The Emergence of Multi-agent Polities of the Northern Central European Plains in the Early Middle Ages, 600–900 CE*

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ABSTRACT

Supra-tribal polities have been confirmed archaeologically, and by historic sources, in the northern part of the Central European Plains for the tenth century CE. However there is no archaeological evidence from the 600 – early 800s CE of socioeconomic conditions suitable to support complex political systems. I suggest that in the apparent absence of critical internal economic and political stimuli, societies of the Northern Central European Plains showed emergent capacity to organize spontaneously in the context of outside socioeconomic pressure and the multi-agent polities of the 800–900s CE are examples of transient political dissipative structures. I discuss both, how multi-agent, short-lived, intermediate forms of sociopolitical organization emerge in a nonequilibrium context, and the rise of social complexity as a multilineal mixture of randomness and regularity caused by a combination of spontaneous processes and deterministic patterns. Elements of systems theory and control theory are used to explain dissipative structures in reference to human societal capacity for self-organization.

INTRODUCTION

Archaeological records suggest a major cultural shift in the Central European Plains after 500 CE, which seems to have been set off by the fall of the Roman Empire. This collapse triggered a chain of cultural changes including significant adjustments to the economic and political patterns of societies living beyond the northern *limes*. The central problem addressed in this study is how to account for

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the transition from noncomplex to supra-tribal polities in the Central European Plains between 600 and 900 CE in the apparent absence of critical economic and political stimuli.

The evolutionary perspective regarding structural changes in human social organization generally utilizes the notion of stages of political complexity with 'band', 'tribe', 'chiefdom' and 'state' (Sahlins 1958, 1963; Service 1975 [1962]; Johnson and Earle 2000) as convenient classificatory variants of political organizations (for a critique of such an unilinear approach see, for instance, Bondarenko *et al.* 2002; Grinin 2003). Here I view cultural change resulting in increased complexity as a multilineal mixture of randomness and regularity and discuss whether the 'outbreak' of social complexity is caused by spontaneous processes or governed by deterministic patterns, or a combination of both. A change in one or more parameters of the integrated system may cause unpredictable behaviors, which could be subsequently modeled as chaotic. The onset of chaotic behavior occurs when one or more factors determining the population's equilibrium changes causing unpredictable responses (behavior) to the new stress. But what sort of change (increase or decrease) and what factor(s) cause the system to act chaotically? Can an order of organization (a dissipative stage) arise 'spontaneously' out of disorder and chaos through a process of 'self-organization'? In simple words: Are these changes to complexity spontaneous or patterned? Prigogine (Prigogine and Nicolis 1977; Prigogine and Stengers 1984) argued that in the far-from-equilibrium condition, new types of structure may originate spontaneously and we may observe transformation from disorder, chaos, into order. New dynamic states of matter – dissipative structures – may originate, reflecting the interaction of a given system with its surroundings.

It has been argued that simple rules contribute to both, better group decisions and individual decisions within groups (see, *e.g.,* Fisher 2009), and help to keep the (social) unit stable. The process by which simple rules produce complex patterns is called self-organization. In such process there is no need for centralized governing (institutionalized leaders) as local rules (conditions) will produce one to oversee the process. When individuals in a group are able to respond collectively to changes, the group becomes a complex adaptive system. But for a complex adaptive system to evolve and grow the interactions of the social actors must be nonlinear.[1] I assume that the process of culture change involves random-

ness and goes through a dissipative stage,[2] which arises out of nonlinear processes in a nonequilibrium system (social group). Dissipation (spontaneous self-organization in nonequilibrium context) becomes a temporary agent of order and develops around an 'attractor' toward which energy is pulled. The attractor feeds the energy level needed for a complex structure to emerge and sustain itself. Examples of successful self-organized complex adaptive systems are big cities, societies, population growth in general, or stock market, *etc.*[3] In the context discussed in this paper the capacity for problem-solving, like the management of common pool resources viewed as an economic process in which costs are assumed and benefits gained, becomes an attractor.

The systematic study of complexity necessarily combines elements of internal and external forces, and such a combination can be expected as a fundamental property of complex dynamic systems (see Erdi 2008 for a detailed discussion). Norman Packard suggests (as quoted in Lewin 1999: 137) that biological complexity has to do with the ability to process information. Key to the reasoning in this paper is the observation that the internal dynamics of a complex structure is altered through a sequence of selective decisions on the part of actors which may bring the system to the edge of disintegration, creating an environment in which new decisions (responses) will be made to ensure stability. Such internal dynamics contributes to constant adaptation (as negative feedback is used to correct errors), which, in effect, always exists at the edge of chaos.[4] A new dynamic state – dissipative structure – may originate, reflecting the interaction of a given system with its surroundings. In this context, dissipative structures are essentially reflections of the situation of nonequilibrium producing them. This observation provokes a fundamental question: How then can systems as complex as human organizations possibly exist? How do they manage to avoid permanent chaos? The stabilizing effect of self-organization, communication, diffusion processes, could be a partial answer. There is a competition between stabilization through communication and instability through fluctuation. The outcome of that competition determines the threshold of stability.

