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Toward Urban Archaeology?

The Future of Mesoamerican Settlement Archaeology and Urban Science

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The field of archaeology is undergoing a drastic change in its access to and use of spatial datasets and in the kinds of research questions that can be addressed with these data. What has been called the "geospatial revolution" (see A. F. Chase et al. 2012; McCoy 2021) has arisen from crossovers between archaeology and other fields through recent advances in remote sensing technologies (particularly lidar); however, technologies such as ancient DNA analyses and bone isotope analyses—in conjunction with other methods that make it possible to investigate spatial distributions, landscapes, and sources for the ancient materials that moved across it—are enabling archaeological research on questions of governance, migration, urbanization, and climate change that might not have previously been imagined. None of these techniques or technologies is new to the 2020s—even lidar saw its initial use in the 1960s in parallel with the invention of the laser (Goyer and Watson 1963). Now, however, we are seeing the results of enhanced technologies (initial use of lidar in archaeology had issues; see Sheets and Sever 1988) and new integration of them into more traditional archaeological research programs (see also A. S. Z. Chase, Chase, and Chase 2017).

For settlement archaeology and the study of early cities, new data have provided unprecedented ideas of the scale and scope of ancient urban systems, especially those of the tropics. These new methods and datasets have also primed archaeology to take a more quantifiable and scientific view of the past through all the features and aspects of ancient settlement and archaeological materials situated across that landscape. Instead of thinking of areas as "sites," an archaeological term that applies equally to both a ceramic or lithic surface scatter and an ancient metropolis, the initial goals of siteless and nonsite perspectives (Dunnell 1992, 33–36) and landscape archaeology (Wilkinson 2003) are being realized. Access to reliable spatial data has provided the necessary evidence (as Fleming [2006] highlighted) to move the field from studying cities as pointillist sites to urban anthropogenic landscapes (A. F. Chase and Chase 2016).

These data-driven changes to the discipline of archaeology have coincided with social and technological developments that have stimulated the collection of unprecedented amounts of fine-grained data concerning what individuals, households, and business do in cities. This data availability—driven by satellite imagery, global positioning systems, smart phones, digital cameras, remote sensing, and social media—together with the development of data science and spatial statistics animated the development of "urban analytics," or "urban informatics," as a new discipline (Shi et al. 2021).[1] For some, the urban manifestation of the "big data" phenomenon provides opportunities for engineering "smart" cities that manage people and resources more efficiently and effectively (Batty et al. 2012). For others, the availability of more data, and different types of data, makes it possible to investigate cities in novel and multidisciplinary ways (Hepworth 1987).

The development of new empirical pathways for studying cities concurred with the planet becoming a "planet of cities" (with over 70 percent of the planet's population expected to reside in urban areas by the year 2050) and the realization that many of the challenges facing humanity thus involve cities (Angel 2012). This has encouraged researchers to treat the city as the unit of analysis, as the Nobel Prize–winning economist Paul Romer (2013, para. 7, 8) has argued:

> The urban environment that humans are so busily creating is many things: a biological environment, a social environment, a built environment, a market environment, a business environment, and a political environment. It includes not only the versions of these environments that exist inside a single city, but also those that are emerging from the interaction between cities.
>
> Our understanding of the urban environment will draw on existing academic disciplines, but it will also develop its own abstractions and insights.

This realization underpins a new approach to cities, *urban science*, which draws on existing research traditions and recent developments in urban economics, economic geography, regional science, labor economics, urban sociology, urban ecology, spatial data analysis, complexity science, and network science. Assuming that the notion of a city as the absence of physical space and social barriers between people applies to cities throughout history, so that proximity, density, and closeness are essential features of cities regardless of era and geography (Glaeser 2011). It would thus seem unproblematic to conclude that a dialogue between urban science and the new urban archaeology would contribute to the construction of a more robust, conceptually, empirically, and explanatorily, theory of urbanization—much as the dialogue between history and economic growth theory resulted in more convincing answers on the origins and drivers of economic growth (Romer 1996).

