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A Sociology of Power: My Intellectual Journey

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Abstract

This is an autobiographical review of the published research that I did over five decades of my academic life, from 1965 to 2015. It highlights the common thread that brings together my intellectual project through a great diversity of topics: the quest for a grounded theory of power. The review presents the gradual emergence of this theory without disguising the difficulties and contradictions in its development. I consider power relationships to be the foundational relationships of society in all domains. Here, I show how my research used this approach to study urban structure and spatial dynamics; the uses and consequences of information technologies; the process of globalization; the formation of a new social structure, the network society; and the interaction between communication and power in a digital environment. Finally, I propose a network theory of power in the network society, the society we are in.

INTRODUCTION: WHY POWER?

This text is an autobiographical review of my scholarly contribution to sociology over five decades. Throughout this span of time I have researched many different topics: urban sociology; social movements; sociology of development; the sociology of economic crises; the origins, structure, and dynamics of contemporary globalization; the critical role of cultural identity in resisting and shaping globalization; the social dimensions of the information and communication technology revolution; the rise of a new social structure, which I conceptualized as a network society; the social construction of the Internet and the transformation of communication; the formation of power relationships in the space of communication; and the specific dynamics of power and counterpower, including social movements, in the network society, which led me to propose a network theory of power.

Yet, in spite of this diversity, a recurrent theme has been the focus of my research and the nucleus of my theoretical construction: power, in the multidimensionality of its manifestations. The reason for selecting power as the key subject of my empirical observation and theoretical elaboration stems from a personal insight, early on in my intellectual trajectory, that power is the key to understanding the primary source of social structuration and dynamics. I consider power relationships as the foundational relationships of society because they construct and shape the institutions and norms that regulate social life. Moreover, those social actors who exercise power construct the dominant institutions and organizations in any given society according to their own values and interests, in a configuration that is specific to each society—and which is derived from its history, geography, and culture. I understand power as the relational capacity that enables certain social actors to asymmetrically influence the decisions of other actors in ways that favor the empowered actors' will, interests, and values. Power is exercised by means of coercion (the monopoly of violence, legitimate or not, by the state) and/or by the construction of meaning in people's minds through mechanisms of cultural production and distribution. Although power relationships are embedded in the institutions of society and particularly within the state, they permeate all dimensions of human activity—particularly in finance, production, consumption, trade, media, communication, culture, health, education, science, technology, and the social construction of space and time.

Those actors who exercise power do so by establishing institutions, laws, and communication systems that express their interests and values and that shape the patterns of social conduct, of what is rewarded, punished, or ignored. To be sure, this is not a simple process of linear causation. Power exercisers are diverse, they operate through alliances to find convergence points in their interests and values, and they work on preexisting institutions that reflect previous patterns of domination. Furthermore, institutionalized power, together with its rules, is always facing resistance by those actors whose interests and values are not sufficiently represented in the dominant institutions: It induces counterpower relationships, by which I mean processes that aim at reversing or renegotiating the rules of society that favor those actors who are structurally dominant in social institutions. At any given point in time in any given society, institutions and norms are the expression of the state of power relationships, in terms both of institutionalized norms and of the struggles and negotiations that challenge the persistence of these norms. This is an endless process of social construction and deconstruction, always caught in a precarious balance between the reproduction of the social structure and the transformation of this same social structure.

The challenges that emerge from alternative value systems, which are projected by new subjects in their efforts to transform society, are at the heart of the process of history making. Thus, I always considered power relationships to be the DNA of societies, the source code of all cultures, and the thread that links everything and ultimately reveals the possible paths of evolution of social life.

At the onset of my research effort, in the late 1960s, the perspective outlined above was more a subjective approach than a theory. Because I did not think that there was just one exclusive site of power and counterpower (e.g., the State or Capital), I explored power making and social movements in a variety of dimensions and contexts. I did so not by following a purposive design, but by using whatever opportunity of research I had in a particular domain to test my hypothesis of the centrality of power in every social process. I started with the study of power in the field of urban sociology, as I will detail below, simply because it was the topic of my dissertation as per the compelling advice of my mentor, Alain Touraine. Yet, my overall intellectual perspective was based on the project of following the signs and expressions of power relationships wherever my research would take me, in the hope that the thread I was unveiling could weave the expressions of a recurrent logic in different domains of human experience.

My investigation proceeded based on two premises: first, a cross-cultural approach to the study of society; second, the embrace of grounded theory as a strategy of theory building. I would start with theoretical constructs but always use them as research tools to be modified and systematized only in terms of their usefulness in the process of discovery. This utilitarian view of theory meant that theory building was always (and still is) for me a work in progress, and therefore I would not attempt to develop a closed theoretical system. Instead, my goal was and is to construct an open-ended theoretical field whose boundaries constantly expand and reconfigure with the incorporation of new findings and insights.¹

These premises (that were explicit in my mind and in my writing)² led to two methodological choices: On the one hand, I conducted my research in many different cultural and institutional contexts. Indeed, I do not trust theoretical constructs that have been solely originated in the confines of a given cultural and institutional boundary and never tested and rectified beyond this boundary. I tried to escape the implicit ethnocentrism I saw dominating in most social sciences research, with the exception of studies that were explicitly comparative. This is not to say that theoretical tools cannot be used in different contexts. Rather, what I mean to say is that the production of generalizable theoretical tools must be influenced by a diversity of contexts if it purports to go beyond description to build, gradually, an understanding of the human experience in its diversity. And so, I took advantage of my personal and academic mobility (which was sometimes forced upon me, as I was a young exile from Franco's Spain) to work and research in many different contexts—in chronological sequence, in France, Latin America, Spain, California, the Asian Pacific, the Soviet Union, Catalonia, Finland, and the European Union at large. These were not simply traveling experiences, but research projects resulting in published monographs, as shown in the bibliographical references of this review. I want to emphasize that this cultural diversity decisively influenced the construction of my analytical framework, as I tried to adapt it to every field of observation I engaged with.

The second premise was and is my deliberate option to engage in grounded theory rather than in grand theory. This meant that all my work had to have an empirical foundation. Of course, any empirical research requires theoretical tools and assumptions; but in my case, I would say, in accordance with most American sociology and in contrast with the French context where I was formed as a sociologist, I went further. All my theoretical elaborations were based on empirical analyses of a different kind, with a very eclectic methodological approach: synthesis of secondary

¹My epistemological approach, particularly concerning the process of theory building, was very influenced, from my early years, by Gaston Bachelard (see Bachelard 1934).

²I made explicit my reliance on a grounded-theory strategy of theorizing in *La question urbaine* [Castells 1972 (1975)], particularly in the postface to the 1975 revised edition, and in *The City and the Grassroots* (Castells 1983).

sources, statistical analysis, survey research, and, foremost in my life as a researcher, ethnography and in-depth interviews (by the hundreds), in many different contexts. I always needed to see the human faces behind the analysis I was elaborating. I still do.

