Almanac's Forecasts Questioned

Anyone can make a mistake forecasting the weather, even the venerable *Old Farmer's Almanac*. Its forecast of a mild mid-January this year for the East and South, when those areas suffered record cold, might be explained away as a fluky miscalculation. But the *Almanac* seems to have a consistent record of erroneous forecasts. A recent study by two weather researchers suggests that you would not do much worse by blindly guessing about the weather than by accepting the *Almanac*'s forecast.

Professional forecasters have long voiced serious doubts about the *Almanac*'s predictions. Calling for "mostly clear, turning hot" between 8 and 14 October 1982 in the Middle Atlantic states is such an absurdly detailed long-range forecast that most scientists think such prognostications useless. Even the monthly forecasts of deviations from normal temperature and precipitation seem overly ambitious. The *Almanac*'s forecasting methods are hardly conventional either. "A secret weather-forecasting formula devised by the founder of this almanac in 1792" has traditionally formed the basis of predictions, according to a statement in this year's edition. Recently the *Almanac*'s chief forecaster has come to depend primarily on "predicting the variation of solar activity and then determining the orientation of the earth relative to that activity."

Whatever the details of the forecasting method, the results for one 5-year period differ little from guessing, according to John Walsh and David Allen, who are research meteorologists at the University of Illinois in Urbana. Allen had become weary of hearing uncritical remarks from farmers about the accuracy of the *Almanac*'s forecasts, so he and Walsh compared 60 monthly forecasts from 1975 to 1980 with the actual weather.* Using the records of 32 cities to describe the weather in the *Almanac*'s 16 forecast regions, they calculated a mean correlation between predicted and actual temperatures of .016. For precipitation forecasts, the correlation was .041. If the predictions had been perfect, which the *Almanac* has never claimed, the correlations would have a value of 1.000; random guessing would produce a correlation of zero. The *Almanac* correctly predicted whether the temperature or precipitation would be above or below normal 52 percent of the time, Walsh says. A coin toss would succeed 50 percent of the time.

Contrary to the *Almanac*'s claim, long-range forecasts that are more successful are made, although they are not made so far in advance. Donald Gilman, head of the National Weather Service's long-range weather-forecasting group, reports that their monthly and seasonal forecasts of temperature are correct about 65 percent of the time in winter and about 60 percent year-round. Precipitation forecasts, on the other hand, exhibit "marginal" forecasting skill. They have a success rate of only 55 percent, he says.

Interestingly, the *Almanac* fared best in its own backyard, achieving seasonal temperature forecast correlations of .47 to .62 in the northeastern states. Even these higher correlations could result simply from a few lucky forecasts over the relatively short 5-year span, Walsh says. A longer sampling period would be needed to rule out the presence of any forecasting skill whatsoever, he notes.

Even if the *Almanac* does not measure up to the modest achievements of conventional long-range forecasting, could it be predicting some of the major weather extremes that stand out in the weather record? Walsh and Allen's comparison of a dozen periods of extreme weather with the *Almanac*'s predictions revealed only three cases in which the *Almanac* anticipated even the type of abnormal weather; in no case did its forecast approach the severity of the actual weather.

The most reliable *Almanac* forecast is the one-page, essay-style national forecast, according to Jud Hale, editor of the *Almanac*. It has been correct in a general way for the past dozen winters, he says. The rub is that, as Hale readily concedes, this forecast is too subjective to be verified statistically.

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*"Testing the *Farmer's Almanac*," *Weatherwise* 34, 212 (October 1981).

of random motions and mutual gravity. But such a configuration would be relatively short-lived, says Tully. He finds it difficult to believe that we just happen to be observing the supercluster at a special moment. Besides, such a model implies that the galaxies should have large velocities perpendicular to the disk, which seems inconsistent with the small random velocities observed along the line of sight, in the plane of the disk.

A second possibility is that the visible galaxies are held within the disk by the gravity of an immense plane of dark, invisible matter. This is not just science fiction. Such dark matter is found in halos around the individual galaxies (including our own) and as an all-pervasive medium within clusters of galaxies (including Virgo). But this model would tend to predict large random motions for the disk galaxies, which again seems inconsistent with the observations, says Tully.

The low random velocities along the line of sight lead Tully to support the third possibility: that the disk, like the Virgo Cluster and the streamer clouds, is nearly as old as the universe itself. It has not dissipated simply because the individual galaxies are moving too slowly to escape.

This model is also in accord with one of the major theories of the origin of structure in the universe, the "pancake" model of Ya. B. Zeldovich and his colleagues in the Soviet Union. Their idea is that the large-scale structure began to form very early in the life of the universe, long before there were galaxies. Clumps of primordial gas on the order of 10^{13} solar masses or larger—supercluster size—began to collapse by their own internal gravity. Because of random deviations from spherical symmetry, they tended to evolve into sheetlike structures, resembling pancakes. Turbulence, viscosity, and shock waves then dissipated the kinetic energy of the infalling gas and the pancakes stabilized. Only later did the galaxies form. The model thus predicts a structure very much like what is seen in the Local Supercluster, says Tully.

The observations are less favorable to a major alternative model, the gravitational clustering picture promoted in recent years by P. James E. Peebles of Princeton University, and others. Their idea is that the galaxies formed first in the early universe, and only then began to cluster. The problem is that this model has no way to dissipate kinetic energy. In the immensity of space the galaxies are very small. They almost never collide. If by chance they formed a thin

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