

Researching Cities, Transforming Ecology

An Investigation into Urban Ecology Agendas

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Abstract: In the last two decades, new academic journals, textbooks, and research networks attest to ecologists' rising interest in cities. How did ecologists come to enter cities and to view them as places worth studying? To what extent does this new interest launch a broader redefinition of the type of knowledge that matters in ecology? Drawing on the new political sociology of science, and using a review of publications in urban ecology, we argue that the politics of urban ecological knowledge does not merely correspond to the promotion of a new subfield of ecology dedicated to cities: it has launched instead a broader, contested redefinition of the goals, practices, and relevance of ecology as a whole. We unpack the tensions between a "city-driven agenda" aiming to integrate ecological science into the interdisciplinary field of urban sciences, and an "ecology-driven agenda" aiming to research cities as part of ecological discipline.

Keywords: cities, discipline, ecology, nature, research agendas, urban ecology



In his review of the recent book *Urban Raptors: Ecology and Conservation of Birds of Prey in Cities*, edited by Clint Boal and Cheryl Dykstra, avian ecologist James Bednarz writes that, although he was well "aware of historical records of these 'wilderness' birds nesting in the great cathedrals and castles of Europe as far back as the Middle Ages" (Bednarz 2019: 234), like many of his fellow naturalists he would not have imagined leaving the remote cliffs he had studied for so many years for urban skyscrapers. He felt indeed that his job was to track the almost extinct peregrine falcon in mountainous regions. However, he emphasizes that the book's unequivocal demonstration that many birds of prey are now adapting to city life opens up a paradigm shift: this demonstration "does not only turn some traditional notions about raptor ecology upside down, but also opens up an entirely new realm of inquiry into urban ecology" (ibid.). Over the last three decades, urban ecology—understood as ecological research on cities and urban environments¹—has indeed grown into a new research field, attested by the





creation of a number of dedicated academic journals (such as *Urban Ecosystems*, created in 1997), the rise of research networks and digital forums (such as the Society of Urban Ecology, established in 2009;² Urbio in 2008;³ and the Nature of Cities) (McPhearson and Maddox 2018), and the publication of reference articles and textbooks (Alberti 2009), leading ecologists to write of a “burgeoning” field and a “golden age of urban ecology” (Wu 2014: 218).

This article addresses the rising interest of ecologists in cities and aims to explore its significance for the politics of ecological knowledge—defined as the various contested visions of the type of ecological knowledge that matters. Ecologists have long favored researching “natural” places, meaning places with little human presence and influence, far from the cities where they live (Miller and Hobbs 2002; Martin et al. 2012).⁴ Science studies literature suggested that natural scientists’ professional identities and commitments to their work was strongly shaped by the time they spent in wilderness. It showed how researching wild, remote places allowed researchers to form special links with fellow researchers around shared heroic stories of their adventurous expeditions in remote, wild places (Anker 2007; Dumoulin-Kervan 2018; Kohler 2006; Kuklick and Kohler 1996; Lorimer and Spedding 2005). Jeremy Vetter even suggested the stark contrast of the moments spent in remote and wild field sites with researchers’ normal urban life: “The Rocky Mountain field station was therefore more than simply a site for producing knowledge; it was equally a place for enjoying long-term experiences of nature in residence that could not be enjoyed in the urban environments in which participants usually lived” (Vetter 2011: 118).

Ecologists’ longstanding preference for research sites with little human influence was also due to the impact on early developments in ecology of the theory of nature equilibrium, which downplays the influence of human actions on ecosystems and implies “that to effectively study ‘nature’ ..., ecologists and conservationists had to locate study sites far from human actions” (McDonnell 2011: 6). So how did ecologists come to enter cities and to view them as places worth studying? What is the politics of knowledge associated with the rise of ecological research related to cities? What are the various visions of the type of ecological knowledge that matters in relation to cities, and to what extent do they launch a broader redefinition of the goals, practices, and relevance of ecology as a whole?

