

Chapter 3

The Social Sphere Size Effect

The equilibrium group number model describes the forces acting on the number of groups into which a given social sphere will tend to divide itself under given circumstances. If all other things remain equal, and the geographic extent of the social sphere increases, then the same equilibrium number of groups will cover a larger area, and each group will tend to have a larger territory. Similarly, if all other things remain equal, and the social sphere decreases in geographic extent, then the same number of groups will cover a smaller area, and each will tend to have a smaller territory. The same argument can be made about population, independent of geographic extent. If all other things remain equal, and the social sphere comes to include more or fewer people, then each group will tend to have correspondingly more or fewer members.

In reality, all other things never remain equal. Changes in a social sphere's geographic extent or population can be expected to have effects on the action of competition and the rational-maximizing calculations of people within the social sphere, as communication and transportation costs become more important, more varied natural and human resources are encompassed within the system, and so on. The influences of changing social sphere size on the psycho-rational curve and the competition curve will be complicated and dependent upon specific circumstances. For the sake of argument, though, we can isolate a general tendency, called the social sphere size effect: As a social sphere changes in geographic extent or population, the size of the groups within it will tend to change in the same direction.

How might a social sphere change in geographic extent or population? We

defined a society's social sphere as the roughly coinciding outer boundaries of the social spheres of its members. These social spheres in turn comprise all the people of whom each individual member is sufficiently aware to classify into groups. The social sphere corresponds to the concentration of interactions that comprise a society. A social sphere grows or shrinks, then, as members of a society become aware of or interact with more or fewer other people. Any circumstances that increase communication or movement, especially over long distances, will tend to increase the size of a social sphere. Increasing seasonal migration, for example, might increase the geographic extent of a social sphere. Growing numbers of traders or other people moving goods from place to place might increase communication and interaction with distant people, increasing the size of the social sphere. Population growth might increase the number of people in a social sphere. On the other hand, sedentization, reductions in trade or other forms of exchange, or population decline could correspondingly reduce the area or population of a social sphere.

Some of these mechanisms, such as transhumant or permanent settlement, would affect the social spheres of most or all members of a society. Other mechanisms such as mobile traders or procurement of distant resources for special purposes might affect the social spheres of only certain individuals within a society, most likely economic, political, or ritual elites. Whose individual social spheres should be used to define the social sphere of the society? The answer depends on the level of grouping to which the model is to be applied. If the model is being used to visualize groups at a family or settlement level (such as hamlets, *saya*, or perhaps *allyus* in Andean contexts), then the relevant social sphere will be defined primarily by the common people involved in these groups. The possible presence of long-distance traders in the entourage of their leaders may be of little importance for groups at this level. On the other hand, if the

model is being applied to higher-level political groups such as chiefdoms or larger-scale groups such as ethnicities, then the social spheres of the elites, elders, or other individuals with unusually wide-ranging contacts will play a more central role, and the relevant social sphere will be largely defined by the outer limits of the social spheres of these elites.

The social sphere size effect has obvious relevance to expanding and collapsing states. As a state expands, whether by conquest, economic or ideological imperialism, population growth, or virtually any other of the many hypothesized means of territorial or population growth, individuals in the upper strata of the society come into contact directly or indirectly with more people representing more different groups on the lengthening periphery of the growing state. This expansion of the social sphere leads to the absorption of the new peripheral groups such that the equilibrium group number is maintained. When a peripheral group is incorporated into the state, it is no longer a separate group, but rather a subdivision of the state; the group is demoted to a lower level in reference to the state, and the total number of groups at the level of the state is reduced back towards the original equilibrium value. The absorption of new groups, in turn, lengthens the state's periphery further and expands the social sphere again. In terms of the social sphere size effect, as the social sphere expands, the equilibrium number of groups at the level of the state tends to be maintained by subsuming new groups, and the size of the expanding state grows accordingly. The social sphere size effect visualizes the growth of the state as an equilibrium-seeking response to the expansion of the social sphere. At the level of proximate mechanisms, the model implies that rational calculations both within and beyond the state may lead people and groups to join the state for a variety of reasons; that the state may out-compete other groups economically or militarily; and so on. As the proto-state social group grows

larger, effects of scale (Johnson and Earle 1987) eventually lead to increasingly complex social and political organization in order to integrate and maintain the social unit effectively. From this general perspective, explaining the growth in size, as the social sphere size effect does, is tantamount to explaining the increase in complexity of a nascent state.

