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Kroeber's Cultural Configurations, Sorokin's Culture Mentalities, and Generational Time-Series Analysis: A quantitative Study of Civilizations

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KROEBER'S CULTURAL CONFIGURATIONS, SOROKIN'S CULTURE MENTALITIES, AND GENERATIONAL TIME-SERIES ANALYSIS: A QUANTITATIVE PARADIGM FOR THE COMPARATIVE STUDY OF CIVILIZATIONS

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Comparative studies of civilizations may use a diversity of analytical tools. For example, some studies are highly theoretical and speculative, such as the classic analyses of Auguste Comte and Oswald Spengler. Other investigations may adopt a more empirical, even quantitative approach, as exemplified by Pitirim Sorokin's 1937-1941 *Social and Cultural Dynamics*. In this latter category must also be placed Alfred Kroeber's 1944 book *Configurations of Culture Growth*. Let me discuss Kroeber first before returning to Sorokin.

Kroeber's (1944) aim was to analyze the rise and fall of civilizations in terms of the coming and going of its representative creative geniuses. To this end, he compiled long lists of eminent creators and creative achievements. These lists represented a great variety of achievement domains – science, philosophy, literature, music, art and architecture – as well as an impressive range of world cultures, namely, ancient and modern European, Islamic, Hindu, Chinese, Japanese, Southeast Asian, and Meso-American. The purpose of these compilations was to document the distinctive manner in which genius creative clustered into certain times and places. That is, the growth of a given *cultural pattern* is characterized by a formative period of pioneers and precursors who represent the culture's birth; these are then followed by the great creators who mark a Golden Age, who are themselves succeeded by a less distinguished cohort of the Silver Age; the latter are themselves followed by *epigones* who display the unfortunate features of *pattern exhaustion*, the whole historical sequence concluding with the descent into a Dark Age.

Kroeber's primary purpose was to show that cultural processes have primacy over the biological determinism advocated in Francis Galton's 1869 *Hereditary Genius*. Galton had argued that the fates of civilizations were determined by the genetic endowment of their populations. For example, the decline of ancient Greek civilization was attributed to miscegenation with "inferior races." Yet Kroeber's data rendered such an interpretation empirically untenable. The coming and going of a civilization's exemplary creators happens far too quickly to

be attributed to changes in the gene pool of the populations producing those geniuses. Therefore, these clusters must represent the impact of some environmental factor that can change rapidly. For Kroeber, this factor must be the sociocultural system. The ups and downs in the appearance of genius within a given civilization merely reflects underlying configurations of culture growth – hence the book's title.

Although Kroeber is to be praised for his willingness to compile a considerable body of data, his work can be faulted for its failure to apply statistical methods. In this respect, Kroeber's inquiry pales in comparison to Sorokin's. The latter not only accumulated large lists of eminent creators and achievements, but also subjected those raw data to quantitative measurement. For instance, in his examination of over 2,000 thinkers of Western civilization Sorokin (1937-1941) determined their relative eminence and the key philosophical positions they advocated. He then tabulated these thinkers into consecutive 20-year periods that extended from the ancient Greeks to the beginning of the 20th century. These tabulations were used to trace the ups and downs in the key "culture mentalities" (about which I will have more to say below). Even so, Sorokin's methodology stopped short of a comprehensive treatment.

Although quantification must be followed by an appropriate statistical analysis, Sorokin did no more than "eyeball" his time series. That is, his inferences were based on subjective impression only rather than executing objective correlational analyses. This failure to introduce appropriate statistics is unfortunate given the ample research showing that human beings are not very adept at drawing valid inferences from complex, probabilistic data without resorting to statistical techniques (Faust, 1984; Meehl, 1954; Simonton, 1990). As a consequence, he ended up drawing conclusions about sociocultural dynamics that could not be supported by his very own data (Simonton, 1976a, 1976b).

The reason why I can make the latter claim is that I have in fact applied a more sophisticated analytical strategy not just to Sorokin's data, but to Kroeber's besides. The method was first devised almost 30 years ago (Simonton, 1974, 1975), and has undergone considerable development and elaboration even since (Simonton, 1984c, 2002). The technique is called *generational time-series analysis* (Simonton, 1984b). Below I outline the key features of the approach, after which I will illustrate how it was used to examine both Kroeber's cultural configurations and Sorokin's cultural mentalities.

