

**Analytical and Empirical Issues in  
the Study of Power-Polarity Configuration Sequences**

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ABSTRACT

An evolving dataset on the power configuration sequences of civilizations/world systems is described, and the data thus far collected graphed. The sequences of power structures exhibited by past world systems are not very consistent with most standard expectations, nor with one another; new hypotheses and analytical techniques seem called for; several are outlined.

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Many scientific disciplines have a more or less customary division of labor between theorists and observationalists, experimenters, field workers and the like. In war theory, it is quite normal for datasets to be collected by some researchers and used by others to test the theories of still others, and this is generally considered to be a very good thing. It does not still controversy, as over say the democratic peace theory, but it probably improves the quality and of such controversy.

Most theories of world systems and world politics could do with a bit of independent testing. Some of these theories propose to explain and perhaps predict or control variation in the political centralization of such systems. It would seem helpful for researchers to collect data on different patterns of centralization in world systems, and changes in such patterns, and from sources independent of the theories to be tested.

The previous papers in the series have examined five world systems' histories, and proposed descriptions of the political condition of each system at intervals, in some cases of 10, in others of 25 years. The current paper builds on its immediate predecessor, which proposed a sequence for a world system centered on the Middle East and Eastern Mediterranean for the period 1500-700 BC.

I have for some years been working on developing data and, to a much lesser extent, testing theory concerning the centralization history--the political structures or power configurations--of civilizations or "world systems," exploring typologies for such structures, locating the sequences of such configurations over very long durations, developing and testing hypotheses about the expected succession of such sequences.

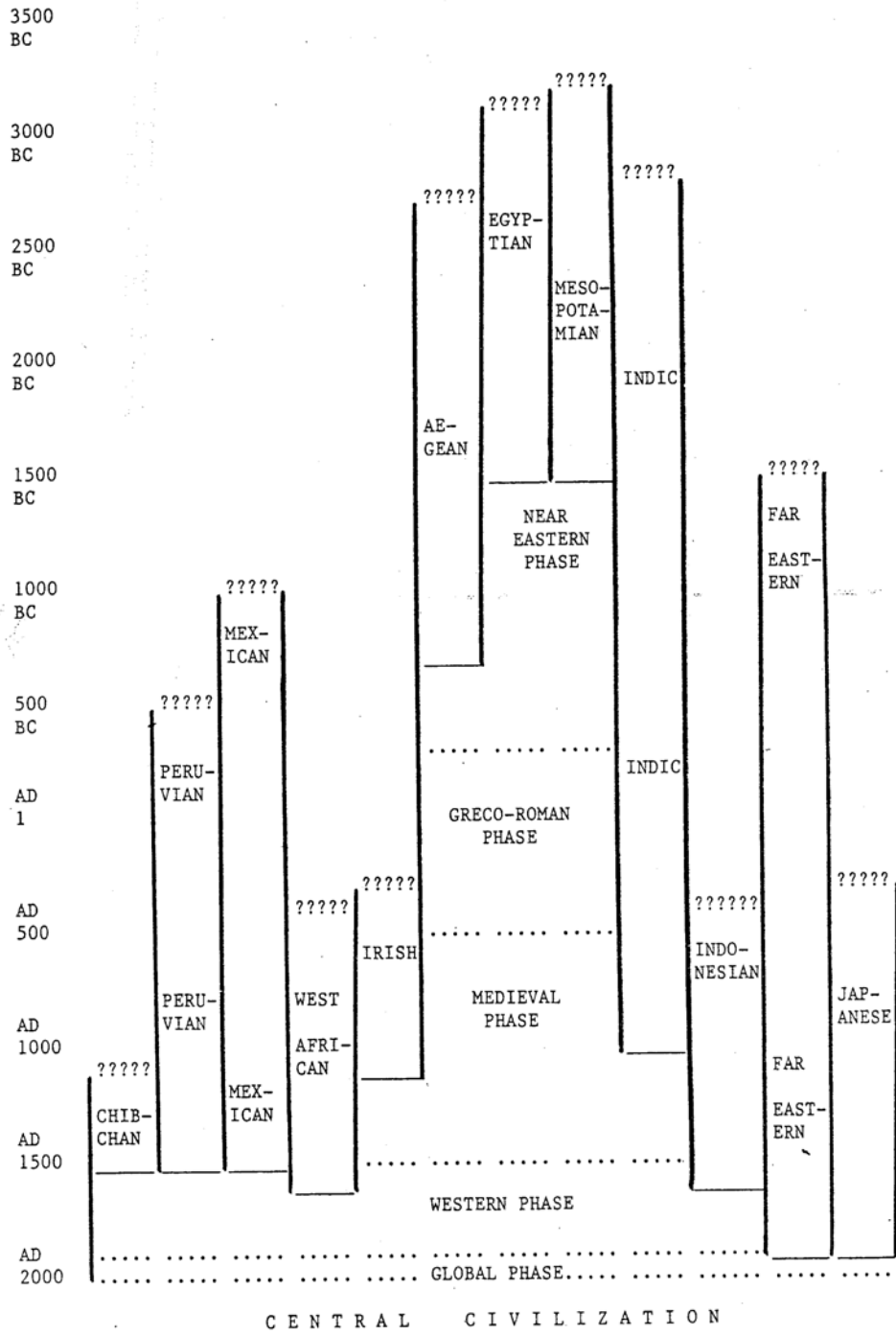
Though the data remain incomplete, I now have enough sequences of power configurations within several world systems of the distant past to conclude that the most prominent existing kinematic hypotheses are largely inadequate, and that more sophisticated techniques and models will be needed to reduce the data to some better order.

What are these "world systems"?

