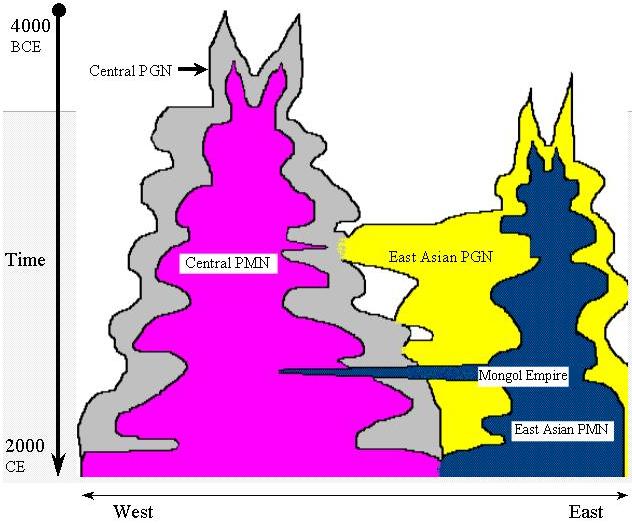
High Bar Rules of Thumb for Time-Mapping Systemic Human Interaction Networks



Eastern and Western Systemic Spatio-temporal Networks

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We propose a general set of decision rules for specifying the spatial and temporal boundaries of interpolity systems in anthropolical comparative perspective. What is needed is a systematic method for separating significantly (high bar) independent cases that can be the basis of comparative analysis and for determining when and where regional systems merged with one another to become the global system that we have today. We try to specify rules that will work across the anthropological spectrum of human polities from nomadic foraging bands to the single global society of today.

We also describe David Wilkinson’s approach to the spatio-temporal bounding of state systems and trade ecumenes since the Bronze Age.

We briefly discuss the concepts that are needed for the bounding task:

* systemness,
* place-centricity,
* fall-off and
* exogenous impacts.

And we specify rules of thumb for systemic connectedness for four types of interaction that typically have different spatial scales:

* bulk goods networks,
* political-military networks,
* prestige goods networks and
* information/communications networks.

Bounding Sociocultural Regions

Most efforts to bound human sociocultural regions rely on the notion of homogeneity. So the *Handbook of North American Indians* divides space up according to alleged institutional and artifactual similarities among indigenous groups. Civilizationists long attempted to designate cultural regions by studying similarities and differences in ideology (Melko and Scott 1987).. The problem with this approach is that it is well known-that interaction produces both similarities and differences. So groups that are interacting with one another frequently differentiate their identities and often specialize in certain activities that come to form a regional division of labor. These tendencies greatly complicate approaches that try to characterize regions in terms of cultural similarties, and they suggest that interactions and connectivity is a better approach (Wilkinson 1993; Chase-Dunn and Jorgenson 2003).

## Sociocultural Systemness

Systemic interaction in human sociocultural systems is defined as two-way and regularized interaction that is important for the reproduction or change of local social structures (Friedman and Rowlands 1977; Chase-Dunn and Hall 1997). Sociocultural systemness means largely self-contained interaction among a set of interdependent entities that produces coherence and observable patterns.[[2]](#footnote-2) Systemness is a variable. The degree of systemness generally declines with distance. Social scientists divide into “splitters” who emphasize the uniqueness and autonomy of local social structures and “lumpers” who emphasize the importance and systemic nature of long-distance connections. The intent here is to propose some general rules for specifying the spatio-temporal boundaries of largely separate and independent whole social systems that can be accepted by those social scientists who wish to test propositions about the causes of social change by comparing cases.

Since all polities[[3]](#footnote-3) interact with adjacent neighboring polities, the establishment of spatio-temporal systemic boundaries requires using a **place-centric** approach.[[4]](#footnote-4) A focal location must be chosen in order to answer the question of what is included within this system and what is outside of it? The focal location could be a household or a settlement or a polity or a set of adjacent polities. Since all known interpolity systems display systemic interaction among directly adjacent territorial polities, we propose that the best way to designate a focal locale is to pick five adjacent autonomous territorial polities. These we shall call the **focal five**.

Designating the focal locale as five adjacent polities allows us to use a combination of direct and short (one degree of separation) indirect linkages for designating expansions of a system or mergers between two formerly separate systems. When a system expands the new connection is typically formed between one of the polities in the focal locale with a polity out on the edge, but not all of them. So, for example, when the Mesopotamian and Egyptian state systems became linked, it was because some of the states (not all of them) in the Mesopotamian system began having direct political-military relations with Egypt. But not all the states in the Mesopotamian system did this. And the ones that started direct warring with Egypt did not directly link with all the states in the Egyptian interpolity system (e.g. Kush). Allowing one degree of separation solves this problem and we shall do that for each of the different kinds of systemic interaction discussed below.

Robert Hanneman *et al* 2016 propose an alternative method that uses data on whole multidimensional networks and formal network analysis of modularity to empirically locate systemic regions of concentrated interaction and connectedness . This is a promising alternative approach to spatially bounding interaction systems that should be compared with the place-centric approach proposed here.