Historians of ecology paid much attention to the development of ecosystem ideas and approaches in the genesis and transformation of the discipline (Hagen 1992; Kingsland 2005; Walker 2020) and its



connection with management and conservation (Takacs 1996; Worster 1994). Less attention was paid to the history of ecological research in and on cities, with the notable exception of Jens Lachmund's influential writings on the development of naturalist inventories in the ruins of Berlin, Germany in the wake of World War II (Lachmund 2003, 2013; see also Grove et al. 2015; Kingsland 2019; Sukopp 2002). However, Lachmund's work focused on natural sciences and the production of urban nature spaces, rather than on the research agendas of ecology itself, understood as a discipline interested in the interactions between living beings and their surroundings.

Ecologists themselves propose a history of urban ecology that—as suggested by Bednarz (2019)—emphasizes their own myopia, ignorance, or even their contempt toward urban places⁵ and tends to see the rise of urban ecology as the long-due realization that cities are indeed an environment for a variety of living beings and a site of important ecological dynamics. In this article, we argue that the rise of ecological research related to cities does not only reflect the late “discovery” of cities as ecosystems, nor does it merely correspond to the constitution of a new disciplinary subfield or specialty dedicated to specific places (i.e. cities) within ecology, in the same way as forest ecology deals with forests, wetland ecology with wetlands, or marine ecology with marine areas. Drawing on insights from the new political sociology of science, and using a review of publications in ecology, we argue that the rise of urban ecological research corresponds to the shaping of new, partly conflicting ideas of the type of knowledge that matters in ecology. This article unpacks the contested politics of urban ecological knowledge and accounts for the tensions among ecological scientists and researchers regarding the need to transform the goals, practices, and relevance of ecology as a whole. In particular, we discuss the tensions between a “city-driven agenda” and an “ecology-driven agenda” of research and unpack their different approaches to ecological knowledge.

Theories and Methods

We mobilize insights from the new political sociology of science toward this goal. This literature proposes to bring the study of the emergence of research agendas closer to the study of social movements in order to account for how scientists and researchers manage to put certain research problems and issues into broader political and scientific agendas: it suggests that ordinary research activities should thus be considered a



type of environmental activism (Frickel et al. 2010; Frickel and Gross 2005; Woodhouse and Breyman 2005). Scott Frickel (2004) showed, for instance, that the emergence of the ecotoxicology research field resulted from the involvement of certain leading scientists in political mobilization and struggles to promote certain research agendas among colleagues, funding agencies, non-academic partners, and the broader society.

While the contributions of the new political sociology of sciences were abundantly elaborated in order to explore the social and political mechanisms of “undone science—that is, to analyze the reasons why some issues (such as the health effects of soil pollution for instance: Frickel and Elliott 2018) are not incorporated into scientific agendas, despite being of acute importance to some actors and groups—the present article focuses on the struggles related to the promotion of new agendas of urban ecological research. Following Frickel and coauthors (2010), and in line with Céline Granjou and Isabelle Arpin (2015), we define scientific agendas as broad programs that combine certain views of the research theories and practices to be developed by scientists with views of the broader goals of that research as well as its relevance and utility for society.

The promotion of research agendas is embedded in scientists’ efforts to enhance their individual and collective visibility and legitimacy, and has heavy consequences for the resources that are granted to laboratories, teams, and researchers, including research grants and doctoral or post-doctoral salaries, assistant staff, and institutional affiliations, labels, and networks. As such, pushing for certain research agendas is part of the cycle of credibility depicted by Bruno Latour (1983) as a main driver of research work and research communities. However, we think that scientists and researchers who push in favor of certain research agendas should not be viewed as mere opportunistic strategists (or “wild capitalists” to use Latour’s words) in search of audiences and resources. The approach developed by Granjou and Arpin (2015) (see also Stoler 2008) highlights the role of ideological and ethical dimensions in scientists’ commitments to promoting certain agendas, that is, the progressive shaping of personal views of the pressing environmental problems and the type of knowledge that matters to help solve them over the long term. In this article we endeavor to unpack the politics of urban ecological knowledge, which we define as scientists’ efforts and struggles to shape shared, accepted views of the research that matters, that is, shared views of how and why ecology should include a growing focus on cities. We focus on the promotion of urban ecological



research programs and agendas as a discursive technology by which some ecologists endeavor to build strong collective commitments to develop urban ecological knowledge. Using Thomas Gieryn's approach to how scientists define and promote the importance and legitimacy of their job (Gieryn 1983), research agenda promotion can be viewed as a form of boundary-work aiming to negotiate the place and boundaries of ecology and urban ecology among other academic fields and specialties. By focusing on a sample of agenda promotion statements (more details in what follows), we thus aim to scrutinize how ecologists promoting urban ecology research endeavored to redefine and renegotiate the place of cities within the whole discipline of ecology, whose boundaries have usually been defined as the science that studies natural places and ecosystems.