Having laid out the goals and means of my intellectual project, I will now turn to summarizing my analysis of power in some of the domains of my research, reserving space to present in more detail my elaboration of a network theory of power grounded in my cross-cultural study of what I conceptualized as the network society. In doing so I will avoid imposing a reconstructed theoretical logic on the original investigation. Instead, I will highlight the hesitant paths that led me from my earlier conceptualization of power to my current, integrated formulation of a multidimensional power structured around networks of actors and their practices.

POWER ON THE CITY

The process of urbanization has always been a major structuring force in the ways in which humans live: The power of cities over the countryside has been recognized as a key lever of social domination (Mumford 1961, Sorre 1952). The rise of empires was associated with the construction of major metropolitan centers with broad territorial reach (Hall 1998). The process of industrialization, and its impact on migrations, uprooted peasant communities and constituted urban concentrations of increasingly large populations in which new forms of habitat and sociability emerged, as social classes were formed and social stratification marked space through processes of segregation and territorial succession (Massey 2005, Massey & Brodmann 2014).

Classic urban sociology, as represented particularly by the Chicago School, came to be one of the most fascinating disciplines in the social sciences that emerged in the early twentieth century. It was largely focused on ecological patterning and on the integration of vastly different immigrant cultures in a shared urban culture (Park & Burgess 1925, Wirth 1938). Power relationships were not ignored by the Chicago sociologists, but came to be understood as the process of formation of local elites and of the mechanisms of patronage and manipulation through which the fragile institutions of governance could become sources of control of a populace always suspected of deviating from the norms (Banfield 1970, Dahl 1961, Hunter 1953). On the other hand, Marxist sociology, a most influential strain of thought outside the United States, basically ignored urban issues as relevant for social change until the 1970s, when the so-called New Urban Sociology emerged in France [Castells 1968, 1972 (1975); Lefebvre 1968, 1970] and in England (Harvey 1973, Pahl 1970). Marx and Engels's emphasis on the division of labor between cities and countryside [Marx & Engels 1846 (1932)] and the pamphlet of Engels (1872) on the housing question were among the few signs of attention to the urban question in the classic Marxist writings. The obvious reason for that intellectual blind spot is that in the original Marxist perspective, the structure of society was supposed to be determined by production relationships under the logic of capital, and social change was expected to originate from the industrial working class engaging in class struggle rather than in urban protests. My work in the 1970s in France and 1980s in the United States contributed, alongside that of other colleagues, a new perspective on urban social change (Susser 2002).³ In *The Urban Question* (1977) and in *City, Class and Power* (1978) I tried to show the interaction between relationships of production and relationships of collective consumption (that is, consumption of public goods mediated by the state) in the formation of urban space and in the overall dynamics of society. I also rejected the isolation of the "urban" as a special

³For a discussion and presentation of my research and theory in urban sociology, I refer to the volume edited and commented on by Ida Susser (2002).

condition that would supersede class relationships and capitalist cultural domination in urban life. Yet, at the same time, I emphasized the significance of collective consumption conflicts and of spatial forms and processes in the dynamics of structuration and change in the whole of society. I tried to integrate the “urban” in the “sociopolitical,” focusing on the transformative potential of urban social movements in society at large. I studied urban social movements for 12 years, both historically and through ethnographic work, in France, England, Latin America, Madrid, and San Francisco, to show how “citizens make cities” by projecting their values and interests in social mobilizations rooted in multidimensional issues that are not only *in* the city, but *about* the city (Castells 1983). Thus, I showed that the key traces of social power were to be found beyond the local political game that was the classical theme of the pluralist school of urban political science. In my perspective, the most important matter is which kind of society and which kind of city are produced and experienced spatially, culturally, and institutionally, by which macrosocial forces, and by which actors in their conflictive interaction. In contrast to a Marxist class struggle approach, I brought urban space to the forefront of structural domination and social change. In contrast to the Chicago School, I emphasized the conflictive processes by which cities, and space in general, are produced, contested, and transformed. In contrast to pluralist political science, I analyzed not just power *in* the city but power *on* the city—that is, how cities, like society in general, are largely shaped in their spatial forms and institutional processes by underlying power relationships.

THE RISE OF THE NETWORK SOCIETY⁴

In the mid-1980s, having completed an undeclared urban trilogy that investigated in three books the dynamics of the urban system [Castells 1972 (1975)], urban institutional politics (Castells 1977), and urban social movements (Castells 1983), I turned my attention, from my new vantage point in Berkeley, to a major structural transformation in the making: the emergence of a new social structure, identified by some as postindustrial, that I gradually conceptualized as a global network society. The magnitude of the technological and morphological transformation was such that my original approach did not focus on power, although it was always in my mind as the fundamental question that ultimately would have to be answered and that foreshadowed my later development of a theory of power in *Communication Power* (Castells 2009).

My effort to comprehend the global network society took me 15 years. This is because I had to research around the world so that my investigation would avoid the ethnocentric trap that characterized early theories of postindustrialism. Moreover, a key dimension of the global network society was globalization, by which I mean the organization of key dimensions of society (starting with the economy) in global networks that became the operating units of much human activity. Because the new social structure deployed its logic globally, I investigated the interaction between the common features of the global network society and the specificity of each context that was affected by global trends. I introduced in my analysis of this global transformation the conflict between the forces that were driving globalization, powered by information technology, and the forces that were resisting globalization as the imposition of dominant values and interests while building their resistance on specific cultural identities. From the outset, I attempted in my study of the Information Age to comprehend the contradictory interaction between the Net and the Self, that is, between the logic of global networks of power and the power of identity. I also extended

⁴For a critical presentation of my theory of the network society, I refer to the book by Stalder (2006). A scholarly selection of reviews and critiques of my work on the Information Age can be found in the three volumes edited by Webster & Dimitriou (2004).

the analysis to the transformation of the state. Indeed, caught in the conflict between the instrumental forces of globalization and the identity-based resistance of their national constituencies, the traditional nation-state faced increasing institutional crises and was compelled to explore new political forms of domination, representation, and governance. As a result of my cross-cultural, global investigation, I wrote a trilogy, *The Information Age: Economy, Society and Culture* [Castells 1996–1998 (2000–2003)], which contained both an empirical analysis and a grounded theoretical interpretation of the processes of structural change that were ushering in a new form of society. In the first volume, *The Rise of the Network Society* [Castells 1996 (2000)], I explored the genesis, contours, and implications of this new social structure by studying it in a variety of contexts around the world. I showed that the genesis of this new society took place in the last quarter of the twentieth century through the interaction of three independent processes that happened to coincide in time: the emergence in the 1970s of a new technological paradigm based on microelectronics and digital information/communication technologies; the socioeconomic restructuring of both capitalism and statism (with different fates for these antagonistic modes of production) to overcome their crises of the 1970s; and the cultural social movements that emerged in the 1960s in the United States and Western Europe, largely as an expression of a culture of freedom and autonomy that would find a perfect fit in the digital networks of horizontal, unfettered communication.

