

## PADGETT NSF PROJECT SUMMARY

### **Overview:**

This proposal seeks funding (a) to complete the development and public release of an unprecedented time-series data set on the evolution of economic, political, and kinship networks over two hundred and fifty years—useful for many purposes in addition to the co-evolution-of-networks purpose at hand—and (b) to write a *longue durée* book about the explosion of organizational and technical innovations that was generated repeatedly in Florence during the Renaissance (1280-1530). This unusually creative case is not typical of anything else. Yet detailed study of dynamic networks in Renaissance Florence already has and will continue to produce insights about relational processes of adaptation, innovation, and emergence that are transposable to other places and times. This research project is a data-intensive study not so much of how individuals learn, but of how whole societies learn.

### **Intellectual Merit:**

For various in-depth historical cases, Padgett already has documented the reality of co-evolution of economic, political, and kinship networks through time. Historical co-evolution of networks spawns novel organizational forms along the way. Network co-evolution does not mean homology between network topologies; it means that economic, political, kinship, and other social networks provide trellises of catalytic support for each other's development and reproduction through time. At the “chemical” level of autocatalytic flows of resources, skills and people, organizational novelty and invention are rewirings of how multiple social networks cross-cut and intertwine. This is an original network theory of the production of evolutionary novelty, described at length in a recent Padgett and Powell book entitled *The Emergence of Organizations and Markets*. The present project moves beyond these previous “proof of concept” studies of diverse episodes of organizational invention to focus on an interacting sequence of inventions in a single place, wherein organizational inventions spilled over into one another in an explosively creative trajectory of positive network externalities. This is the theoretical move from understanding network processes that generate novelty to understanding network processes that generate path-dependent co-evolution.

### **Broader Impacts:**

The specific research topics of the three modules in this project have direct analogues in social-development issues of today: (a) economic resilience and industrial retooling, in the face of systemic shock; (b) stability and adaptation in republican political institutions, in the face of internal factionalism and revolt; and (c) the implications of social mobility for elite network structure and cultural innovation. A second class of broader impacts will derive from public release of the data set itself. No comparable data set exists that traces changes simultaneously in economic, political, kinship and demographic domains over more than two hundred years. The value of these data to historians is self-evident. This data set will also become an empirical platform for developing and testing all sorts of theories of economic, political, and social development. It is commonplace today to call for new models, data, and estimation techniques for dynamic networks. Often this means little more than stochastic convergence to equilibrium in big (but thin) data sets. To be historically and sociologically richer than this, in ways that preserve the grander ambitions of the founders of sociology, requires new data up to the job. This project attempts to develop data that is cutting edge by those standards.

## CURRICULUM VITAE: JOHN F. PADGETT

### Education

- Ph.D. University of Michigan (Sociology and Public Policy), 1978  
M.A., M.P.P. University of Michigan (Sociology, Public Policy), 1974  
B.A. Princeton University (magna cum laude), 1971

### Employment

- 2013-14 Fellow/member, Princeton Institute for Advanced Study  
2011- Professor by courtesy, Department of History, University of Chicago  
2011- Professor by courtesy, Department of Sociology, University of Chicago  
2008- *Professore straordinario*, Faculty of Economics and Management, Univ. of Trento, Italy  
2006-9 External Professor, Santa Fe Institute  
2000-4 Research Professor and Program Director, Santa Fe Institute  
1996-9 External Professor and Program Director, Santa Fe Institute  
1996-7 Jean Monnet Fellow, Department of History, European University Institute, Florence, Italy  
1996-7 Visiting Professor, Villa I Tatti (Harvard U.) center for Renaissance studies, Florence, Italy  
1990-1 Fellow, Center for Advanced Study in the Behavioral Sciences, Stanford, Cal.  
1984- Associate to Full Professor of Political Science, University of Chicago  
1984-85 National Fellow, Political Science, Hoover Institution, Stanford, Cal.  
1981-4 Assistant Professor of Political Science and Sociology, University of Chicago  
1977-81 Assistant Professor of Sociology, Harvard University  
1971-72 Senior Planner, then Policy Assistant for the Mayor, City of Trenton, New Jersey  
1970 (one summer) Mental Health attendant, New Jersey Neuro-psychiatric Hospital, Trenton, N.J.  
1968-69 (two summers) Electrical Engineer, Sonar division, U.S. Navy, Portsmouth, Virginia

### Products/Publications

(i) five publications mostly closely related to the proposal:

**The Emergence of Organizations and Markets**, Princeton University Press, 2012.

(with Walter W. Powell). Chapters by Padgett in this book are the following:

Chap. 1. "The Problem of Emergence." (with Walter W. Powell)

Chap. 2. "Autocatalytic Networks in Chemistry and the Origin of Life."

Chap. 3. "Economic Production as Chemistry II." (with Peter McMahan)

Chap. 4. "From Chemical to Social Networks."

Chap. 5. "The Emergence of Medieval Corporations in Dugento Tuscany."

Chap. 6. "Transposition and Refunctionality: The Birth of Partnership Systems in Renaissance Florence."

Chap. 7. "Country as Global Market: Netherlands, Calvinism and the Joint-stock Company."

Chap. 8. "Conflict Displacement and Dual Inclusion in the Construction of Germany." (with Jonathan Obert)

Chap. 9. "The Politics of Communist Economic Reform: Soviet Union and China."

"Economic Credit in Renaissance Florence." *Journal of Modern History* 83 (March 2011): 1-47. (with Paul McLean; plus on-line JMH appendix of 26 pages)

"Open Elite? Social Mobility, Marriage, and Family in Florence, 1282-1494," *Renaissance Quarterly* 63 (Summer 2010): 357-411. (plus on-line RQ appendix of 38 pages)

"Organizational Invention and Elite Transformation: The Birth of Partnership Systems in Renaissance Florence," *American Journal of Sociology* 111 (March 2006): 1463-1568. (with Paul McLean)

"Robust Action and the Rise of the Medici, 1400-1434." *American Journal of Sociology* 98: 1259-1319 (May 1993). (with Christopher Ansell)

(ii) five other publications:

“Causality in Political Networks.” *American Politics Research* 39 (March 2011): 437-480.  
(with Michael Heaney, Betsy Sinclair and James Fowler)  
“Economic Production as Chemistry,” *Industrial and Corporate Change* 12 (August 2003): 843-878. (with Doowan Lee and Nick Collier)  
"Hierarchy and Ecological Control in Federal Budgetary Decision Making," *American Journal of Sociology* 87 (1981): 75-129.  
"Managing Garbage Can Hierarchies," *Administrative Science Quarterly* 25 (1980): 583-604.  
"Bounded Rationality in Budgetary Research," *American Political Science Review* 74 (1980): 354-372.

### **Synergistic Activities**

Built networks of collaboration between American and Italian social scientists and graduate students, through visiting and teaching in Italy: Universities of Trento, IMT (Lucca), Luiss (Rome), Bocconi (Milan), European University Institute (Florence), Bologna, Modena.  
This included bringing Italian grad students to University of Chicago for a quarter.  
Organized two-week summer school on Evolutionary Economics at University of Trento.  
Keynote speaker at Sunbelt network conference (Hamburg) and at networks summer school (Trier).  
University of Chicago faculty sponsor of development of Repast agent-based modeling platform.

### **Thesis Advisor**

John Patrick Crecine (deceased), University of Michigan, Public Policy

### **Ph.D. Students Produced**

Christopher Ansell, Professor, Political Science, University of California at Berkeley.  
Anibal Jose Aponte Colon. Assistant Professor, Political Science, University of Puerto Rico.  
Dan Carpenter, Professor, Political Science, Harvard University.  
Bruce Carruthers, Professor, Sociology, Northwestern University.  
Jin-Wook Choi, Assistant Professor, Politics and Public Administration, University of Hong Kong.  
Jung-Woon Choi, Professor, International Relations, University of Seoul.  
Lauren Duquette, Assistant Professor, Sociology, University of California Los Angeles.  
Wendy Espeland, Associate Professor, Sociology, Northwestern University. (although not chair)  
Santi Furnari, Assistant Professor, Case Business School, London.  
Blair Gifford, Professor, Business School, University of Colorado.  
Michael Heaney, Assistant Professor, Political Science, University of Michigan.  
Marilyn Lashley, Associate Professor, School of Public Policy, University of Maryland.  
Doowan Lee, lecturer, Master's Program in Social Sciences, University of San Francisco.  
Daniel McFarland, Associate Professor, School of Education, Stanford University.  
Paul McLean, Associate Professor, Sociology, Rutgers University.  
Martina Morris, Professor, Sociology, University of Washington. (although not chair)  
Jonathan Obert, current graduate student, Political Science, University of Chicago  
Elena Obukhova, Assistant Professor, Sloan School of Business, M.I.T.  
Sarah Parkinson, Assistant Professor, Humphrey School of Public Policy, University of Minnesota  
Samory Rashid, Professor, Political Science, Indiana State University.  
Michael Reinhard, Assistant Professor, Millsaps College, Mississippi.  
Frank Smith, Associate Professor, Political Science, University of Sydney.  
Bartholomew Sparrow, Professor, Government, University of Texas.  
Guy Stuart, Senior Lecturer, Kennedy School of Government, Harvard University.  
Xing Zhong, Research Associate, Duke University.  
Jakub Zielinski, Assistant Professor, Political Science, Ohio State University

### **Collaborators**

Walter W. Powell (Stanford), Walter Fontana (SFI), Paul McLean (Rutgers)

**Padgett 2013 proposal (through University of Chicago) to NSF Sociology division:  
Co-evolution of Economic, Political, and Kinship Networks in Renaissance Florence**

**I. TOPICS AND OVERVIEW**

For numerous historical cases, described below, Padgett already has documented the reality of co-evolution of economic, political, and kinship networks through time. This historical co-evolution of networks has spawned novel organizational forms along the way. Network co-evolution does not mean homology between network topologies; it means that economic, political, kinship, and other social networks provide trellises of catalytic support for each other's development and reproduction through time. At the "chemical" level of autocatalytic flows of resources, skills and people, organizational novelty and invention are rewirings of how multiple social networks cross-cut and intertwine. This is an original network theory of the production of evolutionary novelty, described at length in a recent Padgett and Powell book entitled *The Emergence of Organizations and Markets* and summarized in the section on prior research.

This proposal seeks funding (a) to complete the development of an unprecedented time-series data set on the evolution of multiple social networks over two hundred and fifty years—useful for many purposes in addition to the co-evolution-of-networks purpose at hand—and (b) to write a *longue durée* book about the explosion of organizational and technical innovations that was generated repeatedly in Florence during the Renaissance (1280-1530). Needless to say, this unusually creative case is not typical of anything else. Yet detailed study of dynamic networks in Renaissance Florence already has and will continue to produce insights about interactional processes of adaptation, innovation, and emergence that are transposable to other places and times. This research project is a data-intensive study not so much of how individual people learn, but of how whole societies learn.