On the empirical level, we chose to focus on the thirty years from 1990 up to the present, with a specific interest for the turn of the 2000s. This thirty-year period is indeed particularly interesting for studying the transformation of the politics of ecological knowledge associated with ecologists' rising interest in cities for two reasons. First, issues of sustainability, global environmental change, climate change, and—more recently—the Anthropocene have become increasingly powerful incentives and orientations for research work, in every field of the natural sciences, since the 1990s. Attempts to monitor and study environmental global change started expanding toward urban environments, as demonstrated in 1997 by two North-American cities (Phoenix and Baltimore) becoming part of the Long-Term Ecological Research (LTER) Network created by the United States National Science Foundation and aiming to monitor ecological change in a number of ecosystems (Mauz et al. 2012). Then the second half of the 1990s was a period of increasing institutionalization of urban ecology, retrospectively characterized as a “renaissance” of urban ecology by Mark McDonnell (2011). While earlier developments in urban ecology corresponded with attempts to apply ecological knowledge to problems of urban management and planning (as illustrated by the first journal *Urban Ecology*, founded in 1975 by urban planner Royce LaNier [1975] and merged with *Landscape and Urban Planning* in 1986), the second half of the 1990s saw the development of efforts to define and foster urban ecology itself, for instance with the foundation of *Urban Ecosystems* by American ecologist Mark Walbridge (Walbridge 1997).

Our research draws on the qualitative analysis of a purposeful sample of programmatic publications in ecology (Palinkas et al. 2015),⁶ that is, a sample of publications that introduce and promote a program



for urban ecology and explain how and why cities matter for ecological research. This sample is backed up with a number of exchanges with ecologists involved in urban research both within and outside our coauthoring group.⁷ The present article is indeed coauthored by a multidisciplinary research group including human geographers (J. Salomon, S. Flaminio, M. Chalmandrier, C. Kull), a sociologist (C. Granjou), an economist (V. Boisvert), and an ecologist (M. Moretti) involved in research on urban biodiversity and ecosystems functioning and interested in addressing the growth of this rising, yet still marginal, topic within ecology.⁸ We started building our purposeful sample with a small number of published statements from leading international ecologists, including prominent founders of urban ecology journals (such as *Urban Ecosystems*) and urban research platforms (such as the two urban LTER sites).⁹ Based on those first few statements, we identified a set of shared ideas and visions for urban ecology as well as differences of view regarding the role of ecology as a discipline. We progressively confirmed, refined, and enriched this first tentative outline of the politics of urban ecology with further statements. Some of these statements were dated earlier than the 1990–2020 period; they helped confirm that, while some ecologists were pushing for including cities in ecology as soon as the 1970s, the period since 1990 corresponded to a unique and specific step of acceleration and transformation of the politics of urban ecological knowledge. To find additional programmatic statements, we used bibliographical lists of the first publications and primarily selected guest editorials, introductory papers, and textbooks, discussing the sample within our coauthoring group.¹⁰ Once additional statements were no longer found to add something new or different to our analysis, we considered that our sample represented an adequate basis to achieve a realistic understanding of the politics of urban ecological knowledge during the period considered, following the grounded theory notion of “saturation” (Glaser and Strauss 1967); saturation is the point where collecting and analyzing additional data does not bring any new information about the research topic (see also Palinkas et al. 2015: 534).

