Beyond *Guanxi*: Chinese Historical Networks

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JOURNALS

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Solidity in a Turbulent Flow: The Social Network of Aristocratic Families in the Eastern Jin Dynasty (317–420 C.E.)

Abstract   Historians have characterized the Eastern Jin (317–420 C.E.) as an era dominated by aristocratic families. Network analysis provides a unique perspective to understand these families by expanding the scope of research from imperial politics to the aristocrats' social world. This article reconstructs the aristocratic social network from *A New Account of the Tales of the World* (*Shishuo xinyu* 世說新語), a collection of anecdotes that provides rich information on the aristocrats' social interactions in this period, and provides a comprehensive analysis of the network. This article uses network simulation and Exponential Random Graph Models (ERGM) to describe the structure of this network. It calculates cumulative edge weights to measure the homophily by family affiliation in the network and computes several centrality measures to evaluate the importance of various historical figures. These results demonstrate that homophily by family affiliation exists in this network, but is weak. Although members of the same family tend to have close ties, social relationships across aristocratic families were also common. In contrast to many existing studies that emphasize the conflicts between aristocratic families, this article argues that there was a notable degree of social cohesion that united the aristocratic families as a status group during the Eastern Jin. This cohesion provides an element of solidity in the turbulent flow of their political fortunes, which was one of the main reasons why, as a privileged status group, these aristocratic families successfully dominated politics and social life throughout the century of the Eastern Jin.

1.   Introduction*

In the early fourth century, the Jin court fled south after losing control over northern China. There it reestablished itself and ruled for another century. The period, known as the Eastern Jin (317–420 C.E.), was characterized by historians as a "golden age of the great families", since these families monopolized political power under the formal rule of an actually "powerless imperial line."[1] Tian Yuqing called this "the politics of powerful families" (*menfa zhengzhi* 門閥政治). According to Tian, "the politics of powerful families in the strict sense existed only during the Eastern Jin in south China. Neither its predecessor, the Wu regime (222–280 C.E.), nor its successor, the Southern dynasties (420–589 C.E.), satisfied the strict definition, whereas in north China, the politics of powerful families never existed."[2]

Naitō Konan claimed that these powerful families constituted an "aristocratic class," characterized by an enduring lineage, monopoly over office, and marriage within its own group.[3] However, Dennis Grafflin has argued that an aristocracy such as that described by Naitō did not exist, since only the Wang family

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1   Mark Edward Lewis, *China Between Empires: The Northern and Southern Dynasties,* vol. 2, History of Imperial China (Cambridge, MA and London, UK: The Belknap Press of Harvard University Press, 2009), 51–52.
2   Tian Yuqing 田余慶, *Dongjin menfa zhengzhi* 東晉門閥政治 [The Politics of the Powerful Families during the Eastern Jin] (Beijing: Beijingdaxue chubanshe, 2012), 1–2.
3   Naitō Konan 內藤湖南, "Gaikuoxing de Tang Song shidai guan" 概括性的唐宋時代觀 [General Views on the Tang-Song Period], in *Dongyang wenhuashi yanjiu* 東洋文化史研究 [A Study of Oriental Cultural History], trans. Lin Xiaoguang 林曉光 (Shanghai: Fudandaxue chubanshe, 2016), 103–112. On Naitō's theory on this period of Chinese society, see Naitō Konan 內藤湖南, *Zhongguoshi tonglun – Neiteng Hunan Boshi Zhongguo shixue zhuzuo xuanyi* 中國史通論 – 內藤湖南博士中國史學著作選譯 [General Comments of Chinese History – Selected Translations of Dr. Naitō Konan's Works on Chinese History], trans. Xia Yingyuan 夏應元, *et al.* (Beijing: Shehui kexue wenxian chubanshe, 2004), 227–312. A sophisticated examination of Naitō's works and Japanese sinology in the late

of Langya (Langya Wangshi 琅琊王氏) "can be described as perennially important." To Grafflin, "a social paradigm that can only with the aid of self-contradictory qualifications be applied to even a single case is worse than no paradigm at all."[4] Grafflin's argument was based on a remarkable reconstruction of the genealogies of the great families, and therefore empirically solid. Nevertheless, the swift rise and fall of individual families does not necessarily disprove the existence of an aristocracy as a far more enduring status group with a high degree of internal cohesion.

Tian argued that neither the imperial clan nor the aristocratic families could establish a stable government on their own. "Only when imperial power ruled along with the powerful families could balance and order be maintained." None of the aristocratic families in power managed to break this pattern.[5] This suggests that in the turbulent flow of the politics in the Eastern Jin, a certain degree of solidity ensured the aristocratic families' grip on politics. Kawakatsu Yoshio provided an additional perspective by expanding the scope of analysis from imperial politics to social conditions in general. He described the Eastern Jin as an "aristocratic society," characterized by "a social system where a class of aristocrats or powerful families was widely present and held a pivotal position in all realms – political, social, economic, and cultural."[6] Therefore, the aristocracy in the Eastern Jin can be investigated not only from the perspective of political history, but also from that of social history.

Building on Tian and Kawakatsu, this research investigates the social history of aristocratic society[7] in the Eastern Jin. Our source material is *A New Account of the Tales of the World* (*Shishuo Xinyu* 世說新語, henceforth *The Tales*

19th and early 20th century can be found in Joshua A. Fogel, *Politics and Sinology: the Case of Naitō Konan (1866–1934)* (Cambridge, MA: Harvard University Press, 1984).

4   Dennis Grafflin, "The Great Family in Medieval South China," *Harvard Journal of Asiatic Studies* 41, no. 1 (1981): 70–71.

5   Tian, *Dongjin menfa zhengzhi,* 329.

6   Kawakatsu Yoshio 川勝義雄, *Liuchao guizuzhi shehui yanjiu* 六朝貴族制社會研究 [A Study on Aristocratic Society in the Six Dynasties], trans. Xu Gupeng 徐谷芃 and Li Jicang 李濟滄 (Shanghai: Shanghai guji chubanshe, 2007), 53.

7   The 'aristocracy' in medieval China was substantially different from the 'aristocracy' in medieval Europe, although they share many common characteristics. In this article, we follow the convention of using "aristocratic families" to call the "great families" that enjoyed political, economic, and cultural privileges during the Eastern Jin. Membership of a great family is determined on this basis of a person's patriline. For more detailed discussions of the concepts of 'aristocracy' and 'aristocratic families' in imperial China, see Nicolas Tackett, *The Destruction of the Medieval Chinese Aristocracy* (Cambridge, MA: Harvard University Asia Center, 2014), and Patricia Ebrey, *The Aristocratic Families of Imperial China: A Case Study of the Po-Ling Ts'ui Family* (Cambridge, UK and New York, NY: Cambridge University Press, 1978), among others.

of the World)[8], a collection of 1,130 historical anecdotes compiled and edited in the 5th century, immediately following the fall of the Eastern Jin. Although the reliability of this text is not without debate, many historians agree that it has value as a historical record and was a major source for the official dynastic history, the *Book of Jin* (*Jinshu* 晉書), compiled in the seventh century. Furthermore, with its focus on social relationships among the aristocrats, this text has unique value as a supplement to the *Book of Jin,* which focuses on political and military events.

The Tales of the World is also particularly suited for a study of the aristocratic society in the Eastern Jin from a network perspective. Each anecdote in the book narrates an event (usually several sentences in length) involving historical figures and their relationships, which can be easily represented by nodes and edges. This social network provides a unique treasure trove for a comprehensive investigation of aristocratic society.

In this research, we first reconstruct undirected social networks (both weighted and unweighted) from the social relationships between historical figures described in the anecdotes in *The Tales of the World.* Some relationships are positive (i.e., two people engage in favorable interactions or show affirmative attitudes), and others negative (i.e., two people come into conflict or show hostile attitudes). In this study, only positive relationships are used for constructing the networks. In the next step, we analyze these networks at three different levels to address the following questions:

1) At the network level, we use a network evolution model to simulate the process that generated the structure of the network and use a node attribute – each person's 'family affiliation' – to predict the formation of the network. We then visualize the network and detect communities in it, which leads to analyses at the group level.
2) At the group level, we calculate the cumulative weights of edges that link historical figures from different aristocratic families. We pay particular attention to the best-connected families, and examine whether connections within each family were more intensive than connections between families.
3) At the node level, we ask who the most important historical figures were in terms of degree centrality, eigenvector centrality, betweenness centrality, and closeness centrality, and which families they were from.

