APPENDIX 1

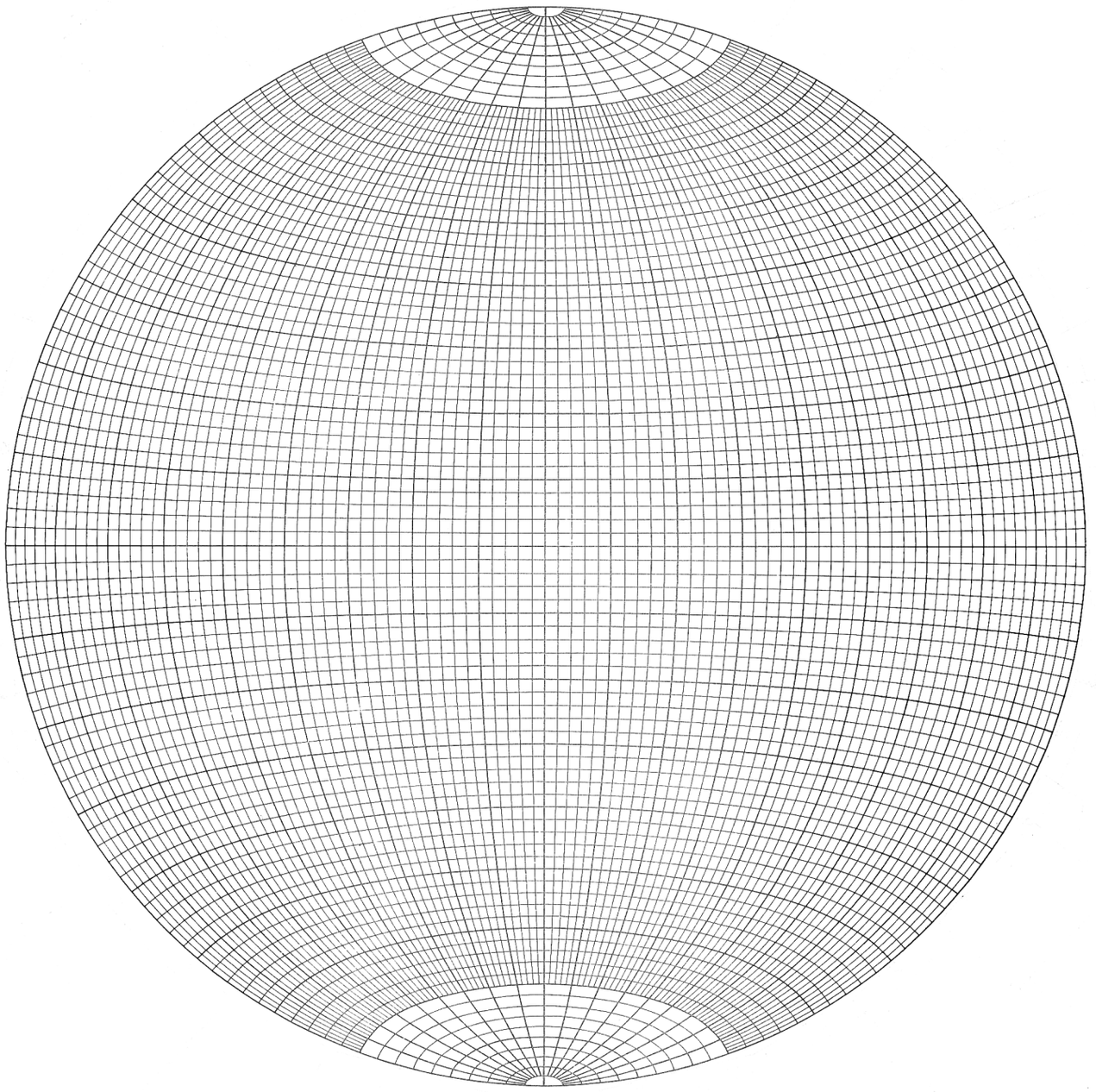
Spherical Projections

Spherical projections are used in geology to present three-dimensional orientation data in two-dimensional space for geometric elements (such as bedding planes, foliations, and hinge lines) and crystallographic orientation data (such as c-axis orientations, glide planes). Generally, we use the lower hemisphere for these data, which can be imagined as slicing the Earth in half along a plane containing the poles (i.e., a meridian). The Earth's lines of latitude and longitude are projected in this sectional plane, which produces a gridded net.

