

Tremors in the Web of Trade: Complexity, Connectivity and Criticality in the Mid-Eighth Century Eurasian World¹

Abstract: Events within a fifteen-year period in mid-eighth century Eurasia included the Abbasid revolution, An Lu-shan's Rebellion in Tang China, and the collapse or emergence of empires from Frankish Europe to Tibet to the kingdom of Srivajaya. Rather than study these events in isolation, this paper views the interconnected peoples of Afro-Eurasia as a self-organizing, adaptive system similar to ecosystems, economies and other emergent, evolving phenomena perpetually balanced on the edge of criticality and chaos.

Short Title: Tremors in the Web of Trade

Key Words: Eurasia, Silk Road, complexity, criticality, self-organizing systems, nonlinearity, Abbasid, Tang Dynasty, Central Asia, An Lushan's Rebellion

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Introduction: The Problem

In the year 742 CE, the Turkish Empire, which had ruled the steppes of Asia for two hundred years, was destroyed from within by a coalition of subject Uighur, Karluk, and Basmil tribes. By 744 the Uighurs had achieved dominance over much of the territory of the former Turkish Empire (534-744) in what today is Mongolia.² The following year, the last Turkish ruler or *kaghan* was killed and his head sent to the Tang emperor in Chang'an. On the collapse of Turkish rule, Denis Sinor wrote that the "decline of the kaghanate was the result of disintegration, interior turmoil."³ But this is merely to say that the Turkish Empire disintegrated because it was in the process of disintegration, taking the symptoms of decline as a proximate cause of collapse.

Other scholars have attributed the decline of the Turkish Empire to tribal conflicts caused by the institution of lateral succession,⁴ or to the machinations of the Chinese.⁵ While these descriptions of the conditions of the declining Turkish Empire are of great importance for understanding the downfall of the Turks, they do not alone explain why the Turkish Empire fell in 742, and not at some other time. After all, the Turks were plagued by succession disputes and Chinese manipulation throughout their history, but managed to maintain their hegemony until 742.

Not long after the collapse of the Turkish Empire, the Tang Dynasty (618-907 CE) suffered a massive rebellion which lasted eight years (755-763). The rebellion was initiated by An Lushan, a Sogdian-Turkish general commanding Tang forces on the northeast border.⁶ While the first half of the eighth century is considered by many to be a high point of Chinese civilization, the latter half of the century, following the devastation of war and rebellion, saw a decline in imperial power. The

² Colin Mackerras, "The Uighurs" in Denis Sinor, ed., *The Cambridge History of Early Inner Asia* (hereafter *CHEIA*) (Cambridge: Cambridge University Press, 1990) 317.

³ Denis Sinor, "The Establishment and Dissolution of the Turk Empire," *CHEIA*.

⁴ Thomas J. Barfield, *The Perilous Frontier* (Cambridge: Blackwell Publishers, 1989) 150.

⁵ William Samolin, *East Turkestan to the Twelfth Century* (The Hague: Mouton and Co., 1964) 64-6.

⁶ Howard S. Levy, *Biography of An Lu-Shan* (Berkeley: University of California Press, 1960) 1; Edwin G.

Tang never fully recovered from the crisis of the mid-eighth century as the dynasty lost control over silk, salt and iron revenues in some of the wealthiest provinces. The rise of eunuch control at court and local gentry control of the peasantry promoted greater regional autonomy while further diminishing imperial authority until the final disintegration of the Tang state in 907.⁷

Conventional wisdom holds that An Lushan's rebellion "caused" the decline of Tang imperial power.⁸ However, this linear explanation fails to demonstrate sufficiently why that rebellion produced such devastating results. The Sui-Tang dynastic enterprise had withstood rebellions, coups, and foreign wars. Although this conflict was astonishing in its devastation, why was it able to bring a dynasty with more than a century of glorious success to its mighty knees, and why did it take more than a century and a half before the dynasty finally ended?⁹

Roughly contemporary with the decline of Turkish and Tang power was the Abbasid revolution in the Arabian Empire. United by Islam, seventh century Arabs conquered a vast territory, destroying Sassanid power in Persia, and surging even to the gates of Constantinople. The Umayyad Caliphate (661-750) covered most of North Africa and Spain, and extended its power east into Khurasan and northern India. The Abbasid revolution originated in Marw in the Khurasan region of Inner Asia. In a series of campaigns in 749-750 the Abbasid armies, mainly Persian and Turkish soldiers led by Abbasid general Abu-Muslim, swept west, overthrowing the Umayyad state and establishing a new capital at Baghdad in 762.¹⁰

The impetus for the Abbasid revolution is generally thought to lie in disputes stemming

Pulleyblank, *The Background of the Rebellion of An Lu-Shan* (London: Oxford University Press, 1955) 7-10.

⁷ Pulleyblank 1; Josephine Chiu-Duke, *To Rebuild the Empire: Lu Chih's Confucian Pragmatist Approach to the Mid-T'ang Predicament* (Albany: SUNY Press, 2000) 1; Mark Elvin, *The Pattern of the Chinese Past* (Stanford: Stanford University Press, 1973) 65-7.

⁸ Chiu-Duke 13; Levy 17-20 provides interpretations by later Tang and Song historians.

⁹ Pulleyblank's account is especially interesting because it seeks to explain the origins and devastating consequences of An Lushan's rebellion in structural and contextual terms. He by no means assumes that the rebellion would have had the same effects under different circumstances.

¹⁰ G. R. Hawting, *The First Dynasty of Islam: The Umayyad Caliphate AD 661-750* (London: Croom Helm, 1986) 100-101.

from the succession to the Caliphate established by Mohammed. Its success has been attributed to many factors including political and religious dissent, conflict between Arabs and non-Arabs, and class conflict, all of which served to make the Umayyad state vulnerable.¹¹ Professor Ashtor suggests that the Umayyad collapse was due to “a long and intense propaganda campaign carried on by the emissaries of the Abbasids, a branch of Mohammed’s family, who claimed to be the champions of true Islam,”¹² and cultivated popular sentiment against the ruling clan.

Again, the factors which made possible the collapse of Umayyad power are clear, but they do not in and of themselves explain why the dynasty fell when it did. The Umayyads built an empire of unprecedented proportions, and had managed regularly to put down rebellions throughout their history.¹³ Why did it fail so suddenly in the mid-eighth century? Furthermore, why did the Tang Dynasty, after surviving a similar internal threat, go into decline while the new Arab dynasty managed to establish itself and flourish? Clearly, even a successful rebellion does not of any necessity entail the collapse of imperial power.

In *The Tibetan Empire in Central Asia*, Christopher Beckwith states that, although the emerging Tibetan kingdom enjoyed some influence in the cities of the Tarim Basin in the seventh century, it was kept in check by the Turks and the Tang. Tibet did not achieve supremacy in the region until the latter half of the eighth century.¹⁴ In the decades before 756 and the enthronement of Srong-lde-brtsan, who ruled the Tibetan Empire at the height of its power, Tibet suffered from political turmoil, conflict with the ascendant Tang and other neighboring powers, and several

1986) 104-118; Albert Hourani, *A History of the Arab Peoples* (New York: Warner Books, 1991) 26-33.

¹¹ E. Ashtor, *A Social and Economic History of the Near East in the Middle Ages* (New York: University of California Press, 1976) 26-35.

¹² Ashtor 71.

¹³ See, for example, Hawting’s account of the Umayyads’ second and third civil wars. Hawting 46-57, 90-103.

¹⁴ Christopher Beckwith, *The Tibetan Empire in Central Asia: a History of the Struggle for Great Power Among Tibetans, Turks, Arabs, and Chinese During the Early Middle Ages* (Princeton: Princeton University Press, 1987).

smallpox epidemics.¹⁵ By 783 however, Tibet had achieved a measure of dominance over the surrounding regions, and continued to grow in power into the next century. How are we to explain the meteoric rise of Tibet? In this case there is an obvious lack of discrete causes, and it would have been difficult to predict the success of the Himalayan empire given its internal conditions prior to the middle of the eighth century.

Beckwith proposes an interesting way of approaching the problem of the sudden shift in power in the mid-eighth century Eurasian world. He suggests that the “importance of international trade routes through Central Eurasia cannot be overemphasized,”¹⁶ implying that an understanding of the network of connections among the polities and populations of Eurasia is essential to understanding changes within any of those polities. Another way to put this is that, in a complex system characterized by a high degree of connectivity, small and common perturbations are able to cascade through the whole system, potentially affecting all participants. In the mid-eighth century, an accumulation of small changes eventually brought about a transformation of the whole system, a sudden *restructuration*, in which the various interconnected polities and economies changed in various and unpredictable ways.

The importance of the event of the mid-eighth century for the various states joined in this complex web of interactions is clear as the years between 742 and 756 CE witnessed dramatic changes in the fortunes of the various actors on the Eurasian stage. Chinese, Turks, Tibetans, and Arabs all emerged from the middle of the century in very different situations than had obtained previously, and many other states experienced similar changes in fortune at that time. It was not until the latter half of the century that the Byzantine Empire began to recover territories it had lost

¹⁵ Helmut Hoffman, “Early and Medieval Tibet,” *CHEIA* 380-2.