Based on the above investigations, this article furthers our understanding of the Eastern Jin aristocracy by quantifying the correlation between the aristocrats' so-

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8   The text has been translated in full into English, see Liu I-ch'ing 劉義慶, *Shih-shuo Hsin-yü: A New Account of Tales of the World,* trans. Richard B. Mather, Second Edition (Ann Arbor, MI: Center for Chinese Studies, The University of Michigan, 2002).

cial relationships and their family affiliations, thereby exploring the solidity in the relationships of the Eastern Jin aristocratic families. Here, 'solidity' refers to the social cohesion that bound different aristocratic families together as a status group. If our study shows a robust correlation between the aristocrats' social relationships and their family affiliations, it suggests that such solidity did not exist, because strong homophily by family affiliation indicates clear boundaries between families. On the contrary, if our results demonstrate a stable, more heterogeneous network (i.e., a weak homophily by family affiliation), it suggests that different families in the aristocratic class bonded together as a self-contained social circle.

2.   Background

2.1   Aristocratic Society in the Eastern Jin Dynasty

The aristocracy in the Eastern Jin has always been an important field of research in Chinese historical studies. Naitō Konan characterized medieval Chinese politics as being dominated by "powerful families," which he called the "aristocracy."[9] Kawakatsu Yoshio further investigated the social character of this aristocracy. He argued that this aristocratic society was a result of the Eastern Jin regime's military origin[10] and was maintained through patron-client relations.[11] Tanigawa Michio adopted a similar perspective in his discussion of medieval Chinese society. He described the aristocratic society of this period as an "autonomous world" whose cohesiveness was ensured by a "communitarian" bond.[12] Tian Yuqing described the Eastern Jin politics as "the politics of powerful families." Five powerful families took turns to dominate the government: the Wang family of Langya, the Yu family of Yingchuan 潁川庾氏, the Huan family of Qiaoguo 譙國桓氏, the Xie family of Chenjun 陳郡謝氏, and the Wang family of Taiyuan 太原王氏. Additionally, the Xi family of Gaoping 高平郗氏 also exerted a significant influence on politics.[13]

The solid strength of this aristocracy was deeply rooted in the dynasty's procedures of selecting officials. A practice known as the "Nine-Rank System" (*jiupin guanren fa* 九品官人法), meticulously studied by Miyazaki Ichisada, assigned each family into one of nine grades and gave families of higher grades exclu-

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9   Naitō, *Zhongguoshi tonglun – Neiteng Hunan Boshi Zhongguo shixue zhuzuo xuanyi,* 227–312.
10   Kawakatsu, *Liuchao guizuzhi shehui yanjiu,* 154–186.
11   Kawakatsu, *Liuchao guizuzhi shehui yanjiu,* 187–220.
12   Tanigawa Michio 谷川道雄, *Medieval Chinese Society and the Local "Community",* trans. Joshua A. Fogel (Berkeley, CA: University of California Press, 1985), 100–19.
13   Tian, *Dongjin menfa zhengzhi,* 316.

sive access to the upper echelons of government.[14] This conferred an advantage on aristocratic families. In his statistical analyses of 4,137 officials of the Jin (265–420 C.E.) and the Southern and Northern Dynasties (420–589 C.E.), Mao Hanguang found that about 70% of them came from aristocratic families, about 20% were from minor clans, while only about 10% were from families of humble origins.[15] In addition to the institutional underpinnings, Tang Zhangru argued that the aristocratic families also enjoyed economic privileges as large landowners with large numbers of retainers and dependents.[16] In terms of cultural prestige, Yu Yingshi maintained that "Wei (220–265 C.E.), Jin (265–420 C.E.), and the Southern and Northern Dynasties (420–589 C.E.) can be considered as a prosperous era for Confucianism which placed the 'family' at the center. This was a result of the actual need of the aristocratic society."[17] Mark Edward Lewis argued that the aristocratic families wrapped themselves "in a refined style of philosophical quietude, nominal eremitism, and literary attainments" as badges of "true nobility."[18]

Despite the consensus surrounding the aristocracy's central role in the Eastern Jin, the question of when the aristocratic families first appeared in Chinese history, and whether they continuously held on to political power for centuries, remains controversial. Mao Hanguang argued that it was in the Han (206 B.C.–220 C.E.) that the great families of medieval China first rose to prominence.[19] Drawing on his analysis of several lists of great families that have survived, David Johnson further suggested that these families formed an "oligarchy" in medieval China. He maintained that "the social stratum…had been in existence for at least

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14   Miyazaki Ichisada 宮崎市定, *Jiupin guanren fa yanjiu: Keju qianshi* 九品官人法研究：
      科舉前史 [Research on the Method of Selecting Officials According to the Nine Ranks:
      The Prehistory of the Examination System], trans. Han Sheng 韓昇 and Liu Jianying
      劉建英 (Beijing: Zhonghua shuju, 2008).
15   Mao Hanguang 毛漢光, "Liangjin Nanbeichao zhuyao wenguan shizu chengfen de tong-
      jifenxi yu bijiao" 兩晉南北朝主要文官士族成分的統計分析與比較 [A Statistical Analy-
      sis and Comparison of the Family Affiliations of Major Officials in the Two Halves of
      Jin and the Southern and Northern Dynasties], in *Zhongguo zhonggu shehuishi lun*
      中國中古社會史論 [Essays on the Social History of Medieval China] (Shanghai: Shanghai
      shudian chubanshe, 2002), 141–86.
16   Tang Zhangru 唐長孺, *Wei Jin Nanbeichao shilun shiyi* 魏晉南北朝史論拾遺 [Miscella-
      neous Treatises on the History of Wei, Jin, and the Southern and Northern Dynasties]
      (Beijing: Zhonghua shuju, 1983), 5–11.
17   Yu Yingshi 余英時, *Zhongguo zhishi jieceng shilun (gudai pian)* 中國知識階層史論
      （古代篇） [A Historical Treatise on Chinese Intelligentsia (Ancient Times)] (Taipei:
      Lianjing chuban shiye gongsi, 1980), 326.
18   Lewis, *China between Empires: The Northern and Southern Dynasties,* 52–53.
19   Mao Hanguang 毛漢光, "Zhonggu da shizu zhi gean yanjiu – Langya Wangshi"
      [A Case Study of the Great Aristocratic Families in Medieval China: The Wang Family
      of Langya] 中古大士族之個案研究 – 琅琊王氏, in *Zhongguo zhonggu shehuishi lun*
      中國中古社會史論 [Essays on the Social History of Medieval China] (Shanghai: Shang-
      hai shudian chubanshe, 2002), 365–404.

four or five centuries, and that during that period its membership had remained remarkably stable."[20] However, Dennis Grafflin opposed this view and denied the existence of an aristocracy composed of perennially important great families.[21] Tian Yuqing showed that of the five most powerful families that once dominated the top echelons of government, none could trace their origins to the great families in the Eastern Han (25–220 C.E.)."[22] In a case study of Huan Xuan 桓玄, a member of the aristocratic Huan family of Qiaoguo who rebelled against the imperial government of Jin and received support from other aristocratic families, Zhu Zongbin pointed out that "the high-ranking aristocratic families were generally in favor of Huan Xuan's attempt to replace Jin and resorted to him for protection of their privileges and solution of the crisis they faced in their times."[23] From his point of view, Huan Xuan's rebellion was actually the last attempt of the aristocratic families to stay in power, which implies a certain degree of social cohesion among the aristocratic families as a status group.

Last but not least, since the Eastern Jin dynasty was a regime of northern elites that ruled southern China, the complex relationship between the northern émigré families (*qiaoxing shizu* 僑姓士族) and the native southern ones (*wuxing shizu* 吳姓士族[24]) has also attracted much attention. Chen Yinke noted that the rise of powerful native southern families with a strong military force exerted a significant influence on the Eastern Jin politics.[25] He went as far as to argue that the reconciliation between the northern émigré families and the native southern ones was the most significant accomplishment of Wang Dao 王導, the crucial political figure of the early Eastern Jin.[26] Kawakatsu Yoshio likewise emphasized the importance of the native southern families and maintained that in the early East-

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20   David G. Johnson, *The Medieval Chinese Oligarchy* (Boulder [CO]: Westview Press, 1977), 126.