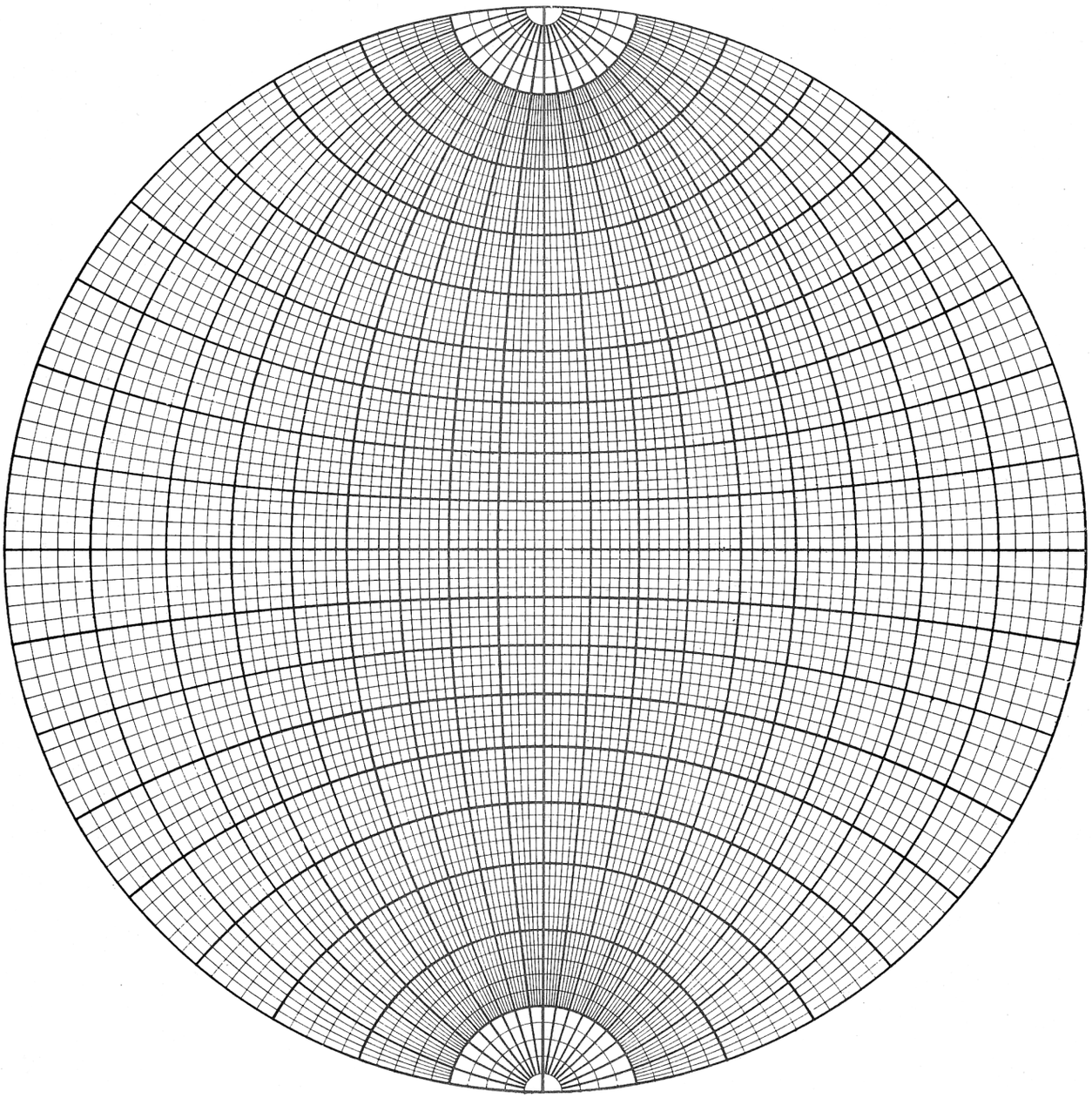
In a spherical projection, a plane appears as an arc. To picture this, imagine that the half-sphere represented by the spherical projection is a bowl. Now pass your hand through a point in space that is the center of the full sphere, while it intersects the lower surface of the bowl. You will find that the trace of the intersection between the plane and the bowl is a curved line. Analogously, a line is represented as a point in spherical projection. To picture this, imagine passing your finger through a point in space through the center of the full sphere, where it intersects the surface of the bowl.

In the equal-area net (or Schmidt net; A1a), the projection of lines of latitude and longitude are elliptical arcs. The main advantage of the equal-area projection is that the area of a $1° \times 1°$ grid segment does not change with position on the net; a $1° \times 1°$ grid segment occupies the same area at the center of the net as it does at the edge (hence the name equal-area net). The equal-area net is, therefore, particularly useful for analyzing the distribution of spatial data. In contrast, the equal-angle net (or Wulff net; A1b) projects lines of latitude and longitude as segments of circular arcs. As a consequence, the area size varies with position on the net. The main advantage of the equal-angle net lies in the fact that angular relationships are preserved (hence its name), which means that circular elements are not distorted in this projection (as opposed to the equal-area projection, where circles become ellipses). For example, the projection of a cylinder remains circular regardless of the position of the equal-angle plot.

The procedures for plotting planar and linear elements are essentially the same for both the equal-area and the equal-angle nets, and you should consult a laboratory manual for step-by-step instructions. Nowadays several very good projection programs are available for personal computers, which also allow increasingly sophisticated data analysis methods (such as contouring, clustering analysis, and rotations). While these computer programs are quick and powerful, it is useful to have your first experience with projection techniques through manual plotting.