Generational Time-Series Analysis

Although Kroeber's raw data consisted of chronological lists of eminent figures in various domains, he realized that the cultural configurations could often be better conceived in terms of a *generation*, which he took to represent one third of a century. The individuals making up his lists could then be assigned to that generation in which they attained their peak of productivity. Kroeber called this optimal career age the person's *acme* or *floruit*, where age 40 was taken to provide "an unusually sound average estimate" (Kroeber, 1944, p. 27), a methodological assumption that has been endorsed by a considerable body of empirical research (Simonton, 1988a). Thus a generation consisted of those geniuses who attained their career acme within the same third century. In accord with Kroeber's basic thesis, genius was not randomly distributed over the generations, but rather appeared to be concentrated in certain periods, while other periods displayed a paucity, if not total absence, of genius. For instance, Kroeber's data on British science showed that genius appeared in three clusters, the first highlighted by Gilbert and Harvey, the second by Boyle and Newton, and the third by Faraday and Darwin.

By introducing the generation concept, Kroeber was actually following an old tradition in the social sciences. Auguste Comte, John Stuart Mill, Wilhelm Dilthey, Karl Mannheim, and José Ortega y Gasset, among many others, viewed the generation as an ideal unit for conceiving transhistorical changes in the sociocultural milieu. Most of these thinkers merely viewed the generation as an aggregation of individuals that lacked significance at the individual level. The Spanish philosopher Ortega y Gasset (1933/1958), however, attempted to conceive the generation in a manner that would integrate aggregate and individual levels. Ortega began with the schematic division of the person's life span into the five ages of 15 years each. The first 30 years are devoted to the periods of childhood (0-15) and youth (15-30), and the last 15 years are assigned to old age (60-75). Between are the age of *initiation* (30-45) and the age of *dominance* (45-60). The former is the period of creativity and the latter of command. In Ortega's model, the characteristics of successive generations are the aggregate manifestations of underlying developmental transitions occurring in the individual's life.

Neither Ortega nor Kroeber nor any of their predecessors went beyond a fairly qualitative conception of the generation. Nonetheless, it is possible to integrate Kroeber's and Ortega's ideas into a more pow-

erful analytical paradigm. The technique begins by subdividing the historical period under consideration into consecutive generations. Following Sorokin's example, these time units are defined by 20-year intervals, or 5 generations per century. For instance, the 20th century would be sliced into the following periods: 1900-1919, 1920-1939, 1940-1959, 1960-1979, and 1980-1999. Then adopting Kroeber's procedure, a given historical figure is assigned to that 20-year unit in which he or she attained age 40. Individuals who died prior to reaching 40 are still assigned as if they had done so. All those individuals who have been assigned to this period are designated as generation *g*.

Assuming that the list of famous personalities is sufficiently extensive, then there will be a respectable number of persons in most or all generations. As a result, it is possible to speak of the average characteristics of those who compose a particular generation. In particular, it may be said that the average person assigned generation *g*, or any other generation, will be 40 years of age. Furthermore, the typical individual will be around 30 at the beginning of this period and around 50 at the end of this period. The 30-50 age interval corresponds very closely with empirical findings on the relation between age and creative achievement (Simonton, 1988a, 1997a). The first major contribution of a creative career tends to appear around 30 and the last around 50.

Hence, the average person is assigned to that generation in which most of his or her most outstanding contributions are likely to have been made. This interval may be styled the individual's *productive period*. Yet if a typical member of generation *g* is 40, then those members will be around 20 in the preceding generation, or what is designated generation *g* - 1. More accurately, the average individual will be between 10 and 30 in this interval. According to this scheme, this interval is labeled the *developmental period* of the individual's life. It is during this phase that the person is most susceptible to various external influences. Some of these influences may entail the internal milieu of a particular creative discipline, whereas other influences may involve the general political, social, cultural, and economic zeitgeist. To assess these influences, additional generational time-series are created that consist of the tabulations of appropriate historical events or circumstances – such as Sorokin (1937-1941) did when he studied fluctuations in war and civil disturbances. In any event, once suitable time series are quantified, they can be subjected to statistical analyses that can test various hypotheses about sociocultural dynamics (Simonton, 1984b). Two characteristic illustrations appear below.

