Planetary Positions, Radio Propagation and the Work of J.H. Nelson

Randomicity tests show that the apparent association of radio disturbance days with planetary position is an artifact of Nelson's counting method.

Philip A. Ianna and Chaim J. Margolin

Considerable controversy has followed John H. Nelson's paper in the *RCA Review* (1951) correlating shortwave radio propagation with planetary positions. Inspired by earlier investigations suggesting a connection between the relative positions of the planets and the solar sunspot cycle, Nelson searched for a relationship between particular planetary positions and disturbances in shortwave radio communications across the North Atlantic. He discovered an apparent tendency for days of disturbed radio propagation to coincide with the dates when any pair of the planets Mercury, Venus, Earth, Mars, Jupiter, or Saturn arrived at relative heliocentric angles of 0, 90, 180, or 270 degrees. Over the years Nelson has extended his work to include planets beyond Saturn and has applied his correlations to the problem of predicting times of poor conditions for shortwave communication.

Nelson has claimed high reliability from his methods of predicting propagation conditions. Of nearly 1,500 forecasts made in 1967, 93.2 percent are said to have been within one point of the observed quality on a six-point rating scale (Dean 1977). Apparently he relies on known periodicities and conventional effects as well as planetary configurations for these predictions. He has attracted some interest in amateur radio circles. In an article for *QST* magazine, E. P. Tilton (1976) argued that limitations in the traditional methods of predicting radio disturbances required some additional factor such as Nelson's planetary configurations. Nelson himself wrote a monthly propagation column for a number of years in *73* magazine

Philip Ianna and Chaim Margolin are astronomers at the Leander McCormick Observatory and Department of Astronomy, University of Virginia, Charlottesville.

and has published *The Propagation Wizard's Handbook* (1979).

However, it is the astrologers who have been the most enthusiastic supporters of Nelson's work. Since the heliocentric angles he used correspond to the traditional geocentric astrological aspects of conjunction, opposition, and square, they see the work as providing empirical confirmation of basic astrological beliefs. It is rare to find an astrology book omitting a discussion of these correlations. King (1975) points to Nelson's "sensational article" as shattering orthodox views about humans and the universe and finds the traditional claims of the influence of planetary positions "triumphantly vindicated"; it "unequivocally supports" astrological theory, say West and Toonder (1970). Sydney Omar devotes a full chapter of *My World of Astrology* to Nelson's work as verification of "ancient astrological concepts." The recent and admirably critical review of the astrological literature by Dean (1977) summarizes and updates in some detail Nelson's continuing investigations of radio disturbances. Owing to the very small number of statistical studies of the astrological aspects, Nelson's radio propagation studies are offered as providing "the most valuable insight of all."

Although, as mentioned, Nelson has modified his views somewhat, the original (1951) correlational evidence seems still to be the foundation for accepting the reality of the modulating influence of the planets. It is our purpose here to point out a possible fundamental difficulty with the initial investigation. We do not comment on the second part of Nelson's paper, where multiple configurations are considered.

Nelson's procedure was quite straightforward. From the *American Ephemeris and Nautical Almanac* for the years 1942, 1944, 1947, 1948, and 1949, he recorded the dates when the heliocentric relationship between any two of the six chosen planets was a multiple of 90 degrees. These dates are termed "configuration days." Mercury, of course, generates the largest number of configuration days, and there are multiple configurations as well on some of these individual days. Commenting on the general pattern of occurrences over the five years, Nelson writes:

> The analysis shows that these configurations are quite random in time and vary from cases where only one configuration between two planets takes place in a 14-day period to cases in which five of these six planets are involved in a configuration with some other planet within a forty-eight hour period. Cases where an inner planet makes a configuration with two outer planets within a twenty-four hour period are quite numerous.