First, I studied the formation of a new technological paradigm based on the deployment of new information and communication technologies, including genetic engineering as the information technology of the living matter. Technological change has to be understood as a socially embedded process, not as an exogenous factor impacting society. Yet, technology is an essential dimension of overall structural change, as new information technologies allow the formation of new forms of social and economic organization and social interaction along electronically powered communication networks. In the same way that the industrial revolution, based upon the generation and distribution of energy, could not be separated from the industrial society that characterized the last two centuries, the information/communication technology revolution, still unfolding, is a powerful lever of multidimensional changes in society, and an indispensable component of the emergence of new forms of production and management, of new communication media, of processes of globalization of the economy and culture, and of networked social movements.

The second dimension of social change, resulting from the process of restructuring capitalism after the economic crisis of the mid-1970s, is an organizational transformation: the networking of economic and social activities. Perhaps the most important manifestation of this networking logic was the rise of contemporary globalization, understood as the technological, organizational, and institutional capacity of the core components of a given system (e.g., the economy) to work as a unit in real or chosen time on a planetary scale. This is historically new, in contrast with past forms of advanced internationalization, which could not rely on information and communication technologies able to handle the current size, complexity, and speed of the global system.

I started my analysis of technological change and global restructuring of the economy in the Silicon Valley, the original site of the technological revolution of our time. Yet, in coherence with my premise of cross-cultural observation, I conducted parallel studies of the same processes in other contexts. Thus, I pursued my work on Europe and on Latin America, conducting a major research project on the interaction between new technologies and economic restructuring in Spain (Castells et al. 1986). I did fieldwork in countries of the Asian Pacific that were engaged in a process of technological change along a very different trajectory than the one epitomized by the Silicon Valley, primarily led by the developmental state. From 1983 to 1995 I taught and researched in Hong Kong, Singapore, Taiwan, South Korea, China, and Japan, and published several works (Carnoy & Castells 1988; Castells 1988, 1992; Castells & Hall 1994; Castells et al. 1990), including empirical analyses of these institutional variations of the network society in several chapters of

my trilogy. Furthermore, thanks to my collaboration with Emma Kiselyova, I could undertake a similar study of the Soviet Union at the time of perestroika, focusing on the insurmountable contradictions between the planned, military-oriented economy and the organizational requirements of the information revolution, ultimately resulting in the collapse of the Soviet System (Castells & Kiselyova 1995). Thus, my study of the network society was truly global in the research I conducted, including the counterexample of the Soviet Union to show the inability of the institutions of industrialism to manage the networking and informational logic of the new social structure.

The third dimension of the analysis proposed in my trilogy focused on a fundamental cultural change characterized by the rise of a culture of autonomy, originated by the social movements of the 1960s and 1970s and empowered by the spread of the Internet and of mobile communication to constitute global/local, interactive networks of communication that were able to construct this autonomy in all dimensions of human interaction. Indeed, in my book on the social construction of the Internet (Castells 2001) I showed how this culture directly influenced the networking technologies that resulted in the Internet architecture. In return, the capabilities of unfettered communication embedded in the Internet strengthened the culture of autonomy, collective and individual, that came to be one key dimension of power relationships in the network society.

In the second volume of my trilogy, *The Power of Identity* [Castells 1997 (2003)], I studied how specific cultural identities throughout the world (including religious fundamentalism, nationalism, and gender-based identities) claimed their right to diversity and autonomy to confront the normalizing pressure of global capitalism, whose logic was powered by networks of production, consumption, finance, technology, and communication. I studied the impact of these conflictive pressures on the state and on systems of political representation, increasingly characterized by a crisis of legitimacy that partly resulted from the inadequacy of the political institutions of the industrial age and of the nation-state to handle the new issues emerging at the forefront of governance in the global network society. As a result, political representation has been redefined, because democracy had been constituted in the national enclosure. Key decisions now have to be taken in an increasingly global frame of reference, concerning issues such as global finance, climate change, global security, or global surveillance. We need to move beyond what Beck labeled “methodological nationalism” (Beck 2000).

In the third volume of my trilogy, *End of Millennium* [Castells 1998 (2003)], I examined the transformation of the state to respond to these challenges, coining the concept of “the network state” to characterize the diverse forms in which nation-states shared sovereignty to survive the global challenges and appease the pressures of the cultural identities present in the societies under their control. This is not to say that current nation-states are disappearing in their institutional existence; rather, their existence as power apparatuses is being profoundly transformed, as they are either bypassed or rearranged in networks of shared sovereignty formed by national governments, supranational institutions, conational institutions (such as the European Union, NATO, or Free Trade Agreements), regional governments, local governments, and NGOs, all of which interact in a negotiated process of decision making. I exemplified my analysis in a study of the formation and contradictions of the European Union. This theme has been recurrent in my work in the twenty-first century and has led to several research projects and publications on the multiple crises of the European Union in the context of global capitalism (Castells & Himanen 2014; Castells et al. 2012).

Although this multidimensional social change has induced a variety of social and cultural expressions in each specific institutional context, there is some commonality in the outcome, if not in the process, at the level where new social forms are constituted—that is, in the social structure. I conceptualized this new social structure as the “network society.” This concept emerged in my thinking as a result of my observation of technological, organizational, and institutional

transformations. I found that the new society in the making was, in all dimensions, made up of networks. Global financial markets are built on electronic networks processing financial transactions in real time. The Internet is a network of computer networks, a network of networks. The electronic hypertext, linking different media in global/local connection, is made up of networks of communication, production studios, newsrooms, computerized information systems, and mobile transmission units, and of an interactive network of senders and receivers. The network enterprise, as a new form of business organization, is made of networks of firms or subunits of firms organized around the performance of a business project. The global economy is a network of financial transactions, production sites, markets, and labor pools, powered by capital, information, and business organization. Indeed, we can consider globalization as the process of global networking in every domain of human activity. Governance relies on the articulation between different levels of institutional decision making linked up by information networks. And the most dynamic social movements are connected via the Internet and wireless communication across the city, the country, and the world.

The prevalence of networks as modes of organization of social practice is redefining social structure in our societies. Social structure refers to the organizational arrangements of humans in relationships of production/consumption, experience, and power, as expressed in meaningful interactions framed by culture. In the Information Age, these specific organizational arrangements are based on information networks powered by information/communication technologies (and in the near future, by biologically based information technologies). Under the conditions of this new, emerging social structure, social sciences are confronted with a number of conceptual and methodological issues. A key issue is to redefine power and counterpower in relation to the specific configuration of the network society. Yet, whereas the analysis of processes of power and counterpower was present in various dimensions of my study of the network society in empirical terms, in the *Information Age* trilogy I did not engage in the construction of a theory of power specific to the network society. The reasons for this were twofold. A personal one: For reasons of health, I had to complete the work on the *Information Age*, undertaken for many years, by bringing it to a provisional closing. A second one, of a theoretical nature: I came to the hypothesis that processes of construction of meaning around the realm of communication were central to the formation of power and counterpower, and that communication was undergoing a major process of transformation in the age of digital technologies and the organizational restructuring of business and government. Thus, before exploring a new theory of power, I needed to understand the interaction between the new forms of communication and the emerging processes of power making and counterpower contestation. This led to another decade of empirical work focused on these questions.