21   Grafflin, "The Great Family in Medieval South China".

22   Tian, *Dongjin menfa zhengzhi,* 318.

23   Zhu Zongbin 祝總斌, "Shilun Dongjin houqi gaoji shizu zhi moluo ji Huan Xuan dai Jin zhi xingzhi" 試論東晉後期高級士族之沒落及桓玄代晉之性質 [On the Decline of the High Aristocratic Families and the Nature of Huan Xuan's Replacement of Jin in the Late Eastern Jin], *Beijingdaxue xuebao (zhexue shehui kexue ban)* 北京大學學報（哲學社會科學版）, no. 3 (1985): 85.

24   Literally, the aristocratic families from the Wu 吳 area (rough the lower Yangzi region), the locus of the Eastern Jin court.

25   Chen Yinke 陳寅恪, "Weishu Sima Rui zhuan Jiangdong minzu tiao shizheng ji tuilun" 魏書司馬睿傳江東民族條釋證及推論 [An Explanation and Inference Concerning the Section on Ethnicities in the Jiangdong Area in Biography of Sima Rui in the *Book of Wei*], in *Jinmingguan conggao chubian* 金明館叢稿初編 [Writings from Jinmingguan, Vol. 1] (Shanghai: Shanghai guji chubanshe, 1980), 78–119.

26   Chen Yinke 陳寅恪, "Shu Dong Jin Wang Dao zhi gongye" 述東晉王導之功業 [On the Accomplishments of Wang Dao in the Eastern Jin], in *Jinmingguan conggao chubian* 金明館叢稿初編 [Writings from Jinmingguan, Vol. 1] (Shanghai: Shanghai guji chubanshe, 1980), 55–77.

ern Jin, the dynasty had to rely on the armies of these southern families to build its military foundation.[27] But the relationship between the northern émigrés and the southern natives was far more complicated than mere cooperation. Kawakatsu Yoshio pointed out that Wang Dun 王敦, a general from a northern émigré family (the Wang family of Langya), suppressed the forces of the native southern families that had once cooperated with him "to prevent them from gathering too much strength."[28] On the other hand, when Wang Dun himself revolted against the court, some other native southern aristocrats nevertheless joined him "to air their grievances."[29] In his interpretation of this event, Tang Zhangru further claimed that the native southern families participated in the rebellion of Wang Dun because Wang's opposition to imperial policy helped protect the privileges of these southern families.[30]

To conclude, previous scholars have discussed the importance of the aristocratic families in the Eastern Jin dynasty, debated their origins, explored the continuity of their political dominance, and analyzed the divide between the northern émigré families and the native southern ones. These arguments have significantly contributed to our understanding of the aristocratic society in the Eastern Jin. However, we still lack a deeper understanding of complex social relationships, for which the methods of historical network analysis provided an enticing solution.

2.2   Historical Network Analysis

As noted in the introductory section, this article analyzes the aristocratic social network, constructed from *The Tales of the World,* at three levels (network, group, and node). In what follows, we will briefly discuss the methods used at each level of analysis and review the pertinent scholarship that has adopted similar approaches. At the network level, we employ statistical methods of SNA. Examples of such methods include Quadratic Assignment Procedure (QAP) and Exponential Random Graph Models (ERGM), the basic ideas of which are hypothesis testing and logistic regression of the network models. These methods provide convincing quantitative evidence and are attracting growing attention in historical network research. For example, Andrew Schauf and Miguel Escobar Varela analyzed the co-occurrence network of characters in Javanese *wayang kulit* (a shadow puppet theatre tradition) using betweenness centrality and closeness centrality. Adopting the method of QAP, they generated artificial networks by re-

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27   Kawakatsu, *Liuchao guizuzhi shehui yanjiu,* 164. For Kawakatsu's detailed discussions on this issue, see Kawakatsu, *Liuchao guizuzhi shehui yanjiu,* 154–86.
28   Kawakatsu, *Liuchao guizuzhi shehui yanjiu,* 164.
29   Kawakatsu, *Liuchao guizuzhi shehui yanjiu,* 171.
30   Tang, *Wei Jin Nanbeichao shilun shiyi,* 151–67.

wiring the connections in the empirical network, which allowed them to identify those "nodes whose centrality measures are higher or lower than expected given the overall strengths of their connections."[31] A typical use of ERGM can be found in a study that reconstructed science networks of the malacological authors in the mid-19th century. The article interpreted the eponyms as "immaterial goods that resemble the properties of regular social contact" and utilized ERGM to explore these connections. With ERGM-based network analysis, the article revealed the network's endogenous structure and its homophilic tendency.[32]

For analysis at the group level, we calculate the cumulative weights for edges between different families. We also create visualizations of the network and analyze its structure using the technique of community detection. Partitioning the network into different communities helps reveal its structural properties, such as the degree of homophily by family affiliation. In her study of Petronius' *Satyrica,* Elena Köstner analyzed the interpersonal interactions related to the last will of the character Trimalchio.[33] In another example, Tom Brughmans and Matt Peeples conducted a bibliometric analysis of a large corpus of publications on the topic between 1965 and 2016 and used community detection to uncover the trends in archaeological network research. They used the Louvain clustering algorithm to identify groups of authors in the co-authorship network.[34] Similarly, our previous work on the social network of *The Tales of the World* also used the Louvain clustering algorithm to detect communities in the aristocratic society of the Eastern Jin.[35]

Finally, at the node level, we use centrality measures to evaluate the importance of different historical figures. In a study of Carib attacks on colonial forces in the sixteenth and seventeenth century, the authors calculated eigenvector centrality from a binary incidence matrix that has data on the attackers, the attacked colonial forces, as well as the locations and years of the attacks.[36] Focusing on the events of a similar era, Aline Deicke investigated the intra-Protestant controversies using polemical pamphlets from the late sixteenth century. She

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31 Andrew Schauf, and Miguel Escobar Varela, "Searching for Hidden Bridges in Co-Occurrence Networks from Javanese *Wayang Kulit,*" *Journal of Historical Network Research* 2 (2018): 26–52.
32 Abraham S. H. Breure, and Raphael H. Heiberger, "Reconstructing Science Networks from the Past. Eponyms Between Malacological Authors in the Mid-19th Century," *Journal of Historical Network Research* 3 (2019): 92–117.
33 Elena Köstner, "Trimalchio's Last Will: Shifting Interactions Between Seeming and Being," *Journal of Historical Network Research* 3 (2019): 1–29.
34 Tom Brughmans, and Matt Peeples, "Trends in Archaeological Network Research: A Bibliometric Analysis," *Journal of Historical Network Research* 1 (2017): 1–24.
35 Shang, and Yu, "Dongjin guizuzhi shehui de wending jizhi – Shishuoxinyu gongci fenxi".
36 Termeh Shafie, *et al.,* "Hypergraph Representations: A Study of Carib Attacks on Colonial Forces (AD 1509–1700)," *Journal of Historical Network Research* 1 (2017): 52–70.

constructed a directed network between the authors of the pamphlets and their opponents and calculated various centrality measures.[37]

In summary, scholars have various methods to analyze historical networks at different levels. Inspired by this body of scholarship, this article combines a variety of methods to analyze the aristocratic social network reconstructed from *The Tales of the World.* We aim to answer whether the pattern of the aristocrats' social relationships is correlated with their family affiliations.

3.   Data and Method

3.1   Data Collection and Preprocessing

Our data on social relationships between the aristocrats are extracted from the historical anecdotes in *The Tales of the World.* The book contains 1,130 anecdotes in total, and each anecdote recounts a distinct event. Therefore, we treat each anecdote as an independent unit of analysis and extract data from it based on the co-occurrences of named persons (i.e., two or more persons from the Eastern Jin mentioned in the same anecdote) as the first step of data collection. In those cases where more than two persons are mentioned in a single anecdote, we create a tie between each pair of these persons. In the next step, we examine the nature of the relationship between each pair of historical figures and filter out all cases of negative relationships. What remains are a total of 484 anecdotes that give us 736 instances of positive relationships between 250 persons.