As a corollary, the social sphere size effect accommodates the formation of secondary states. As the social sphere of one state expands, the social spheres of the peripheral groups will tend to expand as well, simply because social contact is a two-way interaction. When an individual or group is added to the social sphere of the growing state, at least a portion of the state is necessarily added to the social sphere of at least some members of the peripheral group. Social contacts between the peripheral groups themselves may increase, as well, through growing exchange, military contact, elite diplomacy, and so on. Since the peripheral groups are generally smaller than the focal state, their peripheries are shorter and their contacts are probably more limited, so their social spheres will tend to increase in size to a lesser extent than that of the focal state. By the same logic as was applied to the focal state, these peripheral groups can be expected to fuse as their social spheres grow; the equilibrium group number tends to be maintained, while the group sizes tend to grow. Eventually, the fusion of peripheral groups may unite sufficient numbers of people for effects of scale (Johnson and Earle 1987) to require more complex forms of organization, including states, in response to the original state's growth.

The same arguments can be reversed and applied to at least some collapsing states. As lines of control and communication break down for whatever reason, or as long-distance exchange and travel decline, the social sphere of a state's elites may

contract. The reduction in contact relaxes the equilibrium group number constraint over outlying state territory, and the newly local, smaller social spheres on the periphery each divide up into their own equilibrium numbers of groups. The remaining state is smaller than before. Proximate mechanisms might involve countless types of local conflicts that are no longer contained by the state superstructure. As the periphery becomes ever more divided, heterogeneous, and possibly hostile, the collapsing state's elite have ever less contact with the outlying people, their social sphere continues to contract, and the process spirals downwards in a positive feedback cycle I call the "cascading divisions" effect. The cascading divisions effect will be more fully developed in Chapter 5.

As with most explanations for these phenomena, the social sphere size effect faces a chicken-or-egg problem. To label the growth of the state as an effect of the expanding social sphere rather than a cause of it is arbitrary. It is unlikely that even the best historical documentation could ever show whether a social sphere or a political structure began to expand first, and once started, the growth of the social sphere and of the state would both be concurrent, ongoing, inseparable processes. It may be most honest to consider the social sphere size effect as nothing more than the correlation it states: a tendency for group sizes and social sphere size to change at roughly the same time in the same sense, without a claim of causal priority for one change or the other.

The expansion of Tiwanaku

The social sphere size effect brings together several lines of argument that have been suggested to explain the expansion of the Tiwanaku state. The Tiwanaku state never quite reached the coastal Osmore valley, and for that reason, the fieldwork for this dissertation does not include data directly related to Tiwanaku other than its

conspicuous absence. Nevertheless, Tiwanaku's expansion provides a good illustration of the social sphere size effect. It is included here on the basis of published reports in order to set the culture-historical stage for later phases in the coastal Osmore, and because both the social sphere size effect and the nature of the Tiwanaku state as developed here will be important for the discussion of "salient level" and Tiwanaku's collapse, for which there is some indirect evidence in the coastal Osmore.

Like many states and empires, Tiwanaku expanded in different ways in different geographic regions (see Figure 1-4) (Mujica 1985; Berenguer et al. 1980; see also D'Altroy 1992:19 and his citations). In the Tiwanaku heartland of the southern Titicaca basin, the state grew through population increase *in situ* as an urban center, becoming increasingly dependent upon intensive agriculture in enormous areas of raised fields probably underwritten and administered by a state bureaucracy (Kolata 1987, 1988; Albarracin-Jordan and Mathews 1990). Most of the surprisingly limited theoretical discussions of the origins of Tiwanaku specifically in the southern Titicaca basin core, as opposed to the longer-distance extension of its exchange or influence (Mujica 1985; Kolata 1987, 1988; Browman 1978), seem to implicitly rely upon this population growth and the concomitant effects of scale (Johnson and Earle 1987) that tend to translate increasing group size into increasingly complex sociopolitical and economic organization. The important point in this core area is that the burgeoning population did not fragment into fractious petty chiefdoms, but instead persisted as a single organized entity. In this case, "all other things" apparently did remain approximately equal, or at least the pushing and pulling of different forces on the psycho-rational and competition curves canceled each other out. As population increase was expanding the society's social sphere even within the effectively constant geographic area of the Tiwanaku valley (Albarracin-Jordan and Matthews 1990), the

equilibrium group number apparently remained the same, the size of the corporate group comprising the Tiwanaku urban core increased, and scale effects kicked in to encourage increasingly complex, ultimately state level organization.

In the first territorial layer beyond its urban and agricultural core, principally the remainder of the Titicaca basin, Tiwanaku probably expanded by conquering or subsuming smaller neighboring polities, such as Sillumocco on the western side of lake Titicaca (Stanish 1992; Browman 1992; Kolata 1987,1988). This process best fits effects described in subsequent chapters, and will not be considered in detail here.