¹⁶ Beckwith 193.

more than a century earlier.¹⁷ In 751 Pippin the Short established the Carolingian dynasty, which would come to rule most of Europe in the following decades.¹⁸ In North India, the successful repulsion of Arab invaders by Dantidurga II (735 - 756) in 753 led to the establishment of the Rashtrakuta Dynasty (753-982), with its core in Karnataka in southwest India.¹⁹ The kingdom of Srivajaya on Sumatra emerged during the flourishing of the Indian Ocean – South China trade from the seventh century. Although Srivajaya suddenly and mysteriously curtailed its missions to China after 742, the Sumatran trading empire continued to exist into the late tenth century, adapting to changes in the nature, and agents, of maritime commerce.²⁰

Given these remarkable coincidences, it does not seem unreasonable to imagine that the fates of the various states of Eurasia were connected in some fashion. In the mid eighth century changes occurred that somehow affected all of the polities and economies of the Eurasian continent. Why was this? How were these diverse empires connected, and what was the nature of the network? What were its dynamics and how did the forces at play in this complex system bring about such widespread change? What was the significance of this restructuration event for the polities connected in this early medieval trade network? The goal of this paper is to offer an holistic approach to these questions by drawing analogies with the nonlinear behavior of other kinds of complex, dynamic, adaptive systems. First, we will seek to demonstrate the similarity of trans-Eurasian trade and cultural networks to other kinds of complex, dynamic, adaptive systems. Then, using an understanding of the dynamics of such systems, we will attempt to answer some of the

¹⁷ George Ostrogorsky, "The Byzantine Empire in the World of the Seventh Century" *The Dumbarton Oaks Research Library and Collection*, Dumbarton Oaks Papers: Number 13 (Washington, D.C.: Trustees for Harvard University, 1959) 7.

¹⁸ Richard Hodges & David Whitehouse, *Mohammed, Charlemagne & the Origins of Europe: Archaeology and the Pirenne Thesis* (Ithaca: Cornell University Press, 1983) 81.

¹⁹ Mainak Kumar Bose, *Late Classical India* (Calcutta: Mukherjee & Co., 1988) 35.

²⁰ O. W. Wolters, *Early Indonesian Commerce: A Study of the Origins of Srivajaya* (Ithaca: Cornell University Press, 1967) 229-251; B. R. Chatterji, *History of Indonesia, Early and Medieval* (Meerut: Meenakshi Prakashan, 1967) 6.

questions posed above in regard to the mid-eighth century restructuration.

The Theory:

In conceiving of medieval Eurasian trade networks as a complex, dynamic system, we must first change our linear, monocausal ways of thinking. In a nonlinear system, a discrete cause, isolated from its context only by the historian, does not produce an inevitable or determinate effect. Rather, it is the accumulation of many “causes” that brings about change in the whole system.

British philosopher Michael Oakeshott (1901-1990) put the problem this way:

...every historical event is necessary, and it is impossible to distinguish between the importance of necessities. No event is merely negative, none is non-contributory. To speak of a single, ill-distinguished event (for no historical event is securely distinguished from its environment) as determining, in the sense of causing and explaining, the whole subsequent course of events is...not bad or doubtful history, but not history at all...There is no more reason to attribute a whole course of events to one antecedent event rather than another...The strict conception of cause and effect appears...to be without relevance in historical explanation...²¹

Take as an example the Battle of Talas in 751. This battle has been taken by many as a “prime mover” in the history of Asia. In the battle, which involved Abbasid and Tang forces, but also Tibetans, Ferghanians, and nomads from the steppe, the Tang were defeated and forced to flee east after their Karluk allies changed sides on the battlefield.²² It would be easy to accept a linear relationship between cause (the battle of Talas) and effect (the loss of Tang hegemony in the western regions and the rise of Abbasid power there).²³

Peter B. Golden, however, proposes a somewhat more complex understanding of this event in *The Cambridge History of Early Inner Asia*. He recognizes that one must understand the context of an event in order to understand its consequences, suggesting that it was the collapse of

²¹ Quoted in Niall Ferguson, “Virtual History: Towards a ‘Chaotic’ Theory of the Past,” in Niall Ferguson, ed. *Virtual History* (London: Picador, 1997) 50.

²² Beckwith 138-140.

Turkish power, rather than victory in a single battle, that enabled the Arabs to dominate Eastern Turkestan in the late eighth century.²⁴ This is certainly an improvement over the mono-causal explanation which takes it for granted that the victory at Talas has a direct and linear relationship with the rise of Arab power in Central Asia. If we examine the fortunes of the Tang Dynasty, the ultimate effects of the defeat at Talas are similarly ambiguous. As William Samolin points out, “the empire had withstood greater military disasters.” He mentions that, two months prior to the battle at the Talas River, the Tang had suffered a major defeat in Nanchao. The Tang were later able to conquer the region, however, which is now China’s Yunnan Province.²⁵ Thus, in order to understand events in a complex system, one must take into account many factors that may not be connected in obvious ways, but nonetheless play a part in shaping the dynamics of the whole system.

The principles of nonlinear causality should be familiar to most historians. In complex systems, such as human polities, societies and economies, it is often difficult, even in retrospect, to point out any single “cause” as the event that drove the system down one historical path or another. Nonlinear dynamics allows seemingly insignificant factors, like the loss of a single horseshoe nail, the shape of Cleopatra’s nose, or a misplaced cigar, to have a disproportionate effect on later events.²⁶ However, because of the complexity and connectivity of the system, it is foolish to privilege one “horseshoe nail” as the key factor leading to large-scale change. It is, rather, the accumulation of many small, local events that drives the whole system toward one or another novel mode of behavior. In her book, *Before European Hegemony*, Janet Abu-Lughod presents a similar understanding of causality in a nonlinear system. She writes of an “accumulation of vectors,” many

²³ See, for example H.A.R. Gibb, *The Arab Conquests in Central Asia* (1923; New York, 1970) 97-8.

²⁴ Peter B. Golden, “The Karakhanids and Early Islam,” *CHEIA* 344.

²⁵ Samolin 66-7.

²⁶ Meteorologist Edward Lorenz described this nonlinearity as the “butterfly effect.” See James Gleick, *Chaos*,
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small, independent shifts throughout the system, combining to bring about system-wide restructuration, which then affects the fortunes of the various agents participating in the system.²⁷

If the various Eurasian peoples and polities of the seventh and eighth centuries comprised a nonlinear, complex, dynamic, adaptive system, then we cannot take any single factor, such as the Battle of Talas, as a determining cause with only one possible outcome. More importantly, given that it is the interconnectedness of the various regions that accounts for this nonlinearity, we should be wary of explanations of change within any of those regions that entirely ignore the rest of the system. How, then, are we to account for the coincident events of the mid-eighth century so readily apparent to Christopher Beckwith and others?

A brief discussion of complex, dynamic, adaptive systems will be useful in understanding the behavior of the Eurasian trade network in the mid-eighth century. New approaches in the sciences attempt to describe and comprehend the behavior of systems that are complex, nonlinear, unpredictable and subject to sudden restructuration and changes in the rules governing the system. Such systems are self-organizing, emergent properties of interactions among multiple agents. As such, they can only be understood holistically, rather than by isolating and analyzing the individual agents that comprise the system. They are not only irreducible, they are also dynamic. They change over time, evolve, learn and grow.²⁸ They can be said, then, to have a *history*. Their organizing principles record the accumulation of many past events, frozen accidents and systemic restructurations. The emergent structures are never perfectly stable, but are constantly becoming, never achieving equilibrium because there is no “optimal” state in a constantly changing system. Some examples of complex, dynamic, adaptive systems are economies, ecosystems, genomes,

the Making of a New Science (New York: Penguin Books, 1988) 20-3.

²⁷ Janet Abu-Lughod, *Before European Hegemony: The World System A.D. 1250-1350* (Oxford: Oxford University Press, 1989) 368-9.

²⁸ M. Mitchell Waldrop, *Complexity: The Emerging Science at the Edge of Order and Chaos* (New York:

civilizations and human minds.

Before we turn to the dynamics of change, however, let us first look at how complex systems organize themselves. Scientists speculate about a second-order law that would complement the second law of thermodynamics, the law of entropy, as a “second law of order.” Although the tendency toward entropy and dissipation is well understood, far less attention has been given to self-organizing systems – far-from-equilibrium states in open systems that allow, even “encourage” structures to emerge spontaneously from otherwise chaotic and uncoordinated behavior.²⁹ For example it is possible, according to Stuart Kauffman of the Santa Fe Institute, that life itself is an emergent property of autocatalytic reactions that could potentially organize themselves into increasingly complex molecules and groups of molecules, reorganizing simple parts into complex wholes.³⁰

Emergent structures are not created by an external, top-down, organizing agent. Instead, the structure emerges from the mutual interaction and connectivity of the various parts, often behaving according to very simple rules.³¹ Where emergent structures become most interesting is in self-organizing systems that maintain themselves and adapt or evolve to form new structures. These dynamic and evolving systems are made up of many independent agents interacting in diverse ways.³² In many cases, such as a human society, an ecosystem, or a network of production and exchange, the system is itself made up of smaller systems which themselves emerge from the interaction of even smaller systems. For example, our early medieval trade network is an emergent property of the interactions among the various polities and peoples of Eurasia. The empires in turn

Simon and Schuster, 1992) 30-33 (and most of the rest of the book).