Since our source text frequently refers to the same person by different names (e.g., courtesy names, Dharma names, etc.), in the third step, we disambiguate and standardize the names of these historical figures. In the final step, we manually assign each instance of relationship into one of two categories: (a) strong positive (i.e., when two people engage in direct interaction, such as bureaucratic appointment, and gift-giving); (b) weak positive (i.e., when two people show respectful and affirmative attitudes towards each other or when they are said to have had positive interactions in conversations, or as colleagues). We assign a weight of 3 to strong positive relationships and 1 to weak positive relationships.[38] We then sum up the weights of all reported relationships between each pair of historical figures and use this as the final strength of their relationship. In summary, our data collection starts with finding name co-occurrences, but the above

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37   Aline Deicke, "Networks of Conflict: Analyzing the 'Culture of Controversy' of Polemical Pamphlets of Intra-Protestant Disputes (AD 1548–1580)," *Journal of Historical Network Research* 1 (2017): 71–105.

38   Here we give strong positive relationships a weight of 3 (instead of 2) in order to magnify the difference between 'strong' and 'weak' relationships.

steps of data processing ensure that the final data set we obtain is not merely a representation of textual co-occurrences but reflects different types of 'actual' social relationships. In other words, the network we have constructed is not semantic, but rather one that is sociologically and historically meaningful.

The following excerpt provides an example of a historical anecdote from *The Tales of the World.* In our interpretation, this anecdote reports a strong positive relationship between Wang Meng 王濛 and Sima Yu (Ssu-ma Yu) 司馬昱, because the latter 'appointed' the former:

> (In about 345) when Wang Meng had requested the post of grand warden of Tung-yang (Chekiang), the General Governing the Army (Ssu-ma Yu) had not used him. Later, after he became critically ill and was about to die (347), the general, sighing with grief, said, "I'm obligated to Wang Meng in this matter," and issued an order to employ him. Wang Meng said, "People say the Prince of K'uai-chi (Ssu-ma Yu) is an idiot. He really is an idiot!"[39]

In brief, treating historical figures as nodes and their relationships as edges, we have constructed a network that contains 250 nodes connected by 505 edges. We work with both a weighted and an unweighted version of this network for different levels of analysis. In the weighted version, an edge between two nodes is weighted by the sum of the strength of all reported instances of their relationships. In the unweighted version, edge data is binary (either 1 when a tie exists or 0 when it is absent).

We have also added 'family affiliation' as an attribute for each node (person) in the network. Using historical records, we have assigned 195 of the total 250 people into 62 aristocratic families. Each family is labeled by a combination of their home prefecture (choronym) and surname.[40]

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39   Liu, *Shih-shuo Hsin-yü: A New Account of Tales of the World,* 183.
40   A family must be widely accepted by contemporaries as an 'prominent family' (*gaomen* 高門) in the Eastern Jin to be categorized by us as an aristocratic family. We use the home prefecture (*junguo* 郡國), instead of the home county (*xian* 縣), as a family's hometown (e.g., the Huan family of Qiaoguo, instead of the Huan family of Longkang 龍亢桓氏). These prefectures and counties are based on the administrative divisions in the Eastern Jin dynasty.

3.2   Data Analysis

After we completed the data collection, we conducted three rounds of analyses to address the three aforementioned research questions.

Network evolution model and exponential random graph models

At the network level of analysis, we used the unweighted network because network evolution models generally do not take edge weights into account. First, to understand the dynamics that generated the structure of the network, we used an evolving network model to simulate the evolution of the social network that we constructed from *The Tales of the World.* Inspired by the results of community detection in our previous study of a similar network that we constructed from the same source text, where the number of people in each community follows a long-tail distribution (17% of the communities contained 82% of all the people in the network),[41] we hypothesize that the preferential attachment model[42] may be suitable for simulating the evolution of this network. This is also a reasonable hypothesis given that people with more connections are generally more likely to develop more connections with others.

Specifically, we simulated the preferential attachment process, where the probability of any given node acquiring a new edge is proportional to the number of edges it already possesses.[43] We set the total number of nodes to 250 (that is, the total number of nodes we have in the observed network), adjusted the parameters to control the generation rate of new edges, and replicated the simulation until the total number of edges in the simulation reached 505 (i.e., the total number of edges in the observed network). Finally, we plotted on one graph the distribution of the degree centrality for all the nodes in the unweighted observed network and in the simulated network, so as to evaluate whether the preferential attachment model provides a good simulation of the observed network.

Moreover, we used exponential random graph models (ERGM)[44] to assess whether the presence or absence of an edge can be explained by the node attribute 'family affiliation.' First, we set the baseline model in which only an 'edge' term (i.e., number of edges) is specified. We then added a new variable, 'node-

41   Shang, and Yu, "Dongjin guizuzhi shehui de wending jizhi – Shishuoxinyu gongci fenxi", 50.
42   A. L. Barabási, and R. Albert, "Emergence of scaling in random networks," *Science* 286, no. 5439 (1999): 509–12.
43   For the algorithm, see Blake Stacey, "Preferential Attachment in Python," June 19, 2007, https://www.sunclipse.org/?p=163.
44   Paul W. Holland, and Samuel Leinhardt, "An Exponential Family of Probability Distributions for Directed Graphs," *Journal of the American Statistical Association* 76, no. 373 (1981): 33–50.

match (family affiliation),' to evaluate whether nodes from the same family have a higher probability of being connected.

Community detection and group similarity measures

For group-level analysis, we used the Louvain algorithm[45] to partition the weighted network into communities and created visualizations in Gephi to provide an overview of its structure.[46] We laid out the network with the Fruchterman-Reingold algorithm,[47] and used different colors for different communities (Fig. 2).

To assess the relationship between family affiliation and community formation (i.e., whether people from the same family tended to cluster in the network), we used the Kulczynski distance to measure the similarity between each detected community and aristocratic family. The Kulczynski distance is a common null-invariant (i.e., the number of null records does not influence the results) measure of the similarity between two sets of data. Here it is defined as:

$$Similarity\ (A,B) = \frac{1}{2}\left(\frac{|A \cap B|}{|A|} + \frac{|A \cap B|}{|B|}\right)^{[48]}$$

where A is a community detected in the network, B is an aristocratic family, $|A|$ is the number of people in community A, $|B|$ is the number of people in family B, and $|A \cap B|$ is the number of people in community A who also belong to family B.

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45   Vincent D. Blondel, *et al.,* "Fast Unfolding of Communities in Large Networks," *Journal of Statistical Mechanics: Theory and Experiment* 10 (2008): 155–68.

46   M. Bastian, S. Hermann, and M. Jacomy, "Gephi: An Open Source Software for Exploring and Manipulating Network," in *Proceedings of the Third International AAAI Conference on Weblogs and Social Media (ICWSM 2009),* ed. Eytan Adar, *et al.* (San Jose, CA: 2009), 361–62.

47   The Fruchterman-Reingold Algorithm is a force-directed layout algorithm designed for drawing undirected graphs with straight edges. It is suitable only for small graphs due to its high time complexity ($O(N^2 + E)$). We chose this algorithm based on the following considerations: (1) the social network investigated in this research is naturally suitable for this algorithm, as it is undirected and relatively small in size (containing 250 nodes); and (2) the algorithm uses a roughly circular layout, with higher degree nodes at the center, which places important nodes visually together and does not create clear boundaries. This simulates the aristocratic social network in *The Tales of the World* very well, because the interactions between the aristocrats were complex and not confined within small clusters of people separated by clear boundaries. For details on the algorithm, see Thomas M. J. Fruchterman, and Edward M. Reingold, "Graph drawing by force-directed placement," *Software: Practice and Experience* 21, no. 11 (1991): 1129–64.

48   Guang R. Shi, "Multivariate Data Analysis in Palaeoecology and Palaeobiogeography – A Review," Palaeogeography, Palaeoclimatology, Palaeoecology 105, no. 3-4 (1993): 206.

Cumulative weights between families

At the group level, we also calculated the cumulative weights between families in the weighted network. Here, the cumulative weight between two families is defined as the sum of all edge weights between all node-pairs (pairs of people) where each of the two nodes (people) is from a different one of these two families. The cumulative weight between a family and itself is defined as the sum of all edge weights between all node-pairs where the two nodes are both from this family.