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Figure 1 goes about here  
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FIGURE 1

The Incorporation of Twelve Civilizations into One



This chart dates from 1984 and the era of the typewriter. It is a chronogram which begins at the top. As one goes downward on the page, and forward in time, entities begin to appear on the chart. These are the classic or primary civilizations or world systems: Egyptian and Mesopotamian, to begin with, then a collection of others, arranged roughly west to east, left to right.

World systems come into existence at some point in space, and at some moment in time. The moment of origin is usually uncertain--the question marks indicate that uncertainty. World systems have coexisted on the globe for some period, and then merged into larger entities through long-term growth, collision and fusion.

The particular systems distinguished here (and there are in history several more, usually small ones, not shown on the chart) when viewed at their origins mostly reflect those "civilizations" which have been generally recognized by civilizationists. After about 1500 BC, however, the chart reflects my own view that a composite world system, here called the "central" system, arose in the Near East by way of the fusions of two previously separate politico-military networks, the Mesopotamian and Egyptian. Over its entire duration, this system, at first dominated by Near Eastern powers and then by Western powers, ultimately expanded to the global scale which it enjoys today. After AD 1500, the chart reflects the world systems view that Western expansion globalized its system, incorporating all the others, previously autonomous, into its own politico-economic structure.

My specific research interest is to represent and analyze the power configurations or political structures of these world systems at different moments in their careers.

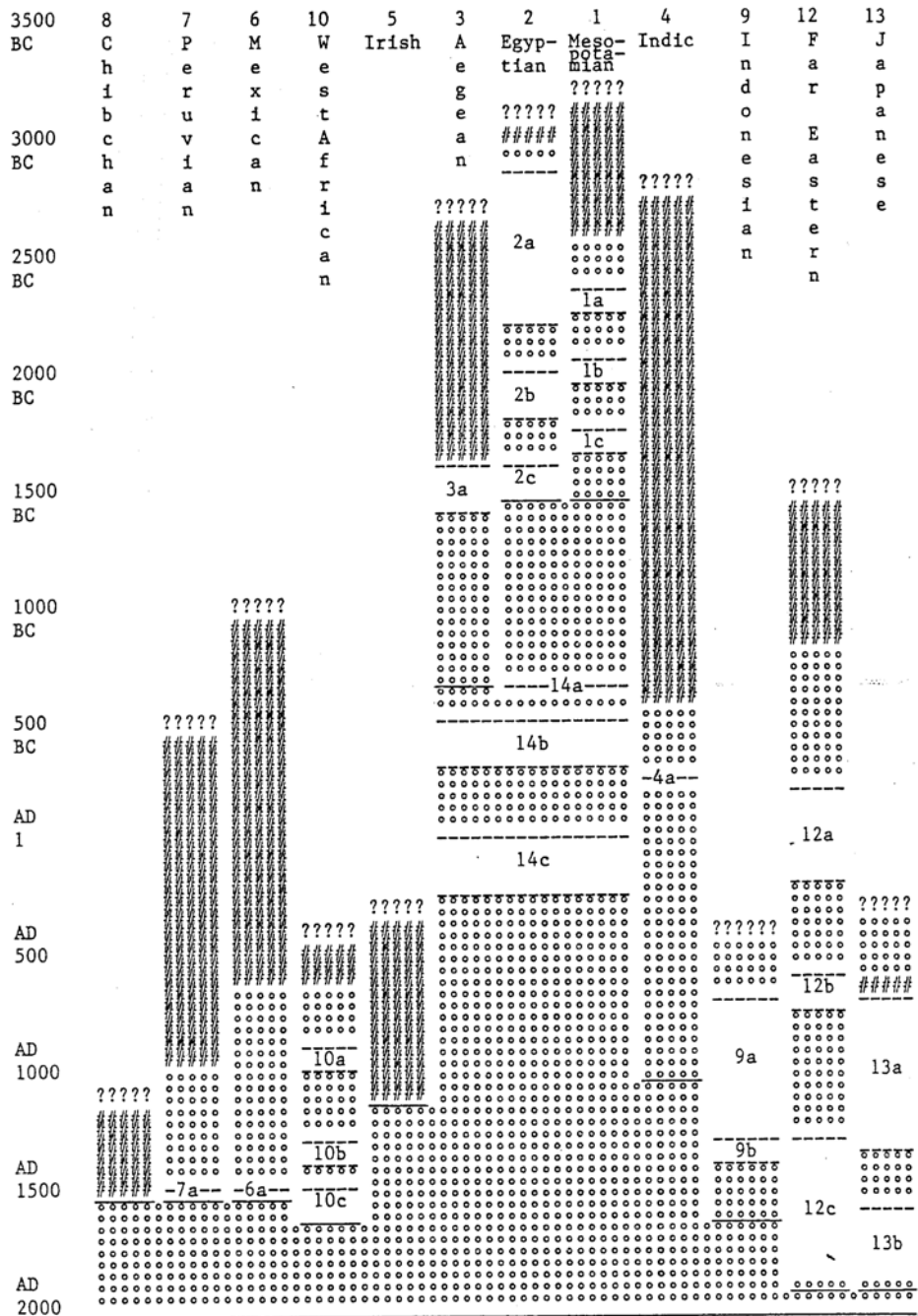
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Figure 2 goes about here

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This chart, Figure 2, again from the typewriter age, gives a preliminary look at what I have in mind. Figure 2 overlays Figure 1 with shadings. The shadings represent values of a dichotomy which answers the question: at a given moment in time, was a world system structured as a system on independent states, or united in a universal state or empire? The circles represent the answer "system of states." The unshaded areas represent the answer "universal empire." The number signs represent the ever-necessary alternative "don't know."