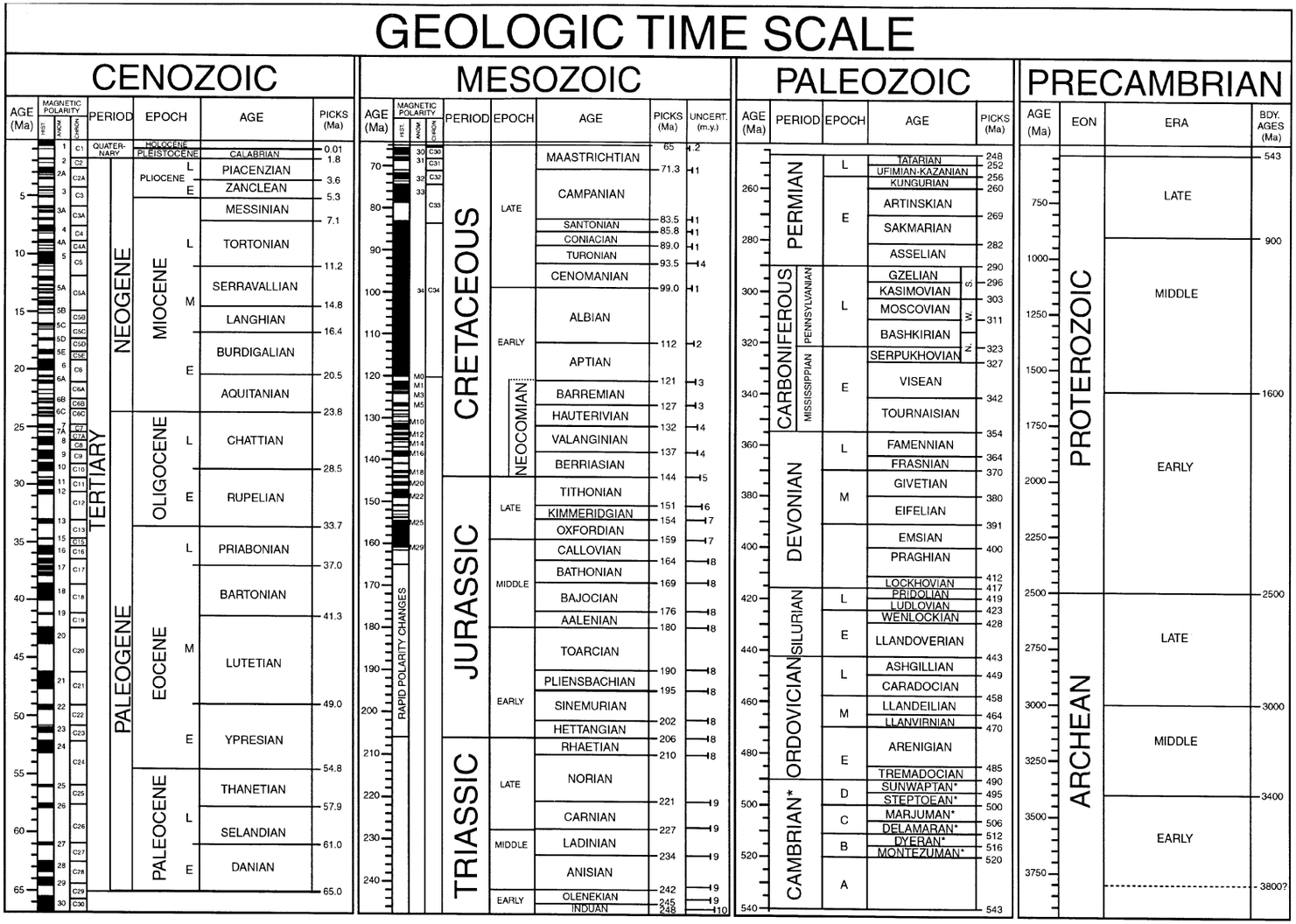
Equal-area net
(a)



Equal-angle net
(b)

APPENDIX 2

Geologic Timescale



*International ages have not been established. These are regional (Laurentian) only. Boundary Picks were based on dating techniques and fossil records as of 1999. Paleomagnetic attributions have errors, Please ignore the paleomagnetic scale.

Sources for nomenclature and ages: Primarily from Gradstein, F., and Ogg, J., 1996, *Episodes*, v. 19, nos. 1 & 2; Gradstein, F., et al., 1995, SEPM Special Pub. 54, p. 95–128; Berggren, W. A., et al., 1995, SEPM Special Pub. 54, p. 129–212; Cambrian and basal Ordovician ages adapted from Landing, E., 1998, *Canadian Journal of Earth Sciences*, v. 35, p. 329–338; and Davidek, K., et al., 1998, *Geological Magazine*, v. 135, p. 305–309. Cambrian age names from Palmer, A. R., 1998, *Canadian Journal of Earth Sciences*, v. 35, p. 323–328.