²⁹ Some of the most eloquent expressions of this theory are those of Nobel laureate Ilya Prigogine (1917-2003). See Prigogine and Stengers, *Order Out of Chaos: Man's New Dialogue With Nature* (New York: Bantam Books, Inc., 1984).

³⁰ Waldrop 315-8. See also Stuart Kauffman, *The Origins of Order: Self-Organization and Selection in Evolution* (New York: Oxford University Press, 1993).

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are emergent properties of independent actors, individuals and groups of individuals, interacting in a complex network of relationships. On another level, each human brain can be seen as a dynamic system in its own right, an emergent property of the complex interaction of billions of neurons, thoughts, and memories.³³

The agents that form a complex system can exhibit tremendous diversity.³⁴ Just as thousands of species make up an ecosystem, so a variety of peoples and state systems participated in the trade networks of the early middle ages. Tang China was a highly centralized, bureaucratic, agricultural empire. The empire of the Turks was a confederation of nomadic tribes that relied upon trade and tribute.³⁵ The Arab empire had semi-nomadic origins, but incorporated settled peoples and the remnants of the earlier Sassanid Empire (224-651) under a universal religion, Islam.³⁶ The kingdoms of the Tarim Basin were city-states of diverse linguistic and cultural traditions.

The various agents participating in the early medieval world system also exhibited a variety of forms of economic organization. Although the political order in late classical India might be described as “feudal,” the economic system did not involve serfdom, and private traders played an important role in the economy.³⁷ In contrast, Tang China exhibited a large degree of state economic control, including imperial monopolies for certain key commodities. Trade in the various city-states at the oases of the Tarim Basin was only loosely controlled (when those states were themselves free of foreign domination). Private production, albeit supervised by the state, abounded in the Arab

³¹ Gleick 252.

³² Waldrop 145.

³³ For an excellent discussion of the brain as a complex network and consciousness as an emergent property of the brain, see William H. Calvin, *The River That Flows Uphill, A Journey From the Big Bang to the Big Brain* (San Francisco: Sierra Club Books, 1986).

³⁴ Roger Lewin, *Complexity, Life at the Edge of Chaos* (New York: Macmillan Publishing Company, 1992) 84-9.

³⁵ Nicolo Di Cosomo, “State Formation and Periodization in Inner Asian History,” *Journal of World History*, 10:1, pp. 30-32.

³⁶ Ashtor 21-2. This unity, an Arab “ecumene,” grew even stronger under the Abbasids who emphasized the universality of Islam.

world. Among the Turks, management of herds and flocks was left to individual pastoralists, but international trade was managed by non-Turkish agents of the *kaghan*.

Not only are the various participants in a complex system diverse in their forms, they also interact in a variety of ways. Darwin's exquisite understanding of the processes of natural selection and speciation has all too often been reduced to simple competition and "survival of the fittest" (a ridiculous notion in a dynamic system wherein what it takes to be "fit" is always changing). Competition for the same, limited resource is but one way in which organisms can interact. Other relationships, such as predation, cooperation, symbiosis, parasitism, and even distant, barely recognizable interactions, such as sharing the same air, soil or water are also possible.

In our network of production and exchange we can see a similar variety of relationships – war, trade, tribute, alliance, conquest and rulership, as well as more distant relations, like that of India and China, which exchanged cultural and material goods, but had almost no direct interaction. China and the Caliphs competed for control over the important trade nexus of East Turkestan. The Turkish Empire was similarly in competition in this region with both China and the Arabs, but at times made alliances with both states. The empire of the nomadic Khazars, which emerged on the steppes of what is now southern Russia following the decline of Turkish power there in the seventh century, enjoyed a relationship with Byzantium which was, in the main, mutually supportive, analogous to symbiosis.³⁸ The city-states around the Tarim Basin in Central Asia were often dominated or preyed upon by the four great empires surrounding them. But the peoples of that region, especially Sogdians, were indispensable agents in trade along the Silk Road. The relationship between China and the empires of the steppe, as described by Thomas Barfield, is rather parasitic, but might also be likened to symbiosis, as the Turks and Uighurs often supported

³⁷ Bose 1-6.

³⁸ Peter B. Golden, "The Peoples of the South Russian Steppes," *CHEIA* 265.

the Tang Dynasty in return for trading privileges.

In studying any complex, dynamic system, an understanding of the connections among agents is as important as the analysis and classification of individual agents. These relationships can be understood as feedback loops. A simple example of a feedback loop is a thermostat, which regulates central heating in a building. The thermostat, however, only requires information about one variable, heat. An agent interacting with other agents in a complex dynamic system, which is in turn created by their mutual interactions as well as many factors beyond their control, must absorb much more complex information, which the agent then uses to build an appropriately heuristic model of its environment. In a dynamic system, such as an economy or an ecosystem, feedback loops both allow and force agents to modify their internal structures and behaviors and to adapt to the changing dynamics of other agents and of the whole system.³⁹

Mutual interaction and constant adjustment on the part of each agent drives a process of co-evolution. Individual agents do not move toward a teleological optimal state in isolation. What is “optimal” at any given time depends on the wider environment, which is frequently in flux. Agents in an economic network, like species in an ecosystem, evolve together in a complex web of competitive and cooperative relationships, never settling into a permanently stable equilibrium.⁴⁰ In an ecosystem, as in an economy, equilibrium means death. Systems in balance are not complex, nor are they particularly interesting. They do not exhibit the dynamism, change and upheaval characteristic of complex, dynamic, adaptive systems, and they cannot be said to have a history.⁴¹

The nonlinearity of complex networks of feedback loops allows small changes and perturbations to be transmitted throughout the system, forcing the participants to make constant adjustments. As individual agents adapt to the actions of their neighbors, small changes accumulate,

³⁹ Waldrop 145-7.

⁴⁰ Waldrop 307-8.

eventually producing a restructuration event in which the whole system reorganizes itself. Physicist Per Bak (1948-2002) described this characteristic of complex systems as “self-organized criticality.” The example he most commonly used was a pile of sand with a trickle of grains falling onto it. As grains of sand fall onto the sand pile, each grain in the pile must adjust, establishing a temporary, local equilibrium. Eventually, these constant adjustments will produce an avalanche in which the whole pile of sand collapses, settling into a new temporarily stable state.⁴²

Once again, we can see the significance of complexity and connectivity for the nonlinear dynamics of the sand pile. It is impossible to predict in advance precisely what effect a given grain of sand will have on the whole system when it is dropped. The effect depends on the state of the system at that moment, the state of interactions among all of the grains of sand in the pile, and not on the qualities of the individual grain of sand itself. Thus, a understanding of nonlinear dynamics does not allow us to predict the outcome of events. Nor does it allow us to discover discrete causes in retrospect – every grain of sand is implicated in every restructuration event. It is possible, however, to study the *history* of a complex system holistically. That is, one can examine the pattern of change over time to illuminate the underlying dynamics of the system.

Take earthquakes, another example of nonlinear change in a complex system characterized by self-organized criticality. Earthquakes are notoriously difficult to predict, and there is no observable cycle in seismic activity that could aid in long-term prediction. However, earthquakes do exhibit a certain statistical regularity. The relationship between earthquake magnitude and frequency is governed by a power law. That is, earthquake magnitude is inversely proportional to some power of earthquake frequency. Small earthquakes are common and large ones are rare. This

⁴¹ Per Bak, *How Nature Works: the Science of Self-Organized Criticality* (New York: Copernicus, 1996) 28-9.

⁴² Bak 31-2. Of course, the sand pile is not as interesting as a genuine complex, dynamic, adaptive system composed of multiple independent agents, because it does not evolve new forms of organization and interaction. That is to say, the rules of the sand pile never change, whereas in life, politics, economics and

is, of course, intuitively obvious. What is interesting, however, is the implication of this discovery. The fact that the relationship between magnitude and frequency is constant regardless of magnitude (which can be demonstrated by the fact that the graph of the logs of each value is a straight line) implies that large and small earthquakes are produced by the same dynamics. That is to say that, large restructuration events are caused by the same dynamics as small changes, and it is difficult to differentiate the scale of change.

A great variety of dynamic systems that do not exhibit predictable, cyclical behavior, nonetheless exhibit the power law pattern typical of systems characterized by self-organized criticality. The energy emitted by quasars varies in the same unpredictable, but statistically comprehensible manner. Temperature variations, market prices, populations of organisms, the size and distribution of cities, the frequency of words used in a language all exhibit the same pattern, sometimes described as “one-over-f noise” or “Zipf’s Law.”⁴³ The seemingly chaotic pattern is recognizable to anyone who has looked at a long-term graph of stock market price fluctuations or changes in the population of gypsy moths. Just as complex systems reveal fractal characteristics across *space*, so the pattern of change over *time* is similarly fractal, with large and small peaks and troughs, self-similar at many levels regardless of scale.