Interactions among dynamic networks in three specific domains—economics, politics, and kinship—provide the primary focus both of data collection and of prospective analysis. (Religious, military, and artistic networks also make occasional appearances in various episodes in this co-evolutionary development, but these will not be measured continuously.) Particular topics to be studied in this project thus are most easily presented in three clusters, even though the main causal argument about innovation and emergence emphasizes changing interactions and spillovers between networks in distinct domains.

**IA. Evolution of Economic Businesses and Markets**

Padgett (2012e, 2012f) analyzed the invention of two new business organizational forms in Florence—the medieval emergence of international merchant-banks in the 1260s, and the Renaissance birth of the partnership system in the 1380s. Padgett and McLean (2011) have also analyzed both the topology and the micro-behavior of the vibrant Florentine inter-company credit network/market in 1427. (All summarized below.) On the economic front, the next round of this ongoing 20-year research project will be to focus on the *longue durée* sequence within which these and other salient episodes of innovation triggered each other.

Brilliant as was the Florentine international banking sector—brokering high-volume trade throughout Europe—macroeconomic matters were considerably rockier in the manufacturing sectors of more direct concern to the Florentine working class. By the late 1200s, the wool-textile industry had become the bread-and-butter economic foundation to the rapidly growing city. In the second half of the fourteenth century, however, the city in general and the wool industry in particular suffered a series of extremely severe shocks—the Black Death and subsequent plagues, international wars and merchant expulsions, the domestic Ciompi revolt/civil war, and the growth of serious wool-textile challengers in England. These caused the number of wool companies to drop 53% from 1381/82 to 1427 (Hoshino 1980, p. 231) and the annual production of wool cloth to plummet 72% from 1371 to 1437 (Franceschi 1993, p. 13). In the face of shocks of this

magnitude, it seems little short of miraculous that Florence quickly righted its listing macroeconomic ship by developing, in the late 1300s and early 1400s, a vibrant and new (for Florence) industry—that of manufacturing silk textiles—to substantially supplement its sputtering wool industry (Goldthwaite 2009). An important economic question for this research project, with considerable policy relevance for today, therefore, is how was economic resiliency of this magnitude achieved?

Existing company-level case studies from the second half of the 1400s (Tognetti 2002) point to the development of patron-client or sponsorship relations of credit between established international bankers and socially upstart silk-manufacturing newcomers. It remains to be established how the new business form of the partnership system, into which merchant-bankers had very recently reorganized themselves, was implicated in this apparent growth of new investment-cum-patronage credit networks. Many account books of Renaissance-era silk companies survive in the *Innocenti* archive of the Florentine silk guild. These can be mined and coded to reconstruct a reasonable time-series sample of those interpersonal credit networks that may have induced the birth of this new industry.

More broadly, across the economy as a whole, Padgett and McLean (2011) measured economy-wide credit networks through means of the 1427 tax *catasto*. Their archival and statistical methodology will be repeated for the tax *catasti* of 1433 and 1458. (One member of the research team, Katalin Prajda, has already begun this 1433 coding task.) Thereby, credit network topologies, as well as company censuses, can be reconstructed across time, to trace their economic evolution. Account books, which can be used to cross-check tax declarations, increase in volume over the course of the fifteenth century. For the late 1400s and early 1500s, surviving account books, in a variety of industries, are voluminous enough to develop reasonable samples of commercial-credit networks for later periods as well.

To complete the credit time series, it will hardest to measure credit networks in the 1300s. But Professor William Caferro of Vanderbilt University has graciously volunteered to collaborate with Padgett on this archivally challenging task.

Research by both Padgett and others (e.g., Weissman 1982, Goldthwaite 2009, esp. chap. 6) have demonstrated that credit—both commercial and personal (not really a sharp difference)—was the life blood through which the Florentine economy functioned and adapted. Credit was both the core of the economy itself and the means through which social networks of all kinds penetrated into the constitution of that economy. A time-series archeology of credit networks, therefore, is the best empirical means of understanding of how resilience and innovation were achieved in this vibrant early commercial-capitalist economy. As for multiple-network co-evolution, credit was the causal link in Florence between evolving elites and evolving markets.

## **IB. Evolution of Political Republicanism and Factions**

Before its transformation into a principate in 1530, Renaissance Florence was among the most prominent of the few political republics of the era, mostly concentrated in northern Italy and the Low Countries. Some political theorists like Baron (1966) and Pocock (1975) place Florence in the historical lineage of the emergence of the liberal tradition that eventually led to the founding of America. Florence's republican history, from 1280 to 1530, was tumultuous, with a major political upheaval almost every 30-year generation. Far from destructive, such political turmoil actually induced tremendous institutional experimentation and innovation—from new electoral systems, to frequently modified legislative and advisory councils, to innovative tax censuses, to changing political faction/party organizations. Padgett and Ansell (1993) have already analyzed one of these turmoil-cum-innovation episodes—namely, the rise of the Medici in 1433—demonstrating how revolt- and war-induced recombination of underlying economic and kinship networks generated this major political transformation. In the current project, Padgett will extend this type of multiple-network analysis to other equally transformative episodes in the

political evolution of the city: the formation of the republic in 1282, the Ciompi revolt in 1378, the republican reaction of 1464, and Savonarola populism in 1494.

These projected political-network analyses will rely heavily on social-network data already collected, to be described below, but they also require additional data on the dependent variables of political and institutional change. Broadly speaking, Florentine political republicanism shifted internally from the volatile guild corporatism of the early 1300s (Brucker 1962, Najemy 1982), to the ‘civic humanist’ or ‘oligarchic’ Albizzi regime of the late 1300s and early 1400s (Molho 1971, Brucker 1977), to Medici consolidation in two phases—Cosimo de’ Medici and Lorenzo de’ Medici—in the mid to late 1400s (Rubinstein 1966), to radical Savonarola ‘populism’ in the very late 1400s (Polizotto 1994), to the back-and-forth turmoil of the Machiavelli era of the early 1500s, when the Medici made their comeback. Excellent political histories, some just cited, have narrated each of these distinctive periods in depth. But both to measure fluid factional allegiances (especially in crucial transitional times) and to connect background social networks to observed institutional changes in each of these periods, two additional sources need to be coded—the *Libri fabarum* and the *Consulte e pratiche*. Well known to political historians, these two republican advisory councils operated almost continuously from 1282 and 1343, respectively. Detailed records of their meetings survive to offer surprisingly clear windows into the legislative debates and political decisions of the period. These enable the coding of membership, votes, speakers, factional allies, and excerpts of speeches and minutes. This coding will allow Padgett and assistants to construct political dependent variables of interest: factional debates, votes, and decisions about the institutional reforms of electoral systems, legislative councils, and bureaucracy. All this is necessary explicitly to connect social networks to institutions, an important causal bridge that needs to be built in contemporary organization theory as well as in comparative-historical sociology.

Based on what he knows so far, Padgett does not expect to find time-invariant causal relationships among the dependent and independent variables in these various historical episodes. Documenting changing clusters of causality, produced by altered network feedbacks, will be a methodological innovation of this study, relevant for the understanding of state-formation in general. Stated less abstractly, a practical as well as a social-science payoff of the political module of this project is to identify how networks (usually though not always elite networks) and state institutions support or destabilize each other, under various conditions.

In addition to coding the rich *Libri fabarum* and the *Consulte e pratiche* sources, more network data on patron-client relations are necessary to beef up existing data on political networks. Padgett’s ex-student Paul McLean wrote a terrific book (2007) analyzing both the linguistic content and the network connections in ~1100 letters of recommendation among Florentines from 1350 to 1500. These data, while exemplary of what can be done, need to be bolstered to reach the densities typical of comparable economic and kinship networks in the existing Padgett relational data base. Extensive letter collections to and from Lorenzo de’ Medici have been published (1977). Similarly extensive collections of letters to and from Cosimo de’ Medici exist in the archives (Kent 1978), but Cosimo’s handwriting is notoriously difficult to read. Professor McLean has generously agreed to assist members of Padgett’s team in their data extension of his work, at least to Lorenzo’s and possibly to Cosimo’s patronage network.

Many indirect clues in the political-history narratives (see especially Najemy 1982) point to a sudden increase in the volume and importance of political patronage ties in the Albizzi regime, right after the Ciompi revolt—simultaneously with the birth of the new silk industry. This can only be verified through a study similar to McLean’s of patronage in the pre-Ciompi period. It is not clear at the moment what sources will be able to reveal this baseline, but the project is devoted to trying to fill this gap and thereby to enrich our understanding of social-network connections between state and market development. The overall hypothesis is that elite transformation after the Ciompi revolt ramified into business organization (including partnerships

and accounting), into international finance, into a shift from guilds to patronage as the relational media of political power, and into the economically resilient rise of the silk industry.

### IC. Evolution of Kinship and Elite Structure

On the social front of kinship and elite network structure, Renaissance Florence was an enigma: on the one side, deeply conservative commitment to status hierarchy and cultural values of elitism; on the other hand, active participation, at top levels of both the economy and the polity, of socially upstart new-men, whose very existence contradicted those values. Padgett (2010, see below) partially helped to explain this contradiction by documenting the open-elite character of Florentine kinship and intermarriage. Because of a lack of statistical correlation among alternative status dimensions of wealth, political office, and family age, status-motivated endogamous intermarriage, designed to close in the elite on any one dimension of status, simultaneously opened that elite to influx on the other two dimensions. Completely differently from France (Duby 1994), from England (Stone 1984), from Venice (Romano 1987), and even from later early-modern Florence (Litchfield 1986), Renaissance Florence under political republicanism was an unusually high-mobility society, in which middle-class “new men” (but not lower-class workers) were sucked into a vortex of cross-cutting elites with high turnover across generations in their constitutive families. Quite a few famous Florentine families successfully reproduced themselves in spite of this vortex (Molho 1994), but most now-forgotten ones did not.

Because of a politics based on guilds, status fluidity, competition and anxiety in the 1300s led to intense class tension and eventually to the Ciompi revolt (Brucker 1962). But in a transformed politics based on patronage, status fluidity, competition and anxiety in the 1400s led to intense mimicry by the middle classes of upper class kinship values and patrilineage structures—even as the upper class families “truly” embodying those values and structures were demographically disappearing. Two cultural spinoffs of this network interaction between politics and kinship were (a) on one side of the exchange, active engagement of economic and political elites in the sponsorship of new forms of humanism and art (Martines 1963, Baxandall 1988, Goldthwaite 1993) to bolster claims to prestige, and (b) on the other side of the exchange, a rise in social status of those artists, humanists, and scientists who successfully produced cultural objects (Alberti [1435] 1991, Vasari [1550] 1991). Status competition and patronage networks were the social foundations of the cultural efflorescence that Renaissance Florence is most remembered for today.