From recorded logs of conditions on shortwave signals over the North Atlantic for each of the daily eight-hour "watch" periods for the years in question, the number of watch periods rated as disturbed at the Riverhead, L.I., receiving station could be correlated with the chosen planetary configurations. The results for a typical year, 1942, are shown in Figure 1. Nelson says, "It can be readily seen from these graphs that disturbed

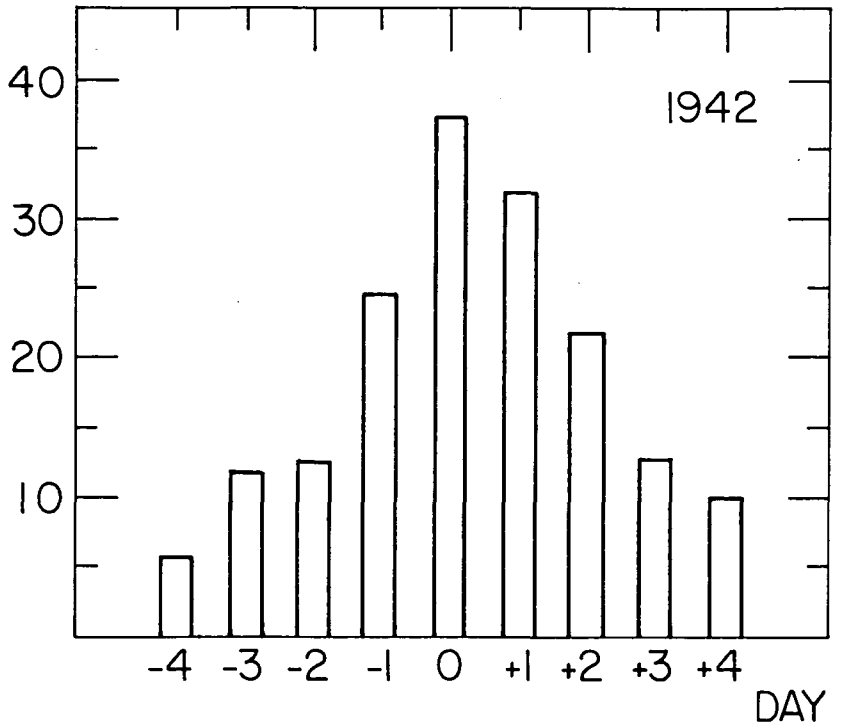

FIGURE 1. Histogram of eight-hour periods of disturbed radio propagation near days of particular planetary configurations, as given by John H. Nelson (1951).

conditions show good correlation with planetary configurations." Indeed, since you might surmise that no correlation would have produced roughly equal numbers of disturbed watch periods in each daily bin, the likelihood of finding such a peaked distribution purely by chance would be quite low. A chi-squared test applied to this data gives a $p \sim 10^{-7}$ for the probability that the sample might be truly uniform over the interval.

It is interesting to look a bit more closely into Nelson's results in order to try to understand what he did and if the correlations he found are justified. From the *Nautical Almanac* we find there are a total of 101 configurations on 91 separate days during 1942. First we note there are not very many periods of disturbed shortwave communication. Of a possible 273 disturbed eight-hour watch periods (hereinafter abbreviated DWP) on the 91 configuration days, Nelson's data show 86 percent of them to be *un*disturbed. At any rate configuration days are quite common; one occurs on the average of every 4.0 days. Now Nelson's histograms, all similar to the one in Figure 1, display the number of DWP for the configuration day and for each of the four days preceding and following. However, owing to the frequency of configuration days and hence their mutual proximity, if the counting criterion is that any (disturbed) day is counted from the

nearest configuration day, there *cannot* be very many days three or four days on either side of a configuration day. It thus seems probable that Nelson's distribution might simply come about from the bias toward configuration day in counting DWP.