Figure 2 Chronogram of States Systems and Universal Empires



Code numbers refer to civilization and universal empire, e.g. 7a="Peruvian:Inca"  
 Areas marked °°° are judged states-system periods; marked ### are doubtful.

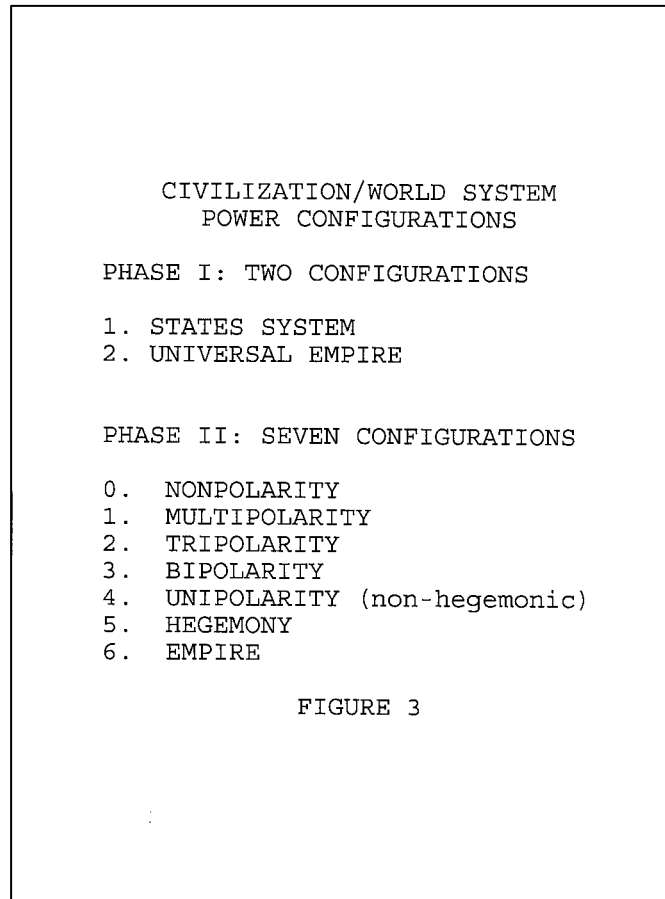
The data represented in this chart are helpful in addressing certain theories. Various theories of civilizational development, for instance, expect increasing political centralization over time. If we had seen a preponderance of circle-shadings toward the top of Figure 2, and unshaded areas toward the bottom, that would be consistent with such theories. This graphic is useful for showing that this is not precisely the case, and that the problem is more complex.

Since producing Figure 2, I have been attempting to deal with the obvious concern that a dichotomous variable--Empire vs. States System--underrepresents intriguing complexities of power structure. For the next step in data collection I elected to try a heptachotomy, a seven-valued nominal power configuration variable, which included configurations long of interest to political scientists and world-systems analysts, as shown in Figure 3.

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Figure 3 goes about here

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In addition to empire, I look for a weaker form of domination, namely hegemony; and among states-systems, I varied the number of great powers, distinguishing unipolarity (with one superpower, as in the world today) from bipolarity (as during the Cold War) from tripolarity (with three great powers), multipolarity (more than three great powers, as in the world system during say 1815-1945), and nonpolarity (no great powers but many small independent states).

Surveying the world systems on this much more complex variable is taking a long time, and I'm far from finishing even a first cut, but I have some results. I provide these results in graphic form as Figures 4-8.

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Figures 4-8 go about here

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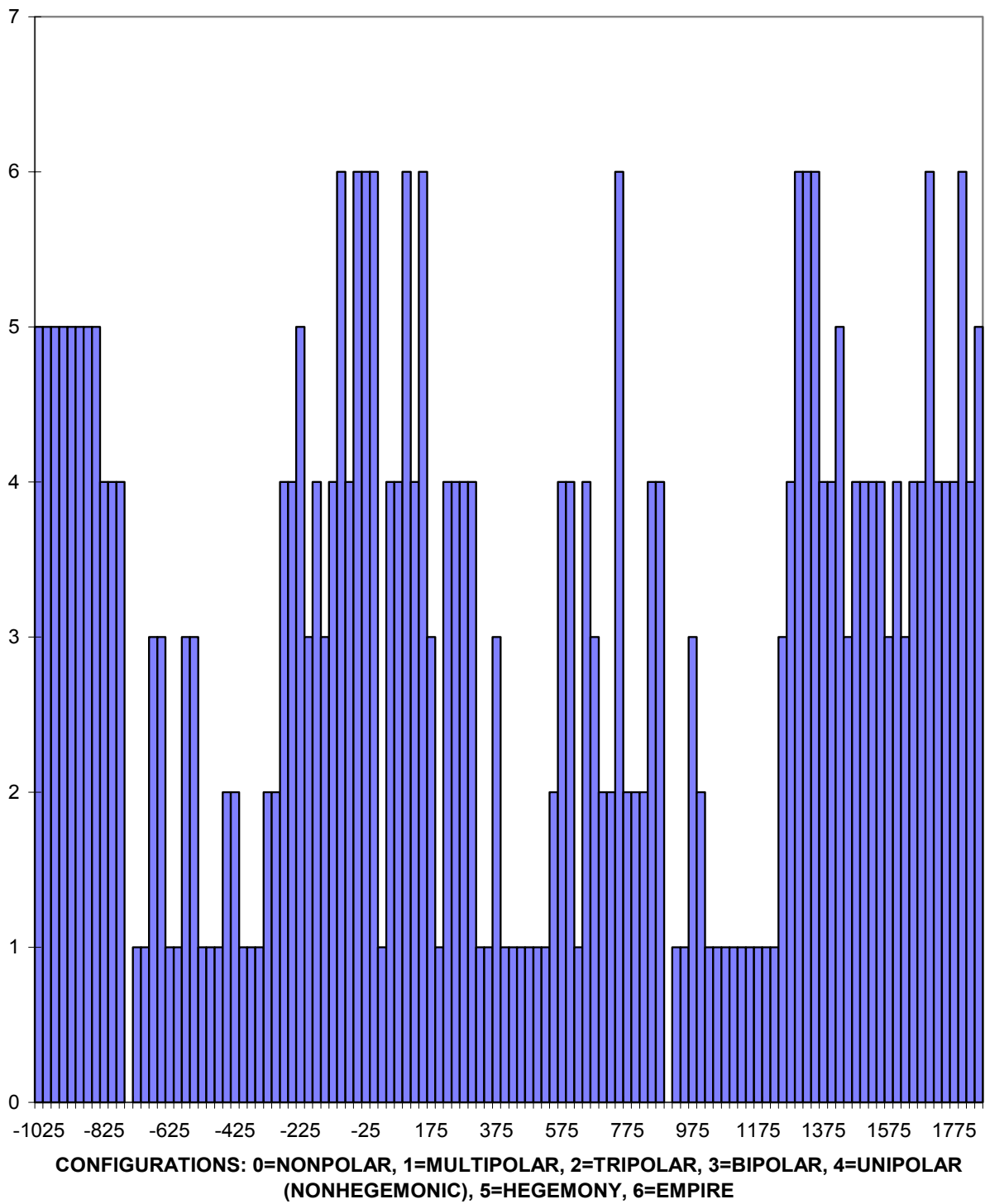