That is the informed hypothesis at least. To test this hypothesis, thereby linking this project to creativity in the usual sense, requires gathering network data on artists, scientists and humanists, in order to link them into the broader networks of the city. In primary sources, locating such people is non-trivial because they often came from obscure families, with no last names. That makes kinship and even their identities in legal documents unclear. (Both we and the Florentines knew many them—for example, Brunelleschi, Masaccio, Donatello—by their nicknames, not their real names.) Fortunately the secondary literature on many of these creative people is vast and of superb quality. Extending the project to include artists, scientists and humanists will benefit from scouring this secondary literature. Team member Prajda has recently initiated an artists’ network project along these lines, based on the primary sources of the *catasti*.

The bigger archival tasks on the kinship front, in order to complete the data set, are coding the tax censuses not coded to date, and extending the entire data series from 1500, the current arbitrary stopping date, to 1530, the more logically defensible (because of end of republic) stopping date. At level of heads-of-household and their tax assessments, the tax censuses that have been coded so far are 1325 (the one-sixth that survived), 1351, 1378, 1403, 1427, 1458, and 1480. Other complete censuses available to be coded in the future are 1363, 1433, 1469, 1495, and 1534. Seventeen hundred lineages have been assembled into genealogies of patrilineage descent already, using sequences of tax censuses for their core data skeletons. Coding the remaining tax censuses will flesh out these genealogies into reasonably complete kinship

demographies, which will cover the evolution of Florentine families, of all social classes, over two centuries. Dates of birth and death were recorded, from 1380 on, by Florentine state in their *Libro d'éta* and *Libri dei morti*, respectively. These sources have been partly coded already, but the job needs to be finished. Once completed, this data set will be of incredible (and really unprecedented) value to demographic historians and sociologists interested in all sorts of questions other than network co-evolution.

Marriage data in particular needs to be extended from 1500 to 1530. Such data are available in the *Monte delle doti*, the Florentine dowry fund. Anthony Molho and Julius Kirshner have already coded this marriage data, but they have not yet publicly released it due to their understandable desire to double-check its quality. If public release occurs within a year or two, that data will be used to extend the time series. Otherwise the research team will code it anew.

“Elite structure” is a multiple-network term that covers more than just intermarriage, but in the Renaissance and early-modern contexts, marriage was probably the core relational medium through which long-lasting social alliances between lineages and between people were negotiated. Tracing the topology of marriage networks over time, therefore, is the most precise and consistent way of identifying the evolution of elite structure (along dimensions such as open vs. closed, centralized vs. decentralized, and fractured vs. polarized vs. diffuse).

#### **ID. Co-evolution**

Each of these topics—economics, politics, kinship—is of considerable interest in its own right, but the ambitious goal of this research project is to explain, not just trace, joint social co-evolution across time. In Renaissance Florence, but also in other cases discussed in *The Emergence of Organizations and Markets*, adaptations are observed to exhibit a punctuated quality, with innovation and turmoil in one domain spilling over into another, not instantly but over generational time. Explanation in history is not a matter of predicting the future, even post hoc. Explanation in the context of any open-ended evolution instead means discovering the realistic array of possible trajectories into which a current system can branch or bifurcate or tip. (This array of accessible developmental trajectories provocatively has been labeled “the topology of the possible” by Fontana and Buss (1994).) Like in all dynamic systems models, the social-organizational or multiple-network variant of this is discovering catalytic feedbacks whereby evolving networks in one domain support or inhibit the reproduction and growth of networks in another linked domain. Intertwined multiple social networks therefore are the architectural prerequisite for understanding evolutionary organizational change, especially punctuated evolutionary change.

In past NSF-supported research, summarized below, this dynamic-systems vision of self-organization and tipping of social networks has been formalized into a suite of agent-based models of autocatalysis. These built upon Nobel-prize-winning models about the biochemical origins of life. Through graduate students working on their dissertations this agent-based modeling work continues on an unfunded basis. On the empirical side, this approach to analyzing history as alternative (but delimited) trajectories of self-reinforcing organizational and network development has been articulated most explicitly and self-consciously by Padgett in his recent book chapter on “The Politics of Communistic Economic Reform: Soviet Union and China.”

## **II. EMPIRICAL FOUNDATION: THE FLORENTINE DATA SET**

### **IIA. Existing relational data set on Renaissance Florence**

A distinctive feature of this project is the extraordinary quality of and coverage in the underlying data set. To a surprisingly high degree of accuracy, this data set measures the social-network structure of an entire city over two centuries. Twenty years have gone into its construction, from primary sources in the Florentine archives. The volume of data in the Florentine archives is staggering – far beyond anything else in pre-modern times – for two reasons: (a) Renaissance Florence was ‘a birthplace of financial capitalism’; hence its



government, its firms, and its families were unusually literate and numerate. And (b) Florentines self-consciously thought of themselves as historically significant; hence they saved much of their written output, beyond the duration of its instrumental utility. Sampling issues, due both to historical survival of documents and to researcher search procedure, of course remain important, but a “high” percentage of the corresponding historical reality of Florentine social and economic networks is captured in this data set. (More precise estimates of sampling coverage, which vary by source, are found in publications.)

The current contents of this relational database are as follows:

**A. Population:**

(1) Tax censuses. Data from the Florentine head-of-household tax censuses of 1325, 1351, 1378, 1403, 1427, 1458, and 1480 have been coded and computerized. The 1427 *catasto* was coded by Herlihy and Klapisch (1985); the 1480 *catasto* was coded by Molho (1994) and Kirshner; the rest were coded by Padgett and assistants. These censuses, around 8,000 to 10,000 declarations apiece, contain information on neighborhood residence, tax assessment, family structure, and in the case of 1427 much more. Sampling coverage for all censuses was 100%; thus these are complete censuses of all taxable heads-of-households in the city.

**B. Kinship:**

(1) Marriage. 11,000+ unique marriages were coded from a seventeenth-century marriage registry, called the *Carte dell'Ancisa*, as well as from eighteenth- and nineteenth-century genealogies located in the rare-book rooms of seven American libraries. Most of the dowry contracts, upon which these registries were based, have been lost.

(2) Patrilineage descent. 37,000+ father-son and 8,000+ father-daughter relations have been identified, enabling the computerized reconstruction of 1700+ patrilineal genealogies or family trees. Missing fathers can and have been identified through this linking procedure. The social evolution of Florentine families, over two centuries, can be traced with these genealogical and marriage data.

**C. Economics:**

(1) Annual banking guild censuses. Annually from 1340 on, and also in 1299, 1300, 1301, 1314 and 1329, the *Arte del Cambio* banking guild required the registration of all banks doing lending business in Florence. This time-series information has been coded, providing invaluable information on the changing partnership structure of Florentine banks over time.

(2) Ad hoc business censuses. Annual time series for other industries do not exist, but numerous ad hoc business censuses exist for merchant trading (1355, 1369, 1380-1400, 1427, 1451, 1458), for wool manufacturing (1353, 1382, 1427, 1451, 1458), and for silk manufacturing (1427, 1451, 1462, 1472). The macroeconomic histories of these core export-oriented Florentine industries can be traced through such censuses.

(3) City-wide debts and credits. For tax calculation purposes, the 1427 *catasto* registered all outstanding debts and credits in the entire society at that moment in time. Such an extraordinarily detailed snapshot of financial indebtedness in the society is unique in pre-modern economic history. 15,000+ of these debts have been coded by McLean, about five thousand of which are company-to-company debts.

(4) Account books. Debtors and creditors from the following company account book have already been coded: Alberti (1355), della Casa and Guadagni (1458), Capponi (1477), Strozzi (1480). These provide credit samples, to give temporal context to more comprehensive 1427 credit data. Many other account books are available in the archives for future coding.

(5) Guilds. Membership over two centuries in the five major guilds in the city has been coded from their matriculation records. The consul leadership of these guilds has been downloaded from Herlihy's and Litchfield's publicly accessible *Tratte* website.

**D. Politics:**

(1) Political offices. Complete time-series of elected Florentine officeholders, from 1284 to 1500, have been coded from primary sources for the following republican offices: the *Signoria*

or city council, the *Mercanzia* or commercial courts, and *balie* or special ad hoc reform councils. Officeholding in the *Buonuomini* and *Gonfalomieri* advisory councils was downloaded from Herlihy's and Litchfield's public website about the *Tratte*. Mediciean 'grand councils' have been coded from Rubinstein (1966). Political office-holding was central to social status and prestige in republican Florence, as well as to political power.

(2) Political factions. From both chronicles and prosopographical studies by others, political memberships in the following factional splits have been identified: magnate versus popolani (1284-1300), Black versus White Guelph (1310s), Albizzi versus Ricci (1360s), Ciampi revolt (1378), Albizzi versus Medici (1434), 'republican reaction' (1466), Savonarola (1490s).

(3) Letters of recommendation. In his dissertation under Padgett, McLean (1996) identified and analyzed 869 letters of elite Florentines to each other, asking political favors of various sorts either for themselves or for their 'friends'. The texts of these letters were coded not only for egocentric social networks, but also for linguistic content and form. This data was analyzed in McLean (1998, 2007). The letters provide invaluable insight into the cultural context, into the interactional and linguistic practices, and also into the daily psychology of Renaissance Florentines.

### **E. Relational linking:**

All of these data have been integrated into an ACCESS relational data base, containing 120 separate tables. Relational linkage of data tables through personal, family, and company IDs involved the tedious manual identification of disambiguated names in all of the primary sources mentioned above. (An attempt at SFI to construct computer programs to automate this task of linking and disambiguation proved a data-quality disaster because of the multiple languages, variant spellings, and nicknames in the original sources.) In total, 59,570 distinct people are included in the existing relational data set – 46,696 males and 12,874 females. Both in the original documents and because of Padgett's selection and linking procedures, this sample is skewed toward Florentines with last names. An extremely high percentage of last-named people appear in the data set, whereas a lower percentage of the poor, who had unlinkable names like "Giovanni, son of Paolo," are included. In 1351, the percentage of the population with last names was around 25%, whereas by 1480 this percentage had grown to around 60%. David Sallach and Nick Collier, then employed at the University of Chicago's social science research computing center, aided in the relational design of this challenging ACCESS data set.

The last page of this Project Description presents a visualization that describes the essential logic of how multiple-network data in this relational database are linked.