Potential emergent drivers for social complexity exist at all levels in human societies. The transient state of all complex systems has to be viewed, however, in association with a very specific potential dynamic outcome, namely, collapse. Dissipative social structures show a tendency to organize spontaneously in the con-

text of outside socioeconomic pressure. They emerge naturally from simple rules of interaction between neighboring entities. The ninth century CE multi-agent political systems of the northern fringes of the Northern Central European Plains are used here as examples of spontaneous albeit transitory dissipative structures as they either turn to more complex state-level structures or disintegrate.

WHAT ELEMENTS CHARACTERIZE SOCIAL COMPLEXITY?

Social complexity results from rules of interactions followed by social actors that produce large-scale dynamic patterns of interactions. The resulting set of emergent patterns characterizes the level of social complexity. Diversity and complexity emerge in an ecological system from available energy and competition (Schneider and Kay 1994; Allen *et al.* 2003: 331, 335, 341; Jørgensen and Fath 2004). Complexity is accessed by the number of elements that contribute to complex system and the number of those elements existing in a system (social group). If Kauffman's (1993) NK model is followed, there are two parameters N and K, where N = number of elements characterizing complexity, and K = number of those elements existing in a system, and their presence in a system identifies its level of complexity. In Table 1 I summarize three groups of elements that characterize social complexities.

Table 1

Elements characterizing social complexity

Ecological	Anthropological	Archaeological
Common elements of the structure and organization of living systems include boundaries, reproducers, matter-energy processors, information processing subsystems, growing population, production and flow of information	Redistributive economic system, institutionalized social stratification and discontinuation of rank, hereditary social hierarchy, occupational specialization, division of labor, sharing of information, differentiation and specialization in social roles, scale of political integration	Prestige goods, burial rites, iconography, technological capacity, infrastructure, tiered settlement pattern, economic network, fortified settlements, towns, cities, script, monumental architecture

Complexity is expensive to produce and maintain but it offers increasing problem-solving capacity, which perpetuates itself as more complex societies face a larger spectrum of problems which put constant pressure on a system to maintain and to increase to the point of collapse (when the cost of maintenance exceeds benefits, see Tainter 2006: Fig. 1). If complexities are measured through the levels of problem solving, which is an economic process in which costs are assumed and benefits gained, the (complex) system becomes ineffective (collapses), if returns are diminishing. In human society complexity is linked to sustainability, which is the capacity to continue a desired condition or process. All solutions to complexity problems are temporary.

There are basic forces that control the rules (conditions) of interactions through which the process of self-organization produces complex patterns. Such forces have been identified to exist in nature (see Hawking and Mlodinow 2010). Basic forces also govern human capacity for self-organization when people get together and form complex social patterns that range from families to states. If individuals in a group are able to respond collectively to changes, the group becomes a complex adaptive system. Cooperating group may solve problems faster and better in a way that the individuals in the group cannot. Such group does not need a leader or centralized decision-making in solving basic problems like hunting for food, finding shelter, *etc.* Table 2 outlines the basic conditions which are instrumental in the self-organization process contributing to social complexity.

Table 2

Forces controlling social complexity

Economy (sustainability and maintenance of a society through the production, distribution, and consumption of goods and services)
Political power (institutionalized [symbolized and codified] power, enforcement agencies, customs, morals, law, norms, *etc.*)
Ecological conditions (adaptability, response to ecological stress, positive and negative feedback regulating resilience and stability)
Attractors (capture, concentration, and use of energy to maintain sustainability through technology, organization of energy, problem-solving, communication, ideology, risk management, *etc.*)

DOES SOCIAL COMPLEXITY EMERGE SPONTANEOUSLY OR IS IT GOVERNED BY DETERMINISTIC PROCESSES?

Discussions on the nature of social complexities (for instance, Claessen 2002; Grinin 2003) relate to speculative questions, like:

- Why complexity happens?
- Do states have to emerge?
- To what extent is the state formation a random outcome of historical process?

According to H. Spencer, the rise of complexity is inevitable and should be attributed to internal dynamics of complex systems (order derives from chaos). According to Ch. Darwin, the biological complexity is not inevitable and is built by a blind, non-directional force (natural selection). Following the traditional evolutionary thinking, complexity is the outcome of an adaptational process. But is it gradual, slow, steady, or is it governed by other physical characteristics? Should the mechanism(s) that drive(s) the rise of socio-political complexity be described differently than natural selection? The science of complexity combines elements of both, internal and external forces, and such combination can be expected as a fundamental property of complex dynamic systems, which ideally lead to the crystallization of order. The internal dynamics of any complex social structure is fueled through a sequence of selective decisions (that is, actors engaged in problem-solving), which may, on occasion, bring the system to the edge of disintegration in which new decision will be made to ensure stability. The fundamental question is: *Is there an aim in the evolution of social systems?* In my view the change is not directed but happens spontaneously although there are certain controlling points (attractors) that stimulate and manage change for a limited time (as long as certain conditions exist). In other words, change to social complexity is not necessarily desired by the actors involved and if complexity is characterized by diminished sustainability of a system, then collapse undermines complexity (see Tainter 2006 for a more general treatment).