COMMUNICATION POWER⁵

As stated in the introduction to this review, I contend that coercion and persuasion are the two main forms of exercising power. Coercion is enacted by the apparatuses of the state, defining and enforcing law and order. Persuasion is articulated in discourses of power that are produced by a variety of cultural mechanisms (starting with the school and biomedical institutions) and distributed and formalized by socialized communication systems—that is, by communication that relates to society as a whole (Foucault 1975, 2008; Laclau 2005; McChesney 2007). The relative weight of

⁵For a summary presentation and discussion of my research on media and communication, I refer to the book by Howard (2013).

coercion and persuasion in asserting the interests of the power holders depends on context. Their effectiveness relies precisely on the complementarity of their procedures in inducing submission to dominant interests and values. In setting up my research on the role of communication in power making, I started from the proposition that

violence, the threat to resort to it, disciplinary discourses, the threat to enact discipline, the institutionalization of power relationships as reproducible domination, and the legitimation process by which values and rules are accepted by the subjects of reference, are all interacting in the process of producing and reproducing power relationships in social practices and in organizational forms. (Castells 2009, p. 13)

My hypothesis is that power that relies mainly on coercion is a weak form of power and is not sustainable in the long term. Only by obtaining the acquiescence or, at least, the resignation of the subjected subjects, can institutions last. Power over minds is more important than power over bodies. Power over minds, moreover, should not be understood as a pure manipulation mechanism, but as the ability of certain discourses to be internalized and accepted by individuals in an effective communication process between senders and receivers of discourses. Thus, the characteristics of communication systems are essential to understanding the formation of discourses of power and their capacity to shape the minds of social actors in ways that construct a meaningful correspondence between people's experience and the structure and content of the discourses in which dominant interests are embedded. Therefore, in order to investigate the discursive production of power, it became essential to deepen my knowledge of the organization and technological transformation of the communication system in the network society. As a personal note, the intellectual imperative to become knowledgeable in communication in general and in digital communication in particular was a key motivation in changing my academic environment from Berkeley to the Annenberg School of Communication at the University of Southern California, and in accepting an offer from USC to hold a chair on Communication Technology and Society in 2003. This was the beginning of my systematic research on the interaction between communication and power, leading to a book on this topic in 2009 (Castells 2009). In this work, I documented the fundamental transformation of communication systems in our time. First, the digitization of communication induced a new form of communication: mass self-communication, based on the Internet and global/local networks of interactive communication, with senders and receivers merging in the same communication flow. Second, because of the digital capacity to expand globally, the traditional mass media became technologically integrated while remaining culturally and organizationally rooted in specific contexts. Third, vertical mass media and horizontal networks of communication gradually became integrated in the same system, forming what I call, after Nelson (1965), a hypertext. Fourth, media corporations became organized around multimedia business networks on a global scale. These business networks concentrated capital and management while diversifying content and customizing audiences. Fifth, although governments still retained considerable regulatory and institutional power over the media system, corporations came to represent the bulk of mass communication, both in traditional mass media and in the networked communication systems. Sixth, networks of mass self-communication became appropriated by hundreds of millions of users who were dependent on the infrastructure of telecommunications and technology companies but were largely autonomous in defining the content of their interaction, at the expense of surrendering their privacy. By 2015, there were close to 3.5 billion Internet users and about 7 billion subscribers of wireless devices, and over 50% of the adult population of the planet were users of a smartphone. Our societies have become almost fully networked by digital communication on a global scale.

To assess the impact of this transformation of communication on power relationships was the task that I assigned to myself. Two main empirical findings were documented by my research: First, because communication networks became so pervasive, precisely because they were digitized, decentralized, and flexible, and because traditional mass media were still the dominant form of mass communication, all politics became essentially media politics. The images of political options and the personalization of politics were played out in the space of communication. Although the media are not the holders of power (because of their diversity and the complex interaction between media, business, and the political system), they constitute the space where power is played out and ultimately exercised. I include in this communication space the networks of Internet communication that came to play an increasing role in elections, governance, legitimation, and delegitimation. The personalization of politics and the strategy of construction and destruction of images of political leaders and parties as the main political weapon led to the politics of scandal, both because media politics could not be financed by traditional financial means and because the undoing of trust in political leaders became the most potent form of outcompeting other political actors (Thompson 2000). The interaction between the transformation of communication and the generalized crisis of legitimacy of political systems was the core of my investigation in *Communication Power* (Castells 2009).

However, my analysis of the transformation of power making in the network society could not be completed without considering the effects of new communication systems on processes of counterpower, and particularly on the structure, organization, dynamics, and outcomes of social movements. The actual social movements that exploded around the world in 2009–2015 came to my rescue by providing in their practice the answers to the questions I had in mind. I plunged into the ethnographic and documentary analysis of what I labeled networked social movements, particularly in Spain, where the Indignadas movement was the beacon for other social movements in the Western world—a very different experience from the sad fate that in the short term befell the Arab Spring of 2011. The result of this investigation was my book *Networks of Outrage and Hope* [Castells 2012 (2015)], which analyzed the common trends of many of these movements in different contexts (from Occupy Wall Street to Brazil) and identified the profile of social movements in the network society by pinpointing their role in projecting new values and new forms of democracy instead of limiting themselves to a subordinate role as pressure groups or institutional political actors. These movements became effective by constructing new experiences of struggle and self-deliberation that combined the flows of relentless communication in the Internet with the occupation of urban space that made them visible in the society at large.

Thus, I had finally been able to come to terms with the specific analysis of power and counterpower, institutional politics and social movements in the network society, relying, again, on my empirical observation. Yet, in spite of a number of ad hoc theoretical interpretations of many of these processes, I was still missing a proper theoretical formulation to understand power in the network society. This was because although communication networks appeared to be fundamental sites of power, the multidimensionality of the network society required a multidimensional theory of power. I proceeded then to construct a theoretical blueprint and I called it, naturally, “a network theory of power” [Castells 2009, 2012 (2015)].

A NETWORK THEORY OF POWER

The structure and procedures of the institutions and organizations that frame human action depend on the specific interaction between power and counterpower in the construction and reconstruction of those institutions. Each type of society has a specific way of exercising power and counterpower. In the network society, social power is primarily exercised by and through networks.

Power is multidimensional, and, in the network society, it is exercised around multidimensional networks programmed in each domain of human activity according to the interests and values of empowered actors. The question is, though, which kind of networks? And how do they operate in the making of power?

