Svalgaard & Schatten (2016) used a ‘backbone’ method to reconstruct the Sunspot Group Number since 1610. Five backbones were used, centered and anchored on the Wolfer Backbone, which then defined the scale of the series. Backbones were constructed by scaling observations already in the series to a primary observer (e.g. Wolfer) without daisy-chaining through intermediate statements thus avoid accumulation of errors. Each observer is scaled to Wolfer and we check that the relation is linear (with $y = 1.5517x + 0.1927 \quad R^2 = 0.9335$) for each observer they are all put on the Wolfer Scale and plotted with different colors (to the right) for each decade. The 1-σ error (yellow curve) is calculated as the number (GN). Yellow circles show the old yearly GNs.

The Figure below compares the yearly GNs for the old Wolfer Backbone (red curve) and the new Backbone presented here (blue curve). The two agree within their respective error bars. The Backbone Reconstruction of the Sunspot Group Number is anchored by the Wolfer Backbone. A new reconstruction with monthly time resolution covering the interval 1860-1940 using all long-term observers overlapping with Wolfer agrees well with a preliminary series (Svalgaard & Schatten, 2015) with yearly resolution. This resolves the problem of the correct level of activity in the latter part of the 19th century and paves the way for trustworthy reconstructions of TSI and the Open Magnetic Flux, and for calibration of the cosmic ray proxies.