We came up with a set of 36 publications (see Table 1) published between 1970 and 2020 in ecology journals (e.g., *Frontiers in Ecology and Evolution*, *BioScience*), urban ecology journals (e.g., *Urban Ecosystems*, *Journal of Urban Ecology*), applied and integrative sciences journals (e.g., *Sustainability*, *Landscape and Ecological Engineering*, *Ecology and Society*, *Landscape and Urban Planning*), general scientific journals (e.g., *Science*) and introductions to urban ecology textbooks (e.g., Alberti 2009; Breuste et al. 1998; Marzluff 2008). This corpus includes

**Table 1** ■ Corpus of 36 Programmatic Publications (chronological order)

	Author	Year	Title	Journal / Type of Book
1	Stearns, F.	1970	Urban Ecology Today	Science
2	Nix, H. A.	1973	The city as a life system?	Proceedings
3	LaNier, R.	1975	Developing an ecological framework for the planning of human settlements	Urban Ecology
4	Stearns, F., and Montag, T. (eds.).	1975	The Urban ecosystem: A holistic approach	Textbook
5	Bornkamm, R., Lee, J. A., and Seaward, M. R. D.	1982	Urban Ecology: The Second European Ecological Symposium	Proceedings
6	Duvigneaud, P.	1985	La synthèse écologique: Populations, communautés, écosystèmes, biosphère, noosphère	Textbook
7	Gilbert, O. L.	1989	The ecology of urban habitats	Textbook
8	McDonnell, M. J. and Pickett S. T. A.	1990	Ecosystem Structure and Function along Urban-Rural Gradients: An Unexploited Opportunity for Ecology	Ecology
9	Walbridge, M. R.	1997	Editorial	Urban Ecosystems
10	Botkin, D. B., and Beveridge, C. E.	1997	Cities as environments	Urban Ecosystems
11	McDonnell, M. J.	1997	A Paradigm Shift.	Urban Ecosystems
12	Pickett, S. T. A., Burch, W. R., Dalton, S. E., Foresman, T. W., Grove, J. M., and Rowntree, R.	1997	A conceptual framework for the study of human ecosystems in urban areas	Urban Ecosystems
13	Rees, W. E.	1997	Urban ecosystems: The human dimension	Urban Ecosystems
14	Breuste, J., Feldmann, H., and Uhlmann, O. (eds.).	1998	Urban Ecology	Textbook
15	Niemelä, J.	1999	Is there a need for a theory of urban ecology?	Urban Ecosystems
16	Collins, J. P., Kinzig, A., Grimm, N. B., Fagan, W. F., Hope, D., Wu, J., and Borer, E. T.	2000	A new urban ecology: Modeling human communities as integral parts of ecosystems poses special problems for the development and testing of ecological theory	American Scientist
17	Grimm, N. B., Grove, J. G., Pickett, S. T. A., and Redman, C. L.	2000	Integrated Approaches to Long-Term Studies of Urban Ecological Systems	BioScience
18	Sukopp, H.	2002	On the Early History of Urban Ecology in Europe	Preslia
19	Alberti, M., Marzluff, J. M., Shulenberger, E., Bradley, G., Ryan, C., and Zumbrennen, C.	2003	Integrating Humans into Ecology: Opportunities and Challenges for Studying Urban Ecosystems	BioScience
20	Redman, C. L., Grove, J. M., and Kuby, L. H.	2004	Integrating Social Science into the Long-Term Ecological Research (LTER) Network: Social Dimensions of Ecological Change and Ecological Dimensions of Social Change	Ecosystems