When all human polities were nomadic foraging bands, before about 12,000 years ago, there was already a single global network because all bands interacted with their neighbors, but there was not yet a single global system. Systemic interaction networks were small because the consequences of events and activities at any point did not travel very far in space. **Fall-off** is the concept that archaeologists (e.g. Renfrew 1975, 1977, Renfrew and Cherry 1986) have used to comprehend the decline of effects over distance. Fall-off curves were short when all polities were composed of nomadic foragers, and they may have become somewhat shorter once sedentism emerged. Rather than moving people to resources, as nomads did, sedentary people increased exchanges among groups, using some goods that had been produced by people in other groups. As exchange networks expanded, the fall-off curve got longer. The question of systemness requires a decision about where on the fall-off curve to draw a line. When the fall-off curve gets to zero there are no consequential interactions between locations A and B. Things that happen at A do not at all effect what happens as B. So all systemic networks are located within the domain of their fall-off curves. But systemness requires more than just occasional or slight consequences.[[5]](#footnote-5)

## Exogenous vs. Endogenous Impacts

Both time and space are important for determining sociocultural systemness. An exploratory expedition or an incursion that does not result in regularized alliance connections or two-way trade between the region of origin and the region of arrival does not constitute systemic interaction. The arrival of genetic materials (food crops), exotic tools or ideas, does not necessarily constitute a systemic connection. These can be **exogenous impacts** and they may have large one-time consequences for a local system, but not be part of that system. A systemic connection is developed when two regions come to expect future interaction or when people in one region become dependent upon inputs coming from another region. Both equal (symmetric) and unequal (asymmetric) exchange can be systemic. Two-way exchange does not necessarily mean equal exchange. Repeated coercive extraction of resources constitutes systemic interaction. Threats are an important type of interaction.

But human sociocultural systems are subsystems within larger biological and geophysical systems (Hornborg and Crowley (2007). Human interactions with the biosphere and the geosphere have always been, and continue to form important constraints and to pose challenging opportunities for polities. And non-human species often display forms of behavior that are similar to those known in human world-systems (territoriality, warfare, demographic cycles, a complex division of labor, etc.). Whereas geophysical processes such as global climate change were once safely considered as exogenous causes of human social change, that is no longer the case. Nevertheless, it is important to develop methods for distinguishing substantially autochthonous human sociocultural systems for purposes of comparative study and hypothesis testing. When exogenous impacts are a plausible cause of social change, as with climate change, these possible causes must be included in models and in comparative research designs.

## Nested Networks and Sociocultural Systemness

The specification of decision rules is somewhat complicated by the observation that different kinds of important interaction often have dissimilar spatial scales, and so may require somewhat different decision rules. Thus we will propose decision rules for four different kinds of potentially systemic interaction that take into account the nature of the interaction processes and how they are affected by space and time. These four networks are bulk goods systems, political-military systems, prestige goods networks and information/communications networks. They are understood to be spatially nested in most premodern whole systems (see Figure 1).

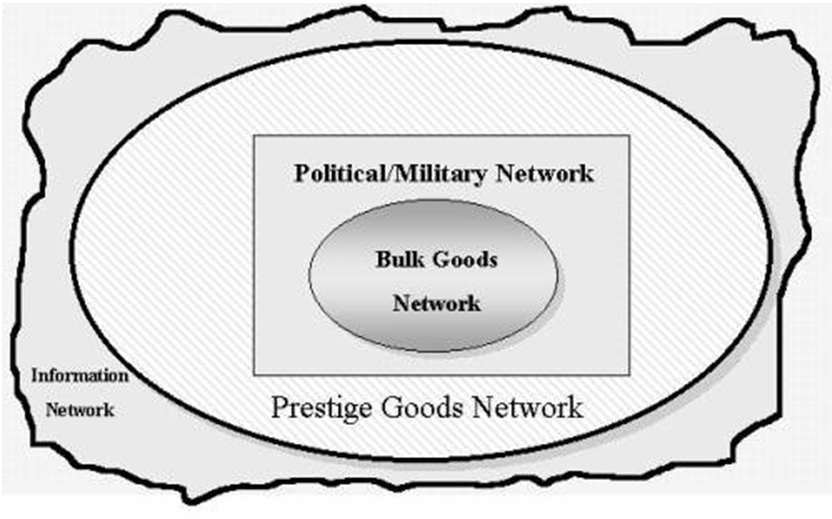


Figure 1: Nested Systemic Interaction Networks

This nested approach is already one step toward distinguishing between degrees of systemness because bulk goods interaction networks and political/military networks are always systemic, whereas the larger prestige goods and information networks are only systemic in some cases.

The world-systems perspective in both the Frankian and Wallersteinian versions have emphasized the importance of core/periphery relations. Chase-Dunn and Hall (1997) agreed that interpolity hierarchies are often crucial for prehension of the nature particular systems and for explaining social change, but they also allow for the possibility that some small-scale world-systems in the past have not had core/periphery hierarchies based on asymmetrical interactions among polities. This allows for the study of the emergence and evolution of core/periphery hierarchies. Chase-Dunn and Hall also point out that the issue of whether or not interpolity interactions are exploitative or not needs to be asked at each level of the nested interaction networks.

Bulk Goods Systems

Food and other resources that are heavy relative to their “value” (so-called “bulk” goods) do not travel very far, but they are systemic in all human polities.[[6]](#footnote-6) Most bulk goods are obtained locally, but in many interpolity systems some bulk goods are obtained across polity boundaries, either by trade or raiding, or both. Eventually the bulk goods network caught up with the larger networks to produce the global system of today. But in earlier eras systemic interaction networks were nested as depicted in Figure 1.