We thought it would be instructive to check this possibility by seeing whether the distribution could be reproduced with a sequence of DWP randomly spread throughout the year. This sequence was constructed using a random number generator and imposing the constraint that one fourth of the 1,100 DWP be considered disturbed, i.e., for $0<n_{random}<1$, the period was considered "disturbed" if $n \geq 0.75$. We then compared the random sequence with the configuration days for 1942 numbered serially from 1 January, taking care not to count any day more than once. Our result is a distribution from the *random* DWP very nearly identical to Nelson's. The two are compared in Figure 2 and Table 1, where our numbers have been divided by two in order to match the number of DWP

TABLE 1

Number of disturbed eight-hour watch periods (DWP) for two different years (1942 and 1949) as taken from Nelson's (1951) tabulation of shortwave propagation conditions compared with simulated data. A configuration day is one where any pair of planets (Mercury, Venus, Earth, Mars, Jupiter, or Saturn) stand at a relative heliocentric angle of 0, 90, 180, or 270 degrees.

	Configuration Day								
	-4	-3	-2	-1	0	+1	+2	+3	+4
1942									
Number of DWP (Nelson)	6	12	13	24	37	32	22	13	10
Number of DWP (Our simulation)	4	8	12	25	36	33	16	9	3
1949									
Number of DWP (Nelson)	3	5	8	12	40	39	17	11	3
Number of DWP (Our simulation)	3	6	17	28	37	38	21	9	4