Kroeber's Cultural Configurations

Kroeber (1944) offered some speculations about why creative genius clusters into configurations. One suggested factor was the intergenerational influence that he styled *emulation*. Kroeber specifically quoted a Roman historian, Velleius Paterculus, who had argued that "Genius is fostered by emulation, and it is now envy, now admiration, which enkindles imitation, and, in the nature of things, that which is cultivated with the highest zeal advances to the highest perfection" (Kroeber, 1944, p. 18). This conjecture can be easily translated into the terms of generational time-series analysis. Creators in their productive period at generation g are in their developmental period at generation g - 1. Hence, during that earlier period they are susceptible to the impact of the previous generation of creators who are at their own productive period. In other words, because the productive period of one generation overlaps with the developmental period of the next, the tabulation of the number of creators in generation g - 1 can be taken as a count of creators available for emulation or imitation by those in generation g.

In the case of Ludwig van Beethoven (1770-1827), for instance, his birth year would place his productive period in generation 1800-1819. In 1780-1799, therefore, he would have been in his developmental period, when he would be exposed to such active composers as Vogler (1749-1814), W. A. Mozart (1756-1791), and Pleyel (1757-1831). As a result, if Kroeber's conjecture is correct, then the count of individuals in generation g should be a positive function of the count of individuals in generation g - 1. The magnitude of this function can then be directly assessed by calculating the *autocorrelation* for the generational time series, that is, the correlation of each generation's score with the score in the immediately preceding generation. This statistical analysis has already been carried out for several world civilizations, namely, the European, Chinese, and Japanese (Simonton, 1975, 1988b, 1992). The analyses uniformly confirm the hypothesis for almost every domain of creative achievement, including the sciences, philosophy, literature, music, and the visual arts. The clustering of genius into cultural configurations can be attributed to the fact that genius cannot appear *de novo*, but rather depends on the availability of role models and mentors within one's chosen discipline. As Newton expressed it, "If I have seen further, it is by standing on the shoulders of giants."

It is important to note one special feature of this intergenerational effect: With rare exceptions, the amount of creative activity in generation g is a function of the amount in generation g - 1, but not of the

activity in generation g - 2. Hence, it is the immediately preceding generation that provides the role models and mentors. This is not tantamount to asserting that *individuals* from generations earlier than g - 1 cannot have an effect on the creative development of *individuals* in generation g. On the contrary, such more distant influences have been documented using individual-level data analyses in both the arts and sciences (Simonton, 1984a, 1992b). It is merely that these more remote effects do not operate consistently enough across many individuals to yield an overall effect at the aggregate level. For example, one artist may imitate a master born a century earlier while another artist emulate a master born two centuries earlier, but both will display the influence of the masters in the immediately preceding generation.

The emulation-imitation process is an example of the impact of the internal milieu. Yet Kroeber (1944) also speculated about the possible impact of the external zeitgeist. In particular, he affirmed that "it is certainly true that high achievements by suppressed nationalities are rather rare" (p. 794). As a result, he linked the onset of configuration growth with nationalistic movements. Similar conclusions have been put forward by many other scholars as well. Alphonse de Candolle (1873) maintained that great scientists are most likely to appear in small independent countries, or at least confederations of small sovereign states and Arnold Toynbee (1946), in his magnum opus *A Study of History*, claimed that the emergence of a *universal state* was negatively correlated with the creative activity of a civilization. Nikolay Danilevsky, the great Russian historical philosopher, even styled this phenomenon the *second law of the dynamics of great cultures*, namely that "in order for the civilization of a potentially creative group to be conceived and developed, the group and its subgroups must be politically independent" (Sorokin, 1947/1969, p. 543).

But qualitative speculations are one thing, quantitative demonstration quite another. Fortunately, generational time-series analysis confirms the importance of this external factor (Simonton, 1984c). In the first place, a study of Western civilization discovered that the number of creative geniuses in generation g is a positive function of the number of independent states in generation g - 1 (Simonton, 1975; cf. Naroll et al., 1971). Moreover, the same investigation showed that nationalistic revolts and popular rebellions against imperial states in generation g - 1 have a positive impact on the number of creative geniuses in generation g (Simonton, 1975). Because these circumstances and events function after a one-generational delay, they can be interpreted as developmental

influences. In particular, the results suggest that political fragmentation and nationalistic revolts may serve to diversify the cultural environment, making it more supportive of the development of creative potential. In other words, such conditions and happenings undermine the cultural homogenization so often favored by imperial states. Generational time-series analyses have yielded two additional empirical findings that tend to endorse this interpretation. First, an analysis of Western civilization revealed that creativity is fostered by ideological diversity, that is, by the presence of many conflicting or rival schools and philosophical positions (Simonton, 1976b). Second, an inquiry into Japanese civilization discovered that creative genius was nurtured by exposure to influences from alien cultures, whereas isolation from foreign ideas tended to stifle creative activity (Simonton, 1997b). Taking all the results together, the creative vitality of a civilization depends on having a rich diversity of ideas.