Gills and Frank (1991; see also Frank and Gills, 1993) proposed that polities that exchange surplus product with one another are systemically connected and that these connections extend to all the polities that are indirectly connected. By this logic they assert that there was a single Afroeurasian-wide world system that became connected with the Americas at the end of the fifteenth century CE. They also imply that both trade and information/communications flows are important aspects of systemness (see below). The observation that all polities are in interaction with their neighbors and so, if we count all indirect connections, there is a single global (or hemispheric) network is correct. But, as Charles Tilly (1984:62) observed, indirect connectedness does not necessarily constitute systemness. It all depends on the rate at which the consequences of connections decreases over space – the fall-off curve. Both bulk and prestige goods involve surplus product transfers and interdependence, but these different kinds of exchange have very dissimilar spatial ranges.[[7]](#footnote-7)

How should the spatial boundaries of the bulk goods system be delimited? The focal locale is conceived as five autonomous adjacent polities. Starting from this focal locale, all other polities that are the source of bulk goods constituting at least five percent of **total bulk goods consumption** and obtained at least once in an average year by any of the five focal polities are part of the systemic bulk goods network (see Figure 2). This usually includes all, or most, adjacent polities and some polities that are non-adjacent. We also include polities that are not directly connected with the focal five, but that are connected by one degree of separation. How far the bulk goods network extends is a function of transportation technology and the institutional nature of production and exchange.

Many scholars have pointed out that the sovereign boundaries between polities were not as institutionalized in the past as they have become today (e.g. Hall 2016). While this is obviously true, it does not mean that earlier polities were not territorial. Even nomadic hunter-gatherers and pastoralists have notions of collective property regarding use rights over places. In ethnographically-known systems of sedentary foragers, such as existed in precontact California, trespass involving the unauthorized use of gathering or hunting sites was a major cause of disputes and warfare among tribelets. In precontact Hawaii territorial boundaries between autonomous chiefdoms and regions within chiefdoms (ahuapua) were formally marked by posts on trails. So the idea that boundaries between polities were so amorphous in premodern worlds that the notion of an interpolity system is inappropriate simple does not hold water. Certainly there were many regions in which boundaries were contested, as they still are, but the basic logic of geopolitical competition for territory was already operating among nomadic hunter-gatherers and also operated when the boundaries were fuzzy.

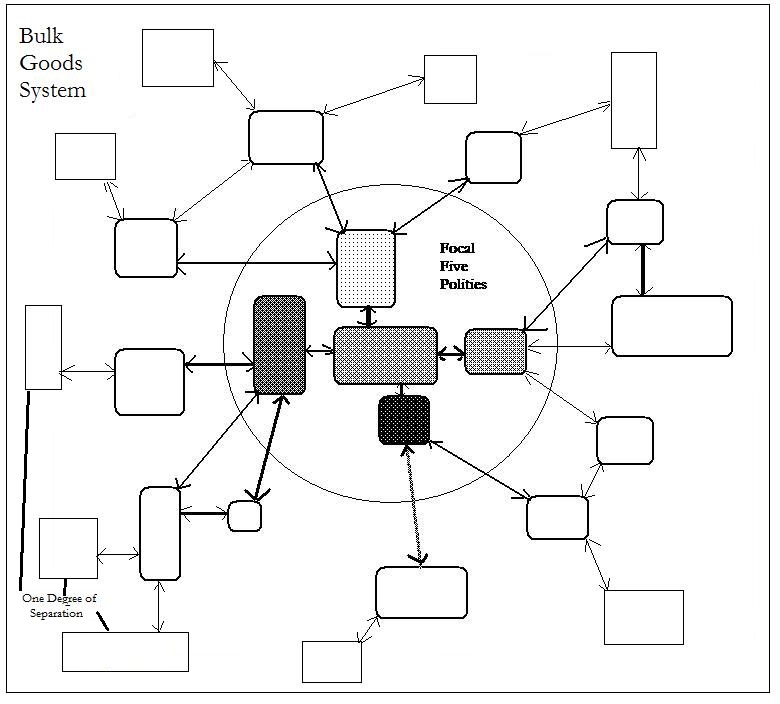


Figure 2: The Bulk Goods Systemic Network of Five Focal Polities

The Political/Military System

Interpolity political-military systems are sets of polities that make war and alliances with one another.[[8]](#footnote-8) As with other networks, this requires specification of a focal locale, because all polities make war or alliances with neighboring polities. Systemness at this level is about the ability of polities to provide protection for their members from attacks from other polities and the distances over which power can be projected in order to force compliance or to produce influence. Warfare is understood to involve both actual attacks and threats of attacks. Alliances are understood as agreement to provide material support and actual provision of such support. Formal agreements and informal understandings involving the exchange of diplomats and/or cross-polity marriages are sometimes indicators of such alliances.[[9]](#footnote-9)

The big issue here is whether or not political/military systemness can extend beyond direct interaction. David Wilkinson’s method of bounding interpolity interaction systems requires direct and sustained interactions, which is a very high bar of systemness. We find it plausible to contend that systemic political/military interaction should include at least one degree of separation, meaning that the neighbors of one’s neighbors also usually have an important impact on security, geopolitical processes and opportunities to obtain resources.

Wilkinson describes the merger of the Egyptian and Mesopotamian interstate systems to form what he calls Central Civilization as follows: “The merger of the Mesopotamian and Egyptian interpolity systems began as a result of Eighteenth Dynasty Egypt’s invasions, conquests, and diplomatic relations with states of the Southwest Asian (Mesopotamian) system -- first of all Mitanni, then the Hittites, Babylon, and Assyria. The signal event was Thutmosis I’s invasion of Syria in about 1505 BCE. The fusion of the systems began then but enlarged and intensified until 1350 BCE. Thutmosis III’s many campaigns in Syria and the establishment of tributary relations, wars and peace-making under Amenhotep II, as well as the peaceful relations and alliance with Mitanni by Thutmosis IV, eventually led to Egyptian hegemony under Amenhotep III” (Wilkinson personal communication Friday, April 15, 2011).[[10]](#footnote-10)