A family with a large number of nodes in the network is more likely to have a higher cumulative weight with other families and with itself. Therefore, we also calculated the average weight between each pair of families by dividing the cumulative weight between these families by the total number of possible node pairs between them. Specifically, the average weight between two different families is the cumulative weight between them divided by the product of the number of people in each of these two families, and the average weight between a family and itself is its cumulative weight divided by $\binom{n}{2}$, where n is the number of people in this family.

Centrality measures

At the node level, both weighted and unweighted networks were used for computing degree centrality and eigenvector centrality. Betweenness centrality and closeness centrality, however, were calculated only for the unweighted network, since these two metrics focus on the position of each node in the network, and for this reason edge weights do not matter.[49] We employed the Python package NetworkX[50] for these calculations.[51] We thus obtained six centrality mea-

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49 Additionally, calculations of weighted betweenness centrality and weighted closeness centrality measures assume that the "distances" between nodes can be represented by the multiplicative inverse (or reciprocal) of edge weights (i.e., dividing 1 by the edge weight). However, this assumption is not suitable for the network investigated in this research, where the edge weight is the strength of social relationships, and its reciprocal cannot be simply interpreted as the "distance". For calculating weighted betweenness centrality, see Ulrik Brandes, "A Faster Algorithm for Betweenness Centrality," *Journal of Mathematical Sociology* 25, no. 2 (2001): 163–77; for calculating weighted closeness centrality, see M. E. J. Newman, "Scientific Collaboration Networks. II. Shortest Paths, Weighted Networks, and Centrality," *Physics Review E* 64 (2001): 016132.

50 Aric A. Hagberg, Daniel A. Schult, and Pieter J. Swart, "Exploring Network Structure, Dynamics, and Function Using NetworkX," in *Proceedings of the 7th Python in Science Conference (SciPy2008),* ed. Gäel Varoquaux, Travis Vaught, and Jarrod Millman (Pasadena, CA: 2008), 11–15.

51 NetworkX does not support the calculation of weighted degree centrality. Therefore, we calculated it by summing up the weights of all adjacent edges of each node. This is consistent with the conventional definition of the weighted degree centrality. For de-

sures for each person: weighted and unweighted degree centrality, weighted and unweighted eigenvector centrality, unweighted betweenness centrality, and unweighted closeness centrality.

After calculating these centrality metrics for each person, we examined the family affiliations of those who are ranked highest on each of these metrics and summed up the metrics of all the nodes in each aristocratic family.

4.   Results

4.1   Network Simulation and Prediction

Figure 1 shows that degree distribution follows a similar pattern in the observed and the simulated networks, although the latter has a longer tail than the former. The significant overlap between the two curves of degree distribution strongly demonstrates that the formation of the aristocratic social network in *The Tales of the World* can be considered a preferential attachment process. This suggests that cumulative advantage exists in this network: prestigious individuals attracted more attention from the author of *The Tales of the World,* and this significantly increases their visibility in the text.

Moreover, the prediction based on ERGM further suggests that a specific node attribute – namely "family affiliation" – has a notable influence on the network structure.

The ERGM analysis (Table 1) reveals that two nodes (people) that share the same family affiliation have a higher probability of having a relationship with each other. In other words, people from the same aristocratic family are more likely to have interactions recorded in *The Tales of the World.* Table 1 provides quantitative evidence for this observation: it shows that the variable 'nodematch (family affiliation)' has a positive estimated logistic coefficient and is statistically significant (p < 0.001). The values of the estimated logistic coefficients mean that the probability of forming an edge (relationship) is $\frac{e^{-4.13}}{1+e^{-4.13}} \approx 0.016$ for two random nodes (people), but slightly more than twice as high ($\frac{e^{-4.13+0.78}}{1+e^{-4.13+0.78}} \approx 0.034$) for two nodes that share the same family affiliation.

However, these statistics only reveal that people from the same family are more likely than those from different families to have positive social interactions in *The Tales of the World.* They do not tell us how common it was for people from dif-

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tails of the definition, see T. Opsahl, F. Agneessens, and J. Skvoretz, "Node Centrality in Weighted Networks: Generalizing Degree and Shortest Paths," *Social Networks* 32, no. 3 (2010): 241–51.
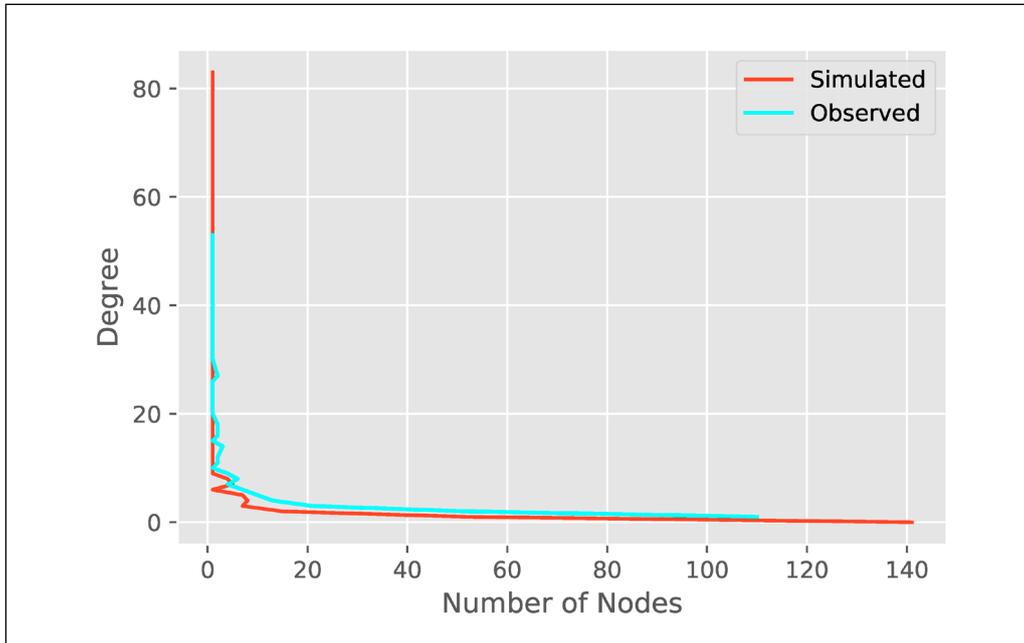
Fig. 1 Degree distribution in the observed network and the simulated network based on the preferential attachment model.

	Estimated Logistic Coefficient	Std. Error	MCMC %	z value	Pr (> |z|)
edges	–4.13	0.05	0	–89.81	< 1e-04***
nodematch (family affiliation)	0.78	0.21	0	3.75	0.0002***

Tab. 1 Results of ERGM. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

ferent families to have such interactions and what proportion of the relationships in the text were between people from the same family. To answer these questions, we will evaluate the strength of homophily by family affiliation in the network in the following sections.

4.2   Visualization and Community Detection

In Figure 2, we visualized the aristocratic social network in *The Tales of the World* to provide a panoramic view of it.