Figure 4

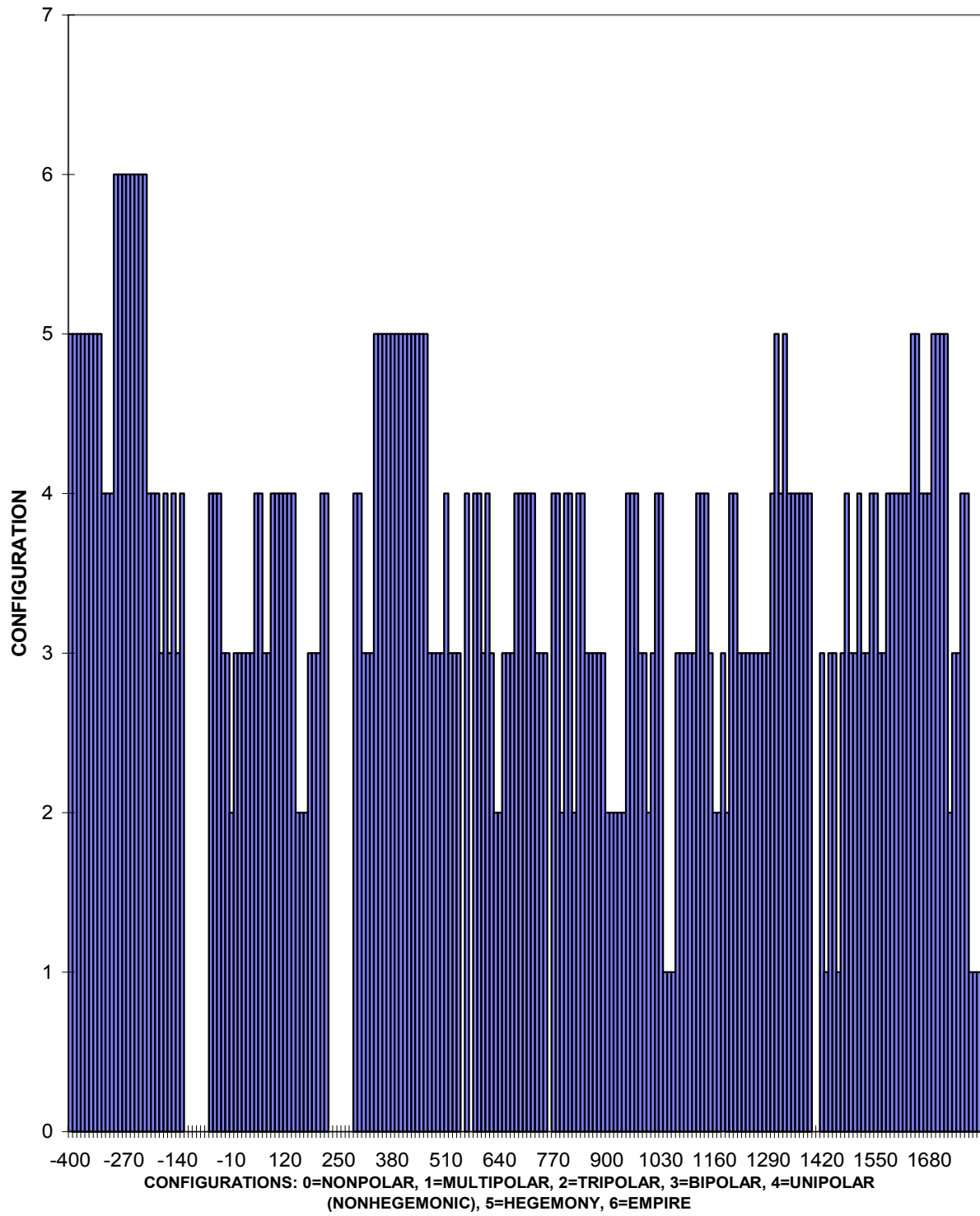


Figure 5

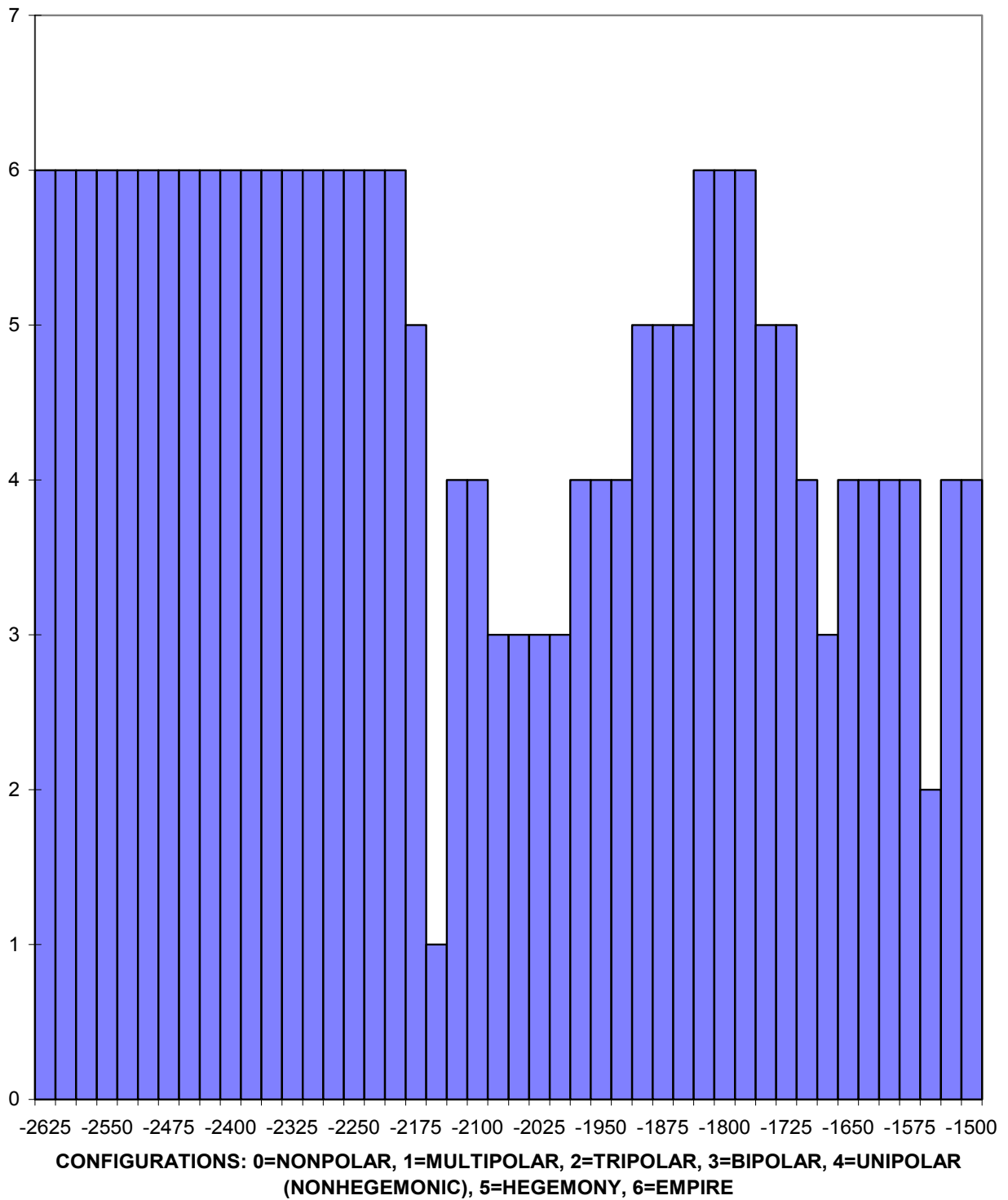


Figure 6