Regarding the incorporation of the Indic PMN into the Central PMN, Wilkinson does not count the Alexandrian conquests in India because that linkage was temporary. So the Indic PMN was first permanently connected to the Central PMN in CE 1008 when Mahmud of Ghazni conquered North India.[[11]](#footnote-11)

By Wilkinson’s rule the East Asian interstate system did not become permanently connected to the Central PMN until the European states established treaty ports in China in the 19th century CE. The PMN connection between the East and the West formed by the Mongol Empire was temporary. [[12]](#footnote-12) The decision to allow one degree of indirect connection would probably result in an earlier date for the merger of the Central and East Asian PMNs. Allowing one degree of separation makes it easier to depict the merging of two state systems while still retaining the focal locale approach developed here. If only direct connections count, Egypt would get added to the Central PMN, but not the adjacent states that were part of the Egyptian PMN prior to the merger.

The abstract formulation of our geopolitical connectedness principle is as follows: beginning with a focal five adjacent territorial polities, both direct conflicts or strong alliances with any of the focal five constitute systemness and so does one degree of separation. The neighbors of neighbors affect decisions and opportunities, and so they are included in the PMN. This is a slight modification of what appears to be Wilkinson’s decision rule to include only direct connections. But the spirit of the high bar of connectedness is honored here.

The Prestige Goods Network

Prestige goods are high value goods that are worth transporting long distances. They are generally light and resistant to decay, which makes them transportable over long distances.[[13]](#footnote-13) The most famous historical prestige goods network is the East/West caravan trade across the several routes that were called the Silk Road and the maritime routes around South Asia that connected the Mediterranean and the Indian Ocean with East and Southeast Asia. These routes emerged well before the Han and Roman Empires. Archaeologists know that valuables were traded over long distances in the precontact Americas as well.

Prestige goods are systemic in some systems but not in others. Economic anthropologists (e.g. Johnson and Earle 2000: 257-258) distinguish between staple and wealth finance systems. In staple systems bulk goods are exchanged and accumulated by elites and symbols of value do not play a big role in the processes of production, reproduction and accumulation. Valuables may be used for decoration, but they are not important to the political economy. This is what Wallerstein meant by “presciosities.” In wealth finance systems prestige goods come to play an important role as storable wealth that facilitates exchange within and between polities and may be important in reproducing hierarchies.[[14]](#footnote-14)

What are good rules of thumb for determining the spatial scale of prestige goods systemic networks? Prestige goods exchanges in small scale-systems are often structured as “down-the-line” trade in which goods move from group to group and there are no long-distance merchants. There are different ways in which prestige goods can be systemic. The large literature on **prestige goods systems** usually points to how local elites use their monopoly over exotic goods to shore up their power over subalterns. If you cannot get married without this special exotic pot and these are only available from Uncle Joe, Joe has a lot of leverage over when you can get married and probably whom you can marry (Meillausoux 1981; Peregrine 1991; Helms 1988, 1992)). But another way that prestige goods can be important for local social structures is when they serve as proto-money – a storable medium of value that can be used to obtain other necessities during times of scarcity. This use of proto-money in indigenous California allowed trade to substitute for raiding during periods of scarcity (Vayda 1967; Chase-Dunn and Mann 1998).[[15]](#footnote-15)

Flows of prestige goods are also commonly organized as tribute payments extracted by a powerful empire or by a marcher state that threatens an empire. The Chinese trade/tribute system was a complex combination of trade and symbolic tribute payments that the Chinese dynasties required of their trading partners. As with bulk goods, prestige goods exchanges can be either symmetrical or asymmetrical mixes of coercion and cooperation.

The first issue is whether or not imported prestige goods are playing a systemic role in the reproduction or change of local social structures. This is best indicated by the distinction between staple and wealth finance described above. In staple finance systems prestige goods are unlikely to be systemic. In wealth finance systems they are very likely to be systemic. Of course some systems combine wealth and staple finance, and for these the call can be made by examining the extent to which social structures are dependent on the importation or export of prestige goods. Once this is decided the question becomes how far to include exchange partners in the system. As with other systemic networks, there is a fall-off curve. Once again we begin with a focal five adjacent territorial polities.

As a rule of thumb for prestige goods in a wealth finance political economy we propose that, when 5% percent or more of the total yearly importation of prestige goods comes from a polity to any one of the focal five polities, that polity should be included in the PGN. The issue of degrees of separation is not crucial because of the nature of down-the-line trade structures. In such systems trade goods obtained from neighbors may have passed through many hands. If 5% by weight or more of total prestige goods imports has come to at least one of the focal five polities from a distant polity, that distant polity should be considered to be within the PGN of the focal five.

The Information/Communications Network

World historian William H. McNeill (1990) noted that information flows transmitted by humans has often had important consequences for social change. In response to McNeill’s prodding Chase-Dunn and Hall (1997) included information networks as one of the types of interaction that can be systemic. As indicated in Figure 1 above, information networks in nested systems were hypothesized to be somewhat larger than prestige goods networks. There has been very of little investigation of the systemic nature of information networks (but see Neal 2015; 2016) and little study of how to spatially and temporally bound them. As Neal (2016) notes, information is ubiquitous and so the discussion in human interaction networks requires that we focus on flows of information among groups of humans – communications. Communications flows are obviously an important component of the reproduction and change of local social structures in both small-scale and complex systems. The structure of attention and communication within small groups, organizations and states is a well-known central component of political and economic processes (Deutsch 1966). Cross-cultural communication is an important aspect of geopolitical and economic relations in multicultural networks. Messengers, line-of-sight signaling, multilingualism and both sign and oral trade languages are known in even small-scale systems like that of indigenous California. Communications technologies have reflected and transformed the nature of historical empires (Innis 1972[1950]) and the modern global system has been importantly impacted by the emergence of the telegraph, the radio, the telephone and now the Internet (Hugill 1999, Zook 2005).