Archaeology frequently borrows concepts and analytical tools from elsewhere, and overlaps between archaeology and other fields have been common throughout its history. In particular, archaeology has gone through at least two other periods of high innovation and overlap with other scientific fields. The first occurred near its founding in Europe, during its alignment with geology, zoology, and biology to study the origins of the ancient world in the mid-1800s; the second built on the technological innovations of World War II through the use of radiocarbon dating and other scientific analyses (Kristiansen 2012). Given the rough timeframe and the periodic nature of American archaeology's theoretical shifts, the geospatial revolution (e.g., A. F. Chase et al. 2012; A. F. Chase et al. 2016) may be as influential to the field of archaeology and its ability to cross-cut disciplinary boundaries as the radiocarbon revolution of the last century (e.g., Arnold and Libby 1949).

Insights from historical archaeology have already informed the development of urban studies and urban science (Hanlon and Heblich 2022; Kotkin 2005; Lobo et al. 2020; Ortman et al. 2020). Pre-Columbian Mesoamerica has long been recognized as a cultural region where early cities and large-scale polities arose autochthonously despite the impediments to communication and resource extraction relative to ancient Afro-Eurasia (e.g., the lack of beasts of burden and wheeled transport and the limited and relatively late use of metal implements). Given the significant population size and areal extent of many pre-Columbian urban centers, their longevity, and the environmental, organizational, and institutional diversity found within the Mesoamerican urban world, Mesoamerican urbanism should be of keen interest to those who think the urban past is of relevance to contemporary discussions of urban sustainability and adaptation to climate change (M. E. Smith et al. 2021). For this research potentiality to be actualized, Mesoamerican urban archaeology must extend the geospatial revolution to consider what it seeks to measure and what data it collects and generates in contrast and similarity to those of other disciplines. This in turn requires the questions asked by Mesoamerican urban archaeology to connect with and use the theoretical and modeling frameworks of urban science.

Here, we argue that the theoretical and modeling framework of urban science, as well as that of urban economics and economic geography, provide a conceptual bridge linking the study of cities and urbanization across time. This does not suggest that use of these approaches and datasets will be easily accomplished or that integration is an inevitable fact. Instead, this potential for intellectual interaction requires archaeologists to ponder what questions we want to ask about our datasets and how we can use the insights of other fields. We humbly suggest that urban archaeological research in general, and the revitalized Mesoamerican urban archaeology, could be of significant relevance to the broad research community interested in cities and their future and that a conceptual and empirical language already exists to enable communication.

URBAN SCIENCE

Urban science is a transdisciplinary research effort studying cities and urbanization that builds on the accumulated insights of extant research traditions, seeks to study the connections among the many different aspects of cities, and aims to construct formal theory (Barthelemy 2016; Batty 2013; Bettencourt 2021; Forman 2014). The scope and purpose of urban science has been articulated well by Michael Batty (2019, 998):

> Urban science deals with the structure and functioning of cities, and the generic laws that seem to govern cities everywhere insofar as they can be articulated . . . a science of human behavior as it applies to cities. . . . This is not the science of the physics of buildings or energy flows in cities (although it clearly relates in part to some of these aspects), it is the science of people flows, flows of goods,

and the flow of information and ideas and the extent to which all these can be generalized over city size and scale.

As with any scientific endeavor, the development of urban science has also been animated by the identification of empirical regularities across urban systems. The construction of theory capable of generating testable hypotheses presupposes that there are enough and varied observations on which to find robust patterns meritorious of explanation. The research program of urban science, however, as well as that of urban economics and economic geography, has relied primarily on modern cities and urban forms. This modern bias is not a consequence of an epistemological stance, but rather reflects the relative paucity of quantitative data on the urban past. Expanding the temporal coverage of data about cities and urbanization can provide insights on how "modern" processes may in fact be far older than currently thought, while also showing how these processes work in a greater diversity of contexts across time and space, including urban forms that no longer exist. The work of urban archaeology would thus seem to be primed to provide crucial inputs to the construction of urban science.

This relationship has echoes in American archaeology's past and its initial movements away from simply describing what has been found to testing observable patterns. The publication of Walter Taylor's *A Study of Archaeology* in 1948 led to widespread changes in the field and, eventually and unevenly, to the wider adoption of more rigorous analyses in archaeology (see Maca, Reyman, and Folan 2010). In this 1943 dissertation, Taylor established the conjunctive approach for the holistic use of data from multiple sources, incorporating as much data as possible from various nonarchaeological sources, such as climatic, geographic, economic, sociopolitical, ethnographic, religious, cultural, and kinship information to better contextualize and interpret the archaeological record and create testable questions. At the time, this more integrative, hypothesis-testing approach pushed against the norms of archaeology as culture history, which tended to simply record and categorize excavated materials. While the influence toward a more positivist perspective was uneven, this approach provided the initial foundation to many modern approaches in Maya archaeology today (Maca 2010). This kind of interdisciplinary or transdisciplinary approach, however, can be even more powerful now given the above-mentioned advances to the field. The potential convergence among disparate disciplines interested in the processes of cities provides a modern example where aspects of the conjunctive approach can be applied by integrating theory, data, and perspectives from these other urban sciences with archaeology.