To approach these questions, I must first differentiate four distinct forms of power:

- networking power
- network power
- networked power
- network-making power

Networking power refers to the power of the actors and organizations included in the networks that constitute the core of the global network society over those human collectives or individuals not included in these global networks. This form of power operates by exclusion/inclusion. Network gatekeeping theory has investigated the processes by which nodes are included in or excluded from the network, showing the key role of the network's gatekeeping capacity to enforce the collective power of some networks over others, or of a given network over disconnected social units (Barzilai-Nahon 2008). Social actors may establish their power position by constituting a network that accumulates valuable resources and then by exercising their gatekeeping strategies to bar access to those who do not add value to the network or who jeopardize the interests that are dominant in the network's programs. Examples include the multimedia networks or the financial institutions.

The understanding of *network power* can be helped by referring to the conceptualization proposed by Grewal (2008) to theorize globalization from the perspective of network analysis. In this view, globalization involves social coordination among multiple networked actors. This coordination requires standards or, in my own terminology, protocols of communication. These protocols of communication determine the rules to be accepted once in the network. Once certain protocols are integrated in the program of networks, power is exercised not by exclusion from the networks but by the imposition of the rules of inclusion. Network power is the power of these protocols over the network's components. This network power ultimately favors the interests of a specific set of social actors at the source of network formation. For instance, the international agreements regulating intergovernmental financial institutions such as the International Monetary Fund or international trade institutions such as the World Trade Organization impose a set of rules that reflect the interests of leading financial private institutions and multinational corporations, represented by governments of the G7 club.

How does *networked power* operate? Who has power inside the networks, once the networks are formed in terms of a set of nodes regulated by a set of protocols? The question of power holding in the networks of the network society could be answered in simple terms by analyzing the workings of each specific network. Each network defines its own power relationships, depending on its programmed goals. Thus, in global capitalism, the global financial market has the last word, and the IMF, the central banks, and the ratings of financial agencies (e.g., Moody's, Fitch, or Standard & Poor) are the interpreters of how better to fulfill these goals. Another example is military power: A state that can harness technological innovation, knowledge, and resources in the pursuit of acquiring superior war-making capacity becomes the dominant node, as is currently the case for the United States. This capacity will establish power in the geopolitical scene if and when violence or the threat of violence becomes the predominant mode of interaction between political actors.

Yet, the question of power in the networks could become an analytical dead end if we try to answer it one-dimensionally and attempt to determine "The Source of Power" as a single

entity. Military power could not prevent a catastrophic financial crisis; in fact, it could actually provoke it under certain conditions of irrational, defensive paranoia and the destabilization of oil-producing countries or of large economies, such as China. Global financial markets could become an automaton beyond the control of any major regulatory institution, given the size, volume, and complexity of the flows of capital that circulate throughout their networks, as well as the dependence of their valuation criteria on unpredictable information turbulences. Political decision making is largely dependent on the media, but the media constitute a plural ground—however biased in ideological and political terms—and the process of media politics is highly unpredictable. As for the capitalist class, it does have some power, but not power over everyone or everything: It is highly dependent on both the dynamics of global markets and the decisions of governments in terms of regulations and policies. Governments themselves are connected in networks of imperfect global governance, conditioned by the pressures of business and interest groups, obliged to negotiate with the media that translate government actions for their citizenries, and confronted by social movements and expressions of resistance from civil societies. Geopolitical unilateralism ultimately has to concede to the realities of our interdependent world, as the US government had to do after a decade of wars in Iraq and Afghanistan that depleted its budget and damaged its international legitimacy. In sum, even the most powerful states have some power (mainly destructive), but they do not have *all* the power.

So perhaps the question of power as traditionally formulated does not make sense in the network society, but it is still the case that new forms of domination and determination are critical in shaping peoples' lives regardless of their will. Indeed, there are power relationships at work, albeit in new forms and with new kinds of actors. The most crucial forms of power follow the logic of *network-making power*.

In a world of networks, the capacity for social actors to exercise control over others depends on two basic mechanisms: (a) the ability to constitute network(s) and to program/reprogram the network(s) in terms of the goals assigned to the network, and (b) the ability to connect and ensure the cooperation of different networks by sharing common goals and combining resources while fending off competition from other networks by setting up strategic cooperation. I call holders of the first power position *programmers*; holders of the second power position are *switchers*. Programmers and switchers are certainly social actors, but not necessarily identified with one particular group or individual. More often than not, networks operate at the interface between various social actors, defined in terms of their positions in the social structure and in the organizational framework of society. Thus, I suggest that in many instances the exercisers of power are networks themselves—not abstract, unconscious networks nor automata, but humans organized around their projects and interests. The exercise of power in the network society requires a complex set of joint actions that goes beyond alliances to produce a new form of subject: a networked subject.

In my books *Communication Power* (Castells 2009) and *Networks of Outrage and Hope* [Castells 2012 (2015)], I empirically analyzed the workings of these two mechanisms of power making in the networks: *programming* and *switching*. The capacity to program the goals of the network, as well as to reprogram it, is decisive, because once programmed, the network has the capability to perform efficiently and reconfigure itself to achieve its goals.

How different actors program the network is a process specific to each network. The process is not the same in global finance as it is in military power, in political systems, in scientific research, or in organized crime. Therefore, power relationships at the network level have to be identified and understood in terms specific to each network. However, all networks do share a common feature: Ideas, visions, projects, and frames generate the programs. These are cultural materials. In the network society, culture is mostly embedded in the processes of communication, particularly in the electronic hypertext, with the global multimedia business networks and the Internet networks

at its core. So, ideas may be generated from a variety of origins and linked to specific interests and subcultures (e.g., neoclassical economics, religions, cultural identities, the worshipping of individual freedom, representative democracy, and the like). Yet, ideas and images are processed in society according to how they are represented in the realm of communication. Ultimately these ideas reach the constituencies of each network depending on the constituencies' level of exposure to the processes of communication. Thus, the control of (or the influence on) the networks of communication, and the ability to create an effective discourse and induce communication and persuasion along the lines that favor the projects of the would-be programmers, are the key assets in the ability to program each network. In other words, the process of communication in society, as well as the organizations and networks that enact this process of communication, is the key field where programming projects are formed and where constituencies are built for these projects. They are the fields of power in the network society.

There is also a second source of power: control of the connecting points between various strategic networks. Holders of these positions are *switchers*, for example, of the connections between the political leadership networks, the media networks, the scientific and technology networks, and the military and security networks to assert a geopolitical strategy. Or they are switchers of the connection between the political networks and the media networks to produce and diffuse specific political-ideological discourses; or of the relationship between religious networks and political networks to advance a religious agenda in a secular society; or between academic networks and business networks to provide knowledge and legitimacy in exchange for resources for universities and jobs for their graduates.