But is the information/communications network itself systemic beyond the roles it plays in bulk goods, political-military and exchange networks? Are systemic information networks usually larger than prestige goods networks because information is even lighter than prestige goods and so has a longer fall-off curve?

Several of the same issues raised in the discussion of bulk goods, political-military and prestige goods networks can be asked about information/communications networks. How much information transfer is necessary in order to constitute systemness according to the high bar criterion advocated above. Do information flows play different roles in dissimilar systems in the reproduction and transformation of local social structures? What are the typical shapes of information fall-off curves, and at what point on the curve is it prudent to draw the line between systemic inclusion and exclusion? Do information flows need to be two-way in order to be systemic?

As with other exogenous impacts discussed above, some information flows are episodic and should not be considered as systemic. So the high bar of two-way flows is probably a good requirement.

Information can be quantified by counting messages. Of course some messages are long and others are short. But, for comparisons across space and time, counts of the number of messages allow for the estimation fall-off curves. In small-scale systems reports of unusual events (news) spread from group to group. Part of information fall-off is due to the decay of information accuracy that occurs because of errors that occur when messages are translated from one language into another.[[16]](#footnote-16)

Cora DuBois’s (2007[1939]) study of the diffusion of the 1870 ghost dance from Western Nevada (Walker River Paiute) to Native Americans in Northern California and Southern Oregon shows how far new ideas spread and the processes of change that occurred as an ideological innovation became adapted to local conditions. Both the 1870 and the more famous 1890 ghost dancers believed that the Indians that had died were going to return and that all the whites would die, and that in order to bring on this millenarian event believers needed to dance a special dance and sing special songs. The ghost dance has been seen by social scientists as a “revitalization movement” in which indigenous societies were adapting to the radical changes brought by the arrival of Europeans to their world (Wallace 1956).

The distances involved in the diffusion of the 1870 ghost dance were probably greater than when earlier ideologies spread across indigenous polities because some Indians had acquired the use of horses and wagons by the 1870s --- transportation technologies that had not been available to their ancestors. The spatial scale of the spread of the 1890s version of the ghost dance was much larger (Smoak 2006), probably reflecting the further lowering of transportation and communications costs for indigenous peoples between the 1870s and the 1890s.

DuBois’s study shows that the diffusion of cult messages among preliterate populations[[17]](#footnote-17) mixed direct contacts made by prophets who traveled to distant peoples to tell the word with down-the-line processes in which local entrepreneurs heard about the new dances and songs and made up their own versions. She also notes that the diffusion was uneven. Groups that had not been very disrupted by the arrival of the whites were less likely to become involved with the ghost dance. The old “sucking doctors” (shamans who cured by extracting bad spirits) resisted the new “dream doctors” who preached a nontraditional vision of the dead and encouraged women and children to participate in the ritual dances (from which they had formerly been excluded because of alleged spiritual dangers). The sucking doctors in regions that were more remote, and so less disrupted, were able to convince their co-villagers to reject the ghost dance. The local entrepreneurs mixed ideas from the Paiute ghost dance with older cults ( e.g. Kuksu, Bole Maru) to produce new combinations for local, neighboring and more distant audiences, and so the content of the rituals became modified as they traveled.[[18]](#footnote-18)

This example is not ideal for the purpose of estimating the information/communications fall-off curve for precontact America because we cannot be sure how much of the process of information diffusion had been affected by the arrival of the Europeans. We know that earlier cults, dances and songs had spread across linguistic groups in indigenous California. But we do not know about the spatial characteristics of those diffusions because they are invisible in archaeological evidence. But the 1870 ghost dance suggests that the information network was larger than the prestige goods network. We know from archaeological evidence that prestige goods exchanges in late prehistoric Northern California utilized clam disk shell beads as protomoney. These beads were produced mainly by the Pomo who lived around Clear Lake, about 500 kilometers from the northern edge of the clam disk bead exchange network. The farthest distance that the 1870 ghost dance is known to have traveled is about 800 kilometers from Walker Lake to central Oregon.

Some anthropologists contend that information traveled very far and rapidly across indigenous polities in indigenous America (Peregrine and Lekson 2006, 2012; Smith and Fauvelle 2015) forming a continent-wide “oikoumene.” Noting inspiration from Frank’s (1998, see also Gills and Frank 1991) idea that there was a single Afroeurasian world system since the emergence of cities and states in Mesopotamia, Smith and Fauvelle (2015) cite ethnohistorical reports that seem to substantiate the idea that very long-distance transportation and communication networks existed in Pre-Columbian North America.[[19]](#footnote-19) They note Frank and Gills’s idea that **important systemic connections based on trade and information flows should result in increasingly synchronous waves of polity formation between connected regions.** [[20]](#footnote-20) Smith and Fauvelle (2015) contend that waves of the emergence of sociopolitical complexity in precontact Southern California and the U.S. Southwest (Arizona, New Mexico and Northern Mexico) reveal synchrony and support the existence of systemic inter-regional connections. As noted above, the Frank and Gills approach to systemic connectedness combines the idea of trade and information connections, and does not explicitly consider the issue of fall-off. Nevertheless the ethnohistorical evidence of long-distance information flows cited by Peregrine, Lekson, Smith and Fauvelle suggests the need for closer attention to the issue of systemness in the precontact Americas.