Yet, for Mesoamerican archaeology to significantly contribute, the data, findings, and insights from archaeological studies of cities need to be accessible and usable to urban scientists. It cannot be taken for granted that researchers studying contemporary cities and urbanization will become enamored with ancient cities and read archaeology-focused work. The insights from studying cities in the ancient past must be presented in compelling historical narratives and high-quality databases. There are attributes important to all cities and of common interest to the various research communities engaged in urban studies, especially in contexts in which the change in the magnitude of attributes can be measured over time: population size, areal extent, material output, resource utilization (energy, water, etc.), measures of inequality, divisions of labor, and provisioning of infrastructure. The construction of robust data around these salient characteristics for ancient cities (including Mesoamerican cities and urban systems) could inform modern discourse, but this list is by no means exhaustive, and the specific topics and measures will depend on developing shared interests and research questions. This will involve working with urban scientists to study ancient and modern cities in similar frameworks. While archaeologists have been frequent consumers of urban theory (e.g., M. E. Smith 2011), this also requires urban archaeology to be more rigorous (e.g., M. E. Smith 2015).

A research dialogue between urban archaeology and urban science, and more generally among urban archaeology, urban economics, and economic geography, is facilitated by the putative applicability to the urban past of the conceptual framework currently underpinning and relating urban science, urban economics, economic geography, and regional science. All these disciplines explain the existence and development of cities as the result of the interplay between centripetal and centrifugal forces, which in turn result from socioeconomic advantages of concentrating human populations in space and account for associated costs. These are known as *agglomeration effects* and are treated as the foundational concepts for explaining the formation and persistence of cities anywhere. Given their widespread and shared use in the other disciplines listed above, are agglomeration effects relevant to Mesoamerican archaeology?

URBANIZATION AND AGGLOMERATION EFFECTS

The archaeological record tends to preserve built features representing the physical space and "hard" infrastructure of ancient peoples. Urbanism, however, is defined not solely by physical space but mostly through the various interactions among individuals and organizations/institutions within that space. In a sense, the individuals, their experiences and knowledge, and those organizations or institutions represent the "soft" infrastructure that archaeologists find more difficult to reconstruct, while the physical features represent the infrastructure that we find preserved (see also A. F. Chase and Chase 2016; Hutson 2016; and M. L. Smith 2014, 2016). In contrast, social interactions are often reconstructed through material remains to obtain a more complete understanding of those social aspects to city life (e.g., A. S. Z. Chase 2023; Ossa, Smith, and Lobo 2017; Peeples 2019). It is essential to remember, however, that while infrastructural features may be concentrated in a settlement, the city can be a political, economic, social, or ecological entity (see Wirth 1938). The city is not just, or even primarily, a physical space, even if that is often the most salient aspect of the archaeological record.

The presence of these urban spaces, however, raises one short question, why are there cities? Or to ask a more general question, and to bypass the often-sterile disputation as to what a city is, why have humans agglomerated throughout history? Many of the social sciences that study human aggregation in its varied forms assume that human interactions are exchanges of material goods and information that happen in physical space; that the intensity, productivity, and quality of individual-level efforts are mediated and enhanced through interaction with others (via social networks); and that any human activity can be thought of as generating benefits and incurring costs (Lobo et al. 2020). Agglomeration effects refer to the costs and benefits generated by humans interacting in close physical proximity, and cities tend to have higher population densities than surrounding nonurban areas—even if the actual densities vary between regions, environments, and periods.