These networks are specific systems of interface that are formulated on a relatively stable basis as a way to articulate the actual operating system of society beyond the formal self-presentation of institutions and organizations. However, this is not to resurrect the idea of a power elite, a simplified image of power in society whose analytical value is limited to some extreme cases. It is precisely because no unified power elite is capable of keeping the programming and switching operations of all important networks under its control that more subtle, complex, and negotiated systems of power enforcement must be established. For these power relationships to be asserted, the programs of the dominant networks of society need to set compatible goals between these networks (e.g., dominance of the market and social stability; military power and financial restraint; political representation and reproduction of capitalism; free expression and cultural control). And they must be able, through the switching processes enacted by actor-networks, to communicate with each other, inducing synergy and limiting contradiction. Switchers are actors, or networks of actors, engaging in dynamic interfaces that are specifically operated in each process of connection. Programmers and switchers are those actors and networks of actors who, because of their position in the social structure, hold network-making power—the paramount form of power in the network society.

Processes of power making must be seen from two perspectives, as I have reiterated throughout my work. On the one hand, these processes can enforce existing domination or seize structural positions of domination; on the other hand, there are countervailing processes that resist established domination on behalf of the interests, values, and projects that are excluded or underrepresented in the programs and composition of the networks. Analytically, both processes ultimately configure the structure of power through their interaction. They are distinct but do, however, operate according to the same logic. This means that resistance to power is achieved through the same two mechanisms that constitute power in the network society: the programs of the networks and the switches between networks. Thus, collective action from social movements, under their different forms, aims to introduce new instructions and new codes into the networks' programs: for instance, imposing the right of homeowners to prevent the foreclosure of unfair mortgages against

the rules of the financial institutions; investigating and punishing political corruption in spite of the secrecy and complicity of the political class as a whole; forcing the cancellation of public debt for a whole country in contradiction to the instructions of abusive financial lenders; or else, denouncing environmental destruction caused by multinational companies, in the hope that this will ultimately impact the attitude of shareholders and consumers vis-à-vis companies deemed to be good or bad citizens of the planet. Under these conditions, the code of economic calculation shifts from growth potential to sustainable and equitable growth potential. These are examples of actual reprogramming of networks from the practice of the networked social movements I studied in 2011–2015. More radical reprogramming comes from resistance movements aimed at altering the fundamental principle of a network—or the kernel of the program code, if I may use the parallel with software language. For instance, if God’s will must prevail under all conditions (as in the statement of religious fundamentalists), the institutional networks that constitute the legal and judicial system must be reprogrammed to follow not the political constitution, legal prescriptions, or government decisions but rather the interpretation of God by bishops or ayatollahs. In another instance, when the movement for global justice claims the rewriting of the trade agreements managed by the World Trade Organization to include environmental conservation, social rights, and the respect of indigenous minorities, it acts to modify the programs under which the networks of the global economy work.

The second mechanism of resistance consists of blocking the switches of connection between networks that allow the networks to be controlled by the meta-program of values that express structural domination. Here, the term “meta-program” refers to a program that functions as the source code for the programs of the networks that operate organizations and institutions. The blocking of the switches can be accomplished, for instance, by filing law suits, or by influencing the US Congress in order to undo the connection between oligopolistic media business and government by challenging the rules of the US Federal Communication Commission that allow greater concentration of ownership. Other forms of resistance include disturbing the networking between corporate business and the political system by regulating campaign finance; spotlighting the incompatibility between being a vice president and receiving income from one’s former company that is benefiting from military contracts; or opposing academic servitude to the powers that be. More radical disruption of the switchers affects the material infrastructure of the network society: for example, the material and psychological attacks on air transportation, computer networks, information systems, and on the networks of facilities on which societies depend for their livelihood in the highly complex, interdependent system that characterizes the informational world. The challenge of terrorism is precisely predicated on the disruption or the threat of disruption of such networks, which would disorganize the daily lives of people and force them to live under a state of emergency, thus feeding the growth of other power networks, particularly the extension of the security networks to every domain of life. Thus, as documented in my book, *Networks of Outrage and Hope* [Castells 2012 (2015)], resistance to power programmed in networks also takes place by and through networks powered by information and communication technologies—a logic that extends to different forms of rebellious networks (Arquilla & Rondfeldt 2001).

A central characteristic of the network society is that both the dynamics of domination and the resistance to domination rely on network formation and network strategies of offense and defense, by forming separate networks and/or reprogramming existing networks. Indeed, this echoes the historical experience of previous types of societies, such as the industrial society. The factory and the large, vertically organized industrial corporation were the material basis for the development of both corporate capital and the centrally organized labor movement. Similarly, computer networks for global financial markets, transnational production systems, “smart” armed forces with a global reach, terrorist resistance networks, the global civil society, and networked

social movements struggling for a better world are all components of the global network society. The conflicts of our time are fought by networked social actors aiming to reach their constituencies and target audiences through the decisive switch to multimedia communication networks.

In sum: Programmers and switchers, as defined in my network theory of power, are the exercisers of power and the subjects of counterpower in the network society. They are embodied by social actors, but they are not isolated individuals; they are networks themselves. But who these actors are and what their networks are is a matter of the specific configuration of networks in each particular context and in each particular process. Therefore, I am not dissolving power relationships in an endless deployment of networks. Rather, I am calling for specificity in the analysis of network-making power and proposing a methodological approach: We must find the specific configuration of actors, interests, and values that engage in their power-making and counterpower-making strategies by connecting to different networks that organize social practice.

Thus, my theory of network power does not aim at identifying in general terms the power holders. What I do is to propose a hypothesis to guide the research on power: Exercisers of power in the network society are networks of actors exercising power in their respective networks, the networks they program to further their interests and values. I am also advancing the hypothesis of the centrality of communication networks to implement the power-making process of any network, because communication networks are the source of construction of meaning in the public mind. And I am suggesting that switching different networks is a fundamental source of power. Who does what, how, where, and why through this multipronged networking strategy is a matter for investigation, not for formal theorization. Formal theory will only make sense on the basis of an accumulation of knowledge by theorized observation. For this knowledge to be generated we need an analytical construction that fits the kind of society we are in. This is my purpose: to build an analytical framework that can be used in research, rectified, and transformed in ways that allow the gradual construction of a theory of power and counterpower in the network society, our society.

And so, this review comes full circle to the original ideas that became embedded in my practice as a researcher in my lifelong intellectual journey: to understand power relationships, the defining relationships of human existence, in ways that are specific to our world, and to do so by constructing an open-ended, grounded theory that could unveil and transform the sources of domination and, eventually, liberation.

APPENDIX

A Reflection on my Main Intellectual Influences

Because this article is an autobiographical review of my lifelong research, I think it could be useful for the interested reader to know who the main intellectual influences that have shaped my thought and studies have been.

Without any doubt in my mind, the most important source of inspiration for my work throughout my entire life has been Alain Touraine, my original mentor and intellectual father. His published work (Touraine 1965, 1973, 2013, among his over 40 books) and our intellectual interaction since 1964 have been essentially formative in my thinking and my style of inquiry, always looking, in his terms, to understand the production of society by social actors rather than the reproduction of social structure by institutions.