Somewhat further away from the urban capital, specifically in the middle Osmore drainage area around Moquegua and possibly in similar circumstances in other Pacific coast drainages and the Cochabamba area on the eastern slopes of the Andes, Tiwanaku seems to have expanded in a manner that might be called "mechanical," after Durkheim's (1949) notion of mechanical solidarity. This concept will be elaborated further in Chapter 5, but here it can be simply described as growth through the geographic diffusion of a culture, more or less entire and to the exclusion of others, probably but not necessarily borne by people physically related to the core population.

A mechanical state can be considered an extreme case on the "hegemonic" to "territorial" continuum of empires conceived by D'Altroy (1992), Luttwak (1976), and Hassig (1985, 1988). Hegemonic empires control territory by creating or coopting relatively independent client states, while territorial empires directly occupy and administer new lands. Mechanical states represent such an extreme case of territoriality that they do not even resemble the empires for which the scale was devised: the state is not preoccupied with controlling territory occupied by a restive conquered populace because the people are culturally, and probably by birth and long

tradition, from and of the state. Control is a matter of internal administration; there are no "other" people or polities present to keep down.

In the area around Moquegua, there is no evidence of an administration imposed on conquered people, nor of coopting existing elites as is so clear in Inka examples (Earle et al. 1987). Instead, there seems to be a single, uniform Tiwanaku culture (Goldstein 1989a,b; Bermann et al. 1989). Goldstein entertains the idea that the early ceramic Huaracane tradition (Feldman 1989) might have continued long enough to be contemporaneous with the Tiwanaku occupation in the middle valley, but since no stratigraphic evidence on the matter has been noted and the only radiocarbon date for a Huaracane context is about AD 50 (Goldstein 1989a), the evidence for such a temporal overlap is thin. At the Tiwanaku sites, everything is in Tiwanaku style, not only ceremonial centers and highly decorated artifacts such as fancy ceramics, stone carvings, textiles, and wooden snuff tablets, but also utilitarian plainware ceramics. Burials are uniformly similar, subterranean, seated and flexed, and often placed in a stone-lined cylindrical to egg-shaped individual tomb. There are no possibly contemporary settlements with distinct, local-style pottery or other different material cultural traits other than the Huaracane material, and no evidence of defensible sites or militarism that might hint at control of a local non-Tiwanaku population. Clearly, this impression may be a result of incomplete evidence, but the data are consistent with a single, relatively homogeneous population of essentially Tiwanaku people. The middle Osmore might be called part of Tiwanaku's hinterland, except that it is too far away, several days' hard foot travel across high, forbidding terrain.

Whether this mechanical expansion was the result of prodigious population growth and emigration among the Tiwanaku people of the altiplano, or some form of

cultural diffusion or conversion, its result was a large area of apparently uniform culture, administered by a single political system. Political unity implies considerable long-distance contact among elites in different parts of the Tiwanaku state, and the material culture uniformity of the common people, even down to utilitarian plainwares, must have been maintained by considerable interregional contact, mobility, and communication at the level of commoners as well. Mechanical expansion by definition involves a growing social sphere. Here again, the rest of the factors affecting group number seem to have remained roughly constant, or any changes in them canceled each other out. The equilibrium group number remained low, and so as the social sphere expanded outward through population growth, migration, and/or unusually inclusive cultural diffusion, the Tiwanaku polity remained a single unit and grew larger in population and geographic extent.

The geographic extent of Tiwanaku's influence grew through at least two more processes: exchange contacts of some form with the regions around San Pedro de Atacama and further south, and possibly colonization or some other more substantial form of exploitation in one or more valleys on the Pacific coast. Tiwanaku's expansion into the Cochabamba area might reflect either of these processes or yet something else. Cochabamba Tiwanaku sites have been described as economic colonies (Kolata 1987; Mujica 1985) and even early examples of *mitmaquna* labor settlements (Browman 1978; Kolata 1982). So little has been published on Tiwanaku in the Cochabamba area that it will not be considered further here.

In San Pedro de Atacama, Tiwanaku artifacts are virtually all highly decorated, iconographically charged luxury goods found in high status tombs (Mujica 1985; Berenguer et al. 1980; Orellana 1985; Thomas et al. 1985). The general consensus is

that these items represent exchange relations between local San Pedro elites and people in closer contact with Tiwanaku, although Rodman (1992) recently argued that the people buried with Tiwanaku goods were people of Tiwanaku origin. Permanent or transitory, these representatives may have been semi-independent traders (Nuñez and Dillehay 1979; Berenguer et al. 1980), "proselytizing merchant missionaries" (Browman 1978:327), agents maintaining client relationships between local elites and Tiwanaku leaders (Kolata 1988), or something else, probably circulating around the Andes with llama caravans of goods (Kolata 1982, 1988).