My initial assumption is that local conditions generate organizational systems. Experimentation followed by increased specialization often seems to characterize the development of complex structures. Patterns of innovation and development of complex sys-

tems seem to be broadly similar with, of course, many local variants. Systems are populated by attractors (states of stability) that regulate the dynamics of the structure (see Diamond 2005; Tainter 1988). The more ordered systems become, the more efficient in problem-solving they are, but there is a price to pay – the more complex a system becomes, the more likely it is that the values of some critical variable will radically change causing a stress or even a failure.

In this view the change in social complexity has a certain random quality in the face of seeming regularity. The emergence of social complexity is usually considered as an outcome of the process driven by deterministic factors, *e.g.,* specific ecological conditions, trade and exchange, access to resources, *etc.* Such explanations, although logical, may in fact be oversimplified models. I find Joseph Ford's assertion that *evolution is chaos with feedback* (Pickover 1991) a more useful way to approach change. The ongoing process of change in social complexity involves a great deal of chance (randomness) and it passes through dissipative stages.

DATA AND METHODS

Keeping this perspective in mind, I re-examine political and social developments in the Northern Central European Plains using elements of the system theory and the control theory delineated below. Mathematically modeled equilibrium shows all the conditions necessary for a stable system to change in a predictable, linear way (if the influx of energy stabilizes). But if the system is pushed into far-from-equilibrium conditions nonlinear relationships prevail. Systems become sensitive to external influences and small input yields huge effects. My approach considers the idea of dissipative structures, which arise out of nonlinear process in a nonequilibrium system (social group). Dissipation, according to Lorenz (1963), is an agent for establishing order, which, as Ruelle (1991) pointed out, develops around an attractor. Order occurs because energy is always pulled toward an attractor, which becomes a stabilizing factor. There are two conditions that make the occurrence of dissipative structures more complex than what deterministic models show. First, the attractor is not a fixed point (or it is fixed temporarily), and second, energy constantly enters the system and drains out. The problem is to identify the attractor that may sustain the level of energy needed for a complex structure to emerge and stabilize.

Data from the northern part of the Central European Plains offers opportunities to see a systemic change over a significant period of time. Pomerania in northwestern Poland is one of the best archaeologically recognized regions of the Plains and offers 1639 sites dated from 500 to 1000 CE (Losinski 1983: 108). Employing settlement analysis reveals conditions and processes contributing to the increase of political integration. The number of known archaeological sites allows for a quantitative analysis of the settlement patterns and conclusions based on empirical evidence.

Multi-agent pre-state polities of the Central European Plains, 600–900 CE

Historic sources on pre-state political systems in the Central European Plains

The ninth century CE historic source *The Bavarian Geographer* mentioned contemporary supra-tribal organizations for the Elbe Serbs naming their areas as *regiones* (Tyszkiewicz 1996: 50, and footnotes 53, 53, and 54).[5] According to the same source, the Obodriti alliance consisted of two tribes (*Ibid.:* footnote 55), while Adam of Bremen and Helmold of Bosau suggested more tribes in the alliance (*Ibid.:* footnote 56 and 57). A supra-tribal alliance was also suggested for the Veleti alliance (*Ibid.:* footnotes 58–61). Medieval sources also mention supra-tribal alliances for the southern Plains, (the Vistulans [Wislane] alliance, Tyszkiewicz 1996: 51; footnote 63, 64, 65, and 66), and in Silesia, where historians suggest the existence of at least one tribal alliance (Tyszkiewicz is skeptical about it, see *Ibid.:* 51, footnote 67, 68, and 69). Presumably four or more Silesian tribes formed alliances (*Ibid.:* 51–52, footnote 76).

A review of historic sources suggests no state-level polities in Central Europe in the ninth century CE, but complex, supra-tribal organization have been noticed in several regions of the Northern Central European Plains.

Archaeological evidence of changes in sociopolitical organization in Central European Plains, 600–900 CE

Dulinicz (2006) suggests the beginnings of a new culture in the northern section of the Northern Central European Plains in the seventh century CE. During the 600s CE the region was occupied by societies organized in tribal political system represented by the Dziedzice type settlements. Between the 600–700s CE the Golancz-Kedrzyno culture emerged (known as the Feldberg culture in Mecklenburg) sug-

gesting wide-spread regional contacts, which after 800 CE produced evidence of multi-agent political systems (23 % of all sites from the region: Losinski 1983: 109). During the 900s to 1000 CE economic and political power shifted to another center to the south and local centers declined.

Table 3 and Fig. 1 show a tendency for rapid increase in inhabited area from 600 to 800 CE and stabilization during 800–900 CE, suggesting the appearance of new settlements as well as the expansion of agriculturally used land (increase in the elements of the pool of common resources, like pastures, *etc.*).