**Table 1 ■** Corpus of 36 Programmatic Publications (cont.)

	Author	Year	Title	Journal / Type of Book
21	Grimm, N. B., Faeth, S. H., Golubiewski, N. E., Redman, C. L., Wu, J., Bai, X., and Briggs, J. M.	2008	Global change and the ecology of cities	Science
22	Marzluff, J. M. (ed.).	2008	Urban ecology: A perspective on the interaction between humans and nature	Textbook
23	Anderson, P., and Elmqvist, T.	2012	Urban Ecological and Social-Ecological Research in the City of Cape Town: Insights Emerging from an Urban Ecology CityLab	Ecology and Society
24	Pickett, S., Cadenasso, M. L., and McGrath, B. (Eds.).	2013	Resilience in Ecology and Urban Design: Linking Theory and Practice for Sustainable Cities (Springer Netherlands)	Textbook
25	Wu, J.	2014	Urban ecology and sustainability: The state-of-the-science and future directions	Landscape and Urban Planning
26	Childers, D. L., Cadenasso, M. L., Grove, J. M., Marshall, V., McGrath, B., and Pickett, S. T. A.	2015	An Ecology for Cities: A Transformational Nexus of Design and Ecology to Advance Climate Change Resilience and Urban Sustainability	Sustainability
27	McDonnell, M.	2015	Journal of Urban Ecology: Linking and promoting research and practice in the evolving discipline of urban ecology	Journal of Urban Ecology
28	Pataki, D. E.	2015	Grand challenges in urban ecology	Frontiers in Ecology and Evolution
29	McDonnell, M. J., and MacGregor-Fors, I.	2016	The ecological future of cities.	Science
30	McPhearson, T., Pickett S. T. A., Grimm, N. B., Niemelä, J., ...and Qureshi, S.	2016	Advancing Urban Ecology toward a Science of Cities	BioScience
31	Johnson, Marc T. L. and Jason Munshi-South.	2017	Evolution of Life in Urban Environments	Science
32	Parris, K. M.	2018	Existing ecological theory applies to urban environments	Landscape and Ecological Engineering
33	Barot, S., Abbadie L., Auclerc, A, Barthélémy C., ... and Veyrières, M.	2019	Urban ecology, stakeholders and the future of ecology	Science of the Total Environment
34	Pickett, S. T. A., Cadenasso, M. L., and Grove, J. M.	2019	Science for the Sustainable City: Empirical Insights from the Baltimore School of Urban Ecology	Textbook
35	Rivkin, L. R., Santangelo, J. S., Alberti, M., Aronson, M. F. J., de Keyzer, C. W., Diamond, S. E., ... and Johnson, M. T. J.	2019	A roadmap for urban evolutionary ecology	Evolutionary Applications
36	Pickett, S. T. A., Cadenasso, M. L., Baker, M. E., Band, L. E., Boone, C. G., ... and Szlavecz, K.	2020	Theoretical Perspectives of the Baltimore Ecosystem Study: Conceptual Evolution in a Social–Ecological Research Project	BioScience



mostly English-language publications, which is linked to the fact that a number of urban ecology journals were founded by North American ecologists; this may lead to a potential underestimation of European, especially German, ecologists in our analysis of the politics of ecological knowledge related to cities. Most of these publications started with the observation that ecologists have long ignored cities, and aimed to fill in this research gap by defining a programmatic agenda for ecological research in relation to cities.

Taking our inspiration from the new political sociology of science, we considered the programmatic publications as evidence of the authors' mobilization to promote, convince, and enroll colleagues into certain views regarding the place of cities within ecology. In line with this position, we not only paid attention to the content of the programmatic statements, that is, authors' ideas and visions of the value of cities for ecological research; instead, we also treated them as distinct discursive technologies, that is, as collective efforts and struggles aiming to enact certain research agendas and to transform the politics of ecological knowledge.

By unpacking the politics of agenda statements, we found that the promotion of urban ecological research launched not only efforts to create a new subfield in ecology devoted to cities, but also a broader debate regarding the extent to which ecology should transform as a whole to address urban issues—away from its focus on “natural” places and environments. The rest of the paper is devoted to analyzing and discussing in details the contested politics of ecological knowledge that we found in our corpus of publications.

Researching Cities, Promoting a New Agenda for Ecology

From the second half of the 1990s onward, a number of programmatic publications in our corpus stated that cities had long been neglected and urban environments deserved much more attention from ecological scientists and researchers. These statements should not be read only as indicative of ecologists' rising interest in cities, but also as evidence of their ongoing attempts and efforts to shift the boundaries of ecological research objectives and fields. We thus found that authors promoted not only the development of urban ecology as a subfield dedicated to cities within ecology; they also promoted a new agenda for ecology as a whole, that is, they promoted new goals, practices, and relevance for the discipline, away from a focus on “wild” nature toward a new



focus on social-ecological dynamics, including cities as laboratories of global environmental change. Key authors promoting this shift included Mark J. McDonnell (professor of urban ecology at the University of Melbourne, Australia, founder and director of the Australian Research Center for Urban Ecology and the *Journal of Urban Ecology* as well as urban ecology university curricula, who worked on the cities of Melbourne in Australia and New York in the United States); James Collins (professor of evolutionary ecology at Arizona State University, who researched species decline and extinction); Nancy Grimm (professor of ecology at Arizona State University, who was the founder and director of the LTER urban site of Phoenix); and Steward Pickett (professor of landscape ecology and urban ecosystems at the University of Illinois, who was the founder and director of the LTER urban site of Baltimore). All these scientists were international leaders in their research fields and founded new research networks of urban ecology well connected with urban management, planning, and decision making.