In the coastal valleys of southernmost Perú and northernmost Chile, Tiwanaku is generally supposed to have established economic colonies to exploit crops that grow best in the *yungas* (warm lands of low and middle elevation) and marine resources including fish, shellfish, and seaweed (Mujica 1985; Mujica et al. 1983; Kolata 1982, 1987, 1988; Browman 1978; Berenguer et al. 1980). According to Mujica (1985:108), "it is accepted that Tiwanaku access in coastal valleys was by colonies," specifically including Chen Chen in the middle Osmore valley near Moquegua, Tacna, Loreto Viejo in the coastal Osmore valley, and various sites in the environs of the Azapa valley in Chile (Kolata 1982:28, 1987:264; Browman 1978:337; Berenguer et al. 1980:82; Goldstein 1989:45-47). Chen Chen, located near Moquegua at around 1400 m elevation, is neither coastal nor a colony. It is part of the "mechanical" long-distance hinterland of the middle Osmore drainage. As Goldstein (1989:45-47) points out, the evidence for coastal colonies is tenuous in the Azapa area and nearly non-existent in southernmost coastal Perú. In Azapa and Tacna, as at San Pedro de Atacama, Tiwanaku material tends to be from mortuary contexts. Based on recent museum study and survey work, Goldstein now entertains the possibility of a small resident elite of Tiwanaku officials in the Azapa valley, but doubts the presence of any

significant Tiwanaku settlement (1992 and pers. com.).

In the coastal Osmore valley, excavations at three sites, including the supposed Tiwanaku colony of Loreto Viejo, and systematic site survey of the entire coastal valley up to 25 km inland (see appendices) encountered only a few fragments that might be even equivocally related to the Tiwanaku state. PCCT excavated 140 m² in 27 areas in the habitation sectors of three sites that were thought to have Tiwanaku-related occupations. The project also made surface collections in two cemeteries thought to have Tiwanaku-related components, and excavated 101 m² in the two cemeteries. Surface artifacts were examined over the entire areas of the excavated sites during intensive, detailed mapping work, as well as at all the sites in the coastal valley that were found during the site survey. The sum total of the artifacts that suggest an occupation related to the Tiwanaku state are the fragments of one ceramic kero, a few other possible Chen Chen phase sherds, a basket shaped like a Tiwanaku IV or V kero, and a tapestry shirt fragment that might be Tiwanaku V in style. Some additional ceramics could fall in either the Chen Chen or the Tumilaca phase. A shirt with Tiwanaku IV or V designs was found in a looted cemetery that has since been obliterated (Disselhof 1967). Vescelius's collections from Loreto Viejo might have contained Chen Chen phase artifacts, but as noted before, the five remaining diagnostic sherds are consistent with the Ilo-Tumilaca style. In short, the few artifacts related to the Tiwanaku state can probably be attributed to, at most, a vanishingly small Tiwanaku population, and more likely to exchange, curation, or Tiwanaku stylistic traits lingering in the craft repertoire of the subsequent phase.

In summary, the social sphere of Tiwanaku's elites was defined, and probably actively enlarged, by an impressive array of mechanisms. In the vicinity of the

Tiwanaku valley itself, population grew dramatically *in situ*, and an elaborate agricultural, craft, and ritual system was organized. To the north, Tiwanaku conquered or absorbed neighboring polities, presumably establishing local administration and other contacts in each. To the south towards San Pedro de Atacama, and possibly in other directions as well, traders or agents of some type travelled long distances to exchange decorated high status goods with distant elites, cementing prestige relations, alliances, or similar connections. To the west, and maybe also to the east, the state expanded "mechanically" through massive emigration or remarkably profound diffusion into peripheral *yungas* zones, which became well integrated into Tiwanaku's social and administrative structures. On the Pacific coast south of the Osmore, the thin data may suggest visiting or resident state officials who probably maintained diplomatic or economic contacts with any local groups, if they did not explicitly exploit their land or labor.

As Tiwanaku's social sphere grew in population and geographic extent, its equilibrium group number evidently remained low, and the size of the state increased. This pattern of growth seems almost tautological, but it by no means describes every growing state. The Inka, for example, can hardly be said to have grown along with their social sphere; instead, they expanded by conquering groups such as the Chimu that often were distant and effectively outside their existing social sphere (D'Altroy 1992; Moseley 1992). While the expansion of the Inka empire (and possibly the conquest of the northern Titicaca groups by Tiwanaku itself) fits better with the competitive exclusion effect (Chapter 7), the growth of the Tiwanaku state in tandem with its extension of its social sphere through exchange, emigration, diplomacy, and internal population growth can be understood as a case of the social sphere size effect in an expanding regime.