In both of the above examples, generational time-series analyses confirmed two of Kroeber's conjectures about the creative dynamics of world civilizations. However, because these analyses are quantitative rather than qualitative, they accomplish more than a mere up-down decision. The statistics also provide estimates of the relative magnitudes of various hypothesized influences. For instance, the internal influence of role-model availability is 3-4 times greater than the external influence of political fragmentation (Simonton, 1975). These quantitative assets can also be applied to cross-civilization comparisons. For example, it can be shown that the effect of role-model availability on the emergence of creative genius is about the same for all civilizations studied (Simonton, 1975, 1988b, 1992a, 1997b). On the other hand, the consequences of political fragmentation are far greater for a polyglot culture like Western civilization than for a monolingual culture like Chinese civilization (Simonton, 1975; Ting, 1986). This difference likely reflects the fact that political fragmentation in China does not necessarily result in greater cultural heterogeneity, and may even cause considerable political anarchy, a consequence that has been shown to have a negative impact on creative development (Simonton, 1975, 1976c).

Sorokin's Culture Mentalities

Although generational time-series analyses vindicated Kroeber's speculations, they do not always have such a benign effect. On the contrary, quantitative methods can just as well contradict a scholar's subjective induction. A case in point is Sorokin's (1937-1941) theory of

sociocultural dynamics. He argued that a civilization at any given time tends to be dominated by a specific *culture mentality*. Three mentalities assume special importance in this regard, namely, the Senate, Idealistic, and Ideational. The Sensate mentality places emphasis on the senses, including the material world and its pleasures; the Ideational mentality concentrates on the spiritual world and stresses the importance of faith and virtue; and the Idealistic mentality represents a transient equilibrium between the Sensate and the Ideational. Corresponding to each mentality is a characteristic set of philosophical beliefs, art forms, political systems, and other cultural traits. Moreover, these mentalities are to a large extent antithetical to each other, with the strongest antagonism appearing between the Sensate and Ideational patterns. Therefore, when Sensate culture is at its zenith, Ideational culture should be at its nadir, and visa versa. The various components of these two mentalities should follow suit.

For instance, when Sensate culture is supreme, scientific creativity should peak, and religious activity should be on the wane. But when Ideational culture rises to the top, the relative prominence of science and religion should reverse. Yet that is not what happens according to generational time-series analyses of Sorokin's own data (Simonton, 1976a). Although the Sensate mentality has a positive correlation with scientific creativity, it has no correlation whatsoever, whether positive or negative, with religious activity. By the same token, even though the Ideational mentality is positively associated with religious activity, it has no relationship whatsoever, positive or negative, with scientific creativity.

These contradictory results can appear because Sorokin was incorrect in maintaining that the two mentalities are so diametrically opposed to each other. In actual fact, the two sociocultural systems are largely independent, and can co-exist within a single civilization. Indeed, if anything, the two systems exhibit a certain affinity toward each other. This positive affiliation was demonstrated by a detailed analysis of the various philosophical positions that make up the two mentalities (i.e., Sensate culture is linked with empiricism, materialism, temporalism, nominalism, singularism, determinism, and the ethics of happiness, while Ideational culture is linked with rationalism, mysticism, idealism, eternalism, realism, universalism, indeterminism, the ethics of principles, and the ethics of love). The generational time series representing Sensate and Ideational philosophies exhibit a slightly positive relation, in stark contrast to the negative correlation expected in Sorokin's theo-

ry (Simonton, 1976a).