New Paradigm and Goals for Ecology: Addressing Human Influence on Planetary Environments

Many programmatic publications in our corpus started with the observation that almost half of the world population lives in cities. With this observation, the authors not only meant that cities represented a growing proportion of the landscapes and environments on Earth, and as such deserved the development of a specific branch or subfield of ecology—alongside other subfields already addressing forests, oceans, or desert areas; they also meant that cities were proof of the growing influence exercised by humans on planetary environments, and argued that ecology could no longer focus (if it ever could) on the study of “pristine” nature devoid of human presence. Grimm and coauthors (2000), for instance, observed that “humans are a part of virtually all ecosystems and have been so for millennia” (Grimm et al. 2000: 572). Collins called for departing from “ecologists’ persistent tendency to focus on pristine environments” (Collins et al. 2000: 416); if the world no longer offered any pristine place to be studied, the author explained, ecology could no longer be defined as the study of “nature”—instead ecology should focus on the relations between human activities and ecological dynamics. In a later article, Ruth Rivkin and coauthors (2019) used the term “Anthropocene,” suggesting the extent of the redefinition of the goals of ecological knowledge in a world deeply marked by urbanization growth. To McDonnell, ecological knowledge should focus



on urban areas in order to be scientifically and socially relevant: “With current estimates stating that by the year 2000, over 50 percent of the world’s human population will reside in urban areas, it is scientifically germane and socially imperative that ecologists apply their expertise to addressing both basic ecological questions and environmental problems in urban and suburban landscapes” (McDonnell 1997: 85).

In the second half of the 1990s, this new definition of the goals of ecological knowledge relied on and participated in a broader shift of scientific theories and paradigms in ecology away from nature equilibrium theories that tended to exclude humans from their focus, toward “a new ‘non-equilibrium paradigm’ ... allowing for the inclusion of humans as components of ecosystems studied by ecologists” (McDonnell 2011: 7).¹¹ McDonnell promoted urban ecological research as part of a “paradigm shift” in ecology, where ecologists should no longer consider “steady-state” systems unsettled by outside disturbances; instead, they should focus on complex and dynamic systems where human disturbances “are legitimate topics of ecological study” (McDonnell 1997: 85). He stated that “with the numerous discoveries over the past 20 years of the extent of human impacts on the globe, this “natural state” is more of an ideal than a reality. The earth today provides ecologists the opportunity and challenge to address ecological questions in a variety of environments with varying levels of human activities” (McDonnell 1997: 85).

The new goals defined by urban ecology promoters thus corresponded both to an extension of the focus of ecological research, including the most human-impacted environments, and to a further affirmation of a new non-equilibrium paradigm considering human activities as part of the systems studied, in an effort to address open and evolutive rather than closed and steady-state systems.

New Research Sites and Practices for Ecology: Cities As “Laboratories”

In our corpus, some authors proposed considering urbanization as a “massive, unplanned experiment” (McDonnell and Pickett 1990: 1232) requiring ecologists to focus on human-dominated landscapes in an increasingly urbanized planet, but also providing them with new means and tools for the study of social-ecological dynamics, as urban environments allowed researchers to develop new kinds of research protocols and practices. This included, in particular, research protocols called “gradients of anthropization,” where cities made it possible to under-



stand various levels of human influence and disturbances on a range of environments, from the least to the most impacted by human activities. These protocols aimed to compare different research sites with various levels of human influence in an “outdoor experimentation” (Niemelä, 1999), that is, as if the various levels of human influence were built and controlled by ecologists. Conceived as the strongest level of human disturbance, cities and their surroundings should thus be compared with places more preserved from human activities. Such research protocols were, for instance, meant to observe the impacts of nighttime light pollution, of the fragmentation of the habitat, or—more recently—of heat increase on living beings and communities. In that sense, cities were not considered as a mere convenient place to conduct ecological research; instead, authors also emphasized that “urbanization provides an unprecedented suite of ‘experimental manipulations’ that ecologists can utilize” (McDonnell and Pickett 1990: 1236).