### **IIB. Proposed extensions, completion, and public release of the Florentine data set**

To summarize, the data-collection tasks proposed above in this proposal include:

- (a) Extend existing data series from current ending date of 1500 to logical ending date of 1530.
- (b) Additional tax censuses: 1363, 1433, 1469, 1495, 1534.
- (c) Economic partnerships and credit in the tax censuses of 1433 and 1458.
- (d) Economic account books in silk manufacturing and international merchant-banking.
- (e) Political debate and factions in *Libri fabarum* and *Consulte e pratiche*.
- (f) Patronage letters, especially to and from Lorenzo de' Medici.
- (g) Finish coding birth and date dates in *Libro d'eta* and *Libri dei morti*.
- (h) Marriages from *Monte delle doti*.
- (i) Artists, scientists, and humanists from secondary sources and from *catasti*.
- (j) Public release:

As described in the Data Release document in this proposal, preparing these data for public release is a major undertaking in and of itself. Manual linkage through IDs is almost as big a job as archival coding itself. Work over the past twenty years, as well as new work, has to be updated and made consistent. Data will have to be ported from the current ACCESS format, suitable for laptops, to a more modern SQL environment, suitable for the web. An institutional home for

these data will need to be found, capable not only of storage but of uploading and integrating new data that will be produced by future researchers. Padgett has attended conferences by historians, where their intense preference for the future capability to connect their data to this data set has been forcibly expressed. Data sets in the future will not be closed containers but will be openly evolving depositories. This project can be a leader in that trend, but that will take a lot of work.

Padgett's goal is to schedule public release of these updated data to be simultaneous with the publication of his Florence book.

### III. SENIOR RESEARCH PERSONNEL

**John F. Padgett**, the Principal Investigator, is a professor at the University of Chicago. His primary appointment is in Political Science, but he holds courtesy appointments there as well in the departments of Sociology and History. He also holds a part-time appointment as *professore straordinario* at the University of Trento, Italy, in their faculty of Economics and Management. For the academic year 2013-2014, he will hold senior fellowships at the Princeton Institute for Advanced Study and the European University Institute. Professor Padgett specializes in social network analysis, organization theory, Renaissance history, and both agent-based and stochastic-process modeling.

**Richard Goldthwaite** is professor emeritus of History at the Johns Hopkins University. Professor Goldthwaite is the foremost historian in the world of the Renaissance Florentine economy. He now resides full-time in Florence. Professor Goldthwaite has agreed to be an unfunded collaborator, in order to provide on-site archival advice to team members in Florence.

**Paul McLean** is associate professor of Sociology at Rutgers University. He is a comparative-historical sociologist primarily concerned with integrating cultural analysis more synthetically into social network analysis. Professor McLean has agreed to be an unfunded collaborator, in order to provide advice on finding and coding patronage letters.

**William Caferro** is professor of History at Vanderbilt University. While his specialty is military history, he is an expert on Florentine sources of the 1300s, and has graciously offered to be an unfunded consultant on those materials, especially those regarding credit and banking.

### IV. RESULTS FROM PRIOR NSF SUPPORT

Padgett was the recipient of NSF-HSD grant 0433006, entitled "The Co-evolution of State and Market," for \$600,000 from NSF's now defunct Human and Social Dynamics program. This grant, through the Santa Fe Institute where Padgett was previously a research professor, was originally for the period 2004-2007. With two no-cost extensions, the grant actually funded the period 2004-2009. This NSF-HSD grant proposed simultaneously (a) to study the intertwined inventions of new organizational forms in Renaissance Florence and elsewhere, and (b) to develop formal biochemistry-inspired agent-based models of organizational autocatalysis and speciation. The current NSF-Sociology project proposes to complete the development of the unprecedented Florentine data set and to write a new book on multiple-network co-evolution over the *longue durée* in Renaissance Florence.

The tangible products of the previous HSD grant were two-fold: a major new book, entitled *The Emergence of Organizations and Markets*, in which Padgett authored nine of the chapters; and three lengthy empirical research articles on network co-evolution in Renaissance Florence, published in top sociology and history journals.

#### IVa. Published book: The Emergence of Organizations and Markets, Princeton

University Press, 2012. (586 oversized pages, co-authored with Walter Powell)

This ambitious book asks a question almost never posed in the social sciences—what explains the emergence of new organizational forms in human history?—and it provides a novel answer—autocatalysis in multiple social networks, which feedback (through reproduction) into co-evolutionary tipping. Taking its inspiration from the well-developed scientific literature on the

biochemical origins of life, this book adapts Darwin's famous question about the origin of biological species to the human domain of the "origins" of novelty in organizations and markets. ["Origins" is here in quotes because everything is a path-dependent transformation of what was there before. The transformation is what is new, not the pre-modified components.] The book argues that methodological individualism is incapable of answering this foundational question because it axiomatically assumes its agents (be those people, organizations, or states) to be atomic. Following in the footsteps of Harrison White (1992) and Bill Sewell (2005), the book constructs a sociological "relational constructivism"—albeit a version that Padgett and Powell believe to be scientifically rigorous through its explicit intellectual engagement with biochemical networks, metaphors, and models. The epistemological mantra of the book is "in the short run, actors make relations; in the long run, relations make actors." The tension between social constructivism and methodological individualism ("structure and agency" if you will) thereby becomes, in the book's hands, not a matter for theological dispute but rather the challenge of how to intercalate multiple time scales. Empirically the book focuses more on longer-term dynamics, showing through many historical examples how actors (from individuals to organizations to states) became constructed through their network interaction over biographical time.

After an introductory chapter in which this point of view is developed and applied to the topic of organizational novelty, the book has three Padgett-authored chapters on biochemistry and agent-based modeling of autocatalysis. Chapter 2 is a lengthy literature review of the biochemistry literature on the origins of life (i.e., bacterial life) on the very early earth. Eigen and Schuster's (1979) core concept of autocatalysis is extracted as the key contribution and insight in that literature, for which Eigen won the Nobel Prize. Autocatalysis is "a set of nodes and transformations in which transformations among the nodes reproduces the set." With such an autocatalytic property, a transformational network can reconstruct or repair itself when damaged. This is resilience. With such a property, a transformational network can reproduce itself in the face of turnover and throughput in its component parts. This is life itself, chemically speaking. Understanding resilience and life in networks, be they chemical or social, the book argues, requires understanding autocatalysis.

Eigen and Schuster had in mind "nodes" as chemicals and "transformations" as chemical reactions. But Padgett extends their definition to more powerful than just biochemistry. An economy is autocatalytic (or "living") if the set of products and technologies that make those products reproduces itself over time, in the face of 'dissipative' throughout. A social network is autocatalytic if the set of people and interactions that make (the skills that comprise) those people reproduces itself over time. A language is autocatalytic if the set of symbols and conversations (or grammars if you are Chomskian) that make those symbols reproduces over time. Padgett labels these three extensions to the core Eigen-Schuster insight "production autocatalysis," "biographical autocatalysis," and "linguistic autocatalysis," respectively.

With NSF-funded programming assistance from two of his students, Padgett in chapter 3 translated production autocatalysis into a working agent-based model of an Leontief-style economic ecology of interlinked industries. Sample derivations from this model include: (a) Embedding production rules or skills in physical space transcends the "complexity barrier" of four products that Eigen and Shuster discovered in their modeling of non-spatial (i.e., gaseous or liquid) interaction. (See also Hofbauer and Sigmund 1988.) In the biological realm, this is why complex biological life comes in the form of creatures in the first place. In the human realm, this is also why complex social life comes in the form of organizations, according to autocatalytic theory. (b) More complex economic ecologies, with more products and production rules, are generated when skill reproduction is altruistic (i.e., when the recipient rule reproduces after joint success) than when it is selfish (i.e., when the initiating rule reproduces after joint success). This is why cooperation exists in autocatalytic theory. (c) Stigmergy—namely, the endogenous construction of a resource environment by the economy itself—is the prerequisite for selfish reproduction to generate complex economies. As the literature on social insects has already

demonstrated, the active construction of physical space by an organism has unanticipated consequences for the evolution of social organization in that organism. (d) Multiple autocatalytic networks, composed of numerous types of intertwined hypercycles, is the automatic consequence of an ALL chemistry (where all possible transformations are permitted), as compared with a SOLO H chemistry (where transformation are restricted to linear sequences). This is the first formal modeling framework that I am aware of where multiple networks—a.k.a., differentiation of social domains—appear endogenously, without purpose.

This suite of agent-based autocatalytic models and their results can be usefully compared with evolutionary game-theory models in the competing tradition of methodological individualism. Autocatalysis is one branch of Santa Fe Institute style complexity theory—the branch associated with Peter Schuster, Stuart Kauffman, and Walter Fontana.

Chapter 4 completes the formal modeling segment of this book. The two halves of this chapter develop detailed blueprints for the extension of autocatalytic models to the evolution of language and to the evolution of family, respectively. These blueprints have not yet been translated into agent-based models; that research is ongoing. I could have asked for money for this in this current NSF-Sociology grant proposal, just as I did in my previous NSF-HSD grant, but I anticipate that this addition will make my monetary request too large for NSF-Sociology.

The rest/bulk of the book consists of detailed case studies of diverse examples of the emergence of organizational novelty in history. In these fourteen empirical chapters, I, Powell, and some other co-authors inductively uncover eight specific multiple-network autocatalytic mechanisms or processes that generated our fourteen (fifteen actually, since one chapter compares two cases) observed organizational inventions. Organizational speciation, our cases reveal, requires not just autocatalysis within one type of network, but also spillover and positive feedback into tipping between multiple networks. I will summarize here only my own five historical chapters, rather than the four chapters by Powell and students and the five chapters by disparate others, because that is what NSF-HSD funded. When it becomes appropriate in this proposal to discuss spillover of my research into more contemporary concerns, however, I will emphasize these already demonstrated synergies between understanding the network generation of organizational novelty in history and understanding the network generation of organizational novelty today. While I recognize that others might disagree, I insist that the study of history reveals far more than just the distant past. The study of history is the study of evolution itself. [Perhaps the 1000+ citations to my Robust Action article are evidence of the potential broad appeal of the study of history in general and of the study of Florence in particular.]

Chapter 5 is a case study, based on primary sources, of the development of international merchant-banking in medieval Tuscany in the period 1250-1300. The organizational invention in question might seem routine today, but it did not exist outside of the Catholic Church then—namely, a geographically dispersed business enterprise with stationary branches in multiple cities and fairs. This new economic organizational form moved goods and newly invented bills of exchange around within itself, thereby internalizing previously migrant merchants into quite a number of “large” (for the time) quasi-bureaucratic commercial businesses. International banking as a distinct “industry” was thereby created, with implications for the subsequent evolution of state finance, as well as nonlocal money and credit markets, in Europe. Through the careful study and coding of papal bulls and letters, as well as English royal liberate rolls, from the period (all in Latin), Padgett demonstrated for the first time that this organizational invention emerged through a two-stage multiple-network process of “incorporation and detachment.”