The costs of agglomeration are those associated with the noise, pollution, congestion, waste, and spread of disease that concentrated populations engender (O'Flaherty 2005). The benefits of agglomeration stem from the variety, intensity, and quality of social interactions that are *facilitated* by spatial proximity. The proximity lowers transportation and interaction costs, and the concentration of population facilitates a division of labor (and thus specialization), learning and copying, the recombination of knowledge to create new ideas, and the matching of skills with needs (Brueckner 2011; Duranton and Puga 2004). Larger populations and higher population densities foster agglomeration benefits (Ahlfeldt and Pietrostefani 2019; Duranton and Puga 2020; Rosenthal and Strange 2020).

The research program in urban economics and economic geography has been to identify and measure agglomeration benefits and their determinants at the levels of the firm and of the individual, using very sophisticated econometric techniques and micro-level data (Coe, Kelly, and Yeung 2019; Puga 2010). But nothing is inherently "modern" about the processes and mechanisms by which aggregated individuals produce greater value, innovate more rapidly, and use infrastructure more efficiently. The extent to which agglomeration effects were present in ancient cities is an empirical question, not an ontological debate. Can the consequences of agglomeration effects (both costs and benefits) be detected in the archaeological record? Applying urban economists' favorite modeling frameworks is probably not a workable approach, but note that settlement scaling theory builds on assumed agglomeration effects to derive predictions on what the coefficients of power-function equations relating *aggregate* output and areal extent of settlements and population size should be (Bettencourt 2013). Additionally, settlement scaling theory has been used in the context of historical and archaeological datasets (see the references in Lobo et al. 2020). Let's pose a narrower question: can the consequences of agglomeration effects (both costs and benefits) be detected in the Mesoamerican urban archaeological record at and below that of the aggregated city-level data? This would seem to partly depend on the ingenuity of Mesoamerican urban archaeologists as they uncover evidence of Mesoamerican urban life.

The potential and utility of overlaps between settlement archaeology and urban science depends on how both fields interact in the future, and whether they can share research questions into fundamental urban processes. Should Mesoamerican urban archaeologists exert the effort to define comparable variables and construct datasets, can such concepts, methods, and models of urban science be employed? Should Mesoamerican urban archaeologists learn to talk like economic geographers? That will ultimately depend on whether urban archaeologists find agglomeration effects a useful probe with which to investigate the urban past. Will insights and findings from Mesoamerican urban archaeology infuse the development of urban science? This will largely depend on these insights and results being presented in a manner that allows them to be used as inputs into modeling efforts.

BROADENING THE IMPACT OF MESOAMERICAN URBAN ARCHAEOLOGY

It would seem to be intellectually churlish to tell Mesoamerican urban archaeology what it should do and what questions it should pose. But helpful suggestions can be made so that the practice of Mesoamerican urban archaeology can be recognized as potentially useful additions to the stock of empirical results on which urban science is erected. In particular, we would like to highlight the importance of creating and testing multiple working hypotheses, defining key terms, quantifying when able, and learning to work with distribution data. These ideas are often already best practice in archaeology (M. E. Smith 2015; see also Ek 2020, 269–76).

First, create and test multiple working hypotheses. This not only helps remove the egocentric nature of a singular hypothesis, because the creation of multiple hypotheses gives the researcher separation from a sense of ownership over a single hypothesis, but simultaneously leads to higher quality research. In particular, multiple working hypotheses facilitate thinking through the potential frailty of each hypothesis. After all, archaeologists should be able to meet the standard of falsifiability: "How would you know if you are wrong?" (Haber 1999, 312; M. E. Smith 2015).

Second, define key terms. This can also provide a useful reflective exercise, especially when some concepts are more elusive and difficult to pin down in concise form or have multiple competing definitions. For example, several common definitions exist for a city (see M. E. Smith and Lobo [2019, 2–3] for some examples in context), and while no single "best" definition exists, some could be applied to both modern and archaeological contexts (e.g., "urban areas" from the US Census 2020). The use of different definitions suggests different paths to research, however, and urban scientists may have quite different terms and vocabulary in general, making our research on the same topic mutually incomprehensible. Providing clear definitions and assumptions helps provide a mechanism to ensure all readers are on the same page.

Third, quantify when able. Instead of saying *many* or *most*, use actual counts and values. As mentioned above, while scholars may disagree on definitions, quantification helps remove some aspects of this issue. For example, what does the difference between a *large city* and a *small city* actually mean in text? To some, a large city may be one with more than fifty thousand people, but to others, a city of ten thousand might be large. If the authors provide their population estimates along with that category, then the reader can learn to read between the lines of those labels, but defining them helps remove some ambiguity. Also, *many* and *most* both suggest more than half of a sample, so they apply equally well to sites with 51 percent or 80 percent of a thing, even though that distinction may be important. In general, providing the actual value of something yields more pertinent information than the categorical data alone.