Table 3

Expansion of inhabited area in Pomerania, 600–900 CE. Total area 28,875 km^2 (data after Losinski 1983)

600–700 CE	800 CE	900 CE
Inhabited area 5,480 km^2 (18.98 %)	Inhabited area 11,715 km^2 (40.57 %)	Inhabited area 12,880 km^2 (44.61 %)

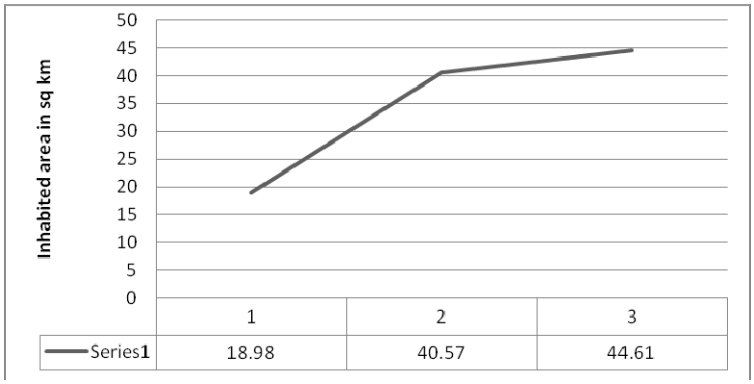

Fig. 1. Change in inhabited area, 600–900 CE. 1: 600–700 CE, 2: 800 CE, 3: 900 CE

Table 4

Density of settlements in Pomerania 600–900 CE (data after Losinski 1983)

600–700 CE	800 CE	900 CE
1 site per 25,37 km^2	1 site per 16,85 km^2	1 site per 13,94 km^2

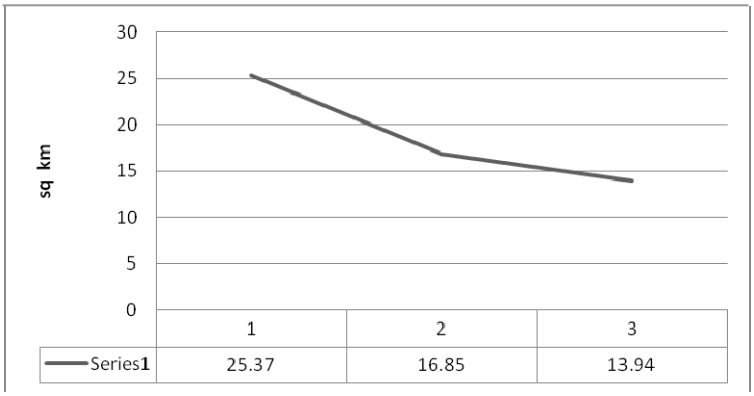

Fig. 2. Settlment density 600–900 CE. 1: 600–700 CE, 2: 800 CE, 3: 900 CE

Table 4 and Fig. 2 show an increase in settlment density; density increases between 600–800 CE and stabilizes during 800–900 CE. Two settlment processes show a stabilizing tendency during 800–900 CE:

1. Inhabited area.
2. Settlment density.

Change in political organization is seen through the dynamics of settlement change, especially in the network of forts. The appearance of forts confirms higher social investment and the existence of decision-making centers on a different scale. Early forts of the 600s CE were sporadic (cf. Table 5 and Fig. 3; about 4 % of all forts in 600–1000 CE). Those were large forts serving local territorial communities rather than as seats of local leaders. The increase in the number of newly constructed forts during the 800s CE (about 33 % of all forts in 600–1000 CE), suggest the emergence of a new political system. During the 900s most forts were abandoned due to political instability of the times (especially after 950 CE, when a state formation process was underway south of the discussed region and controlled by a center in Greater Poland [*Wielkopolska*]). After 1000 CE the percentage of new fort constructions declined to 18 % due to the establishment of a new, state-level political organization, which eventually controlled the region.

Table 5

Percentage of forts constructed between 600–1000 CE

600 CE	700 CE	800 CE	900 CE	1000 CE
4 %	11 %	33 %	33 %	18 %

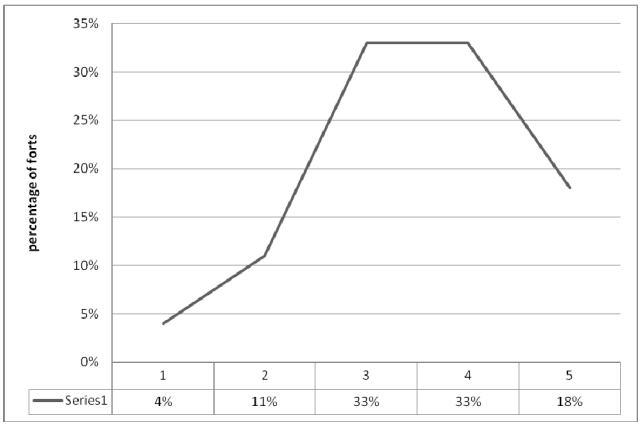

Fig. 3. Dynamics of fort constructions 600–1000 (data after Losinski 1983: 110–111). 1: 600 CE, 2: 700 CE, 3: 800 CE, 4: 900 CE, 5: 1000 CE

Fig. 3 shows a dissipative (stabilizing) stage in the construction of forts during the 800–900s CE.