First “incorporation”: During the Italian crusades (i.e., on the Italian peninsula) of the pope against an invading German emperor, the pope forcibly co-opted previously migratory Tuscan merchants from the Champagne fairs to pay for a French mercenary army. This brokerage counter-strategy, concocted on the run between numerous Italian hill towns, was made possible because the new pope was himself French, from Champagne. He wasn’t brilliant; he was just mobilizing, under stress, his personal networks. The pre-existing organizational form of the

Catholic Church was imprinted onto these fluid Tuscan merchants because the pope sent them to his monasteries and bishoprics all over Europe to slowly get their money back.

Second “detachment”: If that were the end of the story, this would have been only temporary ad hoc innovation, not permanent organizational invention. Huge crusade loans could only be paid off by wool and other material assets of the church. To monetize these repayments, Tuscan merchants had to move into a new activity of transshipping wool, first to Flanders and then to their own newly constructed wool industry in Florence. (This was how Florence as a major city came to be.) No longer just small-scale Champagne-fair bankers (like Shylock), in other words, but rich international merchant-bankers.

Finally “catalysis”: This new organizational form—born originally by imprinting within the church and then by migrating the chrysalis to the cloth trade—was made permanent when this new organizational form altered the networks that surrounded and reproduced them. (This final stage distinguishes organizational invention from organizational innovation in the theory of this book.) Using their new organizational expertise, Tuscan merchants talked the English king into inventing a new customs tax on wool exports, which they could monopolize the collection of. The English customs tax is extremely important in the history of public finance. Back home in Florence, in their social mobility up, these newly rich business upstarts started to mimic the patrilineage kinship structures of their traditional domestic rivals, the feudal aristocracy. Business and feudalism thereby socially merged in Italy in a way that was quite impossible in England and France. Padgett called this spillover into kinship “family out of company,” rather than the usual stereotype of “company out of family.” This social cleavage—magnates versus *popolani*—then fueled the political birth of the Florentine republic in 1282.

I do not have the space to summarize other historical cases in this depth. But I wanted to give reviewers at least one in-depth taste of how the autocatalytic theory of multiple-network co-evolution in this book translates into empirical practice. Crusades, Champagne fairs, wool trade, noble kinship, the economic rise of Florence, the rebirth of political republicanism—all of these distinct social networks were recoupled and rewired in new ways by the emergent organizational form of the Tuscan international merchant-bank. This new “actor” was relationally induced by unanticipated interaction between prior social networks, but then it agentially triggered subsequent novel ‘spillover’ connections, in the search for its own reproduction. While historical details vary greatly and are path-dependent, all of my empirical chapters analyze examples of the birth of organizational novelty using a multiple-network-interaction theoretical schema like this.

Chapter 6 is about the birth of the modular partnership system in Renaissance Florence. This chapter is a 40% reduction of a prize winning 106-page article in the *American Journal of Sociology*. As such, I will describe it below, not here.

Chapter 7 is about the birth of the joint-stock company and the stock exchange in early-modern Amsterdam. These classic organizational pillars of contemporary capitalism are shown in this chapter to have been consequences of the Dutch Revolt against Spain, via the network-rewiring mechanism of “immigration and homology.” Massive segregating population relocations were triggered by the Dutch Revolt—Protestants (particularly merchant Protestants from Antwerp) flowed north from what is now Belgium, and Catholics flowed south from what is now Netherlands. The merchant-network heart of the Spanish Empire thereby became transplanted into the newly independent decentralized political federalism of the north. The organizational form of joint-stock company emerged from reassembling these largely southern immigrant merchants into homology with preexisting domestic political federalism. The resulting Dutch East India Company was divided internally into Dutch geographical chambers; the boards of directors in its chambers were set up in analogy with regent councils in cities; ownership shares in companies, which circulated in secondary markets, were set in parallel to *renten* municipal bonds in cities. The whole economic-trade ensemble was essentially an overseas province—the new Dutch province of Indonesia—owned jointly by northern regents and southern merchants. Shipping skills from the north were combined with mercantile skills from the south, in the service

of new empire logic to survive against Spain. All organizational levels, including the Amsterdam stock market, were controlled by mutual surveillance and supervision techniques (“lateral control”) adapted from Protestant Reformation consistories (cf. Gorski 2003). Padgett causally linked capitalism with Protestantism in this chapter, but more through organizations, networks, and empire than through the mechanism of internalized values that Weber (1930) preferred.

The final two empirical chapters by Padgett—chapter 8 on the nineteenth-century emergence of Germany under Bismarck, and chapter 9 on the evolution of the communist central command economies in the Soviet Union and China—are too large to summarize here. Suffice it to say that in chapter 8, Padgett discovered the multiple-network smashing-and-rewiring mechanism of “conflict displacement and dual inclusion” to explain the nineteenth-century organizational emergence of Germany. And in chapter 9, he described a second multiple-network smashing-and-rewiring mechanism, “purge and mass mobilization,” to explain the evolution of centrally planned economies in the Soviet Union and China. Deng used “robust action and multivocality” to anneal the residues that Mao left after the Cultural Revolution. Padgett shows why Gorbachev’s efforts to do something similar exploded rather than annealed in the quite different residues that Stalin left. For details of these lengthy analyses, readers need to consult the chapters. History is explained not as determinism but as finite and limited numbers of trajectories.

**IVb. Published article: “Organizational Invention and Elite Transformation: The Birth of Partnership Systems in Renaissance Florence,” American Journal of Sociology 111 (March 2006): 1463-1568. (co-authored with Paul McLean)**

This 106-page AJS article was the recipient of the 2008 best article of the year award from the ASA’s section on Comparative and Historical Sociology. In it, Padgett and McLean show how a new modularized business form called the partnership system emerged as an unintended consequence of political suppression of the Ciompi Revolt, through means of a cooptation-style network-invention process they dub “transposition and refunctionality.” “Transposition” was when previously local cambio bankers were coopted into the fragile post-Ciompi regime, in order build a moderate political coalition and in order to repopulate decimated international markets. “Refunctionality” is innovation not in the sense of a new widget for an old goal, but in the opposite sense of a new goal for an old widget. In this case, well established master-apprentice organizational skills, which all guildsmen used, were repurposed to fit into the new international context to which the post-Ciompi regime of moderates shipped them. When Powell discovered through conversation with Padgett at SFI that this same “transposition and refunctionality” network-invention mechanism also described the emergence of his own organizational invention, the biotech firm in Silicon Valley, the basis of their book collaboration was established. This and two following articles were based on the original primary-source archival data set described above, partly funded through NSF-HSD.

**IVc. Published article: “Open Elite? Social Mobility, Marriage, and Family in Florence, 1282-1494,” Renaissance Quarterly 63 (Summer 2010): 357-411. (plus on-line RQ appendix of 38 pages, as public data release)**

This article, published in a prestigious humanities journal for Renaissance studies, analyzed social mobility and the evolution of the family in Renaissance Florence, over a two-hundred year period. Measured three ways (economic, political, and intermarriage), this article documented strikingly high rates of intergenerational mobility among 1700+ families (lineages) across six 30-year panels. It also demonstrated that these high rates of intergenerational mobility were induced by a surprising lack of statistical correlation among four rival measures of social status—wealth, political office, political age, and family size. These measures of status were uncorrelated in the first place because of recurrent patterns of political revolt and upheaval during this period (‘punctuated equilibria’ if you will). Because of this orthogonality in the competing meanings of status, network attempts by ‘elite’ families to close in on themselves, by marrying each other on the dimension that defined their superiority, counterproductively produced

marriages among cross-class families, as defined by other dimensions. The net effect of elitist motivations, therefore, was counter-intuitively to create open elites with very high turnover. Through turnover and churning in status-competitive marriages, patrilineal kinship ideals of the previous feudal elite diffused downward into the rising middle class, even as that feudal elite itself dissolved. This downward diffusion of patrilineage had negative consequences for affected women in the Renaissance (as measured by our contemporary standards). On the other hand, Padgett also pointed out that intense status competition had positive consequences both for the market demand for art and science and for the social status of artists and scientists, both fueled by an explosion of patronage network ties.

Getting this article published in a lead humanities journal required a policy discussion by the RQ editorial board. To its credit, it decided to be open to atypical cooperation with the social sciences. This publication outlet has made Padgett's research accessible to radically different audiences, and it has triggered invitations for him to speak to and to collaborate with interesting scholars not usually found in social-science circles. (Then again, if art and science were not distinct in the Renaissance, why should they be so detached today?)

**IVd. Published article: "Economic Credit in Renaissance Florence," Journal of Modern History 83 (March 2011): 1-47. (co-authored with Paul McLean; plus on-line JMH appendix of 26 pages, as public data release)**

This article, published in lead history journal, analyzed credit relations among 400+ companies in eight industries in Renaissance Florence in the year 1427—essentially the entire import-export economy of Florence. The economic-credit data were drawn from *debitori* and *creditori* declarations those companies submitted to tax authorities during the famous 1427 *catasto*, arguably the first sophisticated tax recording of income as well as assets in European fiscal history. In Granovetter style, these intercompany credit data were then statistically compared with kinship, marriage, neighborhood, and political social-network data in the Padgett relational data set in order to measure varying degrees of "social embeddedness" in different industries and among different types of companies and social families. The findings were that social embeddedness was highest among the economically most advanced capitalist companies of the economy and among the socially highest status families in the polity. Directly contrary to the image of impersonal markets created by Weber, and reinforced by contemporary economists and institutional sociologists, Padgett and McLean find that capitalism progressed fastest during the Renaissance within profoundly personalistic social networks, through which huge volumes of credit flowed. Personalism led to economic progress, not to excessive corruption, because of the social network topology of fluid and open elites, emphasized in the previous article.

The behavioral foundations for these statistics were uncovered through textual linguistic analyses of business letters among merchants of the time. Anthropological gift-giving language was pervasive in these letters, though "gifts" were always carefully recorded in double-entry account books. The editor of JMH singled out this interweaving of quantitative and textual evidence as the methodological innovation in this article.