We propose that systemic information networks are most likely to be spatially associated with prestige goods networks and to be more important in systems that are organized around wealth finance than in those organized around staple finance.. The rules of thumb that we have proposed above for spatially bounding prestige goods networks can also be used for bounding information networks in most cases. As with the case with prestige goods networks, the first task is to determine whether or not two-way information/communications from distant sources is playing a systemic role in the reproduction or transformation of local social structures in some of the five focal polities. A strong clue is whether or not prestige goods are playing a systemic role.

The nested networks with a focal locale of five polities is depicted in Figure 3. The center of Figure 3 is the same as the bulk goods network of the five focal polities shown in Figure 2. Figure 3 does not display all the interactions, but only those that are needed for estimating the spatial scale of the political-military, prestige goods and information networks. As with PMNs and PGNs one degree of separation is allowed.

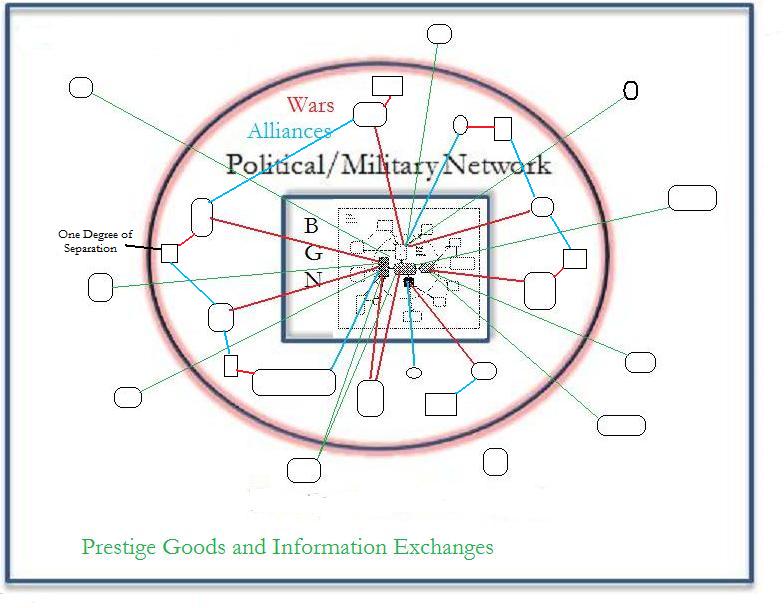


Figure 3: Nested networks systemically connecting five focal polities

Spatial Bounding of PMNs and PGNs In State Systems

The ISA-sponsored [Workshop on Systemic Boundaries](http://wsarch.ucr.edu/archive/conferences/confname/timemap.htm) is intended to interrogate and develop general and consensual decision rules regarding the spatial and temporal boundaries of substantially independent whole interaction systems that can be used for comparative research using these regional systems as units of analysis. The workshop will also examine the decision rules proposed above and will examine David Wilkinson’s decisions about when and where the Central PMN expanded and incorporated other interstate systems.

The following tables designate some of Wilkinson’s bounding proposals and indicate problematic cases in the spatio-temporal bounding of international systems and trade networks. Some of the issues involve the timing of emergent linkages among regional networks that were not yet connected with the Central PMN (e.g. when did the East Asian and Southeast Asian PMNs become connected?). We will also examine the implications of the problem cases for the specification of the general decision rules proposed above.

In order to apply the place-centric approach to regional systems Wilkinson focusses on those areas in which large cities first emerged. So he begins the spatial bounding of regions as soon as they have a largest city with at least 20,000 residents. The decision rules developed above have been designed to be useful no matter how big the settlements are, and for starting at any place where humans polities (including bands, tribes, chiefdoms and states) are present. But Wilkinson’s systemic regions start with those areas that have cities of a certain size. This is a convenient approach that facilitates the task of developing scholarly consensus regarding the designation of a set of whole systems that researchers can compare.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **International System** | **Code** | **Begin\*** | **Merged or Engulfed** | **notes** |
| Mesopotamia | mesop | 3400 BCE | 1500 BCE |  |
| Egypt | egypt | 2500 BCE | 1500 BCE |  |
| Central | cent | 1500 BCE |  |  |
| Aegean | aeg | 1600 BCE? | 600 BCE | Or was this part of the central system after 1500 BCE? |
| South Asian | sas | 1800 BCE | 1100 CE |  |
| Japanese | japa | 600 CE | ? | Or was this part of the East Asian system after the failed Mongol invasions? |
| East Asian | eas | 1400 BCE | 1830 CE |  |
| Mesamerican | mesoa | 200 CE | 1500 CE |  |
| West African | wafr | 800 CE | 1600 CE |  |
| Southeast Asian | sea | 600 CE | 1500 CE | Should what Wilkinson calls Indonesia be seen as connected with mainland Southeast Asia? And when did Southeast Asia become connected with East Asia? |
| Mississippian | missi | 1100 CE | 1500 CE |  |
| Andean | ande | 1300 CE | 1500 CE |  |
| Irish? | ire | ? | ? | When did the Irish system become linked with the Central system? |
| Other? |  |  |  |  |

Table 1: Chronograph of beginnings and merger/engulfment of thirteen state systems