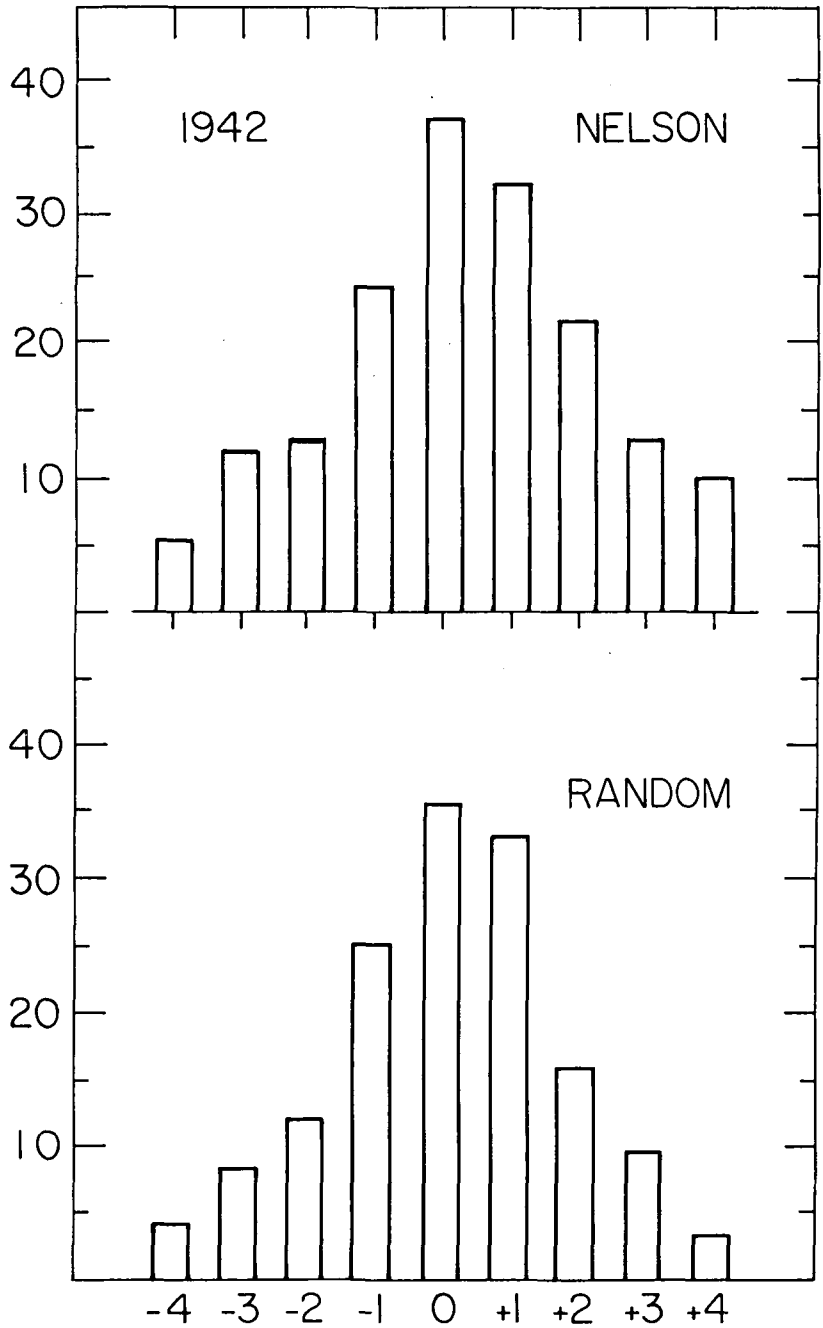

FIGURE 2. Comparison of Nelson's data with random distribution of disturbed periods of configuration days in 1942.

found by Nelson for configuration day.

The random numbers reproduced Nelson's correlations so well that we decided to try another year, this time choosing 1949, since it had the least symmetrical of the distributions. This year is characterized by having almost equal numbers of DWP for day "0" and day "+1." Another sequence of random DWP was generated as before and compared with the 104 configuration days extracted from the *Nautical Almanac* for 1949. This result is shown in Figure 3 and Table 1, again after scaling our numbers to Nelson's by halving the actual counts. Once more we match Nelson. The most prominent feature of the 1949 data is replicated in our counts of the random DWP, although the overall fit to Nelson is not quite as good this time.

As well as being visually similar, these pairs of distribution are statistically not very different either. Since chi-square is unreliable when bin counts are below five, we compared the Nelson and random DWP distribution, omitting the two extreme bins. We also adjusted the random frequency to give the same total counts as observed by Nelson. For 1942 the probability that the two distributions are not different is about 0.6; for 1949 we find $p = 0.02$, almost entirely due to the discordance at day 1.

Finally we tallied the number of days falling in each bin on either side of the configuration day for each of the years included by Nelson. The distribution is almost identical from year to year, as might be expected, and the five-year average is given in Table 2. We have also averaged the number of DWP for the five years. If the counts of DWP in each bin are then weighted upward to compensate for the varying number of days/bin,

TABLE 2

Average over five years of disturbed watch periods (DWP), number of days per bin on either side of a configuration day averaged over the five years, and the disturbed watch period distribution weighted by the number of contributing days per bin.

	Configuration Day								
	-4	-3	-2	-1	0	+1	+2	+3	+4
Mean DWP	5.8	11.4	13.8	23.2	41.2	34.2	19.0	9.4	6.2
Number of days	8.2	16.0	32.8	55.0	91.2	72.8	41.6	22.0	10.4
Weighted Number of DWP	14.5	65.0	38.4	38.5	41.2	42.8	41.6	39.0	54.4