Similarly, some evolutionary biologists have recognized a pattern of “punctuated equilibrium” in the fossil record. Long periods of relative stability, with speciation and extinction occurring on a local level, are punctuated by less frequent, but statistically regular mass extinctions in which whole ecosystems are radically altered.⁴⁴ The most recent such mass extinction occurred

history, the structure of the system and the rules of interaction change over time.

⁴³ Bak 12-27.

⁴⁴ For an excellent discussion of the Pre-Cambrian mass extinction and the significance of contingency and nonlinear causality in biological history, see Stephen J. Gould, *Wonderful Life: The Burgess Shale and the Nature of History* (New York: W. W. Norton, 1989).

at the end of the Cretaceous period, about 65 million years ago.⁴⁵ It is worth emphasizing here, however (and we will return to this issue later) that this kind of upheaval or catastrophe does not necessarily mean systemic collapse, but rather structural change on a system-wide scale (which will almost certainly mean collapse for somebody!) The Earth's ecosystem perseveres today, despite the massive extinction of some 75% of the life-forms which existed here 65 million years ago. It is the same system, radically changed and evolved, but still recognizable in its dynamics. It is important to recognize that complex, dynamic, adaptive systems preserve their history to some degree. "Progress" is simply the accumulation of change over time, rather than the constant improvement of the *status quo*.

The argument of this paper is that the mid-eighth century restructuration was the result of just this kind of complex, nonlinear dynamics and the accumulation and propagation of many small changes throughout the network of connections uniting early medieval Eurasia. It was a "punctuation" in the punctuated equilibrium of human history, a sudden transformation brought about by the everyday, piecemeal changes produced by millions of human beings, great and small, in their efforts to survive, adapt and prosper. The immediate causes of this restructuration (the discrete grains of sand that brought about the avalanche) were inscrutable for contemporary participants and remain so for modern-day historians. The events, however, are potentially comprehensible in terms of the global dynamics of complex, dynamic, adaptive systems.

The System: Structural Change in the Early Medieval World System

Armed now with the dynamic models of nonlinear causality, complex dynamic systems, and self-organized criticality, let us look more closely at the web of production and exchange that

⁴⁵ It is still unclear whether the extinction of the dinosaurs was the result of internal dynamics or a catastrophic event such as a massive object striking the Earth. However, as mass extinctions and meteors both exhibit the

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bound Eurasia together in the seventh and eighth centuries. First, it is necessary to demonstrate that an interconnected trade network existed in the early middle ages. Sir Richard W. Southern has described the period from the seventh to the twelfth centuries as an “Age of Ignorance.”⁴⁶ This implies that there was little contact among early medieval peoples, making a trade network such as the one we describe here impossible. Eileen Power, writing about the reopening of the trans-Eurasian trade routes in the thirteenth century, speaks of the earlier Turkish Empire as “blocking” the land routes to the East. She also writes of a “wall of Islam,” which cut off the Byzantine Empire from the rest of Eurasia.⁴⁷ Although there are important differences between the early medieval trade network and that which emerged after the Mongol conquest, the use of terms such as “dormant,” “blocked,” and impenetrable “wall” are inaccurate.⁴⁸

The land and sea trade routes connecting east and west were by no means dormant in the ancient world. Although there was little direct contact between the Roman Empire and Han China,⁴⁹ trade goods, ideas, technologies, and information nonetheless managed to travel through various intermediaries from one end of the Eurasian continent to the other. In his ambitious and ground-breaking work, *Rome and China*, Frederick J. Teggart suggests that there was significant contact and influence between east and west as early as the first century BCE. He proposes a correlation of wars in Eastern Turkestan between the Han Chinese and the nomadic Xiong-nu, as

same relationship between magnitude and frequency it is difficult to tell one from the other statistically.

⁴⁶ Abu-Lughod 21.

⁴⁷ Eileen Power, “The Opening of the Land Routes to Cathay,” *Travel and Travellers of the Middle Ages*, ed. Arthur Percival Newton (New York: Barnes & Noble, Inc., 1968) 125.

⁴⁸ For some of the latest discoveries concerning trade between Christian Europe and the Muslim world in this period, see Michael McCormick, *Origins of the European Economy: Communication and Commerce A.D. 300-900* (New York: Cambridge University Press, 2001).

⁴⁹ Ying-shih Yu notes that, although the Han Dynasty (202 BCE-220 CE) was little concerned with establishing direct trade ties with Rome, Roman merchants “did show considerable enthusiasm in the establishment of direct commercial intercourse with Han China.” The *Hou Han Shu* records that, in 166 CE, self-proclaimed emissaries of Marcus Aurelius Antoninus appeared in Canton. This was most likely not an official mission, however, but private merchants presenting themselves as ambassadors in order to gain trading privileges. Another Roman merchant is recorded arriving in South China in 226 CE. Ying-shih Yu, *Trade and*

well as wars in the Near East between the Romans and the Parthian Empire of Persia (247 BCE – 224 CE), with the outbreak of rebellions on the Roman frontier along the Danube and Rhine.

Teggart suggests that the connection between events east and west of the Transoxus region, which reveals striking regularity and duration, was due to the interruption of the flow of trade goods.⁵⁰

Even if Teggart's explanation of rebellions on the Roman frontier fails to satisfy many classicists, the importance of land and sea trade in the ancient world is undeniable.⁵¹ Although trade periodically dropped off as travel along these routes became dangerous, or production and consumption in various regions declined, this was not the case from the sixth to eighth centuries.

Whereas Power holds that the Turkish Empire "blocked" the routes through Central Asia, other scholars argue that the Ashina Clan's unification of the Turkish peoples of the steppes under the Turkish *kaghanate* in 552 CE facilitated the opening of the caravan routes, and that access to trade in turn reinforced state formation on the steppe.⁵² Denis Sinor's description of the Turkish unification deserves to be quoted here at length. "The Turk Empire linked four civilizations: Byzantium, Iran, India and China. It is fascinating to think that a Turk envoy who had spent several years in Constantinople might have been sent to China on his next mission, and that Buddhist monks from India or from China might have discussed religion with Greek Christians or Persian disciples of Zoroaster at the court of the Turk ruler."⁵³

Although the Sassanid Persians had long maintained trade with the Turkic-Iranian Hephthalite Empire (420-567) in Central Asia, as well as other polities in Asia, Africa and Europe, the rise of Islam in the seventh century "linked together two great sea basins of the civilized world,

Expansion in Han China (Berkeley: University of California Press, 1967) 159-60.

⁵⁰ Frederick J. Teggart, *Rome and China: A Study of Correlations in Historical Events* (Berkeley: University of California Press, 1969).

⁵¹ See also Samolin 35; Gauranganath Banerjee, *India as Known to the Ancient World* (New Delhi: Asian Educational Services, 1990); and A.K. Narain, "Indo-Europeans in Inner Asia," *CHEIA* 158-167.

⁵² Di Cosmo 24-5, 30-2; Beckwith 10.

those of the Mediterranean and the Indian Ocean.”⁵⁴ As early as the period of Sassanid rule in Arabia, the Byzantine emperor, Justin II attempted to contact Arab sailors in order to gain easier access to eastern silk.⁵⁵ Even after the Arabs had destroyed Sassanid power and remained hostile to Byzantium, there was trade between Constantinople and the Near East. A treaty signed by Byzantines and Arabs in 688 included conditions regarding trade and the collection of taxes from Cyprus that were to be shared by the two powers.⁵⁶ While often violent and hostile, the relationship between Christian Constantinople and the Umayyad Caliphate did not entirely preclude the flow of trade goods.

The rise of the Turkish Empire on the steppes of Asia in the sixth century facilitated trade between east and west, increasing the connectivity of the whole system and developing the routes by which goods, people, and information could pass.⁵⁷ Similarly, the expansion of the Arab Empire increased the flow of trade goods in the Indian Ocean basin. International trade was made possible by surplus production, and the increase in trade “fed back” into various regions, promoting further increases in production, trade, and consumption. Long-distance trade, however, almost exclusively involved luxury goods and specialized products that could only be obtained from other regions. Only luxury items and rarities were still marketable after passing through the chain of intermediaries along the medieval Silk Road.⁵⁸

At this time Western Europe lacked transportation infrastructure, and there was little

⁵³ Denis Sinor, “The Historical Role of the Turk Empire,” *Journal of World History*, I,2 (1953): reprinted in *Inner Asia and Its Contacts With Medieval Europe* (London: Variorum Reprints, 1977) 433.

⁵⁴ A. Hourani 43.

⁵⁵ Sinor, “The Historical Role” 430.

⁵⁶ Robert S. Lopez, “The Role of Trade in the Economic Readjustment of Byzantium in the Seventh Century,” *Dumbarton Oaks Research Library* 74.

⁵⁷ It is also interesting to note that Tibet, Byzantium, and the Near East all seem to have suffered from disease in the seventh and eighth centuries. This is possibly due to increased communication and travel, which facilitated the spread of disease.