This conclusion may seem surprising. In his treatment of belief systems, Sorokin presents numerous tables and graphs purporting to prove that Sensate beliefs are antithetical to the corresponding Ideational beliefs. However, these tabular and graphic presentations were predicated on an erroneous analysis of his raw data. Rather than calculate the correlations between the measures (detrended or otherwise), he first transformed his time series into percentages. The new numbers represented the percentage of thinkers advocating Ideational versus Sensate beliefs in a given generation. The problem with this data manipulation is that it makes the measures *ipsative*. As a consequence, the correlations between the measures are compelled to be negative, even when the raw correlations are positive. To illustrate the error in this approach, consider a hypothetical situation where someone had compiled two generational time series, one counting the total number of men and the other the total number of women. Even though these two series will be positively correlated, the percentage of men in any given generation will be negatively correlated with the percentage of women. The correlation, in fact, will be perfectly negative.

In this case, a proper quantitative analysis will contradict Sorokin's ideas. Yet this is not the only possible outcome. Instead, the analysis may only qualify them in an important way. To illustrate, Sorokin (1947/1969) once hypothesized that turbulent times might exert a polarizing influence on the course of intellectual history. He called this effect the *law of polarization*, which he described as follows:

> The overwhelming majority of the population in normal times is neither distinctly bad nor conspicuously virtuous, neither very socially-minded nor extremely antisocial, neither markedly religious nor highly irreligious. In times of revolution this indifferent majority tends to split, the segments shifting to opposite poles and yielding a greater number of sinners and saints, social altruists and antisocial egoists, devout religious believers and militant atheists. The "balanced majority" tend to decrease in favor of extreme polar factions in the ethical, religious, intellectual, and other fields. This polarization is generated by revolutions in all fields of social and cultural life. (p. 487)

Sorokin never actually tested this law, despite having collected data on both civil unrest and philosophical change for his *Social and Cultural Dynamics*. When such a test was conducted using generational time-series analysis, the outcome requires the insertion of a significant qualification (Simonton, 1976d). The law of polarization holds only if

it is stated in terms of a lagged, or intergenerational effect. In particular, the representation of almost every philosophical position increased *one generation after* a period of major civil disturbances. More specifically, the number of popular revolts, revolutions, and rebellions in generation $g - 1$ is positively related to generation g's representation of (a) empiricists, rationalists, and mystics, (b) materialists and idealists, (c) eternalists and temporalists, (d) nominalists and realists, (e) singularists and universalists, (f) determinists and indeterminists, and (g) advocates of the ethics of happiness and advocates of the ethics of principles or love. Hence, the political conflicts that thinkers experienced when young become translated into adulthood intellectual conflicts. The law of polarization describes a developmental influence that takes a couple of decades to unfold.

This modified version of the law of polarization has a provocative consequence: It helps explain why Sensate and Ideational mentalities can often be cultural concomitants. Both Sensate and Ideational philosophies are likely to emerge as delayed repercussions of political turmoil. Less turbulent times, in contrast, will nurture the development of fewer great thinkers, Sensate or Ideational.

Conclusion

I have only tried to provide a brief overview of how generational time-series analyses have addressed significant issues in the study of world civilizations. Accordingly, I made no attempt to provide the technical details behind the technique. Yet in the absence of such information, it may not be always obvious exactly how a given generalization can be empirically justified. Even so, these methodological specifics have been amply discussed elsewhere (Simonton, 1984b, 1990, 2002). In addition, I have concentrated on how this technique has been applied to the civilization inquiries conducted by Kroeber and Sorokin. Yet these two examples by no means exhaust the applications of generational time-series analysis. For instance, the method has been applied to assess the operation of Hegelian pendulum swings in the history of ideas (Simonton, 1978). In addition, the approach can be extended to any civilization with an adequate historical record. Western, Islamic, Chinese, and Japanese civilizations are especially rich in potential data. Moreover, other quantitative methods besides generational time-series analysis can be used to address many other problems besides Kroeber's cultural configurations, Sorokin's culture mentalities, or Hegel's dialectic process. For example, quantitative techniques have been used to test

the views of Auguste Comte, Herbert Spencer, and Thomas Kuhn (Carneiro, 1970; Simonton, 2002). Hence, quantitative methodologies may be able to provide a unique addition to more traditional approaches to the comparative study of civilizations.

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Toynbee, A. J. (1946). *A study of history* (abridged by D. C. Somervell, Vols. 1-2). New York: Oxford University Press.The African Linguistic Diaspora: Gullah as a Creole Claimant

Norman C. Rothman, Independent Scholar