## V. WORK PLAN

The grant request is to fund two research teams for three years: one working in the Florentine archives, to code the data, and the other working in Chicago, to process the data and prepare it for public distribution. The PI will rotate back and forth between locations—teaching during the academic year at his home institution, the University of Chicago, and spending two- or three-month summers (plus other trips as necessary) in Florence. During Padgett's academic year in Chicago, the resident archival research team will be headed by Hungarian post-doc Katalin Prajda, a PhD in History from the European University Institute, who did her 2011 dissertation on the overlaps of kinship, political, patronage and trade networks in the Florentine community in Hungary during the Albizzi regime. Padgett has worked with Prajda for many years, first as member of her committee and more recently as a research collaborator. In addition to this Padgett



and Prajda core, professors Goldthwaite, McLean, and Caferro have generously agreed to provide guidance as unfunded consultants in their respective areas of expertise.

In addition to funding Padgett and Prajda, funding is requested to hire two additional employees at each site: two knowledgeable Florentine archivalists, likely to be Italians but not necessarily, and two University of Chicago graduate students and/or computer-savvy staffers.

## **VI. BROADER IMPACTS OF THE PROPOSED ACTIVITIES**

The direct intellectual purpose of the project is to write a book about organizational inventions in Renaissance Florence and the underlying co-evolution of social networks that generated those. Spillovers from this research on social evolution come in two forms: spillovers from the theory of co-evolution, and spillovers from public release of the data set.

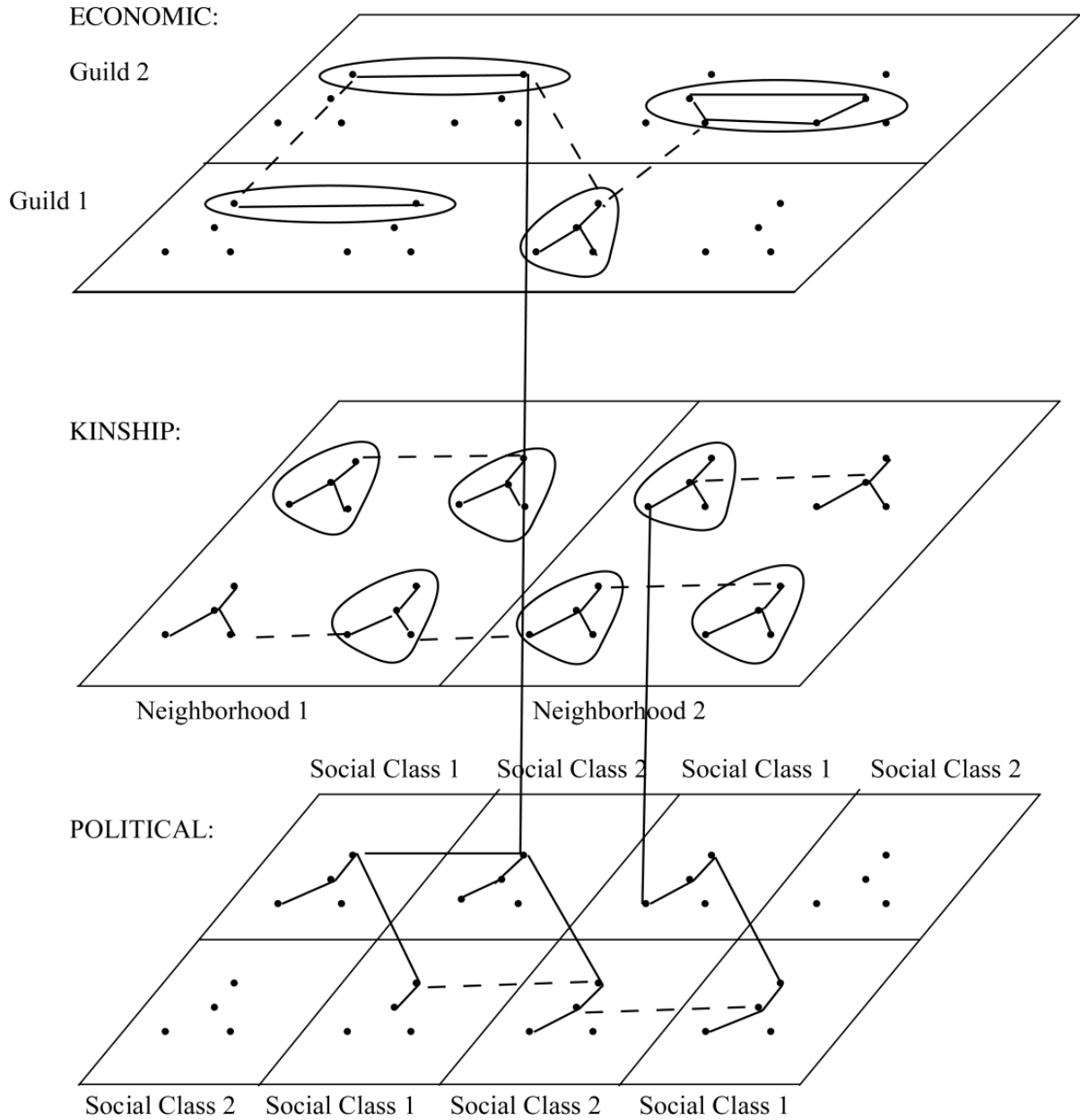
The research topics of the three modules in this project have fairly obvious analogues in pressing social-development issues of today: (a) economic resilience and industrial retooling, in the face of systemic shock; (b) stability and adaptation in republican political institutions, in the face of internal factionalism and revolt; and (c) the implications of social mobility for elite structure and cultural innovation. Neither Padgett nor any other serious student of history would claim that “lessons from history” are straightforward or clear. “Lessons from history,” indeed, is a naïve and misleadingly formulaic way to put it, when the lesson is question really is to think about and analyze cross-domain dynamic feedback processes.

That caveat notwithstanding, Padgett already has applied his theory of organizational invention and network co-evolution, which emerged out of his detailed study of Renaissance Florence, to medieval Italy, to early-modern Netherlands, to nineteenth-century Germany, and to twentieth-century communism in the Soviet Union and China. No proposal was ever submitted for “policy application” to these other historically profound cases. Instead, spillover to other application areas in Padgett’s own research emerged through the routine mechanism of teaching. As long as Padgett continues to teach, other historical application areas are already in the queue: French Revolution, Meiji Japan, and post-independence India.

Engagement of the theory with contemporary America came through collaboration with Woody Powell of Stanford University. Due to his deep immersion in network data and empirical context, Powell powerfully applied the perspective with great success to contemporary organizational innovation and network co-evolution in the biotechnology industry in Silicon Valley, Boston, and San Diego. Other contemporary cases in the Padgett-Powell book included the banking (Spicer) and telecom (Yabukovich) industries in post-Communist Russia, business groups in Hungary (Stark and Vedres), inventor networks in the American computer industry (Fleming et al.), and open-source software collaboration around the world (Ferraro and O’Mahoney). Contemporary application of the Florence-derived theory, therefore, is more than an empty promissory note. What future applications of the theory will be can no more be predicted now than they could in 2003, when the previous NSF-HSD application was written.

A second class of broader impacts of this project will derive from public release of the data set itself. No comparable data set, for any period much less for a period this far back, exists that traces changes simultaneously in economic, political, kinship and demographic domains over more than two hundred years. The value of these data to historians is self-evident. Ongoing work in economic, political and social history will be speeded up, and internal barriers between these subfields will be lowered. This data set will also become the *E.coli* for developing and testing all sorts of theories of social evolution and economic and political development. It is a commonplace these days in sociology and elsewhere to call for new models, data, and estimation techniques for dynamic networks. Often this means in practice, unfortunately, little more than stochastic convergence to equilibrium in big (but thin) data sets. To be historically and sociologically more fruitful than this, in ways that preserve the grander ambitions of the founders of sociology, requires new data up to the job. This project attempts to develop data that is cutting edge by those standards.

Figure 1. Multiple-network ensemble Renaissance Florence



Note: (a) Solid lines are constitutive ties. Dotted lines are relational social exchanges. Oblongs are formal organizations (families and firms.)

(b) People in multiple roles are vertical lines connecting corresponding dots in the domains of activity in which people are active. (Only two are shown for illustration.)

## References for Padgett NSF-Sociology proposal

- Alberti, Leon Battista. (1435) 1991. *On Painting*. New York: Penguin Books.
- Baron, Hans. 1966. *The Crisis of the Early Italian Renaissance: Civic Humanism and Republican Liberty in an Age of Classicism and Tyranny*. Princeton, N.J.: Princeton University Press.
- Baxandall, Michael. 1988. *Painting and Experience in Fifteenth Century Italy*. Oxford: Oxford University Press.
- Brucker, Gene A. 1962. *Florentine Politics and Society, 1343-1378*. Princeton, N.J.: Princeton University Press.
- Brucker, Gene A. 1968. "The Ciompi Revolution." Pp. 314-56 in *Florentine Studies*, edited by Nicolai Rubinstein. London: Faber.
- Brucker, Gene A. 1977. *The Civic World of Early Renaissance Florence*. Princeton, N.J.: Princeton University Press.
- Colyvas, Jeannette A., and Spiro Maroulis. 2012. "Academic Laboratories and the Reproduction of Proprietary Science: Modeling Organizational Rules through Autocatalytic Networks." Chapter 16 (pp. 496-519) in Padgett and Powell.
- Duby, Georges. 1994. *Love and Marriage in the Middle Ages*. Chicago: University of Chicago Press.
- Eigen Manfred, and Peter Schuster. 1979. *The Hypercycle: A Principle of Natural Self-Organization*. Berlin: Springer-Verlag.
- Ferraro, Fabrizio, and Siobhán O'Mahony. 2012. "Managing the Boundaries of an 'Open' Project." Chapter 18 (pp. 545-565) in Padgett and Powell.
- Fleming, Lee, Lyra Colfer, Alexandra Marin, and Jonathan McPhie. 2012. "Why the Valley Went First: Aggregation and Emergence in Regional Inventor Networks." Chapter 17 (pp. 520-544) in Padgett and Powell.
- Fontana, Walter, and Leo Buss. 1994. "The Arrival of the Fittest: Toward a Theory of Biological Organization." *Bulletin of Mathematical Biology* 56:1-64.
- Franceschi, Franco. 1993. *Oltre il Tumulto: I laboratori fiorentini dell'Arte della Lana fra Tre e Quattrocento*. Firenze: Leo S. Olschki.
- Goldthwaite, Richard A. 1993. *Wealth and the Demand for Art in Italy, 1300-1600*. Baltimore, Md.: Johns Hopkins University Press.
- Goldthwaite, Richard. 2009. *The Economy of Renaissance Florence*. Baltimore, Md.: Johns Hopkins University Press.
- Gorski, Philip. 2003. *The Disciplinary Revolution: Calvinism and the Rise of the State in Early Modern Europe*. Chicago: University of Chicago Press.
- Herlihy, David, and Christiane Klapisch-Zuber. 1985. *Tuscans and their Families: A Study of the Florentine Catasto of 1427*. New Haven: Yale University Press.
- Hofbauer, Josef, and Karl Sigmund. 1988. *The Theory of Evolution and Dynamical Systems*. Cambridge, England: Cambridge University Press.
- Hoshino, Hidetoshi. 1980. *L'Arte della Lana in Firenze nel basso medioevo: Il commercio della lana e il mercato dei panni fiorentini nei secoli XIII-XV*. Firenze: Leo S. Olschki.
- Kent, Dale. 1978. *The Rise of the Medici: Faction in Florence, 1426-1434*. Oxford: Oxford University Press.
- Litchfield, R. Burr. 1986. *Emergence of a Bureaucracy: The Florentine Patricians, 1530-1790*. Princeton, N.J.: Princeton University Press.
- Martines, Lauro. 1963. *The Social World of the Florentine Humanists*. Princeton, N.J.: Princeton University Press.
- McLean, Paul D. 1996. "Patronage and Political Culture: Frames, Networks, and Strategies of Self-Presentation in Renaissance Florence." Ph.D. dissertation, University of Chicago.
- McLean, Paul D. 1998. "A Frame Analysis of Favor Seeking in the Renaissance: Agency, Networks, and Political Culture." *American Journal of Sociology* 104: 51-91.