\*Starts when largest city reaches a population size of 20,000

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Prestige Goods Trade Network** | **Code** | **Begin\*** | **Merged or Engulfed** | **notes** |
| Mesopotamia | mesop | 3400 BCE | ? |  |
| Egypt | egypt | 2500 BCE | ? |  |
| Central | cent | 1500 BCE | ? |  |
| Aegean | aeg | 1600 BCE? | ? | When did it become part of Central trade network? |
| South Asian | sas | 1800 BCE | ? |  |
| Japanese | japa | 600 CE | ??? | When was Japan linked to the East Asian trade network? |
| East Asian | eas | 1400 BCE | ? |  |
| Mesamerican | mesoa | 200 CE | 1500 CE |  |
| West African | wafr | 800 CE | ? |  |
| Southeast Asian | sea | 600 CE | ? | Should what Wilkinson calls Indonesia be seen as connected with mainland Southeast Asia? And when did Southeast Asia become connected with East Asia? |
| Mississippian | missi | 1100 CE | 1500 CE |  |
| Andean | Ande | 1300 CE | 1500 CE |  |
| Irish? | Ire | ? | ? | When did the Irish system become linked with the Central trade network? |
| Other? |  |  |  | ?? |

Table 2: Chronograph of beginnings and merger/engulfment of thirteen prestige goods systems

\*Starts when largest city reaches a population size of 20,000

Political/military networks (PMNs) since the Bronze Age

We begin bounding PMNs by focusing on those five focal adjacent polities in which at least one of the focal five contains a city with a residential population of at least 20,000 humans. These focal five polities are the focal locale of the direct and indirect political/military links. An alliance or war between any of the focal five polities and a distant polity constitutes a link for the whole PMN that is being bounded and the system extends to one indirect political/military link.

This allows one indirect link or one degree of separation. Direct links can exist between non-adjacent polities if they travel across other polities to engage in warfare or the kinds of links that are involved in alliances (gift exchanges, intermarriages, treaties, communications, diplomatic missions, etc.). So each PMN consists of a set of five focal polities and those polities elsewhere with which one or more of the focal polities are directly engaging in warfare or alliances and it extends to the polities that are one degree of separation from the focal polities.

Incursions in which a group invades a territory but is not under the control of the polity from which it came (Vikings, sea peoples, etc.) do not constitute a PMN link with the polity from which they came. But if the invading group does continue its relationship with its polity of origin then it does constitute a systemic link.

Prestige goods networks (PGNs) since the Bronze Age

A prestige goods network is a set of polities that are exchanging significant amounts of prestige goods with one another. In order to spatially bound such networks we must pick a set of five focal polities, because all polities trade with their immediate neighbors. Once again we begin bounding PGNs by focusing on that set of five adjacent polities in which at least one contains a city with a population of at least 20,000 residents.

In the case of exchange links, systemness depends on the amount and importance of imported and exported prestige goods for maintaining or changing local social structures. In some PGNs imported prestige goods facilitate interpolity cooperation. In others prestige goods are used by local elites to control subalterns. In both of these kinds of prestige goods systems important goods may be obtained from indirect down-the-line trade in which goods move from polity to polity. In such cases it makes sense to not limit the PGN boundaries to direct links, but to allow as many indirect links as are involved in the network of significant provisions. When 5% percent or more of the total yearly importation of prestige goods comes from a polity to any one of the focal five polities, that polity should be included in the PGN.

Our proposed decision rules are tentative. We invite critical discussion and proposals for improving this formulation.

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1. Our project is the Settlements and Polities (SetPol) Research Working Group at the Institute for Research on

   World-Systems at the University of California-Riverside. The project web site is at [http://irows.ucr.edu/](http://irows.ucr.edu/research/citemp/citemptoc.htm)

   [research/citemp/citemp.html](http://irows.ucr.edu/research/citemp/citemptoc.htm) [↑](#footnote-ref-1)
2. Charles Tilly (1984:61) argued that world‑systems should be understood in terms of coherence and interdependence.. Tilly proposed a "rule of thumb for connectedness" based on the projection of political power. He suggested that the boundaries of a world‑system should be drawn as follows:

   the actions of powerholders in one region of a network rapidly (say within a year) and visibly (say in changes actually reported by nearby observers) affect the welfare of at least a significant minority (say a tenth) of the population in another region of the network. (1984:62)