Fourth, learn to work with distributional data. One reason archaeologists may use the vague language above is that obtaining exact values can be difficult. Providing ranges of data as an interval, however, can help get around this issue. For example, if one city is between 10,000 and 40,000 while another is between 30,000 and 80,000, it is important to note the potential overlaps but still suggest that one city is probably larger than the other. Mathematically, this could be noted as City A's population is [10,000–40,000] and City B's population is [30,000–80,000]. The square brackets indicate that the value within them is included in the range, while parentheses would indicate that the enclosed value is excluded from that range of values itself in that notation. Archaeologists actually have a lot of experience dealing with these types of data, since all radiocarbon dates are actually probability distributions and incorporate ranges.

CONCLUDING THOUGHTS

Urban science provides archaeology with one path to address its "grand challenges" (Kintigh et al. 2014), interacting with the shared interests of other disciplines. At the same time, this process and its application will allow archaeologists to apply their own lessons learned from the back-and-forth changes in theory and discourse that have led to many "once and future" ideas within the field (Cobb 2014). Open dialogue between archaeology and urban science would advance archaeology, but it requires effort from archaeologists to facilitate communication and earn a seat at the urban science table. This would not only help settlement archaeology gain relevance to modern research topics, but would also lead to new research topics, as diverse scholars address multiple, mutually interesting research questions. Ultimately, whether urban science can help archaeology depends on how the methods, concepts, and insights from its constituent fields are used to address archaeological questions, and whether those questions in turn allow archaeology to share its own findings to inform the larger set of fields interested in ancient and modern cities.

NOTE

1. Data science is an interdisciplinary field that uses a variety of methods, drawn from probability theory, data mining, computer science, expert systems, machine learning, and artificial intelligence, to find patterns and generate insights from noisy, large-scaled, structured, and unstructured data (Kelleher and Tierney 2018). Spatial statistics, or spatial analysis, is a set of concepts, methods, and techniques used to study the topological, geometric, and geographic properties of data-generating processes and data (Kent and Mardia 2022).

REFERENCES

Ahlfeldt, Gabriel M., and Elisabetta Pietrostefani. 2019. "The Economic Effects of Density: A Synthesis." *Journal of Urban Economics* 111:93–107.

Angel, Shlomo. 2012. *Planet of Cities*. Cambridge, Mass.: Lincoln Institute of Land Policy.

Arnold, J. R., and W. F. Libby. 1949. "Age Determinations by Radiocarbon Content: Checks with Samples of Known Age." *Science* 110 (2869): 678–80.

Barthelemy, Marc. 2016. *The Structure and Dynamics of Cities: Urban Data Analysis and Theoretical Modeling*. Cambridge: Cambridge University Press.

Batty, Michael. 2013. *The New Science of Cities*. Cambridge, Mass.: MIT Press.

Batty, Michael. 2019. "On the Confusion of Terminologies." *Environment and Planning B: Urban Analytics and City Science* 46 (6): 997–99.

Batty, Michael, K. W. Axhausen, F. Giannotti, A. Pozdnoukhov, A. Bazzani, M. Wachowicz, G. Ouzounis, and Y. Portugali. 2012. "Smart Cities of the Future." *European Physical Journal Special Topics* 214 (1): 481–518.