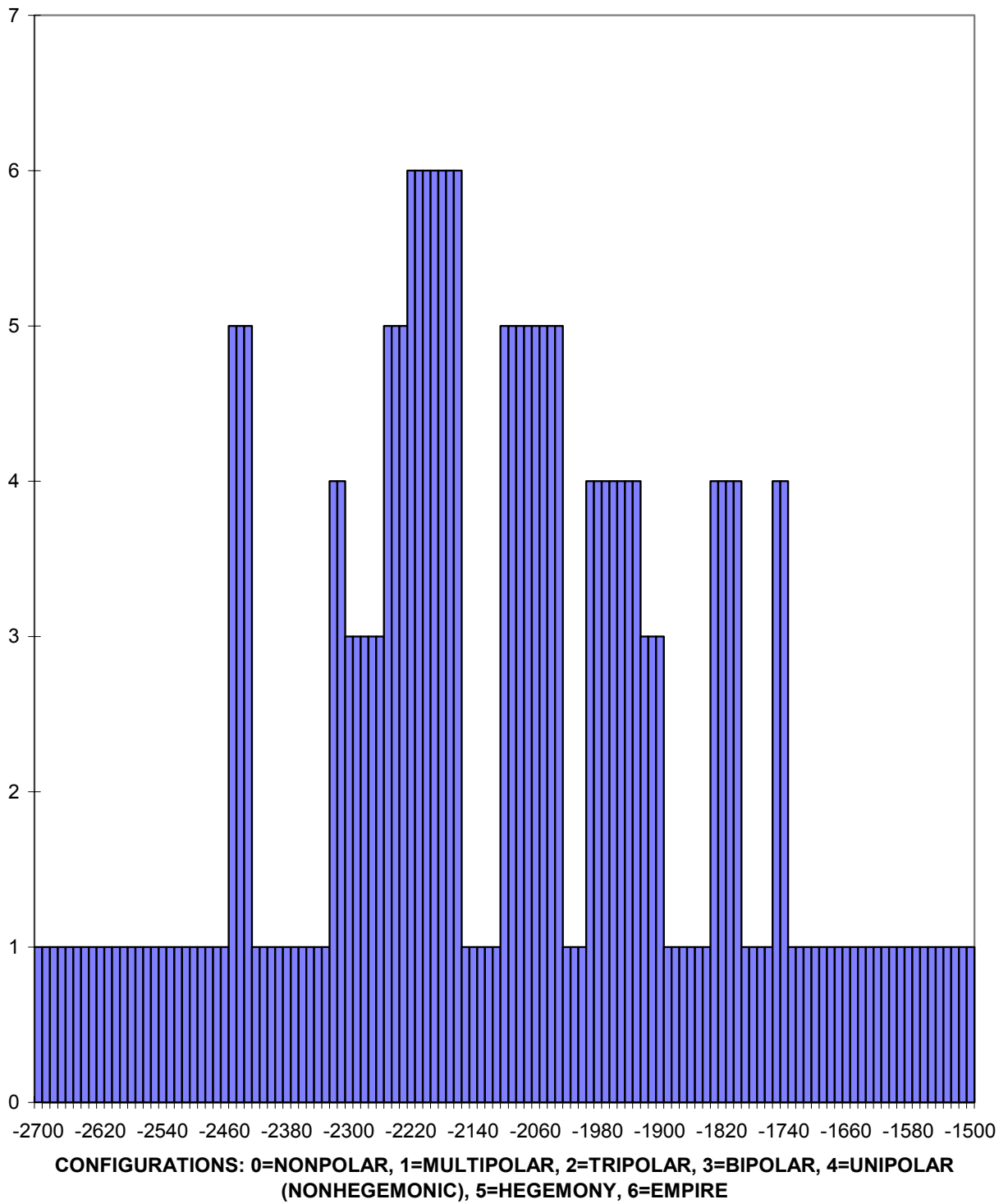


Figure 7

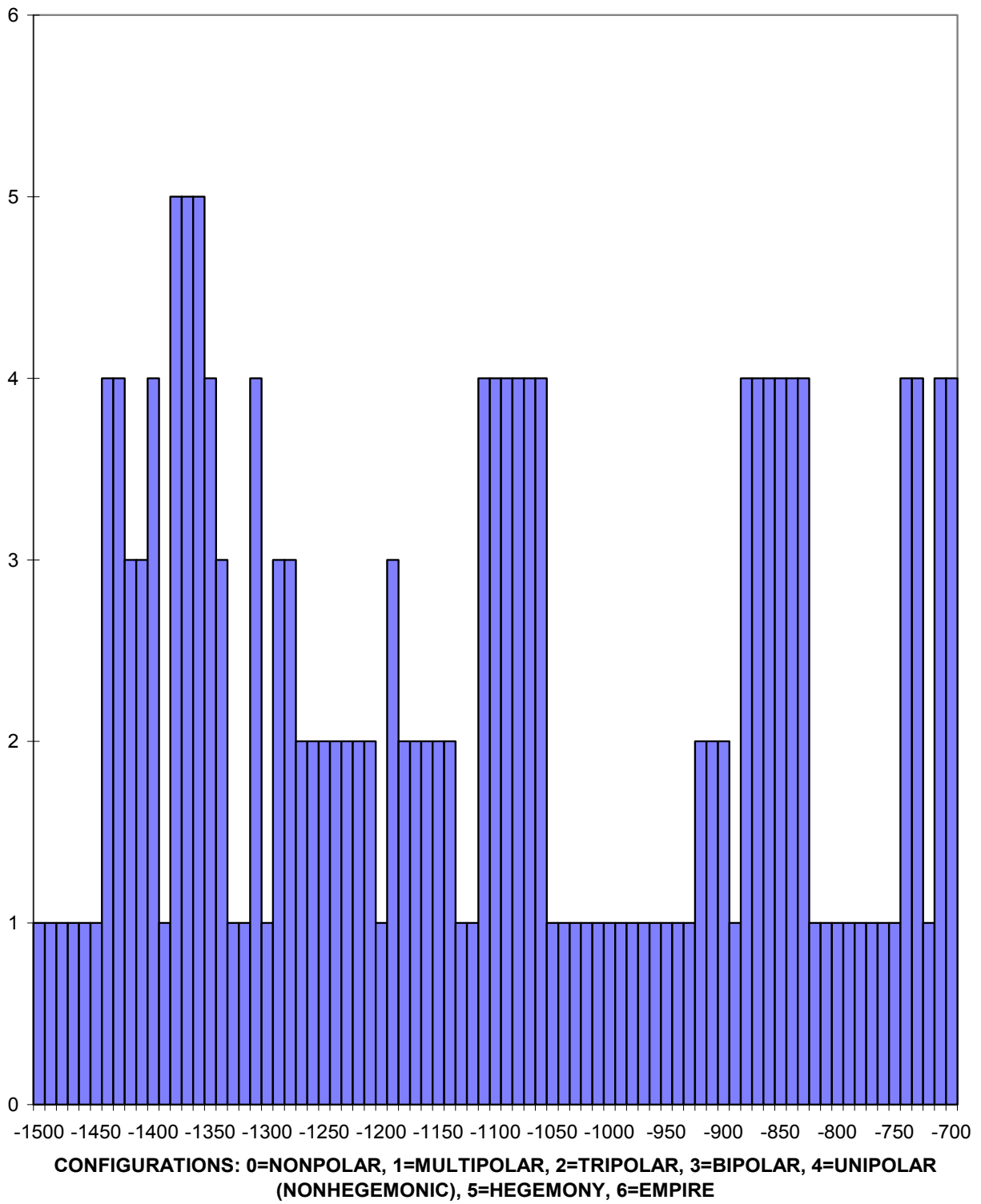


Figure 8

The values on the Y-axis are: 0=Nonpolarity, 6=Empire, and the other configurations in between, as stated in the legend on each charts.