Nonetheless, in the early stage of my work in the 1970s, my theorizing adopted a Marxist terminology, sometimes framed within the theory of structuralist Marxism. Yet, my direct influence did not come from Althusser, as many commentators of my work have said, but from Nicos Poulantzas (Poulantzas 1968), my closest friend and colleague until his death. Nicos, as myself,

was a political activist, and so his Marxism was always situated directly within the actual process of historical change rather than in the dogmatic world of the Althusserians, who were in the 1960s (not any longer now) largely self-confined within the walls of the elitist *École Normale Supérieure*. As for myself, I was an active participant in the May '68 movement that was much closer in its practice to anarchism than to Marxism, in spite of using the terminology of the Left, which itself remained dependent on the Marxist tradition. In the late 1970s, I felt increasingly distant from Marxist theory, not for ideological reasons but for practical reasons. It was largely useless for my work. I explicitly expressed my critique of Marxism as an intellectual tool in 1983 in my book *The City and the Grassroots*, which prompted a flurry of denunciations about my betrayal of Marxism. However, as I wrote then, I was (and still am) neither a Marxist nor an anti-Marxist. For me this is a quasi-religious debate. Theories should not be used as ideological proclamations, but as tools for research and understanding. So, I continued to use, in a few areas of my work, some analytical tools inherited from the Marxist tradition (particularly in my research on political economy, for which Marxism proved much more useful than neoclassical economics), but refused to base my work on a Talmudic interpretation of Marx's writings as the holy texts. Thus, I remained loyal to my deep involvement with social and political change, and with social movements around the world, but refused to align myself with any theoretical construction that asserted its legitimacy on the grounds of being politically correct rather than on its explanatory power. In the general conclusion of my trilogy on the Information Age, in the last chapter of the third volume, *The End of Millennium*, I presented the full argument of my epistemological and theoretical position, which is ultimately independent from any theoretical allegiance that is not supported by methodologically sound research. This remains, and will remain, my position as a scholar.

Therefore, even during what some commentators call my Marxist period, I was also open to beneficial influences that had little to do with Marxism, particularly from the Chicago School of urban sociology, in spite of having made it the main target of my critique in the study of cities and urban space [Castells 1972 (1975)]. Precisely because I knew this classic work very well, I admired the originality of the research by these early urban sociologists and their deliberate attempt to observe rigorously urban society in the making. I was highly influenced by the human ecology school, by the theories of Amos Hawley, and by the comprehensive analysis of urbanization by Leo Schnore, with whom I interacted briefly at the University of Wisconsin.

Much later on, my research on cities was essentially influenced by two giants of urban theory, both close friends and colleagues: Peter Hall and William Mitchell. Peter and I worked together in Berkeley and around the world, sharing a profound interest for the interaction between cities and technology and a deep fascination for the creative potential of major cities, both in history and in the Information Age. Bill Mitchell literally taught me, during the years when I spent regular visiting periods at MIT, how to adapt urban analysis to the specificity of the digital environment overlaid on the urban space to understand the interaction between cyberspace and the urban space. I am still working to finish the book that we projected together.

In terms of my interest in power in society at large, I came to be, as so many other researchers in the world, heavily influenced by the work of Michel Foucault, with whom I interacted too little when I was in Paris, in part because our fields of research (and our social statuses) were very distant. I received his insights largely through my collaboration with some of the most interesting Foucauldians, the researchers of a center inspired by Foucault, the CERFI, with whom I shared my activism in the 1968 movement and my interest in urban studies from a power perspective, a story that I recount in an article of 1994 (Castells 1994). To look at power making across different domains of society, in contrast to both the Marxist and the liberal political science tradition, was an essential factor in my evolution toward a multilayered theory of power, which I have presented in this review.

As for my theory and research on globalization, and particularly in Latin America, my approach was decisively shaped from the beginning of my career, in 1968–1970 in Chile, by Fernando Henrique Cardoso and Enzo Faletto and the dependency theory they created, which was in complete contrast to the dogmatic analyses of dependency that polluted the intellectual map of what we then called the Third World. In Cardoso & Faletto's (1970) early formulation of dependency, and in their political historical analysis of Latin America, I have found the key intellectual tools to understand contemporary globalization. This is what I have been trying to accomplish in my work on globalization and power (Calderon 2003, Castells 2005), adding my own perspective in terms of introducing the technological and networking components of globalization in our time.

In terms of general social theory, another important influence on my work comes from Anthony Giddens and his theory of structuration (Giddens 1984), which helped me comprehend the processes of formation of a new social structure in terms of the interaction between structure and agency, a key question in social theory. This question was always an obstacle in my own analysis, as I often oscillated between structuralism and subjectivism. I think that under Giddens's inspiration I have made some progress in my late work through my emphasis on communication and networking of social practices [Castells 2009, 2012 (2015)]. And although by the time I could finally use Giddens's approach to solve my theoretical problems he had become a Lord, and preoccupied by more earthly issues, I will always be indebted to his intellectual legacy.

As a biographical anecdote for those interested in the lineage of my work, my book *The Rise of the Network Society* [Castells 1996 (2000)], in which for the first time I fully exposed my theory, was endorsed by three theorists: Alain Touraine, Fernando Henrique Cardoso, and Anthony Giddens. Yet, once I entered the analysis of the technological paradigm and of digital communication as levers of social transformation, thus redefining power relationships, I found myself very lonely in my endeavor. There were technologists and prophets of technology more interested in selling futurology than in investigating as an open question a fundamental transformation of the human condition. On the other hand, some of the best social scientists and philosophers often dismiss the whole set of new technology-related issues as technological determinism, in some cases without knowing what they are talking about. Young researchers in fields such as network analysis, digital culture, or networked social movements are sensitive and literate about the new instrumental world we have entered; but they can hardly rely on appropriate social theory, let alone a social theory of power that would link up the tradition of deep theory with their new, fascinating research. I found myself suspended between the two worlds, the way of thinking of the past (unfairly decried by the postmodern fashion) and the attempt to understand the novelty of the present human condition. I intend to keep ploughing in my research to contribute to building a most necessary intellectual bridge between the two worlds. And to do so, I hang on to the one thread that links up all human experiences: the theory of power and counterpower that has marked my lifelong search for the discovery of who we are.