Table 6

Settlment density 600–900 CE

Type of settlement	600–700 CE	800 CE	900 CE
All sites	1 per 25,37 km^2	1 per 16,85 km^2	1 per 13,94 km^2
Forts	1 per 94,48 km^2	1 per 65,81 km^2	1 per 73,18 km^2
Villages	1 per 42,48 km^2	1 per 29,14 km^2	1 per 21,76 km^2

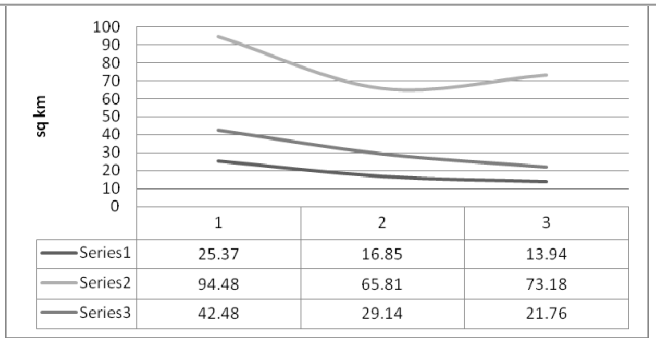

Fig. 4. Settlement density, 600–900 CE. 1: 600–700 CE, 2: 800 CE, 3: 900 CE

Series 1 – all sites
Series 2 – forts
Series 3 – villages

Fig. 4 shows that while the density of all sites increases toward the 900s CE (mostly villages), forts represent an opposite tendnecy. The dense network of the 800s CE weakens toward the 900s CE. In the 600–700s CE forts controlled larger territory and during the 800s CE a new denser network of forts emerged, which susbsequently disintegrated in the 900s CE. Fig. 4 suggests an increase in the construction of forts during the 800s CE, stabilization (political and economic) during the 900s CE, and decline after 1000 CE. In political terms, it indicates the emergence of a stable but impermanent non state-level political system in the 800–900s CE, and its collapse around 1000 CE, probably due to political competition from the south Greater Poland (*Wielkopolska*) where after 950 CE a state formation process was by numerous accounts (see Kurnatowska and Kurnatowski 1972, 1983; Leciejewicz 1989, 2007) underway. According to data presented by Losinski (1983: 111), over 50 % of all forts from 600 to 1000 CE were constructed in the 800–900s CE. This number, even if skewed by research, shows a clear tendency: the 800–900s CE represent times of increased social investment, political and economic stabilization should be interpreted as the emergence of a political power able to mobilize labor and probably effective pattern of collecting tribute.

Logically, other forms of settlements, especially undefended settlements (villages) show a similar dynamics with 20 % of all undefended settlements (villages) of the 600–1000s CE established in the 800s CE. A decline is observable in the archaeological record and this type of settlements during the 900s CE and the number of new villages picks up again after 1000 CE due to the emergence of a new political structure related to agricultural intensification suggested by some historians (see Dembinska and Podwinska 1978: 82ff.).

Spatial analysis also suggests a significant socioeconomic and political change around 800 CE and after. According to Losinski (1983: 112), the total area of the analyzed region is 28,875 km^2. During the 600–700s CE about 5500 km^2 (ca 19 %) were inhabited, while this doubled to 11,700 km^2 in the 800s CE and further increased slightly in the 900s CE to 13,000 km^2. The increase during the 800s CE can be explained by changes in settlement pattern (restructuring settlements as described earlier) and not population growth. Also the increased density of settlements suggests the emergence of a new political pattern.

No evidence suggests that population influx or population growth was related to the dynamics of settlement pattern in the 800s CE. I suggest that internal socioeconomic conditions mobilized local societies to change local political pattern from small territorial units to territorial alliances representing new forms of political integration. Older, large forts disappeared and were replaced by a new network of smaller forts which were standardized in size and construction and whose role was military. Those small forts were surrounded by a number of villages serving the local power center. The settlement structure changed from large, communal centers (supported by communal cooperation in the management of local resources [see Lozny 2010], and serving territorial communities) to smaller and dispersed settlement pattern representing kinship-based competitive social structures. Local economic conditions, especially trade and exchange, contributed to the accumulation of wealth and power in certain locations further contributing to diversification of rank and the emergence of specialized labor (crafts). This new multi-agent socioeconomic pattern does not resemble a state-level polity but is more complex than the previous traditional territorial political structure with at least two levels of decision-making.

Three phases of settlement change in Pomerania can be distinguished based on the data presented.

First phase, 600–700 CE. It is characterized by low density of settlements and slow processes of settlement expansion. Two forms of settlement coexisted: not numerous, large, single-component forts and dispersed villages. Settlement networks appear relatively stable over this period.

Second phase, 800 CE. Increase in settlement dynamics and internal colonization of previously inhabited areas. The number of forts tripled. Some older (communal) forts were destroyed and a new network (serving new sociopolitical units) was established, suggesting political integration and the emergence of new political organization (non-state). Standardized in their construction (similar size and construction methods), small and heavily fortified forts were accompanied by clusters of villages.

Third phase, 900 CE. This phase is characterized by a slower rate of change in the settlement pattern, except for the Wolin region, where the center (Wolin) seems to have stimulated fast growth. Settlement pattern stabilized and the number of villages

slightly increased while the number of forts remained unchanged. The number of forts declined towards the end of the 900s CE and a new network of forts with a central fort accompanied by a number of villages emerged. This change might suggest the transition from kinship-based political system to a more complex and centralized form of governance. The new system was based on large forts, serving as political, economic, and cultural centers.

Settlement pattern changed again after 1000 CE when the region was incorporated into the newly emerging state-level complexity of the Greater Poland (*Wielkopolska*) region. Settlement change in the Greater Poland (*Wielkopolska*) region followed a different trajectory (see Kurnatowski 1971; Kurnatowska and Kunrnatowski 1972), and in the 900s CE a significant increase in the forts construction has been recorded and the newly emerging pattern turned to a state level complexity and impacted the neighboring regions including parts of Pomerania, where at the same time local settlement patterns declined.

