head into the backstop—which seems to me to have been the true purpose of the shape. While the spiraling does not rotate the arrow quickly enough in flight to eliminate the need for feathers, it does cause embedment when the arrow hits. An embedded arrow is less easily removed than one that has passed through.

There is no question that flint can make remarkably effective tools. Because flint tools were much sharper, Mexican barbers continued to shave with them in preference to the softer metals when the Spaniards first arrived; for the same reason many primitive peoples prefer them for circumcision. Leakey (*10*) himself, using a single Aurignacian backed blade about 5 cm long and estimated to be 25,000 years old, was able to skin and dress a Thompson's gazelle (about the size of a goat) in just under 20 minutes; the blade had certainly kept its cutting edge. Stone Age man may have been better equipped than we suppose; his tools and weapons were cheap, sharp, and very enduring.

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Tree Ring Indices and Statistics

A report by Haugen, "Tree ring indices: A circumpolar comparison" (*1*), contains several examples of statistical naiveté in his analyses of time series. From the data he presents, I would judge that he has established the existence of a circumpolar synchrony of tree rings with about the same precision that Cole established the "Biological clock in the unicorn" (*2*). The parallels between these two papers are quite striking. First, they find moving averages the solution to perplexing variation. Haugen perpetuates uncritically Adamenko's practice of using a 30-year running mean although, as Cole recognized, "Slutzky [*3*] showed in 1927 that such smoothing would actually create cycles in random data." Second, the tree ring indices of two of the series were "slipped" by a 25-year period—although this lag for the Labrador series was unsupported by any logical extrapolation of Adamenko's tentative reason. By similar logic Cole found a 1-hour lag in the unicorn's physiology attributable to the delayed rising of the moon.

Finally, Haugen grossly overstates the significance of the correlations he computed by applying criteria of significance that are applicable only to paired data in which each pair is independent of the remaining pairs. Data comprised of 30-year running averages certainly cannot be judged against this standard unless the pairs are limited to points in time separated by at least 30 years. Thus, Haugen overstates the degrees of freedom by a factor of about 30. Judged on this basis, the 21 correlations listed in Haugen's Table 2 would just about match Cole's admonition about granting the certificate of significance to the one in 20.

I find Cole's conclusion can be applied to Haugen's paper so precisely that even the figure reference stands unchanged: "A rhythm as definite as that in Fig. 1 could easily be shown to be highly correlated with environmental fluctuations, but the nature of the material employed in this experiment seems to preclude any such causal relationships."

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The analogies Stage has drawn between the papers by Cole and myself are entertaining but not valid. First, Cole did not "find moving averages the solution to perplexing variation," as Stage has stated. Cole lagged five repetitions of his "hourly" data by one, then added and averaged the results bringing his desired pattern "clearly into focus." A three-point moving average was subsequently applied to this already clear pattern. Second, in Cole's unicorn example, time was treated as a continuum, defined by an arbitrary unit of time, the hour, which Cole clearly distinguished from studies involving year-to-year variations where time can legitimately be treated as a discontinuous variable. Also, Stage refers to the Slutzky effect mentioned by Cole. Quasi-oscillations induced by this effect could indeed influence the apparent smoothness of the running mean values, but their influence on the amplitude and period of the major oscillations interpreted in the circumpolar comparison would be negligible. Further, induced quasi-oscillations would not tend to produce a synchrony among the indices. The major oscillations apparent in the running means I presented were also apparent in the original data.

Table 1. Correlations of interregional tree ring data; n refres to pairs of data.

Regions	Inclusive dates	n	r	P
Alaska–Urals	1780–1959	6	.86	.05
Urals–Scandinavia	1790–1939	5	.91	.05
Alaska–Scandinavia	1700–1939	8	.72	.05

Regarding Stage's second point, I compared the Labrador series directly with the Scandinavian series, which it appeared to resemble most closely. I gave no physical interpretation of this and would consider speculative any extrapolation of Adamenko's tentative reasoning.

Stage's criticism of the significance of the correlations presented, however, is justified; but the correlation coefficients remain valid as a measure of covariation between the series. Following Stage's suggestion, using n pairs of data taken at 30-year intervals from the final date of each series, I find the correlations (r) and their significance levels (P) shown in Table 1. The Labrador series is too short to attain significance on this basis.

I thank Stage for pointing out an important error in the significance levels originally stated. The above treatment indicates, however, that a correlation between the indices at an acceptable level of significance exists, and the main conclusion of the paper that "there is a significant degree of similarity in the major oscillations of tree ring indices representative of the circumpolar area" remains valid.

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