Our corpus of publications thus suggested that cities were not only promoted as a convenient or legitimate places for ecological research, but also as laboratories for developing new practices and new theories of “general importance and applicability” (McDonnell and Pickett 1990: 1232). While these authors emphasized the role of anthropization gradients to unpack the various impacts of human activities on a range of environments, cities were also promoted as laboratories for the production of knowledge on social-ecological dynamics and transformations in a context of global environmental change. Collins et al. (2000) stated, for instance: “If there is a laboratory where ecological change can be viewed at close hand, it is the city ... we believe that there is no better place than the city to develop hypotheses and test predictions that emerge when one attempts to adapt ecological theory to include humans” (Collins et al. 2000: 416).¹² In this quotation, cities no longer represent the highest level of human disturbance on nature in a protocol including a variety of sites; rather, they are the best places to elaborate a non-equilibrium paradigm and to adapt ecological practices in order to explore the high level of complexity and rapid evolutions of urban social-ecological systems in a context of global environmental change.

A New Type of Relevance for Ecology

Authors not only promoted the production of ecological knowledge *in* cities: they also promoted producing ecological knowledge *of* and *for* cities, in the perspective of fostering sustainable cities able to manage

their own detrimental effects (such as pollution and heat) and of addressing future environmental problems. While this is more broadly in line with the advisory role acquired by ecologists in matters of land planning, agricultural extension, and forestry since the earlier developments of the discipline in the twentieth century (Worster 1994), urban management and planning represented a new field for the affirmation of the relevance and utility of ecological knowledge to solve applied problems and inform future decisions and policies.

While earlier developments of urban ecology research in the 1970s focused on managing and mitigating cities' detrimental effects on the global environment, the 1990s and 2000s saw a stronger emphasis on the role of ecological knowledge for building resilient and livable cities, including helping cities and urban inhabitants adapt to climate change and other forms of global environmental change. McDonnell strongly contributed to defining cities as privileged recipients for ecological expertise, advice, and knowledge, stating that "the discipline of urban ecology is at the forefront of creating the knowledge base, conceptual frameworks, and tools that are crucial for building and maintaining sustainable and resilient cities and towns in the future" (McDonnell 2011: 13). Daniel Botkin and Charles Beveridge (1997) also argued that ecology should help design a better urban future and promote cities that are more pleasant and "livable" for humans, animals, and plants, and that deliver aesthetic amenities, save water, regulate temperature, and reduce pollution. The importance of reorienting ecology in order to contribute to urban planning and design has been reasserted by promoters of urban ecology throughout the 2000s and 2010s, with Wu (2014: 218), for instance, stating that "global sustainability depends critically on cities, and urban ecology can—and needs to—play a key role in the transition toward sustainability" (Wu 2014; see also Pickett et al. 2019).

A Tension Between a City-Driven Agenda and an Ecology-Driven Agenda

While all authors in our corpus promoted urban ecological research as part of a broader redefinition of ecological goals, paradigms, practices, and social roles, we found that some of them disagreed on the desirable extent of this transformation. From the turn of the year 2000 onward, we found rising evidence of the expression and confrontation of two partly conflicting agendas, as the increased maturation of ecological



research on cities from the end of the 1990s enabled the expression of internal disagreements and partly conflicting views of the significance of urban research for the discipline of ecology itself. While some authors were pushing a “city-driven agenda” that called for making ecology an integral part of a broader, interdisciplinary field of urban sciences, others were pushing an “ecology-driven agenda” that called instead for applying, extending, and further refining existing ecological theories and approaches in relation to cities.¹³ While promoters of the first agenda tended to view ecology as being in the service of the interdisciplinary study of cities, promoters of the second agenda tended to view cities as being in the service of the development of ecological science.

While not incompatible on certain aspects,¹⁴ those two agendas still represented different versions of the significance of urban ecological research for the future of the discipline of ecology. Authors taking sides in this controversy from the 2000s onward were indeed not always different from the authors promoting a shared agenda for ecology at the end of the nineties (including James Collins, Nancy Grimm, and Jari Niemelä). We found instead that clarifications regarding the extent to which they thought that ecology should be transformed led to a divide between a city-driven agenda promoting a radical merging of ecology into urban research, and an ecology-driven agenda promoting a much more moderate incorporation of urban environments into the ecological discipline.