One of the key elements stimulating the dynamics of socioeconomic and political complexity of the 800s CE in Pomerania was the emergence of trade and exchange centers on the Baltic coast serving coastal communities and markets in southern Scandinavia (Leciejewicz 1989), whereas in Greater Poland (*Wielkopolska*) the key element was the long-distance trade network suggested by Kurnatowska and Kurnatowski (1983). Both were supported by the economy based on agricultural intensification inferred indirectly from the change in inhabited (arable) areas (see Table 3, Fig. 1).

Data on social ranking among societies of the Central European Plains, 600–900 CE

Complex societies emerge around the institutionalized centers of power, governments. The key question is: How is power institutionalized? And further: What processes lead to the emergence of social institutions that sustain power? The simplest definition of power is the ‘capacity to get things done’. Power is about the ability for social control and sanctioning. Chiefs shape their positions from three primary sources: controlling economy, military, and ideology. Gregory Johnson (1983) has shown that certain level of span of control and decision-making does exist among societies usually labeled as ‘egalitarian’ or non-complex. Therefore, the existence of some rank among societies of the Northern Central European Plains of

the sixth century CE, even if it is unnoticeable in historic sources, may be assumed. It may also be inferred indirectly from the archaeological record discussed below.

Chiefs run all kinds of societies but not all of those are identified as multi-agent polities (chiefdoms). The term has been reserved for a society of certain level of social complexity. And here is the problem: how complex a society should be to be called chiefdom? I do not think we can answer this question by using evolutionary ideas. Perhaps, the way to look at chiefdoms is to focus on specific characteristics. Chiefdom is not an evolutionary stage in social evolution, but it emerges under specific conditions, like the need to organize a military alliance in response to specific pressure. When the threat dissipates the chiefdom either dissolves or it turns into a more complex structure supported by a new level of political integrity and fueled by economic networks. In this view chiefdoms will be dissipative structures and might not always be recognizable archaeologically. Carneiro (1981) called chiefdoms fundamentally warlike. My examples related to the political organization in the northern part of the Central European Plains (Obodriti and Veleti, cf. Leciejewicz 2007) at the time of Charlemagne's expansion to the northeastern Europe, corroborate this claim. Their emergence along with the growing political system in Greater Poland created the pressure on the societies discussed in this paper.

No archaeological data from the 600–900s CE Northern Central European Plains suggest that power was inherited but historical information points out to individuals who controlled trade and exchange as significant local leaders. The case of the seventh century CE Central European polity, the so-called Samo state, suggests that control over trade and exchange networks was a legitimate source of power (Lozny 2004; Tyszkiewicz 1991). Powerful leaders controlled the alliances located west of the discussed region, like the leader of the Veleti polity, Dragowit (Leciejewicz 2007). Was this a type of leadership close to what is called in anthropology a big-man as suggested by Barford (2001)? No evidence exists to argue in favour of such an idea (the accumulation of individual wealth is not documented). If charismatic leaders existed, their power could have been linked rather with other qualities (religious significance, medical skills, *etc.*) than wealth. Some ethnographic records show that random individuals may have been elevated to the chiefly

status by outsiders and not by their peers (cf. the Ojibwa chiefs who have been labeled as leader by the European traders because of frequent contacts with them and later also accepted by their peers – Hallowell and Brown 1992). Anthropological literature provides accounts of such behavior in reference to the leaders whose power was not based on the ability to use force or threat, but those who were rather considered as charismatic leaders (as witnessed by Posposil among the Kapauku of New Guinea: cf. Pospisil 1963: 49).

Archaeological records from the discussed region confirm the existence of chiefs. For instance, the evidence confirming (probably indirectly) trade contacts with the Byzantinian Empire in form of coins (solids) found in the European Plains, may suggest that during the 800 CE local chiefs were gaining power through accumulation of wealth due to their controlling role over long distance trade. What sort of political system it was is not clear, however. Leaders emerge because there is a need to solve problems and they become institutionalized as the demand for problem-solving increases. Complex and institutionalized alliances and segmentary, heterarchical society often develops (Ehrenreich *et al.* 1995). Ideological manipulation was, however, the primary mechanism in gaining power in chiefdoms (cf. Service 1975: 294).

DISCUSSION

The two characteristic features of multi-agent polities are: 1) significant control of power by a chief, and 2) centrally organized administration and decision-making hierarchy. These can be recognized archaeologically among the 600–900s CE societies of the Northern Central European Plains. Despite the evidence for discontinuation of social rank, the distribution of influence in decision-making does not resemble that of a state structure. Table 7 summarizes the key characteristics of multi-agent social complexities identified as chiefdoms as opposed to states.

Earle (1978: 12) recognizes the following symbolically coded features of a complex chiefdom:

- discontinuity in rank between chiefs and commoners;
- specialization in leadership roles;
- increased centrality in the regional hierarchy.

A complex chiefdom is characterized by one or two levels of control hierarchy above the level of the local community (Johnson 1973:

2–11, Fig. 1), while a state consists of three or more levels of control (*Ibid.*). The basic distinction between a complex chiefdom and a more advanced polity (state) is, therefore, characterized by a span of control within its decision-making hierarchy. The 800–900s settlement pattern of the Northern Central European Plains with standardized in their construction forts surrounded by cluster of villages seems to resemble the non-state level of control.