Using the Louvain algorithm with a resolution of 1.0, we partitioned the network into 18 communities. Nine of these communities each have 15 or more members, and the others each have three or fewer members. Each of the nine major communities centers on a man from a powerful family: Wang Dao (center of the community in purple) and Wang Dun (grey) from the Wang family of Langya, Yu Liang 庾亮 (pink) from the Yu family of Yingchuan, Huan Wen 桓溫
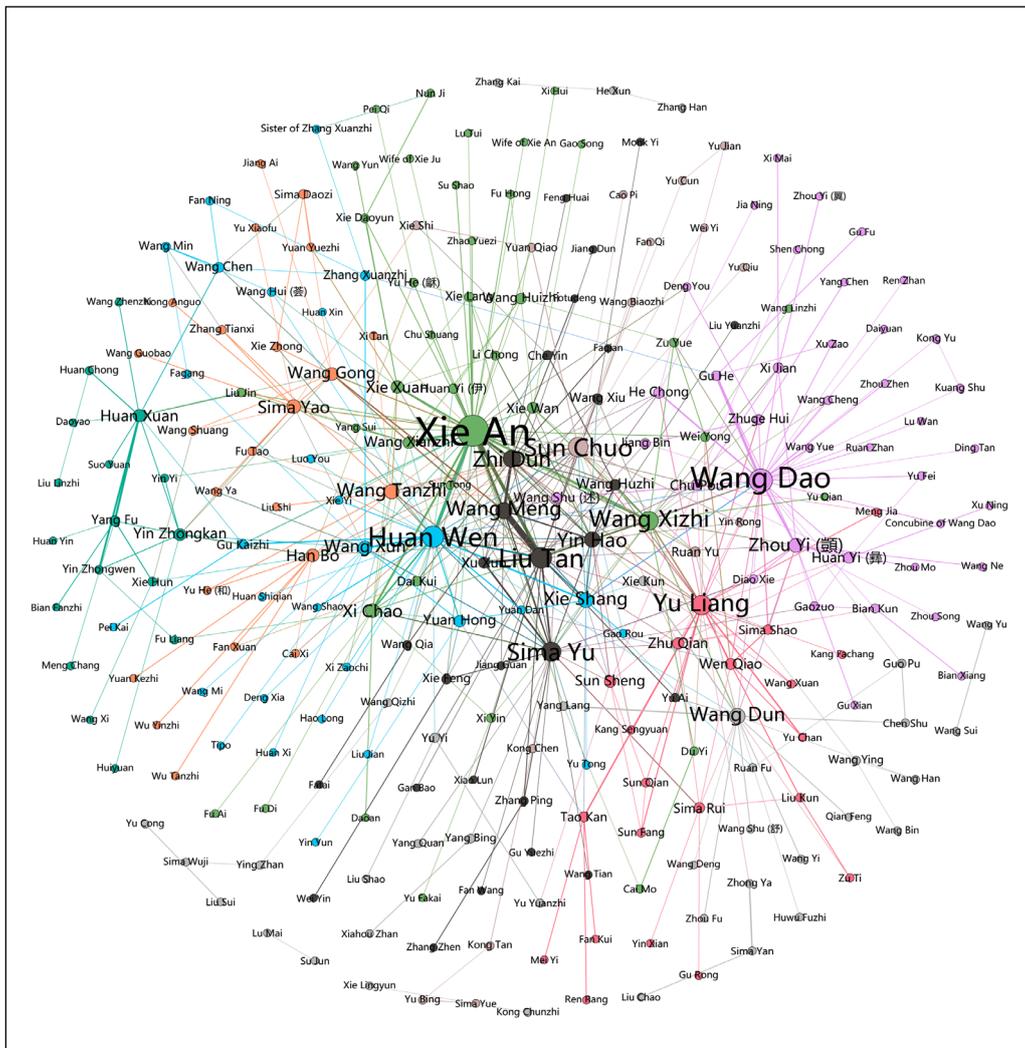
Fig. 2 Aristocratic Social network of the Eastern Jin in *The Tales of the World.*

(blue) and Huan Xuan (cyan) from the Huan family of Qiaoguo, Xie An 謝安 (green) from the Xie family of Chenjun, Wang Tanzhi 王坦之 (orange) from the Wang family of Taiyuan, Sun Chuo 孫綽 (brown) from the Sun family of Taiyuan 太原孫氏, and Liu Tan (black) from the Liu family of Peiguo 沛國劉氏. Therefore, the central figures in seven of the nine major communities (i.e., all except for the communities in green and brown) are from the five most powerful families that once dominated the positions of power in the Eastern Jin, and all of these five families each have a member at the center of at least one of the major communities.

Hence, the social interactions of the five most powerful families attracted exceptional attention in *The Tales of the World,* and each of these families had a remarkable influence within their respective social circles. However, the boundaries of these social circles are porous, and the detected social communities in the network should not be considered as a mirror image of different aristocratic families.

Table 2 reports the Kulczynski similarity measures between the nine major communities detected by the Louvain algorithm and the five most powerful aristocratic families. These statistics show that the Wang family of Langya and the community in grey have the highest similarity score of 0.363, but this is nonetheless only a moderate value. The similarity scores for other families and detected communities are even lower: none of the five most powerful families has a similarity score above 0.3 with any of the major communities. This indicates that heterogeneity in family affiliation is strong and homophily by family affiliation is weak in all the communities.[52]

These results provide a preliminary answer to the question raised in section 4.1 concerning the strength of homophily by family affiliation: although the aristocrats in the Eastern Jin were more likely to have positive interactions with people from their own family, it was still common for them to associate with people from other families. Instead of consolidating around their own kin and keeping a distance from other families, aristocrats in the Eastern Jin dynasty formed a congen-

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52   The Kulczynski similarity of two sets is defined as the average of a) the size of the intersection of the two sets divided by the size of set A, and b) the size of the intersection of the two sets divided by the size of set B (its formula can be found in section 3.2). Therefore, if one-third of the members of community A are from family B, and one-third of the members of family B are in community A, the Kulczynski similarity between community A and family B would be (1/3 + 1/3)/2 = 1/3. However, in this case, the heterogeneity is still strong, because two-thirds of the members of community A are from other families and two-thirds of the members of family B are in other communities. Therefore, 0.363, which is only slightly greater than 1/3, should not be considered a high value that indicates strong similarity, and values less than 0.3 are very low.

Aristocratic Family	Detected community (denoted by color)	Central Figure in the Community	Similarity
Wang family of Langya	Grey	Wang Dun	0.363
Huan family of Qiaoguo	Blue	Huan Wen	0.291
Xie family of Chenjun	Green	Xie An	0.272
Huan family of Qiaoguo	Cyan	Huan Xuan	0.255
Wang family of Taiyuan	Orange	Wang Tanzhi	0.254
Wang family of Langya	Blue	Huan Wen	0.179
Wang family of Taiyuan	Purple	Wang Dao	0.163
Wang family of Langya	Black	Liu Tan	0.146
Yu family of Yingchuan	Pink	Yu Liang	0.139
…	…	…	…

Tab. 2 Kulczynski similarity between the five most powerful families and the nine major communities (in descending order, based on similarity).

ial social circle in *The Tales of the World,* a sign of their shared consciousness of being part of a privileged status group.

4.3   Cumulative Weights Between Families

The preceding discussion has shown that homophily by family affiliation is weak within the network. In this section, we take a closer look at homophily in the network and examine whether the degree of homophily varies for different aristocratic families by calculating the cumulative weights between these families in the network.

We focus particularly on the five most powerful families that once dominated the positions of power in the Eastern Jin. Tables 3 and 4 show that the cumulative and average weights between two different aristocratic families are not generally smaller than those between an aristocratic family and itself. For example, of the highest four cumulative weights (the four over 30) in Table 3, three are between different families and only one is between a family and itself. Table 4 also shows that three out of the five families (the Wang family of Langya, the Huan family of Qiaoguo, and the Wang family of Taiyuan) have the highest average weights with other families, rather than themselves. This suggests that it was common for these families to have interactions with one another in *The Tale of the World.* In other words, homophily by family affiliation is relatively weak in this network, which implies a high degree of social cohesion uniting these aristocratic families as a status group.

	Wang family of Langya	Yu family of Yingchuan	Huan family of Qiaoguo	Xie family of Chenjun	Wang family of Taiyuan
Wang family of Langya	37	–	–	–	–
Yu family of Yingchuan	17	10	–	–	–
Huan family of Qiaoguo	25	2	7	–	–
Xie family of Chenjun	51	9	32	28	–
Wang family of Taiyuan	21	3	10	33	15

Tab. 3 Cumulative weights between the five most powerful families.

	Wang family of Langya	Yu family of Yingchuan	Huan family of Qiaoguo	Xie family of Chenjun	Wang family of Taiyuan
Wang family of Langya	0.105	–	–	–	–
Yu family of Yingchuan	0.057	0.182	–	–	–
Huan family of Qiaoguo	0.103	0.020	0.194	–	–
Xie family of Chenjun	0.157	0.068	0.296	0.424	–
Wang family of Taiyuan	0.065	0.023	0.093	0.229	0.227

Tab. 4 Average weights between the five most powerful families.

The Xie family of Chenjun is particularly notable for their intensive interactions with other families. This family traced their descent only to the mid-third century and therefore could not look back on a long aristocratic tradition as an "old family."[53] More or less a parvenu, the Xie family of Chenjun may have been particularly eager to build social connections with the other powerful families as a means of securing its status in the aristocratic circles. In Table 3, three out of the four highest average weights in the network are between the Xie and other

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53   Grafflin, "The Great Family in Medieval South China", 69.

powerful families, while in Table 4, all three families that have the highest average weights with other families rather than themselves have the highest average weights with the Xie family of Chenjun.