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LITERATURE CITED

- Arquilla J, Rondfeldt D. 2001. *Networks and Netwars: The Future of Terror, Crime, and Militancy*. Santa Monica, CA: RAND Corp.
- Bachelard G. 1934. *Le Nouvel Esprit Scientifique*. Paris: PUF
- Banfield E. 1970. *The Unheavenly City: The Nature and Future of our Urban Crisis*. New York: Little, Brown & Co.
- Barzilai-Nahon K. 2008. Toward a theory of network gatekeeping: a framework for exploring information control. *J. Am. Soc. Inf. Sci. Technol.* 59(9):1493–512
- Beck U. 2000. *Power in the Global Age*. Cambridge, UK: Polity
- Calderon F, ed. 2003. *¿Es sostenible la globalización en América Latina? Debates con Manuel Castells*, vols. 1, 2. Mexico City: FCE
- Cardoso F, Faletto E. 1970. *Dependencia y desarrollo en América Latina*. Mexico City: Siglo XXI
- Carnoy M, Castells M. 1988. *Economic Modernization and Technology Transfer in the People's Republic of China*. Stanford, CA: Stanford Univ. Sch. Educ., CERAS
- Castells M. 1968. Y a-t-il une sociologie urbaine? *Sociol. Trav.* 1:72–90
- Castells M. 1972 (1975). *La question urbaine*. Paris: Francois Maspero/La Decouverte
- Castells M. 1977. *The Urban Question: A Marxist Approach*. Cambridge, MA: MIT Press
- Castells M. 1978. *City, Class and Power*. London: Palgrave
- Castells M. 1983. *The City and the Grassroots: A Cross-Cultural Theory of Urban Social Movements*. Berkeley: Univ. Calif. Press
- Castells M. 1988. *The Developmental City State in an Open World Economy: The Singapore Experience*. Berkeley: Univ. Calif., Berkeley Roundtable Int. Econ.
- Castells M. 1992. Four Asian tigers with a dragon head: state intervention and economic development in the Asian Pacific Rim. In *State and Society in the Pacific Rim*, ed. R Applebaum, J Henderson, pp. 33–70. London: Sage
- Castells M. 1994. L'école française de sociologie urbaine vingt ans après: retour au futur? *Ann. Rech. Urbaine* 64:58–60
- Castells M. 1996 (2000). *The Information Age: Economy, Society, and Culture*, Vol. 1: *The Rise of the Network Society*. Oxford, UK: Blackwell
- Castells M. 1996–1998 (2000–2003). *The Information Age: Economy, Society, and Culture*. Oxford, UK: Blackwell
- Castells M. 1997 (2003). *The Information Age: Economy, Society, and Culture*, Vol. 2: *The Power of Identity*. Oxford, UK: Blackwell
- Castells M. 1998 (2003). *The Information Age: Economy, Society, and Culture*, Vol. 3: *End of Millennium*. Oxford, UK: Blackwell
- Castells M. 2001. *The Internet Galaxy*. Oxford, UK: Oxford Univ. Press
- Castells M. 2005. *Globalización, desarrollo y democracia en Chile*. Santiago de Chile: FCE
- Castells M. 2009. *Communication Power*. Oxford, UK: Oxford Univ. Press
- Castells M. 2012 (2015). *Networks of Outrage and Hope: Social Movements in the Internet Age*. Cambridge, UK: Polity Press
- Castells M, Barrera A, Castano C, Nadal J. 1986. *Nuevas Tecnologías, Economía y Sociedad en España*, Vols. 1, 2. Madrid: Alianza Editor
- Castells M, Caraca J, Cardoso G, eds. 2012. *Aftermath: The Cultures of the Economic Crisis*. Oxford, UK: Oxford Univ. Press
- Castells M, Hall P. 1994. *Technopoles of the World*. London: Routledge

- Castells M, Himanen P, eds. 2014. *Reconceptualizing Development in the Global Information Age*. Oxford, UK: Oxford Univ. Press
- Castells M, Kiselyova E. 1995. *The Collapse of Soviet Communism: The View from the Information Society*. Berkeley: Univ. Calif., Inst. Int. Stud.
- Castells M, Kwok R, Goh L. 1990. *Economic Development and Public Housing in the Asian Pacific Rim: A Comparative Analysis of Hong Kong, Singapore, and Shenzhen Special Economic Zone*. London: Pion
- Dahl R. 1961. *Who Governs: Democracy and Power in an American City*. New Haven, CT: Yale Univ. Press
- Engels F. 1872. *Bur Wohnangfrage* [The Housing Question]. <https://www.marxists.org/archive/marx/works/1872/housing-question/index.htm>
- Foucault M. 1975. *Surveiller et punir*. Paris: Gallimard
- Foucault M. 2008. *The Birth of Biopolitics: Lectures at the Collège de France, 1978–79*. London: Palgrave Macmillan
- Giddens A. 1984. *The Constitution of Society: Outline of a Theory of Structuration*. Cambridge, UK: Polity Press
- Grewal D. 2008. *Network Power: The Social Dynamics of Globalization*. New Haven, CT: Yale Univ. Press
- Hall P. 1998. *Cities in Civilization*. New York: Pantheon
- Harvey D. 1973. *Social Justice and the City*. London: Edward Arnold Press
- Howard P. 2013. *Castells and the Media*. Cambridge, UK: Polity Press
- Hunter F. 1953. *Community Power Structure*. Chapel Hill: Univ. N. C. Press
- Laclau E. 2005. *On Populist Reason*. London: Verso
- Lefebvre H. 1968. *Le droit à la ville*. Paris: Anthropos
- Lefebvre H. 1970. *La révolution urbaine*. Paris: Gallimard
- Marx K, Engels F. 1846 (1932). *The Real Basis of Ideology: Division of Labour: Town and Country*. In *Die Deutsche Ideologie* [The German Ideology], Part IC. <https://www.marxists.org/archive/marx/works/1845/german-ideology/ch01c.htm>
- Massey D. 2005. *Strangers in a Strange Land: Humans in an Urbanizing World*. New York: W. W. Norton
- Massey D, Brodmann S. 2014. *The Social Ecology and Racial and Class Inequality*. New York: Russell Sage
- McChesney R. 2007. *Communication Revolution: Critical Junctures and the Future of Media*. New York: New Press
- Mumford L. 1961. *The City in History*. New York: Harcourt Brace
- Nelson T. 1965. Complex information processing: a file structure for the complex, the changing and the indeterminate. *ACM Proc. 1965 20th Natl. Conf.*, pp. 84–100. ACM: New York
- Pahl R. 1970. *Whose City?* Harmondsworth, UK: Penguin
- Park R, Burgess E, eds. 1925. *The City*. Chicago: Univ. Chicago Press
- Poulantzas N. 1968. *Pouvoir politique et classes sociales*. Paris: Francois Maspero
- Sorrie M. 1952. *Les fondements de la géographie humaine*. Paris: Armand Colin
- Stalder F. 2006. *Manuel Castells: The Theory of the Network Society*. Cambridge, UK: Polity Press
- Susser I, ed. 2002. *The Castells Reader on Cities and Social Theory*. Oxford, UK: Blackwell
- Thompson J. 2000. *Political Scandal: Power and Visibility in the Media Age*. Cambridge, UK: Polity Press
- Touraine A. 1965. *Sociologie de l'action*. Paris: Seuil
- Touraine A. 1973. *Production de la société*. Paris: Seuil
- Touraine A. 2013. *La fin des sociétés*. Paris: Seuil
- Webster F, Dimitriou B, eds. 2004. *Manuel Castells*. SAGE Masters of Modern Social Thought Series, Vols. 1, 2, 3. London: Sage
- Wirth L. 1938. Urbanism as a way of life. *Am. J. Sociol.* 44:1–24



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Errata

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