⁵⁸ Sinor, “The Historical Role” 430. See also Philip D. Curtin, *Cross-Cultural Trade in World History* (Cambridge: Cambridge University Press, 1984).

surplus production or consumer demand. Even as early as the sixth century, however, there was limited inter-regional trade in Europe, managed by Frisians with their base at Dorestad on the Rhine. It does not seem that their trade network was closely connected with others emerging in Russia and the Near East. Nonetheless, Allen Mawer writes that the Frisians carried out trade from England to the Baltic from the sixth to the eighth century. Interestingly, they lost their trade empire entirely after the mid eighth century. The coevolving empires of the Franks and the Scandinavian Varangians finally eliminated Frisian dominance of European trade in the eighth century.⁵⁹

The Byzantine-Sassanid wars of 540-629 made trade in the Eastern Mediterranean very difficult.⁶⁰ In 629, the Persians took Egypt, a source of Byzantine grain since the fourth century.⁶¹ Constantinople's access to markets and trade routes was severely limited with the rise of Islam in the seventh and eighth centuries, but it was by no means entirely isolated. Byzantium was able to adapt and seek alternate sources of trade goods and grain. Robert S. Lopez speculates that the loss of Egyptian and African grain led to an increase in Thracian and Anatolian grain production. Furthermore, the redirection of Syrian textile production promoted the growth of the local silk industry in Constantinople, though production was insufficient to meet domestic consumption needs.⁶²

The international trade in silk and other luxury goods was of vital importance to Byzantium, and the constant shifts in trading partners and routes of access reveal the complexity and adaptability of the trade network. In 716 Constantinople signed a treaty with the Bulgars,⁶³ a semi-nomadic people who, by the late seventh century had settled in lands on the Danube

⁵⁹ Allen Mawer, "The Viking Age," *Travel and Travellers of the Middle Ages* 72-4.

⁶⁰ A. Hourani 11.

⁶¹ John L. Teall, "The Grain Supply of the Byzantine Empire," *Dumbarton Oaks Papers* 100.

⁶² Lopez 71-2.

⁶³ Lopez 77.

previously controlled by the Avars.⁶⁴ The Bulgars, and their contemporaries the Khazars, were of great importance to the Byzantine Empire, both as partners in the silk trade and as allies against the Arabs to the south.⁶⁵

In the period of Arab conflict in the Mediterranean, Byzantine trade became less tightly controlled, with an increase in private trade, and the creation of “contract pool capitals.”⁶⁶ Even as early as the seventh century, when Constantinople’s power was still greatly reduced, Jewish merchants and entrepreneurs played an important role in both Mediterranean trade and the trade with the Bulgars and Khazars.⁶⁷ The importance of Jewish traders in Byzantine relations with the Khazars is evidenced by the conversion of many Khazars to Judaism in the eighth century.⁶⁸ There is also evidence (for example, gifts of silk to churches in Belgium) that Byzantium maintained limited trade with Northern Europe. Byzantine gold besants from the seventh century have been found as far away as Britain, Scandinavia, and even Siberia.⁶⁹

One of Constantinople’s most important allies and trading partners in the early seventh century was the Turkish *kaghanate*. The Turks, originally miners and blacksmiths living in the Altai region of Central Asia, had been subjects of a nomadic confederacy led by a people called the Rou-ran in Chinese. In 546 they fought off an enemy attack on the territory of their overlords, and the chief of the Ashina Clan of the Turks, Bumin, then asked for the hand of the *kaghan*’s daughter in marriage. The lowly ironworkers were rebuked for their impudence. Slighted, Bumin then led his people to overthrow the Rou-ran *kaghanate*, eventually establishing an empire dominated by Turks, whose territory stretched from Manchuria in the east to the Caspian Sea in the west, and

⁶⁴ Samuel Szadeczky-Kardoss, “The Avars,” *CHEIA* 214.

⁶⁵ Golden, “South Russian Steppes,” *CHEIA* 265.

⁶⁶ Lopez 77-80. Lopez attributes this liberalization in part to the influence of the Arabs who held honest and prosperous merchants in high esteem.

⁶⁷ Lopez 82-3.

⁶⁸ Golden, “South Russian Steppes” 266.

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included lands in the Pamirs and Transoxania that had previously been controlled by the Hephthalites.⁷⁰

During the peak of Turkish dominance in the seventh century, control of the silk trade between Tang China and points west was very profitable. Within the Turkish sphere, this trade was managed by Sogdian merchants, Indo-Iranian people from the oasis states of the Tarim Basin, who had previously performed a similar function for the Hephthalites. In 568, the Turks sent a trade mission to the Sassanid Empire in Persia. The merchants were Sogdian and were led by one of their own, a man named Maniakh. They brought silk from the East and asked permission to trade in Persia. The Sassanids purchased the silk that Maniakh had brought and then burned it publicly. This was to signify that the Sassanid Empire wished to maintain its own monopoly on the silk trade in Persia. The Turks and Sogdians sought to sell their silk products directly to Persian and foreign consumers in order to increase their profit margin.⁷¹ A second mission composed of Turks was sent that same year. They died in Persian territory, however, and the *kaghan* suspected foul play. Maniakh was a man of great determination, however. Furthermore, the Turks were to a large degree dependent on the trade in Chinese silk, and had no choice but to seek alternative markets. Late in 568, Maniakh was dispatched with a third Turkish-Sogdian trade mission, this time bound for Constantinople.

This is yet another example of the flexibility of relationships in complex, dynamic systems. When the steppe was united and relatively safe, there were two possible routes from Central Asia to the west, splitting off at Samarkand. One led south into Persia and on to the sea ports on the Persian Gulf and Mediterranean. The other bypassed Persian territory, leading north of the Aral and

⁶⁹ Lopez 75, 77.

⁷⁰ Sinor, "The Establishment" 295-8.

⁷¹ Sinor, "The Establishment" 301-2.

Caspian Seas to Byzantine ports on the shores of the Black Sea.⁷² A common desire for trade, and animosity toward the Sassanid Persians and Avars, led to cooperation between the Turkish and Byzantine Empires in the sixth and seventh centuries. Although a large-scale joint campaign against Persia never materialized, and Constantinople's complicated relationship with the Avars on the Danube often caused diplomatic problems between the two empires,⁷³ the trade in silk continued to be profitable to both powers into the eighth century.

In the Far East, the Turks obtained silk and other goods from the Chinese by various means, both before and after the Sui reunification (581-617 CE). Thomas J. Barfield notes that the "silk trade was a major agent binding the Turkish Empire together."⁷⁴ In a complex and often confrontational system of tribute and warfare, coupled with officially managed border markets, the Turks exchanged horses and furs for silk and other manufactured goods in China.⁷⁵ The Turks then traded silk and other products in markets in the west, especially with their Byzantine allies.

China's international trade in the Tang period was more heavily controlled by the state than was trade in contemporary Arabia and Byzantium. Although non-tribute exchange between China and the steppe was normally carried out at official border markets, these institutions were often poorly managed, vulnerable to corruption (especially after 756) and regularly broke down, prompting attacks from the steppe. There must also have been a considerable amount of illicit trade and smuggling across this border, although the Chinese sources are prudently silent on this issue. The border region was heavily influenced by Turkish customs, and that it was often difficult for the Tang to control the activities of their own subjects along the frontier, as evidenced by the rebellion

⁷² Power 134-5.

⁷³ The Turks saw the Avars as subjects who had fled their rightful masters and resented any friendly relations between Avars and Byzantium. Szadeczky-Kardoss 213.

⁷⁴ Thomas J. Barfield, *The Perilous Frontier: Nomadic Empires and China, 221 BC to AD 1757* (Cambridge: Blackwell, 1989) 133; also Di Cosmo.

⁷⁵ Sechin Jagchid and Van Jay Symons, *Peace, War, and Trade along the Great Wall* (Bloomington: Indiana University Press, 1989) 133.

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of General An Lushan.⁷⁶

The appeal of foreign fashions in Tang China is well known. In Chang'an, the cosmopolitan capital of the Tang, one might see Chinese women riding horses and wearing Persian or Turkish dress. Tang art depicted distant and exotic lands; India, Khotan, Persia, even distant "Hrom" (Rome) of the exotic Far West. The son of the Taizong Emperor (599-649), Li Chengqian, enjoyed Turkish customs, dressing, dining, and living in a Turkish manner. He even preferred to speak Turkish rather than Chinese.⁷⁷ Several cities in China hosted foreign communities; Turks, Uighurs, Sogdians, and others could be found in the capitals of Chang'an and Luoyang. There were large Arab and Persian communities in Kaifeng, Suiyang and Chenliu.⁷⁸ Foreigners were restricted to dwelling in segregated ghettos, and if they married Chinese women, they were required to remain in China.⁷⁹ Before the seventh century, foreign traders in Constantinople also lived in segregated communities.⁸⁰ Similarly, the Khazar capital, Atil was a kind of dual city, with Khazars living in one part and foreigners in another.⁸¹

In the seventh and eighth centuries, Canton (Guangzhou) on China's south coast, was a bustling port city with a large community of Persians and Arabs. Persian ships, bringing goods from the Near East and India, visited Canton as early as 671 CE. In the early eighth century, the Tang established a "Commissioner for Commercial Argossies," a kind of customs official to regulate international trade at Canton.⁸² By 748 Arabs and Persians had established a permanent base on

University Press, 1989) 70-114.