- McLean, Paul D. 2007. *The Art of the Network: Strategic Interaction and Patronage in Renaissance Florence*. Durham, N.C.: Duke University Press.
- Medici, Lorenzo de'. (1449-1492) 1977. *Lettere, volumes 1-18*. Istituto nazionale di studi sul Rinascimento.
- Molho, Anthony. 1971. *Florentine Public Finances in the Early Renaissance, 1400-1433*. Cambridge, Mass.: Harvard University Press.
- Molho, Anthony. 1994. *Marriage Alliance in Late Medieval Florence*. Cambridge, Mass.: Harvard University Press.
- Najemy, John M. 1982. *Corporatism and Consensus in Florentine Electoral Politics, 1280-1400*. Chapel Hill, N.C.: University of North Carolina Press.
- Padgett, John F., and Christopher K. Ansell. 1993. "Robust Action and the Rise of the Medici, 1400-1431." *American Journal of Sociology* 98:1259-1319.
- Padgett, John F., and Paul D. McLean. 2006. "Organizational Invention and Elite Transformation: The Birth of Partnership Systems in Renaissance Florence." *American Journal of Sociology* 111:1463-1568.
- Padgett, John F. 2010. "Open Elite? Social Mobility, Marriage, and Family in Florence, 1282-1494." *Renaissance Quarterly* 63:357-411.
- Padgett, John F. and Paul D. McLean. 2011. "Economic Credit in Renaissance Florence." *Journal of Modern History* 83:1-47.
- Padgett, John F., and Walter W. Powell. 2012. *The Emergence of Organizations and Markets*. Princeton, N.J.: Princeton University Press.
- Padgett, John F., and Walter W. Powell. 2012a. "The Problem of Emergence." Chapter 1 (pp. 1-30) in Padgett and Powell.
- Padgett, John F. 2012b. "Autocatalysis in Chemistry and the Origin of Life." Chapter 2 (pp. 33-69) in Padgett and Powell.
- Padgett, John F., Peter McMahan, and Xing Zhong. 2012c. "Economic Production as Chemistry II." Chapter 3 (pp. 70-91) in Padgett and Powell.
- Padgett, John F. 2012d. "From Chemical to Social Networks." Chapter 4 (pp. 92-114) in Padgett and Powell.
- Padgett, John F. 2012e. "The Emergence of Corporate Merchant-Banks in Dugento Tuscany." Chapter 5 (pp. 121-167) in Padgett and Powell.
- Padgett, John F. 2012f. "Transposition and Refunctionality: The Birth of Partnership Systems in Renaissance Florence." Chapter 6 (pp. 168-207) in Padgett and Powell.
- Padgett, John F. 2012g. "Country as Global Market: Netherlands, Calvinism, and the Joint-Stock Company." Chapter 7 (pp. 208-234) in Padgett and Powell.
- Padgett, John F., and Jonathan Obert. 2012h. "Conflict Displacement and Dual Inclusion in the Construction of Germany." Chapter 8 (pp. 235-266) in Padgett and Powell.
- Padgett, John F. 2012i. "The Politics of Communist Economic Reform: Soviet Union and China." Chapter 9 (pp. 271-315) in Padgett and Powell.
- Pocock, J.G.A. 1975. *The Machiavellian Moment: Florentine Political Thought and the Atlantic Republican Tradition*. Princeton, N.J.: Princeton University Press.
- Polizzotto, Lorenzo. 1994. *The Elect Nation: The Savonarolan Movement in Florence, 1495-1545*. Oxford: Clarendon Press.
- Powell, Walter W., and Kurt Sandholtz. 2012a. "Chance, Nécessité, et Naïveté: Ingredients to Create a New Organizational Form." Chapter 13 (pp. 379-433) in Padgett and Powell.
- Powell, Walter W., Kelley Packalen, and Kjersten Whittington. 2012b. "Organizational and Institutional Genesis: The Emergence of High-Tech Clusters in the Life Sciences." Chapter 14 (pp. 434-465) in Padgett and Powell.
- Powell, Walter W., and Jason Owen-Smith. 2012c. "An Open Elite: Arbiters, Catalysts, or Gatekeepers in the Dynamics of Industry Evolution?" Chapter 15 (pp. 466-495) in Padgett and Powell.

- Prajda, Katalin. 2011. *Rapporti tra la Repubblica Fiorentina e il Regno d'Ungheria a livello di diplomazia, migrazione umana, reti mercantile e mediazione cultural nell'età del regime oligarchio (1382-1434), che corrisponde al regno di Sigismondo di Lussemburgo (1387-1437)*. Ph.D. dissertation, Department of History. European University Institute.
- Romano, Dennis. 1987. *Patricians and Popolani: The Social Foundations of the Venetian Renaissance State*. Baltimore, Md.: Johns Hopkins University Press.
- Rubinstein, Nicolai. 1966. *The Government of Florence under the Medici (1434 to 1494)*. Oxford: Clarendon Press.
- Sewell, William H. Jr. 2005. *Logics of History: Social Theory and Social Transformation*. Chicago: University of Chicago Press.
- Andrew Spicer. 2012. "Deviations from Design: The Emergence of New Financial Markets and Organizations in Yeltsin's Russia." Chapter 10 (pp. 316-333) in Padgett and Powell.
- Stark, David, and Balázs Vedres. 2012. "Social Sequence Analysis: Ownership Networks, Political Ties, and Foreign Investment in Hungary." Chapter 12 (pp. 347-374) in Padgett and Powell.
- Stone, Lawrence, and Jeanne C. Fawtier Stone. 1986. *An Open Elite? England 1540-1880*. Oxford: Oxford University Press.
- Tognetti, Sergio. 2002. *Un'industria di lusso al servizio del grande commercio: Il mercato dei drappi serici e della seta nella Firenze del Quattrocento*. Firenze: Leo S. Olschki.
- Vasari, Georgio. (1550) 1991. *The Lives of the Artists*. New York: Oxford University Press.
- Weber, Max. 1930. *The Protestant Ethic and the Spirit of Capitalism*. London: Allen and Unwin.
- Weissman, Ronald. 1982. *Ritual Brotherhood in Renaissance Florence*. New York: Academic Press.
- White, Harrison C. 1992. *Identity and Control: A Structural Theory of Social Action*. Princeton, N.J.: Princeton University Press.
- Yakubovich, Valery, and Stanislav Shekshnia. 2012. "The Emergence of the Russian Mobile Telecom Market: Local Technical Leadership and Global Investors in a Shadow of the State." Chapter 11 (pp. 334-346) in Padgett and Powell.

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5 August 2013

National Science Foundation  
Sociology division

I write to support the project of Professor John Padgett, "Co-evolution of Economic, Political, and Kinship Networks in Renaissance Florence."

Let me say right off that I am in no position to evaluate Padgett as a sociologist: I am a historian, not a sociologist, and I do not know his work in that discipline. For many years now, however, he has been doing research in late medieval documents in the Florentine archives to give an historical dimension to some of his sociological ideas, and I think that I am in a fairly good position to judge that work, being a Florentine historian who has specialized in the economic history of the city.

Medieval Italy has attracted many scholars from the social sciences, chiefly sociologists and economists, who have sought to develop or substantiate explanatory models of behavior on the basis of historical materials; but to my knowledge Padgett stands head and shoulders above all the others in that he did not just spend a summer or two "working up" his knowledge of the historical background (I won't mention any names!) but instead embarked on a major research campaign in Florentine documents of the 14<sup>th</sup> and early 15<sup>th</sup> century that has now been underway for many years and shows no sign of letting up. His research is directed to defining the structures – political, economic, familial – through which members of the elite were tied together in networks, some overlapping and some exclusive. He has a voracious appetite for all the sources that supply him with lists of people that indicate relations among them, such as marriages, rosters of public office, company partners, debit and credit ties and even (most recently) participation on government committees as reflected in minutes of meetings – and no archive of a medieval city is nearly so rich in relevant materials as that of Florence. Moreover, he has the intellectual equipment to fit the data into interpretative schemes.

In applying his sociological interest to the analysis of this material, he is addressing problems that are at the very center of historians' interest in, and debates about, the history of this city. There is much talk among us Florentine historians about elites and networks that lay behind the fluid political life of this republic, but most historians tend to be rather vague when it comes to precise identification of these terms. Padgett, instead, has the solid statistical evidence to support his definitions; and however critical historians may be of his work – and on many occasions I for one have expressed my criticisms to him, especially of his ideas about the economy – he has provided a foundation of new data and interpretive frameworks for a fresh start in the study of some of the most basic issues in Florentine historiography. Moreover, in reporting out his research and addressing these issues, Padgett has avoided the kind of polemics that so characterizes my field. In this respect, by the way, in the true spirit of scholarship as a community enterprise, he has always made his materials immediately available on the internet, for all to use, along with working drafts of articles still in progress. I myself have used those materials extensively, and my research is much better for that.