Figure 4 charts the centralization fluctuations of the Far Eastern world system 1025 BC--AD 1850 at 25-year intervals, Figure 5 the Indic system 400 BC--AD 1800 at 10-year intervals, Figure 6 the Northeast African (Egyptian) c. 2625-1500 BC at 25-year intervals, Figure 7 the Southwest Asian (Mesopotamian) c. 2700-1500 BC at 10-year intervals, and Figure 8 the Central system 1500-700 BC at 10-year intervals.

These data allow us to address a number of recurrent issues in civilizations theory and world system theory having to do with the behavioral and evolutionary propensities of whole systems. Let us consider some of the simpler hypotheses which float about the research environment, sometimes compatibly with, sometimes contradicting one another.

- (1) Systems increase in centralization as they age.
- (2) Systems tend to increase in centralization over time, but there are strong short-duration fluctuations enroute.

The data graphed in Figures 4-8 are not at all consistent with either (1) or (2), which reflect the civilizational ideas of Spengler, Toynbee (original) and Melko.

- (3) Multipolarity is the norm.
- (4) Multipolarity is the stablest configuration.

The notion that multipolarity is the stable norm is reflected in Figure 9 by a data trace that represents an idealized career of a stably multipolar world system's power configurations. The system is usually multipolar, and when it deviates from multipolarity it quickly returns thereto.

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Figure 9 goes about here

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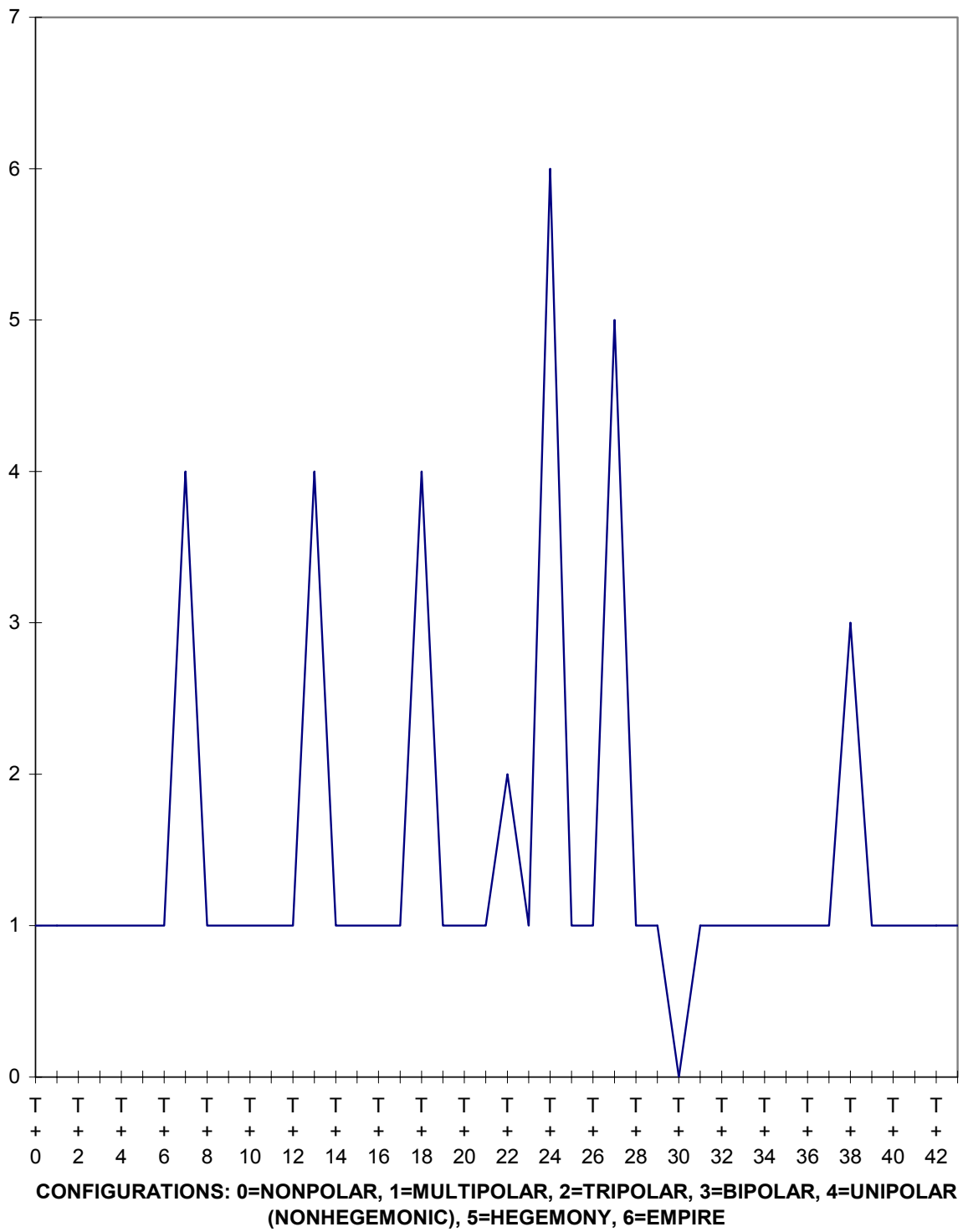


Figure 9

Although multipolarism is widely approved by contemporary politicians, it is fairly consistent with only two graphs (Figure 7, SW Asia, and Figure 8, Central), and even there one observes are long failure epochs.

(5) Empire is the stablest configuration.

No doubt approved by Sons of Heaven, Caesars and Pharaohs, and certainly by Dante Alighieri, what we might call ultra-imperialism is very consistent with part of one graph (Figure 6, Northeast Africa), but not the rest.