Next, we expand our scope of investigation beyond the five most powerful families and look at homophily between different categories of aristocratic families in the Eastern Jin. We place aristocratic families into two broad categories: the native southern families, and the northern émigré families. Within each category, we make a further distinction and categorize the native southern families into top-tier families and other families, and the northern émigré families into top-tier families, second-tier families, and other families.[54] Table 5 compares the intensity of cumulative weights (ICW)[55] within each group of families (indicative of homophily within the group) and also between different groups (indicative of intimacy between groups).

Historians argue that the top-tier native southern families had a deep distrust of the Eastern Jin regime and the powerful northern émigré families that dominated the court. The statistics in Table 5 are broadly consistent with this view. It shows that the top-tier native southern families tended to focus more on building relationships among themselves (hence the exceptionally high ICW of 2.585

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54   The top-tier native southern families are the Gu 顧, Lu 陸, Zhu 朱, Zhang 張 families of Wujun 吳郡 and the Yu 虞, Xie 謝, Kong 孔, Wei 魏 families of Kuaiji 會稽. This definition is based on the contemporary recognition of these families' prominent status in the Eastern Jin. For example, *The Tales of the World* lists 'Gu, Lu, Zhu, Zhang' as the 'four principal surnames' of Wujun, while *Jiangxi kaogu lu* lists 'Gu, Lu, Zhu, Zhang' as the top-tier families of Wujun and 'Yu, Xie, Kong, Wei' as the top-tier families of Kuaiji. See Liu, *Shih-shuo Hsin-yü: A New Account of Tales of the World,* 261, and Wang Mo 王謨, *Jiangxi kaogu lu* 江西考古錄 [Investigations on Ancient Matters of Jiangxi] (n.p.: Fumei shuwu, 1891), 371. In this research, only seven of the eight families are included, since no member of the Zhu family of Wujun appears in the network. All other native southern families are second-tier native southern families. The five second-tier northern émigré families are those that each have 5 to 7 members included in the network: the Xi family of Gaoping, the Sun family of Taiyuan, the Yin family of Chenjun 陳郡殷氏, the Yuan family of Chenjun 陳郡袁氏, and the Yang family of Taishan 泰山羊氏. By contrast, the five most powerful families and the imperial clan (the Sima family of Henei 河內司馬氏) are the top-tier northern émigré families, which each have 8 to 27 members in the network. All other northern émigré families are the third-tier northern émigré families.

55   In this research, A's intensity of cumulative weights with B is defined as: $I_{AB} = \frac{CW_{AB}/CW_A}{n_A n_B/\left(n_A(n-n_A)+\binom{n_A}{2}\right)}$, where CW_{AB} is the cumulative weights between all nodes in A and all nodes in B, CW_A is the cumulative weight between all nodes in A and all the nodes in the entire network, n_A, n_B, n are the number of nodes in A, B and the whole network respectively. For example, if there are two nodes in A, five nodes in B, and one hundred nodes in the entire network, and if the cumulative weight between the two nodes in A and the five nodes in B is 10 and that between the two nodes in A and all the nodes of network is 50, then A's 'intensity of cumulative weights' with B is $(10 \div 50) \div ((2 \times 5) \div (2 \times (100 - 2) + 1)) = 3.94$.

	All northern émigré families	Top-tier northern émigré families	Second-tier northern émigré families	Third-tier northern émigré families	All native southern families	Top-tier native southern families	Second-tier native southern families
All northern émigré families	1.284	1.48	1.146	0.906	0.306	0.315	0.278
Top-tier northern émigré families	1.29	1.633	1.176	0.882	0.36	0.351	0.389
Second-tier northern émigré families	1.179	1.506	1.567	0.613	0.2	0.264	0
Third-tier northern émigré families	1.001	1.356	0.736	0.823	0.196	0.21	0.152
All native southern families	0.917	1.344	0.583	0.475	1.837	1.832	0.709
Top-tier native southern families	0.906	1.257	0.739	0.489	1.758	2.585	0.517
Second-tier native southern families	1.023	1.782	0	0.452	0.872	0.663	2.366

Tab. 5 Intensity of cumulative weights for different groups of families.

within this group, which more than doubles that of a randomly selected group of families) than with the top-tier families of northern origins (hence the low ICW of 1.257, which is slightly higher than that for a randomly selected group of families). This seems to suggest that the top-tier native southern families cautiously avoided intimacy with the top-tier northern émigré families in order to distance themselves from political conflicts.[56]

The second-tier native southern families showed a similar tendency: they interacted more intensively among themselves than with the northern émigrés. However, there is also a crucial difference: the second-tier southern families could not solely rely on each other to shore up their social position, but also had to build connections with the powerful northern émigré families. Compared to the top-tier southern families, the second-tier southern families had fewer connections among themselves (ICW = 2.366) and a much closer relationship with the top-tier northern émigré families (ICW = 1.782).

Unlike native southern families, which have closer relationships among themselves than with the top-tier northern émigré families, the second-tier northern émigré families were almost as closely connected with the top-tier northern émigré families (ICW = 1.506) as they were with each other (ICW = 1.567), and the third-tier northern families had closer relationships with the five most powerful ones (ICW = 1.356) than among themselves (ICW = 0.823). These results suggest that these less prominent northern émigré families acted as 'adhesives' in the aristocratic society of the Eastern Jin, mediating the relationship between the top-tier northern émigré families and the others. Tian Yuqing's study of Xi Jian 郗鑒 from the Xi family of Gaoping corroborates this finding. He argued that "the efforts of Xi Jian maintained the balance of power between different powerful families, perpetuated 'the politics of powerful families,' and allowed the Eastern Jin regime to exist for a long time."[57]

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56 An alternative explanation for why the native southern families had a low intensity of cumulative weights with the top-tier northern émigré families is that the northern émigré families looked down upon the southerners and edged them out. However, it should be noted that the intensity of cumulative weights between the top-tier native southern families and the top-tier northern émigré families is even lower than that between second-tier southern families and the top-tier northern émigré families. Since it is unlikely that the top-tier native southern families were more marginalized by the northern émigrés than were the second-tier native southern families, their low intensity of interaction with the top-tier northern émigré families seems more likely a result of their deliberate choice.

57 Tian, *Dongjin menfa zhengzhi*, 96.

4.4   Node Centrality Measures

Statistics on node-level centrality measures (Table 6) show that members of the five most powerful families occupied the most important structural positions in the aristocratic social network of *The Tales of the World.* For example, the three people with the highest ranking in degree centrality were all from the five most powerful families: Xie An was from the Xie family of Chenjun, Wang Dao from the Wang family of Langya, and Huan Wen from the Huan family of Qiaoguo.

Table 6 shows that a person who ranks high in one centrality measure tends to have a high ranking in other centrality measures as well. However, there are a few outliers, which deserve attention. For example, Wang Dao and Yu Liang rank considerably lower in eigenvector centralities (weighted and unweighted) but high in all other centrality measures, while Liu Tan ranks high in eigenvector centrality but low on betweenness centrality.

To fully understand these variances requires that we look into the different roles played by different aristocratic families in the network. We calculated the centrality scores for each family by adding up the relevant centrality scores for all members of that family. In Table 7, we focus again on the five most powerful families.

Table 7 shows that the Wang family of Langya and the Xie family of Chenjun dominated the network. They were the most securely established, ranking highest in all centrality measures. The high connectivity of these two families might explain their dominance in the aristocratic network and why they were the only

Person	Rank in degree centrality (un-weighted)	Rank in degree centrality (weighted)	Rank in eigenvector centrality (un-weighted)	Rank in eigenvector centrality (weighted)	Rank in between-ness centrality	Rank in closeness centrality
Xie An	1	1	1	2	1	1
Wang Dao	2	3	11	19	2	8
Huan Wen	3	4	7	4	3	2
Liu Tan	4	2	2	1	7	3
Yu Liang	5	7	10	16	5	11
…	…	…	…	…	…	…

Tab. 6 Rank of people in different centrality measures (showing only those that rank in the top five in unweighted degree centrality).