Bettencourt, Luís M. A. 2013. "The Origins of Scaling in Cities." *Science* 340 (6139): 1438–41.
Bettencourt, Luís M. A. 2021. *Introduction to Urban Science: Evidence and Theory of Cities as Complex Systems*. Cambridge, Mass.: MIT Press.
Brueckner, Jan K. 2011. *Lectures on Urban Economics*. Cambridge, Mass.: MIT Press.
Chase, Adrian S. Z. 2023. "Reconstructing and Testing Neighborhoods at the Maya City of Caracol, Belize." *Journal of Anthropological Archaeology* 70:101514.
Chase, Adrian S. Z., Diane Z. Chase, and Arlen F. Chase. 2017. "LiDAR for Archaeological Research and the Study of Historical Landscapes." In *Sensing the Past: From Artifact to Historical Site*, edited by Nicola Masini and Francesco Soldovieri, 89–100. New York: Springer.
Chase, Arlen F., and Diane Z. Chase. 2016. "Urbanism and Anthropogenic Landscapes." *Annual Review of Anthropology* 45:361–76.
Chase, Arlen F., Diane Z. Chase, Christopher T. Fisher, Stephen J. Leisz, and John F. Weishampel. 2012. "Geospatial Revolution and Remote Sensing LiDAR in Mesoamerican Archaeology." *Proceedings of the National Academy of Sciences* 109 (32): 12916–21.
Chase, Arlen F., Kathryn Reese-Taylor, Juan Carlos Fernandez-Diaz, and Diane Z. Chase. 2016. "Progression and Issues in the Mesoamerican Geospatial Revolution: An Introduction." *Advances in Archaeological Practice* 4 (3): 219–31.
Cobb, Charles R. 2014. "The Once and Future Archaeology." *American Antiquity* 79 (4): 589–95.
Coe, Neil M., Philip F. Kelly, and Henry W.-C. Yeung. 2019. *Economic Geography: A Contemporary Introduction*. 3rd ed. Hoboken, N.J.: Wiley-Blackwell.
Dunnell, Robert C. 1992. "The Notion Site." In *Space, Time, and Archaeological Landscapes*, edited by Jacqueline Rossignol and LuAnn Wandsnider, 21–41. Boston: Springer.
Duranton, Gilles, and Diego Puga. 2004. "Micro-Foundations of Urban Agglomeration Economies." In *Handbook of Regional and Urban Economics*, vol. 4, *Cities and Geography*, edited by J. Vernon Henderson and Jacques-François Thisse, 2063–2117. Amsterdam: Elsevier.
Duranton, Gilles, and Diego Puga. 2020. "The Economics of Urban Density." *Journal of Economic Perspectives* 34 (3): 3–26.
Ek, Jerald D. 2020. "The Inertia of Old Ideas: A Historical Overview of Theoretical and Methodological Challenges in the Study of Classic Maya Political Organization." *Journal of Archaeological Research* 28:241–87.
Fleming, Andrew. 2006. "Post-processual Landscape Archaeology: A Critique." *Cambridge Archaeological Journal* 16 (3): 267–80.
Forman, Richard T. T. 2014. *Urban Ecology: Science of Cities*. New York: Cambridge University Press.
Glaeser, Edward L. 2011. *Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier*. New York: Penguin.

Goyer, G. G., and R. Watson. 1963. "The Laser and Its Application to Meteorology." *Bulletin of the American Meteorological Society* 44 (9): 564–70.
Haber, Stephen. 1999. "Anything Goes: Mexico's 'New' Cultural History." *Hispanic American Historical Review* 79 (2): 309–30.
Hanlon, W. Walker, and Stephan Heblich. 2022. "History and Urban Economics." *Regional Science and Urban Economics* 94:103751.
Hepworth, Mark E. 1987. "The Information City." *Cities* 4 (3): 253–62.
Hutson, Scott R. 2016. *The Ancient Urban Maya: Neighborhoods, Inequality, and Built Form*. Gainesville: University Press of Florida.
Kelleher, John D., and Brendan Tierney. 2018. *Data Science*. Essential Knowledge Series. Cambridge, Mass.: MIT Press.
Kent, John T., and Kanti V. Mardia. 2022. *Spatial Analysis*. Hoboken: Wiley.
Kintigh, Keith W., Jeffrey H. Altschul, Mary C. Beaudry, Robert D. Drennan, Ann P. Kinzig, Timothy A. Kohler, W. Fredrick Limp, Herbert D. G. Maschner, et al. 2014. "Grand Challenges for Archaeology." *Proceedings of the National Academy of Sciences* 111 (3): 879–80.
Kotkin, Joel. 2005. *The City: A Global History*. New York: Modern Library.
Kristiansen, Kristian. 2012. Theory Does Not Die It Changes Direction. In *The Death of Archaeological Theory?*, edited by John Bintliff and Mark Pearce, 72–79. Oxford: Oxbow.
Lobo, José, Luís M. A. Bettencourt, Michael E. Smith, and Scott Ortman. 2020. "Settlement Scaling Theory: Bridging the Study of Ancient and Contemporary Urban Systems." *Urban Studies* 57 (4): 731–47.
Maca, Allan L. 2010. "Walter Taylor's Conjunctive Approach in Maya Archaeology." In *Prophet, Pariah, and Pioneer: Walter W. Taylor and Dissension in American Archaeology*, edited by Allan L. Maca, Jonathan E. Reyman, and William J. Folan, 243–98. Boulder: University Press of Colorado.
Maca, Allan L., Jonathan E. Reyman, and William J. Folan, eds. 2010. *Prophet, Pariah, and Pioneer: Walter W. Taylor and Dissension in American Archaeology*. Boulder: University Press of Colorado.
McCoy, Mark D. 2021. "Defining the Geospatial Revolution in Archaeology." *Journal of Archaeological Science: Reports* 37:102988.
O'Flaherty, Brendan. 2005. *City Economics*. Cambridge, Mass.: Harvard University Press.
Ortman, Scott G., Michael E. Smith, José Lobo, and Luís M. A. Bettencourt. 2020. "Why Archaeology Is Necessary for a Theory of Urbanization." *Journal of Urban Archaeology* 1:151–67.
Ossa, Alanna, Michael E. Smith, and José Lobo. 2017. "The Size of Plazas in Mesoamerican Cities and Towns: A Quantitative Analysis." *Latin American Antiquity* 28 (4): 457–75.
Peeples, Matthew A. 2019. "Finding a Place for Networks in Archaeology." *Journal of Archaeological Research* 27:451–99.

