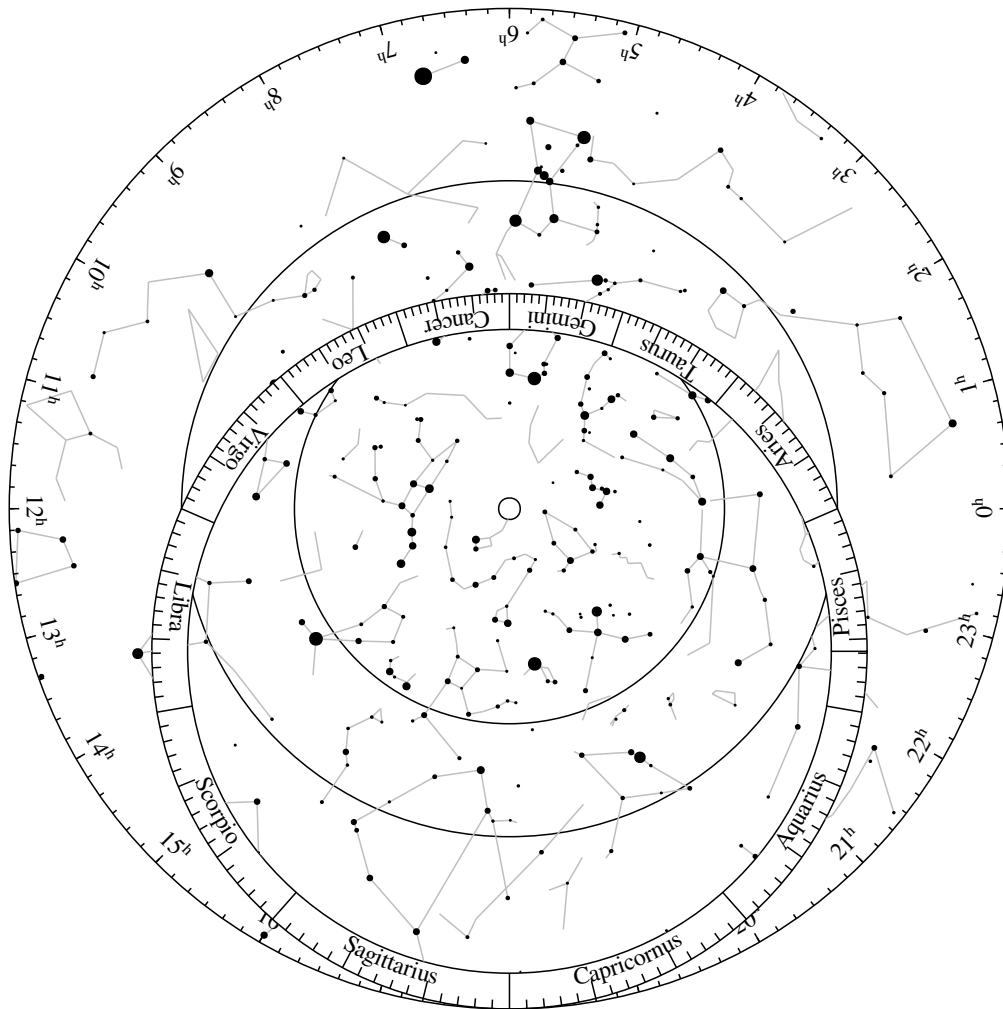


Figure 4: The rete of the astrolabe, showing the stars of the night sky. This should be printed onto a piece of transparent plastic; most stationers should be able to provide acetate sheets for use on overhead projectors, which are ideal for this purpose.