Family	Rank in degree centrality (un-weighted)	Rank in degree centrality (weighted)	Rank in eigenvector centrality (unweighted)	Rank in eigenvector centrality (weighted)	Rank in between-ness centrality	Rank in closeness centrality
Wang family of Langya	1	1	1	3	1	1
Xie family of Chenjun	2	2	2	1	2	2
Wang family of Taiyuan	3	3	3	2	6	3
Huan family of Qiaoguo	4	4	4	5	3	5
Yu family of Yingchuan	6	7	7	9	5	4

Tab. 7 Rank of the five most powerful families in different centrality measures.

two that continued to produce a good number of eminent figures in the fifth and sixth centuries following the fall of the Eastern Jin.[58]

Not all families rank similarly in all centrality measures. The Huan family of Qiaoguo ranks high in betweenness centrality (which measures how often a node is traversed along the shortest paths between two other nodes) but relatively low in closeness centrality (which measures the multiplicative inverse of the average length of the shortest path between a node and all other nodes in the network). The Huan were at the peak of their power in the mid-fourth century when Huan Wen dominated the court. The Huan's high rank in betweenness centrality reflects the historical importance of Huan Wen and Huan Xuan, who act as 'gatekeepers' or 'bridges' in this network, and through whom many shortest links between people pass.

The Wang family of Taiyuan is just the opposite: it ranks low in betweenness centrality but relatively high in closeness centrality. The Wang reached the peak of their power in the late fourth century. The Wang's high rank in closeness centrality reflects their role as 'monitors' in the network, who are capable of reaching other people quickly. This appears to partly explain why the Wang continued to be influential after they fell from the peak of their power, unlike the Huan, whose influence declined dramatically after their golden days were over.

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58   Grafflin, "The Great Family in Medieval South China", 70.

Family	Rank in degree centrality (un-weighted)	Rank in de-gree centrality (weighted)	Rank in eigenvec-tor centrality (un-weighted)	Rank in eigen-vector centrality (weighted)	Rank in between-ness centrality	Rank in closeness centrality
Gu family of Wujun	13	12	16	13	14	9
Zhang family of Wujun	15	18	25	15	16	15
Yu family of Kuaiji	20	28	23	32	35	12
Kong family of Kuaiji	23	25	28	35	13	16
Xie family of Kuaiji	28	29	22	25	23	32
Wei family of Kuaiji	40	44	39	42	44	25
Lu family of Wujun	40	51	47	45	44	44

Tab. 8 Rank of the top-tier native southern families in different centrality measures (in ascending order, based on the rank of degree centrality).

The Yu family of Yingchuan's influence also declined rapidly after losing their power, which may be partly explained by the fact that many of those who had relations with the Yu family were themselves poorly connected. This is reflected in the Yu family's low ranking in weighted eigenvector centrality, which measures the influence of a node on its connections by assigning higher weights to those connections that are themselves well connected, as well as taking edge weights (the strength of relationships) into account.

The top-tier native southern families, in general, tend to rank higher in closeness centrality than in weighted eigenvector centrality. This suggests that although they had contacts with a variety of people in the network and were generally capable of reaching different parts of the network efficiently, their connections were themselves usually not well-connected. These findings corroborate the argument we made earlier in this article on how these southern families successfully maintained their status in the Eastern Jin: despite their close relationships among themselves, different native southern families often sided with different northern émigrés in the political struggle, which in effect reduced the overall risk facing the southern families as a whole. Tian Yuqing also pointed out that "the native southern families were always divided into two camps, each allying itself with a different side in the conflict within the northern émigré families."[59]

5.   Conclusions, Limitations, and Future Work

The foregoing analyses lead to several conclusions. First, at the network level, the formation of the aristocratic social network of *The Tales of the World* follows the logic of preferential attachment. Furthermore, an identical family affiliation of two nodes increases the probability of a positive social connection between them. Community detection reveals that the five most powerful families had a remarkable influence in the network, with each at the center of a sizable social circle (i.e., a detected community), although each circle had participants from many different families.

Second, at the group level, each group of families had internal connections of varying intensity. The native southern families – the top-tier ones in particular – were more strongly connected to each than the northern émigré families, while all families had intensive connections with the five most powerful families.

Third, at the node level, although people with a high score in one centrality measure generally have a high score in all the other centrality measures, a close look at the outliers leads to historically meaningful discoveries. Different northern émigré families rank relatively higher in different centrality measures,

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59   Tian, *Dongjin menfa zhengzhi,* 72.

suggesting that they occupied different structural positions and played different roles in the network. Native southern families generally rank high in closeness centrality and low in weighted eigenvector centrality, reflecting the unique challenges they faced in Eastern Jin politics and how they tackled them.

These findings lead us to a more general conclusion. *The Tales of the World* shows that homophily by family affiliation existed in the aristocratic society of the Eastern Jin, but that such homophily was weak. While many previous studies have emphasized the conflicts between the aristocratic families in the Eastern Jin, some going so far as to argue that some of these families were "as incompatible as water and fire,"[60] our findings reveal a different dimension to their relationship: despite the political struggles that divided them, aristocratic families in the Eastern Jin developed intensive and favorable relationships with each other, which helped them to maintain a high degree of social cohesion among themselves and ensured their century-long dominance in the Eastern Jin society as a privileged status group.

This argument corroborates some earlier studies. Building on his case study of Huan Xuan's rebellion against the Eastern Jin court, Zhu Zongbin has suggested that aristocratic families may have formed alliances for their common interests.[61] However, our study goes beyond microscopic case studies to provide a comprehensive analysis of the social relationships among the aristocratic families. In doing so, we have expanded the social historical research started by Kawakatsu Yoshio with the help of social network analysis.

Admittedly, the data source for this study has its limitations. Like all historical texts, *The Tales of the World* is not free from the author's bias. It is arguably more selective and less thorough than official dynastic histories in its representation of history.[62] Therefore, the aristocratic social network we have constructed from *The Tales of the World* is far from an exhaustive or unbiased representation of the social interactions between aristocrats. For example, members of the same family were obviously connected by consanguinity, which creates arguably strong intra-family connections but is not explicitly mentioned in *The Tales of the World*. Therefore, weak homophily by family affiliation means only that interactions between members of the same family in a social setting were limited or

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60   Tian, *Dongjin menfa zhengzhi,* 123.

61   Zhu, "Shilun Dongjin houqi gaoji shizu zhi moluo ji Huan Xuan dai Jin zhi xingzhi".

62   Kawakatsu Yoshio provided insightful discussions on the historical context for the composition of *The Tales of the World* and the author's inclinations. See Kawakatsu, *Liuchao guizuzhi shehui yanjiu,* 238–252. The bias has also been noted in the introduction to the English translation of *The Tales of the World,* where Richard B. Mather observed that the author of the book had a preference for the "adherents of naturalness" over the "adherents of conformity." See Richard B. Mather, "Introduction: The World of the Shih-Shuo Hsin-Yü," in *Shih-Shuo Hsin-Yü: A New Account of Tales of the World,* xviii.

went unnoticed in *The Tales of the World.* This caveat notwithstanding, the network we have constructed provides sufficient evidence to show that although different aristocratic families frequently came into conflict, there was a high degree of social cohesion that united them as a status group, which vigorously defended their common interests when they were threatened by the imperial power or foreign enemies (for example, in the Battle of Fei River against invaders from the north in 383 C.E.). This was the element of solidity in the turbulent flow of aristocratic society, which explains why the entire century of the Eastern Jin was characterized by "the politics of powerful families."[63]

Many other aspects of the aristocratic social network of *The Tales of the World* invite future research. Particularly promising topics include, for example, the structural equivalence of people from different aristocratic families in the network, the balance of triads, and its relationship with the family affiliation of individual nodes. It may also be worthwhile to collect network data from the official dynastic history, the *Book of Jin,* and combine it with what we have already reconstructed from *The Tales of the World.*

This research is an example of how network analysis methods can be adopted for the study of pre-modern history. Network analysis allows us to abstract relationships from complex historical sources and create manageable graph models based on a set of well-defined rules. This methodological conciseness, inherent in the network analysis approach, not only forces scholars to clarify their research questions, but also allows them to synthesize a large corpus of source materials and draw more convincing conclusions than is possible with case studies. Combining theories from mathematics, computer sciences, and social sciences, network analysis significantly improves the methodological power of humanities research.

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63   Tian, *Dongjin menfa zhengzhi,* 1–2.

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