Puga, Diego. 2010. "The Magnitude and Causes of Agglomeration Economies." *Journal of Regional Science* 50 (1): 203–19.

Romer, Paul M. 1996. "Why, Indeed, in America? Theory, History, and the Origins of Modern Economic Growth." *American Economic Review* 86 (2): 202–6.

Romer, Paul M. 2013. "The City as Unit of Analysis." Paul Romer website, February 13. https://paulromer.net/the-city-as-unit-of-analysis/.

Rosenthal, Stuart S., and William C. Strange. 2020. "How Close Is Close? The Spatial Reach of Agglomeration Economies." *Journal of Economic Perspectives* 34 (3): 27–49.

Sheets, Payson, and Tom Sever. 1988. "High-Tech Wizardry." *Archaeology* 41 (6): 28–35.

Shi, Wenzhong, Michael F. Goodchild, Michael Batty, Mei-Po Kwan, and Anshu Zhang, eds. 2021. *Urban Informatics*. The Urban Book Series. Singapore: Springer.

Smith, Michael E. 2011. "Empirical Urban Theory for Archaeologists." *Journal of Archaeological Method and Theory* 18 (3): 167–92.

Smith, Michael E. 2015. "How Can Archaeologists Make Better Arguments?" *SAA Archaeological Record* 15 (4): 18–23.

Smith, Michael E., and José Lobo. 2019. "Cities Through the Ages: One Thing or Many?" *Frontiers in Digital Humanities* 6 (12). https://doi.org/10.3389/fdigh.2019.00012.

Smith, Michael E., José Lobo, Matthew A. Peeples, Abigail M. York, Benjamin W. Stanley, Katherine A. Crawford, Nicolas Gauthier, and Angela C. Huster. 2021. "The Persistence of Ancient Settlements and Urban Sustainability." *Proceedings of the National Academy of Sciences* 118 (20): e2018155118.

Smith, Monica L. 2014. "The Archaeology of Urban Landscapes." *Annual Review of Anthropology* 43 (1): 307–23.

Smith, Monica L. 2016. "Urban Infrastructure as Materialized Consensus." *World Archaeology* 48 (1): 164–78.

Taylor, Walter W. 1943. "A Study of Archaeology: A Dialectical, Practical and Critical Discussion with Special Reference to American Archaeology and the Conjunctive Approach." PhD diss., Department of Anthropology, Harvard University, Cambridge, Mass.

U.S. Census Bureau (USCB). 2020. "2020 Urban Areas FAQs." US Census Bureau. Accessed September 25, 2022. https://www2.census.gov/geo/pdfs/reference/ua/2020_Urban_Areas_FAQs.pdf.

Wilkinson, Tony J. 2003. *Archaeological Landscapes of the Near East*. Tucson: University of Arizona Press.

Wirth, Louis. 1938. "Urbanism as a Way of Life." *American Journal of Sociology* 44 (1): 1–24.

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