Table 7

Comparative characteristic of chiefdoms and states

Author	Chiefdom	State
1	2	3
Service	Large population; economy based on complex subsistence (irrigations); exploitation of diverse microenvironments; centralized leadership (hereditary); ideological manipulation was the primary mechanism in gaining power in chiefdoms; 'kinship societies' (Service 1962: 171)	Same as chiefdom plus refined art, monumental architecture, writing, calendrical system, laws, organized warfare, long-distance trade network, specialized craft (some of the above mentioned can be found in some chiefdoms); 'primitive state' and 'archaic civilization'; primitive states develop through contacts between advanced states and chiefdoms; archaic civilization evolves from chiefdom and the change is quantitative rather than qualitative; social and environmental conditions contribute to the emergence of state – centralized and hierarchical administration and bureaucracy; state is larger, more elaborate, more powerful, more complex version of chiefdom (quantitative difference); state is a political institution that uses coercive force to govern;

1	2	3
		no definition per se; state is a quantitative stage of a chiefdom; state is a form of political organization, which uses repressive force to govern
Fried		State is 'the complex of institutions by means of which the power of the society is organized on a basis superior to kinship'. Fried disputed Service's idea of beneficent chiefdom and suggested that social stratification existed before states emerged, and state emerged to institutionalize social strata
Earle	Discontinuity of ranks; specialized leadership; increased centralization of decision-making; a regional polity with institutionalized governance and some social stratification organizing population of a few thousands to dozens of thousands of people	
Carneiro	A regional polity with institutionalized governance and some social stratification organizing a population of a few thousands to dozens of thousands of people; redistribution	
Johnson	Span of control in decision-making hierarchies: two or less levels of control; presence of hierarchies (social, political, decision-making, controlling)	Span of control in decision-making hierarchies: three or more levels of control of decision-making hierarchies

1	2	3
Yoffee	Social organization consists of branching kinship (conical clans), members are ranked hierarchically by measuring the distance from apical ancestors. Chiefdoms are 'kinship societies' (Service 1962: 171) and in political terms contain hereditary and usually endogamous leaders and centralized ceremonial place and rituals, but no formal coercive pattern	Yoffee suggests that states are characterized by governmental centers and controlled by them territories and to him civilizations are distinguished on the principle of scale and not cultural differences

Evidence for the emergence of multi-agent polities in the northern region of Central European Plains, 600–900 CE

During the seventh and especially eighth century CE the first fortified enclosures appeared across the Central European Plains. Enclosures were built to protect the territorial community wealth. Some, like those known from the lower Oder River, consisted of defensive walls built on naturally elevated areas (Feldberg in Mecklenburg) and were inhabited probably by one kin group.

Throughout the 800–900s CE clusters of settlements in the region became integrated to form more complex polities. The reason for such integration could have been political or economic, or both. Clusters are easily identifiable through the nearest neighbor testing (one level only). Although population size can be estimated for the clusters, the real number of people is not significant, however; what matters is the level of change in population size within a time unit. For instance, if a cluster was estimated to have been populated by 2000 and one hundred years later it changed to 10,000, the change has to be explained in political and economic terms as such demographic change may be associated with the appearance of a center, larger village or a town (stronghold).

Complex clusters can also be identified by looking at the distribution of common artifacts, like pottery. For instance, the diagnostic Feldberg pottery was distributed over larger area either through trade and exchange network or through intermarriage. Either way, the dis-

tribution shows elements of political and/or economic integration as people who are not in some sort of agreement do not trade and/or exchange items or wives. Therefore, I argue that the distribution of unified pottery types in the Northern Central European Plains during the 700s CE represents the appearance of socioeconomic relationships that led to the emergence of politically integrated multi-agent polities during the 800–900s CE in Pomerania.

Relying on the archaeological data, we may speculate that two major factors contributed to the emergence of multi-agent polities of the 800–900s CE in Pomerania: 1) economic growth linked to agricultural intensification, and 2) internal political stability. The social structure of those polities could be characterized as a territorial alliance with autonomous local chiefs and possibly a paramount chief. This internal structure of the alliance resembles a description of a 'complex chiefdom' structure, and entirely fits within the classical definition of chiefdom (Carneiro 1981: 45): 'a chiefdom is an autonomous political unit comprising a number of villages or communities under the permanent control of a paramount chief', which, as Earle (1987) points out: 'was rather loosely defined as a polity that organizes centrally a regional population in the thousands'.

There are two characteristic features of chiefdom: 1) permanent control of power by a chieftain, and 2) centrally organized impermanent administration and decision-making hierarchy and both are present among the 800–900s CE multi-agent polities of the Central European Plains. Therefore, I presume that the idea of a centralized form of decision-making hierarchy had been introduced in Central Europe by that time. But despite the evidence for discontinued rank status, the power balance in decision-making within the alliance does not resemble state structure. The lack of institutionalized decision-making centers and unstable leadership possibly caused failures in a redistribution system (evidenced by the collapse of the fort network after 900 CE), considered one of the fundamental elements of a chiefdom structure (Carneiro 1981), and decline of local centers during the tenth century CE.