⁷⁶ Jagchid and Symons 177-183.

⁷⁷ Edward H. Schafer, *The Golden Peaches of Samarkand* (Berkeley: University of California Press, 1963) 28-31.

⁷⁸ Schafer 18-20.

⁷⁹ Schafer 25.

⁸⁰ Lopez 73.

⁸¹ Golden, "The South Russian Steppes" 260. See also Curtin, op. cit. on merchant diaspora communities.

⁸² Schafer 15-6.

Hainan Island.⁸³ In 758, during An Lushan's rebellion, Arab traders participated in a conflict in Canton that destroyed the city, shifting maritime trade in the region to Hanoi for the next half century.⁸⁴

Although few Chinese traveled the land and sea trade routes (mainly Buddhist pilgrims, though there were some Chinese merchants, especially in the Canton-India and Canton-Korea sea trade) it is obvious that in the seventh and eighth centuries, China drew merchants, theologians, warriors, artists, and travelers from all over the world. For the Chinese, the early medieval period was a cosmopolitan age of discovery and intercourse between great civilizations rather than an "Age of Ignorance".

Although the Arab Empire did not emerge until the latter half of the seventh century, spreading out along the early medieval trade network, Albert Hourani traces the rise of Islam and Arab power to the process of co-evolution and increasing connectivity that began in the sixth century.⁸⁵ Under the Umayyad Caliphate, the Arabs expanded into Inner Asia in an attempt to control trans-Eurasian trade and bring it south into their Persian domains. By 683 their armies had swept to the banks of the Oxus River, seizing Bukhara, a key city on the land route from China.⁸⁶ Following a period of civil war (which, it should be noted, did not cause the collapse of Umayyad power), the Umayyads expanded further, taking most of North Africa and Spain, and establishing a fort on the northern reaches of the Indus River in order to control the land route through the Khyber Pass. The legendary Umayyad general, Qutayba b Muslim carried out campaigns in

⁸³ Ashtor 107-8, George Hourani, *Arab Seafaring in the Indian Ocean in Ancient and Early Medieval Times* (Princeton: Princeton University Press, 1995) 62.

⁸⁴ Ashtor 108; G. Hourani 63; Schafer describes this same incident as a raid by "a horde of Arabs and Persians, who expelled the governor, looted the warehouses, burned dwellings, and departed by sea, perhaps to a pirate haven on the island of Hainan." Schafer 16.

⁸⁵ A. Hourani 11; Similarly, G. Hourani notes "The occurrence of sea trade between the Persian Gulf and China at this period of history was made possible by the simultaneous existence of large empires at both ends of the route." G. Hourani 61.

⁸⁶ Samolin 64.

Khurasan and Eastern Turkestan, conquering Ferghana and Samarkand, and even laying siege to Kashgar, a city at the gateway to China, before his execution in 715.⁸⁷

Access to the land routes through Central Asia was of obvious importance to the Arabs, and they expended considerable effort in that region. Seafaring in the Indian Ocean also had a long history, however, and access to sea routes provided flexibility and alternative sources of trade goods. Although the sea trade between India and China, passing through the Straits of Malacca, was less important in this period than it would become in the ninth century,⁸⁸ the presence of Arabs and Persians in Chinese and Sumatran port cities attests to the volume of trade even in earlier centuries. On the other hand, the sea routes connecting the Red Sea and Persian Gulf with India were already familiar to Persians, Yemenis, Copts and Arabs, who had sailed those waters since Roman times if not earlier.⁸⁹

In pre-Islamic times there was frequent trade throughout the Red Sea, and the peoples of what are now Yemen and Ethiopia were active in the Indian Ocean trade.⁹⁰ In Umayyad, and increasingly in Abbasid times, Persian, Jewish and Arab merchants sailed from the Persian Gulf to India, Ceylon, Sumatra and eventually to China.⁹¹ A round trip from Persia to China in those days took a year and a half, riding the monsoon winds. From Siraf, Sohar, or Basra on the Persian Gulf, ships would sail along the Persian coast to Northwest India or across the ocean to Malabar. In the eighth century many would continue on to Kalah, in Malaysia, Srivajaya on Sumatra, and eventually Canton.⁹²

In contrast with the Chinese and Byzantine attitudes toward trade, Arab culture respected

⁸⁷ Ashtor 27-8.

⁸⁸ Wolters 214.

⁸⁹ G. Hourani 17-36, 46-50.

⁹⁰ Nayef Abdullah Shamrookh, "The Commerce and Trade of the Rasulids in the Yemen, 630-858/1231-1454" (Ph.D. Thesis, University of Manchester, 1993); Hable Selassie Sergew, *Ancient and Medieval Ethiopian History to 1270* (Addis Ababa: United Printers, 1972).

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and honored merchants. Mohammed himself came from a merchant family, as did the Umayyad Caliphs. E. Ashtor compares the status of honest and pious Muslim merchants to that of English Puritans who could “demonstrate their religious merit by their economic activities.” The Ibbadiyya, a branch of the Khawaridj, are an excellent example of this. Devout Muslims, they were noted for their faith and honest business practices. Based in Basra, they mainly traded in Oman, East Africa and the Maghrib (North Africa).⁹³

Another merchant group that deserves mention here is the Radhanites, Jewish traders who could be found plying goods from all over the world in cities from Europe to China. Some sailed on Persian ships in the Mediterranean, Persian Gulf and Indian Ocean, at times continuing from India overland into Tibet and China. Radhanites also traveled the land routes from Central Europe, through Khazar lands in Russia, to join the Silk Road from Samarkand, through Kashgar and Turfan to the Tang capital of Chang'an.⁹⁴

The Radhanites remind us that, even when trade was sponsored or controlled by states and rulers, specialized groups conducted the trade itself, travelling the network and transmitting goods and ideas. Sogdians ran the Turkish silk trade. Sogdian merchants also worked the Khurasan region and Oasis States, and could be found throughout Chinese domains. Jewish traders acted as go-betweens in the Near East and Byzantium. The Frisians connected Northern Europe. Persians, Armenians, Arabs, and Coptic Christians traveled throughout the Muslim world, visiting diaspora communities in trading cities from Africa to Asia.

The trade network described above emerged from the complex interactions of the various peoples of Eurasia. It is an excellent example of co-evolution in a complex, dynamic system. What

⁹¹ G Hourani 64; A. Hourani 10, 44.

⁹² G Hourani 74-6; Ashtor 108-9.

⁹³ Ashtor 26, 32-3.

⁹⁴ Ashtor 105-6.

we see in the sixth and seventh centuries is a reaching out by all of these states, striving to connect and maintain flexible and adaptable relationships with other agents in the system. Nicolo Di Cosmo emphasizes the importance of international trade for the emergence and survival of the Turkish Empire.⁹⁵ Similarly, it was only when Tibet became integrated into the early medieval trade network that it was able to rise to a position of power.⁹⁶ Arab, Frankish and Tang expansion can all be seen as efforts to integrate these empires into an emerging trans-Eurasian network.

As the connectivity of the network increased, each participant was forced to adjust internally to adapt to changes in the rest of the network. The rulers of Sui and Tang China carried out massive public works, and expended great effort building up a highly trained army of conquest in order to take control of the Oasis States along the Silk Road.⁹⁷ The Byzantine Empire, having lost its Egyptian grain to the Sassanid Persians, was forced to adapt, developing agriculture in Thrace and Anatolia, and restructuring its army in a similar fashion to the Tang.⁹⁸ Likewise, the Byzantines and Khazars evolved together, adapting to one another's situation in the seventh and eighth centuries. The "Persianization" of the Abbasid dynasty in the late eighth century can similarly be attributed both to increased integration and internal restructuring similar to China and Byzantium.

The connectivity and flexibility of the Eurasian trade network is also evident in the inter-imperial conflicts of the seventh and eighth centuries. The struggle among Arabs, Chinese, Turks, and Tibetans for control of the trade routes around the Taklamakan Desert reveals the great importance of that major nexus of trade and travel for all four states. In the early eighth century, Arabs under Qutayba b Muslim pushed deep into lands that had been dominated by Turks a century

⁹⁵ Di Cosmo 24-5.

⁹⁶ Beckwith 9-10.

⁹⁷ Elvin 54-57.

⁹⁸ Lopez 80. Mark Elvin also makes this comparison.

before. Around the turn of the century, the Tibetans, also harboring ambitions in the Oasis States, allied with the Western Turks to attack Tang-dominated cities in Eastern Turkestan.⁹⁹ In 715 the Tibetans allied with Qutayba b Muslim in his conquest of Ferghana, which was allied with the Tang. The Tibetans continued to find common cause with the Umayyad Arabs for more than a decade, allying with them or with the peoples of the oases against the Chinese or Turks. In 729, however, a Tibetan army fought alongside Turks, Khurasanians, and Sogdians against Asras al-Sulami, the Umayyad governor of Transoxania. The year 730 saw the negotiation of an alliance between the Tang, Turks, and Tibetans against the Arabs. Just five years later, however, we see an informal battlefield alliance between the Tang general Wang Husi and the Umayyad Emir of Khurasan against the Turks who had been raiding Kashgar and Kucha.¹⁰⁰

This kaleidoscope of alliance and conflict in Central Asia reveals three things – the importance of the Tarim Basin to the four great powers in the region, the connection between such distant realms as Arabia and China or Tibet and the Asian steppe, and the flexibility of the connections that bound these peoples' fortunes together in a complex, dynamic, adaptive system. One year, the Chinese and Turks might be allies, as when in 727 the Turks informed the Tang Dynasty of Tibetan overtures to them to join in a raid on Tang territory.¹⁰¹ The next year, the Turks might be raiding Tang garrisons in the “Pacified West” (Eastern Turkestan). The Tibetans and Chinese were perennial enemies, but even they might combine against the Arabs, who were more often allies of the Tibetan Empire.