(6) Bipolarity is more stable than multipolarity.

Particularly identified with Kenneth Waltz, this hypothesis is inconsistent with one graph (Figure 4, Far East), not inconsistent with three graphs (Figures 5, Indic, 7, SW Asia, and 9, Central), and probably not adequately tested in the fifth (Figure 6, NE Africa).

(7) Systems fluctuate between the hegemony of one power and a multipolar balance.

This notion has great currency among world-systems analysts. It is not a particularly good fit to any of the data traces.

(8) All world systems display cycles of centralization and decentralization, with no clear directionality and no normal resting point, stable state, or terminus ad quem.

This, the weakest hypothesis of the set, identifiable with the "Helleno-Sinic" theory of civilizations to which Arnold Toynbee retreated in his late work (Reconsiderations), after abandoning his original increasing-centralization theory. By inspection, it seems broadly consistent with all graphs except perhaps one (Figure 6, NE Africa).

One would like to know more than this, certainly. One clue may lie in the fact that each system seems to have an "individuality," a recognizable signature, reflecting some persistent behavioral patterns. Based on visual inspection of the data, I have elaborated a few more hypotheses that seem worth a try, but will require more careful testing than the simple, straightforward optical analysis just employed. Two are derivable from ancient and early modern physics, as well as from bureaucratic experience.

(9) Systems are Newtonian-physical, or conservative, and will most likely be found at any time in the same configuration they showed at the time of last measurement.

(10) Systems are Aristotelian-physical, or reactionary, and will most likely be found at any time in the configuration they have occupied for most of their duration.

Another hypothesis might emerge from common network analysis. Two network types seem to have parallels in the power configurations. "Random" networks, with nodes linked at random, lack such a parallel. "Regular" networks, with neighbors highly interconnected, best approximate the Nonpolar configuration. "Scale-free" networks, with a small number of highly connected nodes and a large number of weakly connected nodes, are represented by the other six configurations, with Empire having the smallest number of highly connected nodes, Multipolarity the largest.

(11) A relevant hypothesis might then be: the bigger they are, the harder they fall. A chance of large cascading failures seems inherent in highly interconnected systems when they are stressed: perhaps then transitions out of the Empire configuration will tend toward greater decentralization than those out of the less-connected Hegemony and Unipolarity configurations.

At this point I will stop posing hypotheses and start asking questions, to which I hope somebody in the audience will have answers that may either propose additional hypotheses or means of measurement.

(12) To what extent do these world systems behave according to Zipf's Law? If for each of them we calculate the frequency of occurrence of each of the seven configurations, then logarithmically plot the frequencies in descending order, to the degree that the slope of the plot approximates -1 (vs. 0), the curve may be a "signal" containing information and implying complexity of the underlying system. (A 0 slope would be noise, a signal with no information, attributable to chance.) Zipfian behavior would to some extent seem consistent with "traditionalism," in that the more often a behavior (configuration) was displayed in the past, the more often it would be predicted to occur. But is there more to it than that?

(13) Discussion of Zipfian patterns leads to introducing the--at least to me--difficult notion of Shannon entropy. Verbal descriptions of Shannon entropy, with whose mathematics I am unfamiliar, inform me that zero-order Shannon entropy measures the diversity of a repertoire: in this case, a world system's repertoire would be the number of configurations which are actually displayed by that world system over time. For instance, the repertoire of Northeast Africa excluded nonpolarity, as did that of Southwest Asia, which also omitted tripolarity, while all seven configurations appear in the Far eastern and Indic timelines.

First-order Shannon entropy measures the frequency or probability of occurrence of each element in the repertoire. Second-order entropy is a conditional probability: knowing an item in a sequence of configurations, what are the chances of predicting the next item? The third-order entropy value is the probability of predicting the third configuration in a sequence, given the first two. Higher entropy values at given orders, and non-zero high-order Shannon entropies, imply a higher degree of predictability, regularity and form in the whole system.

It might be of interest to calculate the Shannon entropies of the various world systems, and to attempt to interpret them.

(14) It would appear by inspection that the volatility (variance) of power configurations changes over time--compare the first and second halves of the Figure 4 timeline--and perhaps therefore also their Zipfianness and Shannon entropy do so as well. Do any particular configurations or sequences predict higher or lower volatility? But what is an appropriate measure of volatility in a nominal variable?

Doug White has kindly provided me with yet further analytical and empirical questions, which I have somewhat modified and augmented, and hope may stimulate some joint efforts.

(15) Are there statistical characterizations of, and differences between the signatures of different world systems?

(16) When do signatures shift (e.g. Fig. 6, NE Africa, c. 2200 BC; perhaps Fig. 7, SW Asia, c. 2450 and again c. 1730 BC), and why?

(17) Is there synchrony between the dates and perhaps directions of configuration change in coexisting world systems?

(18) Is there a correlation between configurations, or configuration changes, and innovation?

(19) Is there a correlation between roadbuilding and road network size and systemic centralization?

(20) Is there a correlation between the frequency, intensity, magnitude, and complexity of wars and the systemic power configuration--or configuration changes--or the systemic signature?

(21) Is there a correlation between demographics--city sizes, numbers, hierarchies--and power configuration?

(22) ... between economic growth and power configuration?

(23) ... between climate change and configuration change?

(24) ... between the (changing) geopolitics of a world system and its power configuration?

Hypotheses 9-11, and topics 12-24, I don't feel prepared to tackle alone; I have more pressing business in the datamaking area. They need either more sophisticated tools than I currently possess, or datasets I am not aiming to collect, which leads me to a search for someone better able than I to deploy the tools, or inclined to collect the matching data. So my objective at this meeting is to find a collaborator or two.

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