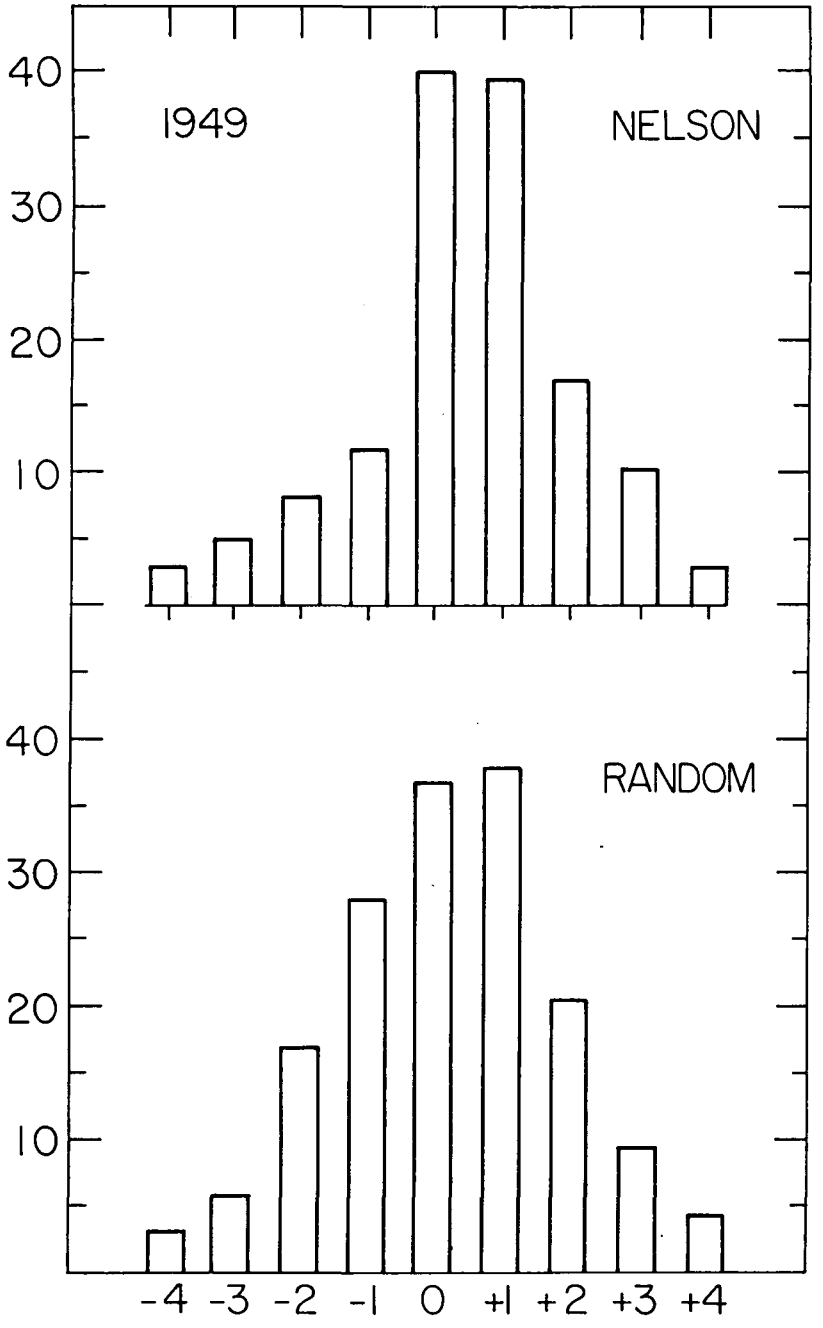

FIGURE 3. Comparison of Nelson's data with random distribution of disturbed periods for configuration days in 1949.

the distribution of DWP flattens out and there is no longer any excess of DWP on configuration day or the days on either side. If anything, there is a tendency for the suppression of DWP around configuration day. This cannot be considered significant however, since only the lower information endpoints deviate from uniformity. Furthermore, at the extremes, this weighted distribution is very sensitive to our day counts, and they are not entirely free of ambiguity in the assignment of days to particular bins preceding or following the configuration day.

In view of how very closely we could duplicate Nelson's histograms from a sample of randomly distributed "disturbed" intervals and the flatness of the distribution of DWP around configuration day, when the counts are properly weighted, we must conclude that Nelson's initial basic result is incorrect. The more frequently disturbed periods on configuration days compared with non-aspect days can be understood simply as an artifact of the close spacing of the configuration days and his counting procedure. Thus Nelson's correlation of disturbed shortwave radio propagation with planetary configurations cannot be construed as evidence for planetary influence, or as empirical support for astrological aspects.

Acknowledgment

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