Until now Padgett has concentrated on the pre-Medicean period in the history of the Florentine republic, that is down to the regime established by Cosimo de' Medici in 1434; and now he wants to expand his research into the subsequent period, taking the republic

down to its final demise with the advent of the Medici principedom in 1531. This is a period during which the network structure of Florentine political society has been much more elusive to historians than it is in the earlier period. That structure was subordinate to the dominant but informal influence of the Medici down to the expulsion of Lorenzo the Magnificent's son in 1494; but at this point it broke open in vigorous, even violent, divisions as the city faced invasions from abroad and popular, religious-inspired revolt from within. The consequent political vicissitudes of the last four decades of the republic generated the most intellectually stimulating debates about the nature of political order and, even, the meaning of history, that any place in medieval Europe had ever experienced (suffice it to mention the names of Machiavelli and Guicciardini). This is a period in Florentine history most debated by historians of all stripes—political, social, intellectual; and a primary problem behind these debates is very basic: who are the people involved? The answers are all based on vague, slippery notions of class, elites, factions, families, parties (even!)—in short, all those groups that can be defined as constituting networks. What Padgett offers to contribute to this situation is a vast body of statistically analyzable data derived from archival sources that can be used to construct some much more solid networks, especially those based on ties of family relationships, of political positions, of economic interests

Whatever he does with these data for his sociological models (which I have no competence to judge, in fact slight understanding of what they all about!), Padgett will present two tools that will serve historians of this period. The first is a complex of hypotheses about behavior built on the data base (and obviously further informed by his experience as an historical sociologist) that will enrich the discourse among historians about this important period in the history of Florence, whether in the end they agree with him or not. The second tool will be a data base that historians can exploit for their own purposes, probably including some not even envisaged in Padgett's project. These are the tools that to date Padgett has put in the hands of historians of the earlier period of Florentine history through articles published in at least two of our most prestigious journals; and the same tools, now honed for a different period, are bound to have an even greater impact on the more lively, more diverse and more wide-ranging debates in the historiography of this later period. Moreover, it is to be hoped that a project of this dimension serve as a stimulus, if not a model, for the similar study of other Italian cities with an equally complex internal history, above all Venice and Genoa.

The most serious problem that confronts Padgett at this point is identification of documents that lend themselves to the kind of analysis he wants to do, for some of the most important series for his study of the earlier period do not continue through the rest of the century, at least not without significant change in relevant quality if not quantity. He has in fact identified what I should think are the most promising sources, but whether they will fulfill that promise remains to be seen. That is why he needs assistant, first for exploratory searches and then, of course, for data collecting. Such assistant can be easily found in Italy, where 40% of young people are unemployed, including many highly qualified holders of doctorates well trained in archival research. And I can assure you that notwithstanding the extraordinary quantity of extant documents for this city begging for systematic analysis – tax records, minutes of meetings of political bodies, minutes of court proceedings in cases involving debit-credit relations, treasury records of state bond holders, private account books - no historian has ever attempted to take on any one of these sources, probably because the overwhelming quantity of material, while begging for the kind of research Padgett proposes, simply intimidate the individual historian ill equipped to know how to deal with it. Padgett, with his vast experience in documents of the earlier period, his expertise in the use of the most sophisticated computer programs,

and a staff of trained researchers is in the unique position of being able to take on these documents according to a well-defined program of research.

I am certainly willing to be a consultant for this project. I think I can help in dealing with at least some of the technical problems involved in particular archival collections, and above all I am anxious that specific research campaigns lead to results of use, at both the interpretive and factual level, to historians as well as to sociologists. In the entire historiography of this city, as notable for the extent of its archives as it is for the richness of its cultural traditions, Padgett's research project to date has been by far the most ambitious and the most comprehensive, its merits are well established, and this proposal to extend it chronologically through to the end of the republican period deserves all the support it can get.

Richard A. Goldthwaite  
Professor of history, emeritus  
The Johns Hopkins University



August 5, 2013

To: The National Science Foundation,  
Sociology division

From: Paul D. McLean

Re: "Co-evolution of Economic, Political, and Kinship Networks in Renaissance Florence,"  
(proposal submitted by John F. Padgett, University of Chicago)

Dear Colleagues,

It is with great pleasure and enthusiasm that I write to you to indicate my strong commitment to participate as an unfunded collaborator in the project named above, submitted by John F. Padgett of the University of Chicago. I have been involved in one way or another in Professor Padgett's work on Florence for almost twenty-five years, working first as his student and RA, and later as his co-author on three major journal articles. Under his tutelage I worked on the project that eventually became my first book (*The Art of the Network: Strategic Interaction and Patronage in Renaissance Florence*; Duke UP, 2007). I have gotten a lot out of Padgett's research, materially and intellectually, and I am more than happy to put something back in.

I can attest first-hand to the immensity of the data collection project Padgett has already completed, chronicling in minute detail social relations of multiple sorts over a period of more than two hundred years in one of the locations on the globe most vital to the emergence of modernity. Truly there is no dataset of comparable size and richness available, not only to Florentine historians, but to *any* historians interested in pre-modern social structures, kinship dynamics, social mobility, early modern commercial development, deliberative republicanism, and a host of other topics. Furthermore, other historical datasets may be large, but typically they concern only one domain of social life. What is truly unique about the Florence data is how it allows us to examine multiple spheres of social life at once, thereby situating actors, actions, and institutions in a far richer context of social influences and social dynamics, and in a more systematic way, than is possible anywhere else.

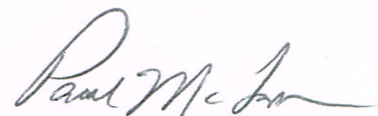
Above and beyond the historical payoff of Padgett's research, it is precisely its theoretical sophistication, and the architecture of connections, constraints, recombination, and cascading across multiple network domains that he has described for the case of Florence, that gives his work such wide appeal to sociologists and to social network analysts. "Padgett's dataset," as it is commonly called in the social networks community (although most of them don't know a tenth or a hundredth of what that actually means), attracts them for the opportunities it provides to examine fundamental social processes of homophily, group formation, network growth, social stratification, alliance building, institutional emergence and innovation, and so on. It has the potential for the long term to become a kind of *Arabidopsis thaliana* of sociological research.

As it currently stands, the dataset (really, a massive relational database of conjoined datasets) is remarkable. Nevertheless, most of the data already amassed was gathered, coded, and organized in the last century with last century's techniques. Many of the components of the overall dataset were collected by individual historians and social scientists (myself being a case in point) working predominantly alone. That means that occasional difficult data collection issues were sometimes resolved without discussion among experts (a sound technique historians frequently can be seen employing in the archives) and without some degree of inter-coder reliability; and coding and cataloguing decisions were inevitably made without sufficient attention to the desirability of having multiple datasets speak to each other clearly. It would be fabulous to see the existing data further cleaned and further classified for easier use. Furthermore, I can personally attest to the intractability of much of the textual data in the archives, especially business and personal correspondence from before roughly 1450. It would be highly desirable to collect this data more systematically, but that can be done only with more input from historians on site possessing superior philological and paleographic skills. With such input, though, this project actually presents an exciting opportunity to link ancient skills of textual deciphering with twenty-first century techniques of textual data mining, topic modelling, and semantic network analysis. I want to be a part of that. Such techniques were simply not part of my repertoire when I analyzed a small sample of such textual materials some years ago in my book.

I would like to mention briefly two other justifications for funding this project. First, I know for a fact that archival materials are scarcer and more dispersed for the fourteenth century than they are for the later fifteenth century. Yet there are sources – notarial records for example – that could be tapped, *if* sufficient manpower can be directed at them. This is not a one-person job. Second, I know for a fact that data on commercial credit networks exists, more or less comparable to the 1427 data Padgett and I used in our 2006 and 2011 articles, for later years in the fifteenth century. Gathering that data would allow for more or less unprecedented analysis of changes in historical economic network structures. I would love to see that data coded, and I'd be happy to do whatever I can to help it happen.

By way of conclusion, let me simply reiterate that I would be honored and delighted to support this project, using whatever expertise I possess and whatever experience-based advice I can muster, both for the short-term benefits I can see it having for me, and for the long-term opportunities it promises to provide to future generations of historians and social scientists.

Sincerely yours,



Paul McLean  
Associate Professor



National Science Foundation  
Sociology division

Dear Colleagues

It is with great enthusiasm that I write in support of John Padgett's project *Co-evolution of Economic, Political, and Kinship Networks in Renaissance Florence*. Professor Padgett is well known to Florentinists for his important essays on social and economic networks in the city. His proposal represents an extension of his provocative and original line of inquiry; the massive data base he will assemble will be an invaluable tool for all historians of the era (and augment the already large data sets that he has gathered). I look forward to working with him on the project.

I evaluate Professor Padgett as a historian, who knows little of the terms of discussion of his primary field, sociology. It is a tribute to this proposal (and Padgett's work more generally) that it crosses rigid disciplinary lines and provides much needed perspective for historians on their own methodology. I have known Professor Padgett for fifteen years, having met him (at a conference on banking at Saint Louis University) when he first began his study of Florence. We have regularly discussed our projects and ideas, served on panels together and most recently worked in close proximity in the Florentine archives. It is in the context of the archive that I have seen Professor Padgett's unflagging energy and determination to do the difficult and often exhausting labor of digging out data directly from original documents. He was the first person in the archive in the morning and the last one to leave, often with a very minimal break. Given his different disciplinary background, he is inclined to look at materials that others have neglected or at materials well worked through but from a different perspective and with an entirely different set of questions. Thus his broader theoretical observations—however uncomfortable they sometimes make more “conservative” historians such as myself—are grounded in solid and wide-ranging archival research. This has earned Padgett great respect and admiration.

Padgett has routinely addressed “big” socio-economic Renaissance questions--the functioning of credit markets, individualistic versus associative commercial practices, network alignments, the role of trust and the status of double entry bookkeeping. The topics are central to current historical debates, but go still further, beyond the confines of Florence and the Renaissance, to basic issues about the nature of capitalism and Western kinship networks. They may be judged in terms of the work of economists such as Avner Greif. But Padgett offers a far greater empirical apparatus and understanding of the historical context. Padgett's project for the NSF follows naturally from his earlier work. He proposes to move forward in time to the period of Lorenzo de' Medici and just afterward, a period for which the current historical scholarship is somewhat uneven. It is a good choice. Combined with his studies of the earlier era, Padgett is well positioned to provide a very unique *longue durée*, as he promises.

It is important to stress the scope and importance of the archival research Padgett has proposed. He has identified a wide range of sources--many of which he has already begun working with—that will uncover a treasure trove of new information. The project compares to Herlihy and Klapisch-Zuber's great work on the *catasto* of 1427, but is far more diversified. It will be quite a

challenge and certainly require the group of assistants that Padgett seeks to employ. Having myself worked for nearly two decades in the Florentine and other archives in Italy, I look forward to consulting with Padgett along way, working together on material relating to *trecento* bankers and the economics of violence, my area of expertise. With his considerable experience with documents and his clearly defined theoretical framework of study, Professor Padgett is I think uniquely positioned to handle the rigorous course he has set for himself and produce a truly original work of scholarship.

Sincerely.

William Caferro

Gertrude Conaway Vanderbilt Professor

Department of History

Vanderbilt University