Despite its great importance as a major nexus of trade routes, however, Eastern Turkestan and the battles waged there should not be seen as a determining factor in the emergent system of the seventh and eighth centuries. The oasis states were important because of their position in the

⁹⁹ Beckwith 65.

¹⁰⁰ Beckwith 107-8, 112.

geography of the early medieval trade network, but the network also included India, peninsular and insular Southeast Asia, Africa, and Europe. In a nonlinear system, change does not come from a single, fixed source. Rather, it is built into the system in the form of self-organized criticality. It is this adaptability and capacity for systemic change that allows ecologies to evolve, technologies to develop, minds to learn, and life to survive.

We now know something of the agents participating in this system, the routes which connected them and the various ways in which they organized themselves, interacted, and conducted trade and war. We also know something of the people who traveled these networks and what conditions they found away from home. What, then were they trading? What goods were carried on the ships, wagons, and camel caravans circulating traveling this network of production and exchange?

Despite Europe's relative poverty in the early medieval period, we nonetheless find some European goods transported east to lands unheard of by Europeans of that day. The Radhanites carried Frankish swords, Greek brocades, and furs from Europe and Russia, as well as slaves and eunuchs from Spain and Slavic lands.¹⁰² The Byzantines purchased Chinese silk from Sogdian agents of the Turks. Some of this silk was re-exported to the rest of Europe. Constantinople also traded with the Khazars, but the only product the Khazars exported themselves was isinglass or mica.¹⁰³ The Byzantines also received swords, furs, and slaves from their Bulgar neighbors and traded silk with them in exchange.¹⁰⁴

Controlling both the sea route to India and the southern land route to Central Asia, the Arabs were more prominent than Europeans in Eurasian trade. Egyptian, Persian and Syrian

¹⁰¹ Beckwith 102-3.

¹⁰² Ashtor 106.

¹⁰³ Teall 118.

¹⁰⁴ Lopez 77.

glassware, renowned for its beauty and craftsmanship, was traded in Africa and India.¹⁰⁵ The Arab salt trade in Africa began during the Umayyad Dynasty, but was initially rather limited. The Arabs traded salt for gold in the Western Sudan at a very high profit.¹⁰⁶ Arabs imported indigo from the Maghrib for Syrian textile production. Dates from Iraq, sugar from Yemen, alum from Egypt, and carpets from Armenia were traded throughout the Muslim world and beyond.¹⁰⁷ The Umayyads controlled the high quality textile production of Transoxania, and mined silver there and in territories they controlled in what is now Afghanistan.¹⁰⁸

Persia was a huge market for products from all over Eurasia. Arab and Persian ships brought brazil-wood, teak, arms and finely-wrought mail from India, as well as precious jewels from Ceylon. From India and Sumatra came cinnamon, cloves, camphor, musk, cardamom, sandalwood, and other spices, dyes and perfumes.¹⁰⁹ Although most of these long-distance trade goods were expensive luxury items, the one exception was probably timber, which was badly needed in Arabia. There is evidence that the Middle East imported timber from India, as abundant European timber was more difficult to access.¹¹⁰ Arab and Ethiopian ships brought Arab goods, as well as ambergris (whale vomit) and ivory from East Africa, to Indian and Chinese waters, and returned with silk and porcelain from China.¹¹¹

China was, of course, another giant market that attracted trade goods of all sorts: amber and glass from Arabia; pepper and other spices, aloe, camphor, ebony, and fragrant sandalwood from Southeast Asia; pearls and gems from Ceylon; plus ginger and muslins “like tissue of spiders’

¹⁰⁵ Ashtor 98.

¹⁰⁶ Ashtor 81, 100-1.

¹⁰⁷ Ashtor 78, 98.

¹⁰⁸ Ashtor 83.

¹⁰⁹ Ashtor 108-9. Interestingly, the Arabs did not import pepper which was to become so important in the European spice trade.

¹¹⁰ G. Hourani 72.

¹¹¹ Ashtor 108.

webs” from Southern India.¹¹² The Chinese also imported musk from Tibet, which they traded to other regions, as well as Tibetan armor, which had won fame on the battlefields of Central Asia.¹¹³ The Chinese traded in jade, produced in Khotan, and Manchurian herbs, like ginseng, prized for its rejuvenating powers. They purchased sun-bleached white beeswax from Annam (Vietnam), and human hair from Korea. Whole animals; elephants and rhinoceroses from Southeast Asia and India, lions and leopards, even the odd trained ferret from distant Persia were brought as tribute.¹¹⁴

The Tang emperors, especially Taizong (r. 629-49) and Xuanzong (r. 712-756), loved hawks and falcons. Korean and Manchurian birds were said to be the finest, but those from Mongolia were a popular second.¹¹⁵ The Tang also received such diverse birds as parrots and cockatoos from the south to the noble ostrich of Tokharia, now extinct.¹¹⁶ For centuries the Chinese coveted fine horses from the Mongolian steppes and the Western Regions, especially Ferghana. In the period under discussion here, these peoples preferred to receive trade goods, especially silk, in return for their horses. When given metal or paper currency, they might attack and raid in order to secure the goods they desired.¹¹⁷

The wealthy elite of Chang’an enjoyed patchouli, a perfume from Malaysia, jasmine oil from Persia, and rose water from the exotic west, especially the Balkans (though interestingly this last was once presented by an embassy from Champa).¹¹⁸ There were beautiful stones – lapis and carnelian from Samarkand, malachite from the Urals, tortoise shell, jet, coral, and diamonds from India and Tibetan turquoise.¹¹⁹ All kinds of exotic foods, scents, furs, and cloth found their way into the homes of the Tang elite. In the streets of Chang’an one could find performers from

¹¹² Power 135.

¹¹³ Beckwith 109.

¹¹⁴ Schafer 79-90.

¹¹⁵ Schafer 94.

¹¹⁶ Schafer 102.

¹¹⁷ Jagchid and Symons 80-1.

Transoxania, preachers from the Far West, fair-haired Tokharian dancing girls, and Turkish warriors. One could sit down for tea with a Manichaean Uighur, a Buddhist from Annam, or an Arabian merchant, stopping on his way to the mosque in the West Quarter. The inhabitants of Chang'an thus delighted in the treasures circulating the web of trade in their time.

It was not only material goods that moved along the trade routes of early medieval Eurasia. Religions, technologies, arts, and new ideas traveled with them. The Chinese learned polo from Persia.¹²⁰ The Avars, fleeing Turkish advances in the sixth century, were the first to bring the stirrup to European lands.¹²¹ The early medieval trade network brought new crops to the Arab world; cotton, oranges, watermelons, lemons, and sugarcane. Sugar was later transmitted to Europeans in Cyprus during the crusades. Chinese prisoners of war from the Battle of Talas in 751 taught the Arabs to manufacture paper from textile fibers. By the end of the century Samarkand, Baghdad, Damascus, and Yemen all had flourishing paper industries.¹²²

The new faith of Islam spread as far as Spain and China, leaving a legacy of poetry, architecture, song, art, and a religion based on brotherhood and a personal relationship with a single omnipotent god. The Turks first adopted Buddhism after their seizure of the Transoxus region in the sixth century. The famous seventh century Chinese traveler and Buddhist scholar, Xuan Zang (602-664) passed through the Western Regions in his travels from China to India in search of Buddhist texts.¹²³ Central Asia became a center for the study and translation of Buddhist texts, as well as a haven for Chinese monks fleeing persecution in China under the Northern Zhou.¹²⁴ The ubiquitous Sogdians were followers of the Persian prophet Mani, and it was Sogdian merchants

¹¹⁸ Schafer 172-3.

¹¹⁹ Schafer 228-31.

¹²⁰ Schafer 66.

¹²¹ Szadeczky-Kardoss 211.

¹²² A. Hourani 45.

¹²³ Narain 152.

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living in Luoyang who introduced that faith to the nomadic Uighurs during An Lushan's rebellion, also taking the opportunity to offer their services as silk merchants as they had done previously with the Hephthalites and the Turks.¹²⁵

Nestorian Christianity came to Central Asia and China at this time, and in the "Forest of Stele" in Chang'an (present-day Xi'an) one can see a stone stele carved with a Christian text in Chinese and Syriac script. The Nestorian brand of Christianity survived in Asia into the time of the Mongols, when envoys from Pope Innocent IV met Nestorians on their way to the city of the Great Khan.¹²⁶ Zoroastrians could be found in cities across Asia, and Jewish travelers and traders created sojourner communities wherever they went, most notably among the Khazars of Russia, but also in China and India.