CONCLUSIONS

Societies of the northern Central European Plains did not form complex socioeconomic systems during the sixth century CE, but more complex tribal alliances and states emerged in the ninth and tenth centuries CE. A military organization to protect economic

interests of the local leaders was the key function of tribal alliances and powerful leaders who governed those alliances. The multi-agent political structures included titled leaders of small territorial units whom Byzantine sources named as *primates, archontes, etnarchai, fylarchai,* and *hegemones* and titled leaders of larger tribal organizations named *reges*. Also Latin sources name small tribes and mention tribal alliances of the Northern Central European Plains in the eight century CE and later.

Thus the period from 600 to 800 CE can be seen as representing relatively unstable (nonequilibrium) conditions for change as the data presented in Table 3 and Fig. 1 show a tendency for rapid expansion in inhabited area from 600 to 800 CE followed by a quite stable period during 800–900 CE, represented by the appearance of a new settlement pattern as well as the expansion of agriculturally used land (increase in the elements of the pool of common resources). Also the density of settlments increased between 600–800 CE and stabilized during 800–900 CE. The optimum in the number of constructed forts during the 800s and 900s CE (about 33 % of all forts 600–1000 CE), suggests the emergence of a new political system. Fig. 3 shows an increase in the construction of forts during the 800s CE, stabilization (political and economic) during the 900s CE and decline after 1000 CE. It seems to represent a dissipative stage in the construction of forts during 800–900 CE. In political terms, it indicates the emergence of a stable political system (non state-level) in the 800–900s CE and its collapse after 1000 CE, probably due to political competition from the south (Greater Poland), where a state formation process was underway after 950 CE.

It is commonly accepted that economic conditions stimulate political change. The rise and fall of state level complexities can be linked to the economic success or decline. Such evolutionary models seem too simple. Obviously there is a strong correlation between the economic condition and the level of social complexity, but the overall picture seems more complex. Generally two models have been proposed to explain the socioeconomic relations: 1) intensified agricultural productivity generates surplus which turns to profit, allowing for the emergence and support of non-agricultural specialists, and 2) competition for resources through trade, warfare, political alliances leads to the emergence of class societies (complexities). In both models it is assumed that the new economic pattern was based on other than a kin structure in terms of exchange

and decision-making. It seems that the smallholding approach allows for economic sustainability even at times of political unrest and collapse. In other words, the state-level economy (the economy of the elites) is crumbling, while the economy of the kin remains as the key supportive system. In this system, kin relations give a natural order to family labor. Wealth differences exist but are never extreme, and are more ideological than economic. Archaeological evidence supporting the existence of such a system would be a network of equal in rank settlements in which houses would not be drastically different. Elite power is recognizable archaeologically in the mobilization and deployment of large amount of labour, manifested as massive construction features. This is a characteristic of the settlement pattern of the populations of the Northern Central European Plains of the seventh to eight centuries CE (Lozny 2010). The sixth to ninth century CE societies of the region were quasi-egalitarian swidden cultivators/livestock keepers who managed the critical common pool resources (land, water, livestock, game, forest products, *etc.*) in cooperative manner, and as economic and political conditions changed during the ninth-tenth century CE (farming and trade intensified), cooperative management of the resources contributed to the creation of socioeconomic conditions suitable for the emergence of higher level hierarchal structure resembling multi-agent complexity, and this transition is visible in the archaeological record (for instance, change of settlement pattern, house size, land use, evidence of collective works, *etc*.). The key differences among multi-agent political structures identified as chiefdoms and states are summarized in Table 8.

Table 8

Key characteristics of two levels of multi-agent political systems (chiefdom and state)

Chiefdom	State
1	2
1) permanent control of power by a chieftain; and 2) centrally organized administration and decision-making hierarchy; 3) lineage-based social structure;	1) permanent control of power by a chieftain; 2) centrally organized administration and decision-making hierarchy; 3) monumental architecture; 4) systematic collection of funds (taxation);

1	2
4) impermanent succession of power; 5) tiered settlement pattern; 6) two levels of control.	5) legal system and law enforcement agencies; 6) established (codified) succession of power; 7) tiered settlement pattern; 8) three or more levels of control.

NOTES

[*] I thank Daniel G. Bates for his comments on an earlier version of this paper. While writing this paper I learned that my dearest friend Prof. Marek Dulinicz and his wife were killed in a car accident in Poland June 6, 2010. I have benefited a great deal from His friendship and wisdom. Several ideas presented in this paper emerged from our discussions on early medieval political systems of Central Europe. I dedicate this paper to the memory of Grazyna and Marek Dulinicz.

[1] An action by one individual produces response among others (or in the group). Fisher (2009) calls such behavior 'swarm intelligence'.

[2] See Lorenz 1963; see Brogliato *et al.* 2007 for basic discussion on dissipative systems. See Prigogine and Nicolis 1977 and Turcotte and Rundle 2002 for discussion on self-organized complexities.

[3] Logistic difference equation (see May 1976) is used to describe the nature of all sorts of complexities controlled by positive and negative feedbacks, which are central to their emergence.

[4] What I mean here is that the degree of organization lies between complete order and complete chaos.

[5] A tribe was recognized as a political territorial unit rather than ethnic entity.

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