   See also Chase-Dunn 1998 Chapter 15 “Spatio-temporal mapping” p. 317 [↑](#footnote-ref-2)
3. We use the term “polity” to generally denote a spatially bounded realm of sovereign authority such as a band, tribe, chiefdom, state or empire. We agree with Michael Mann (1986) that the term “society” does not usually designate a bounded territorial entity. [↑](#footnote-ref-3)
4. Tilly (1984:62 pointed out that allowing any connection at all to constitute grounds for inclusion results in most areas of the globe having been parts of a single "system" for millennia, a usage that was employed by Lenski and Lenski (1995) and by Modelski (2008). [↑](#footnote-ref-4)
5. One way to estimate differences along the fall-off curve is to compare with the levels of interdependence that exist among adjacent polities. Once the local consequences have fallen below, say a twentieth (5%) of the consequences of adjacent neighbors it is reasonable to conclude that we are outside the system of the focal locale. Between this point on the fall-off curve and the zero point is a zone of low connectedness that is of particular interest to some scholars (Hall 1986, 2016). [↑](#footnote-ref-5)
6. Immanuel Wallerstein's (1974) definition of the spatial boundaries of a world‑sy­stem focused on links in an interdependent network of the exchange of "fundamental commodities," by which he meant food and other necessities of everyday life (here called bulk goods). He excluded the exchange of "preciosities" (luxuries) that were alleged to not have important consequences for the exchanging parties or their societies. Wallerstein also emphasized the importance of mode of production (capitalism) as a feature of a whole world-system that could be used to distinguish between the modern Europe-centered system and the Ottoman Empire. And he used the idea of a core/periphery division of labor to distinguish between “external arenas” and the periphery within the modern system (Wallerstein 2011 [1974] Chapter 6). These were very high bars that drew the line on the fall-off very curve perhaps too close to European Christendom. [↑](#footnote-ref-6)
7. The systemness of information/communications flows is discussed below. [↑](#footnote-ref-7)
8. Wilkinson (1976) uses the term “civilization” for interaction networks based on war and alliances. Here we prefer the terms “interpolity system” or “political-military network” (PMN). Wilkinson’s conceptualization comes from the political science literature on “international systems” understood as a geopolitical logic of competition amongst states that want to protect their own territory and expand into the territory of other states. This aspect of systemness is an important component of interaction in all known systemic networks. [↑](#footnote-ref-8)
9. Wilkinson (2016) proposes useful archetypes of systemic geopolitical interactions among Iron Age states.; The sorts of geopolitical interaction he lists are: “ warmaking and peacemaking, conquest and redress, hierarchy and equality, extortion and exchange, demands and concessions, negotiations and snubs, demarcations and redemarcations.” He also mentions protectorates, leagues, polarization, alliance wars, bandwagoning, balancing, diplomatic missions and instances in which peripheral states inserted themselves into older state systems. [↑](#footnote-ref-9)
10. The one degree of separation rule suggested above might result in a somewhat earlier date for the merger of the Egyptian and Mesopotamian state systems than the period proposed by Wilkinson. [↑](#footnote-ref-10)
11. But Wilkinson(2016) now says: “I feel the need to re-examine connections, especially the Central-Indic connection, with respect to three sorts of cases:   
    1) temporary connections like Alexander's that lasted longer than his (some fuller sense of the distribution of the durations of connections seems needed);   
    2) Central invaders/conquerors of Indic who then moved their political base into Indic; and   
    3) whole peoples (Yuezhi?) who pulled up stakes and moved between civilizations, thus decolonizing  their old home and neocolonizing their new (e.g. Indic) abode, and perhaps disconnecting from a former network while making new political connections. “ [↑](#footnote-ref-11)
12. A bibliography of Wilkinson’s publications is available at <http://wsarch.ucr.edu/archive/conferences/confname/wilkinsonbib.docx> [↑](#footnote-ref-12)
13. Some valuable items such as Olmec heads or steatite (soapstone) bowls are not light but they seem to function as prestige goods nevertheless. [↑](#footnote-ref-13)
14. An example of a transition from staple to wealth finance is seen in the evolution of a regional division of labor between Chumash coastal and island villages (Arnold 2004). As population density increased and hierarchy emerged the islanders, who had long made beads out of olivella shells and traded them, began devoting more of their labor time to the production of these beads in order to have something to trade for food from the mainland. The whole regional system increasingly used these beads as a form of protomoney that facilitated exchange in a system that was still predominantly organized as gift-giving. [↑](#footnote-ref-14)
15. Some trade goods, such as obsidian, can be sourced – meaning that the location of the original quarry from which a piece of obsidian came can be determined by the “chemical fingerprint” of the obsidian. Such materials are particularly useful for studying the spatial nature of trade networks and change in them over time. Ethnohistorical evidence is also useful for locating the sources of prestige goods such as shell beads. When a particular group is specializing in the production of shell beads that are used over a wide area this will be observable in the archaeological record and the spatial fall-off of the frequency of these trade items will be visible. [↑](#footnote-ref-15)
16. The factors that affect decay in information networks according to Kannan, Ray and Sarengi ( 2007) are :

    1. The significance of information. Communicated information is likely to be less significant when it gets farther from its point of origin. And the decay of information is affected by costs and rewards of creating or maintaining network connections.
    2. homogeneity /heterogeneity of interactors . Information is usually more valuable when the communication partners are more culturally similar..The more homogeneous the interactors, the more significant are the information networks. So heterogeneity affects the fall-of curve of information.
    3. the distance of the network links. Long links with many nodes make it difficult to retain the accuracy of information.

    [↑](#footnote-ref-16)
17. Very few indigenous people in the West had learned to read by the 1870s. Dubois (2007:xxx) quotes one of her informants thus: “The white man stares at paper, talks to it, and laughs.” Literacy and writing greatly extend the distance of the information/communications fall-off curve. [↑](#footnote-ref-17)
18. There was also a commercial aspect to the movement because dancers were instructed to bring their valuables to the ceremonies to contribute to the cause, and some individuals produced and sold ritual items such as capes made out of chicken feathers to be worn during the dances. [↑](#footnote-ref-18)
19. Smith and Fauvelle (2015) cite Herbert Eugene Bolton’s (1908:19-21, 23-25) translation of the account of the 1542 Cabrillo sailing expedition up the coast of California, in which the explorers reported several encounters with indigenes who communicated with them “by signs” that indicated that men similar to the explorers were either close at hand on the land or five days away. Cabrillo’s expedition thought that these Indians had knowledge of the Ulloa or Alarcon

    Expeditions up the Sea of Cortez to the mouth of the Colorado River This may have just been a confusion over the interpretation of gestures between people who were unfamiliar with each other’s signing conventions. But the news may have passed from polity to polity across the Baja Peninsula and as far north as the Chumash villages. If this is so it is further indication about the distances that communications could travel in the precontact Americas. [↑](#footnote-ref-19)
20. The idea that systemic connections cause synchronous development sequences has been investigated by Lieberman (2003, 2009), Chase-Dunn, Pasciuti, Alvarez and Hall (2006) Turchin and Hall (2003) and Chase-Dunn, Inoue, A. Alvarez, R. Alvarez, Anderson and Neal (2015) with mixed results. [↑](#footnote-ref-20)