The Aftermath of the Mid-Eighth Century Restructuration: Progress or Accumulation?

The early medieval Eurasian trade network developed through the interaction of the various peoples of the continent, through the exchange of goods, ideas, and knowledge. Through diplomacy, war, trade, and cultural exchange, a structure emerged, a complex and decentralized system created by the parallel actions of many agents pursuing power, prestige, profit, enlightenment and the objects of material life. But this was not a permanent or static structure. A few simple forces or rules may bring about the emergence of highly complex organization, but no linear, mechanical equations could ever hope to describe, let alone predict the behavior of such a system. Because of the nonlinear feedback loops connecting agents, and the "self-organized criticality" of the whole system, systemic change, affecting all of the actors engaged in the system, is inevitable but also unpredictable.

¹²⁴ Sinor, "The Establishment" 314.

¹²⁵ Narain 175-6.

It is this tenuous existence that, ironically, allows such systems to sustain themselves, to adapt, evolve, grow and change. The feedback loops connecting the various agents of the system allow the system itself to emerge and allow these diverse actors to adapt to changing conditions. Each adaptation potentially affects the entire network as changes cascade through the system and are amplified. The state of maximum adaptability that complex, dynamic systems enjoy precludes any permanent equilibrium. This means that change, restructuration, breakdown, collapse, and renewed organization is an ongoing process so long as the various agents remain connected and energy (in this case human ambition and the struggle for growth and survival) continues to drive the system.

That is why this paper adopts the term “restructuration” rather than collapse to describe the events of the mid-eighth century. What we see is a shift in the dynamics of the Eurasian world network, benefiting some and bringing disaster for others. Janet Abu-Lughod conceives of something like this when she writes, “[if] restructuring, rather than substitution is what happens when world systems succeed one another, albeit after intervening periods of disorganization, then *failure* cannot refer to the parts themselves but only to the declining efficiency and functioning of the ways in which they were formerly connected.”¹²⁷ It is thus unreasonable to privilege any particular *status quo*. After all, a perfectly stable, unchanging equilibrium, neither dynamic nor critical (in Per Bak’s sense of the word), would be dead – the “end of history.” The origin of the present lies in the transformation and demise of the past. Why should we mourn the passing of the dinosaurs or the trilobites, lamenting the “failure” or “decline” of their system, when in fact it is the

¹²⁶ See Christopher Dawson, ed., *The Mongol Mission* (1955; London: Sheed and Ward, 1970).

¹²⁷ Abu-Lughod 366. Emphasis added. For an interesting discussion of collapse as a viable survival strategy for agents in a complex system that has become too “expensive” to maintain, see Joseph A. Tainter, *The Collapse of Complex Societies* (Cambridge: Cambridge University Press, 1988) especially pages 91-126.

very same system we thrive in at present, reconfigured and renewed?¹²⁸

What then was the state of affairs following the mid-eighth century restructuration? The Tang suffered a collapse of sorts. Although the dynasty was not replaced, and no foreign invader conquered China, the imperial government lost authority and control in the provinces, most critically in wealthy silk, iron and salt producing regions.¹²⁹ The Tibetans, however, reached the peak of their power in the century following the accession of Srong-lde-brtsan to the Tibetan throne in 756. As early as 763, they captured the Tang capital and enthroned a new emperor.¹³⁰ By 783 they had imposed a treaty in which the Tang recognized Tibetan suzerainty over East Turkestan, Gansu Province, and a large part of Sichuan.¹³¹ This put the late Tang at a serious disadvantage with regard to access to the western land routes for several decades.

The Turks were overthrown by their own subjects in 742, but the Uighurs established a new and powerful state on the foundations of the old, and played an important role in Chinese and Central Asian affairs for the next century. When their Kirgiz subjects finally overthrew the Uighurs in 840, no new empire was established on the eastern steppe.¹³² The Umayyad Caliphate was defeated by Abbasid forces, but rather than collapse, the Abbasids expanded Arab power and built a flourishing and vital empire until overspending led to economic collapse by about 820. Abbasid rule brought many important changes. The Abbasids are often described as “Persianized,” and they moved the capital from Damascus to Baghdad. Soldiers from Persia, Khurasan and Central Asia played an important role in the establishment of the Abbasid dynasty, and Turks, mainly military

¹²⁸ In his article, “State Formation and Periodization in Inner Asian History,” Nicola Di Cosmo suggests something like this when he describes the evolution of steppe empires. What he describes is not a series of unrelated, novel imperial systems, but rather an accumulation of change over time. Old practices are preserved just as new ones are developed, creating novel systems that are based in part on past practices. Di Cosmo 37-40.

¹²⁹ Denis Twitchett, “Provincial Autonomy and Central Finance in Late T’ang,” *Asia Major* (new series) 11.2 (1965): 211-232.

¹³⁰ Beckwith 148.

¹³¹ Hoffman 383.

slaves, were more or less in control of the court in later centuries.¹³³ The Abbasids expanded the scope and volume of their international trade, and Islam flourished across large parts of the continents of Eurasia and Africa.

The Byzantine Empire, struggling to keep itself alive in this period, and suffering economic depression and deflation, emerged from the mid-eighth century restructuration to take advantage of the new opportunities offered.¹³⁴ In the ninth century, the lords of Constantinople re-conquered many of their lost territories in the Balkans and restored something of their earlier “thalassocracy,” a series of port cities in the Black Sea and Mediterranean.¹³⁵ Also at this time, the Frankish Kingdom grew in power and expanded, defeating the Saxons and Avars in the last decade of the eighth century.¹³⁶ The Carolingians made strenuous efforts to secure access to Abbasid silver, which came to Northern Europe by way of the Volga and the Baltic Sea. Although Frankish relations with both Byzantium and the Abbasids were strained, even hostile at times, this did not prevent the exchange of diplomatic missions between the Franks and Arabs in 765, 797, 802 and 807.¹³⁷ This is yet another example of a previously isolated agent adapting and striving to connect with the constantly evolving wider system.

Conclusion:

Hopefully we now have a better understanding of the dynamics of the complex network of production and exchange that bound together the peoples of early medieval Eurasia. We can see that restructuration is as much emergence as collapse, two sides of the same nonlinear coin. We can

¹³² Barfield 157.

¹³³ A. Hourani 33.

¹³⁴ Lopez 69.

¹³⁵ Ostrogorsky 6-7.

¹³⁶ Szadeczky-Kardoss 218-9.

¹³⁷ Hodges and Whitehouse 77-101, 120-1.

see, too, that the connectivity of the system precludes a purely linear explanation of either system-wide or local change. This leads us to a holistic, dynamic understanding of historical events. In this case, it would seem that a model based on nonlinear causality, self-organized criticality, punctuated equilibrium, and historical accumulation would be preferable to either linear developmental models or cyclical theories of rise and decline.

Janet Abu-Lughod identifies the weakness of all such models when she notes that “cycles” are not explanations in their own right, but merely “more or less useful observational or measurement artifacts.”¹³⁸ They are tools of understanding, like the concept “center of gravity,” which, while useful, does not describe anything real. So too, our complex, dynamic, adaptive system is but a tool of understanding, a metaphor and not a description of reality. But what can it help us to understand? If nonlinear dynamics prevents us from discerning first causes, or even drawing a clear relationship between cause and effect, what use are complexity, connectivity and criticality to the historian?

An historian who seeks to explain the decline of Tang imperial power, or the collapse of the Turkish Empire solely within the confines of those civilizations, is choosing to ignore the influence not only of neighboring rivals and allies, but of the wider system in which those polities existed – their ecosystem or society to continue the analogy. A model based on complex systems, while not pointing to discrete causes, can serve to put local events in their global context, to account for small changes and events without attempting to determine their discrete effects in a linear fashion. It provides the theoretical tools to make the interaction between the global and the local comprehensible, if not entirely transparent. Nonlinearity highlights the responsibility of individual actors, reminding us that our decisions can have far-reaching consequences, and that what affects any of us ultimately affects us all.

Where these novel theories of complex systems and self-organized criticality seem most applicable is in understanding system-wide events such as the mid-eighth century restructuration, or the emergence or restoration of inter-regional systems such the Mongol Empire. It would be wise, however, to heed the warnings of one of the great scholars of world history, Phillip Curtin. He wrote, “theory and broad generalizations often conceal so many exceptions that they are in danger of becoming only vague reflections of reality.” This may be doubly true of the scientific pretensions to understanding presented here. We should, however, also observe Curtin’s advice as to how to overcome the limitations of general theories in the study of world history. Curtin advocates taking case studies as the basis for application. Case studies, he contends, “can only be a partial reflection of the broader processes of history, but they make it possible to stay closer to the empirical data on which all good history must be based.”¹³⁹ That is what this paper has attempted by examining a sudden and brief, but system-wide and continent-spanning event, without it is hoped causing too much offense to specialists.

¹³⁸ Abu-Lughod 356.

¹³⁹ Philip D. Curtin, *The World and the West: The European Challenge and the Overseas Response in the Age of Empire* (New York: Cambridge University Press, 2000) xi.