At stake with this tension were struggles to gain and maintain new audiences and resources, such as the funds and partnerships with urban decision makers and researchers in other disciplines, that are associated with ecologists becoming experts helping and advising urban decision makers and managers, especially in the case of cities such as LTERs Phoenix and Baltimore or CityLab Cape Town (see Anderson and Elmqvist 2012). The city-driven agenda also seems to have played an important role for their promoters to access visibility and positions within broader interdisciplinary and transdisciplinary communities interested in issues of environmental change and social-ecological insights, including the LTER network, as suggested by the coauthoring groups in our sample that include specialists of sustainability and environmental sciences and urban planning. In the second half of the 2010s, several statements promoting the city-driven agenda were published in prestigious journals with broad editorial scope in biological sciences, such as *Science of the Total Environment* and *BioScience*, while statements in favor of the ecology-driven agenda were published instead in more specialized journals of ecology interested in the development of

ecological research itself, such as *Landscape and Ecological Engineering* (Parris 2018).

A City-Driven Agenda

From the turn of the 2000s onward, some ecologists started to question whether ecology was meant to radically transform into another social-ecological and interdisciplinary science, or to carry on its own disciplinary research program. A number of authors promoted a “new” ecology focused on the interdisciplinary study of cities. After Jari Niemelä (a promoter of the ecology-driven agenda) published a paper entitled “Is there a need for a theory of urban ecology?” in 1999 in the journal *Urban Ecosystems*, Collins and coauthors (2000) published an article entitled “A New Urban Ecology” in the public dissemination magazine *The American Scientist*, which emphasized the need to unsettle “classical ecological theory” in order to become able to address the very high level of human influence on urban landscapes and dynamics: “Essentially we wish to present a challenge to classical ecological theory” (Collins et al. 2000: 416). The authors stated: “We lack a method of modeling ecosystems that effectively incorporates human activity and behavior. And the processes and dynamics within cities largely elude an understanding based on traditional ecological theories” (Collins et al. 2000: 416).

Among promoters of the city-driven agenda were leading scientists who were involved in the extension of the LTER program toward urban sites, such as Steward Pickett (the founder and director of the LTER urban site of Baltimore), Nancy Grimm (the founder and director of the LTER urban site of Phoenix), and Daniel Childers, its current director. Their coauthors in our sample of programmatic publications also included some scientists specialized in the social dimensions of sustainability sciences (such as Charles Redman) and urban planning (such as Brian P Mcgrath). The city-driven agenda was also in line with the theories of social-ecosystems, that is, theories aiming to address natural and social dimensions in an integrated manner, as proposed by the influential Resilience Alliance.¹⁵ The Resilience Alliance is an international consortium of researchers set up at the end of the 1990s in order to explore the dynamics of social-ecological systems and to contribute to their resilience and sustainability. This group strongly contributed to the formulation and circulation of concepts and theories, such as nonlinear dynamics, complexity, and adaptation, through connecting research groups and networks that were using these notions in isolation from



each other. Relying on cybernetics and ecosystem ecology theories, the Resilience Alliance claimed to have reconceptualized “what is often divided into separate ‘natural’ and human spheres as a single, complex SES [Socio-Ecological System]” (Redman et al. 2004: 165).

In line with the Resilience Alliance’s approaches and theories, Grimm and coauthors (2000) called for going beyond “classical ecology” in order to build “a new integrative ecology” in the idea that cities were places requiring the elaboration of novel interdisciplinary concepts and synthesis. While taking their inspiration from the ecosystems approach developed by Howard Odum when he calculated city metabolic profiles, Grimm and coauthors called for going beyond the concept of ecosystem in order to embrace that of social-ecological system, which they thought more adapted to the integration of social science approaches with ecological approaches: “We suspect that simple modification of ecological theory will prove unsatisfactory, because the modifications we have just discussed deal with aspects of human social systems that are far from simple ... the development of a new integrative ecology that explicitly incorporates human decisions, culture, institutions, and economic systems will ultimately be needed” (Grimm et al. 2000: 575).

After the 2010s, a number of promoters of the city-driven agenda suggested that the transformation of ecology should reach the point that ecological science would “merge” with urban design and probably disappear as such. Pickett and coauthors (2013) stated that urban ecology should align “the interests of contemporary ecological science ... with the concerns of urban geographers and urban sociologists, among others, to fashion a new kind of synthetic science. This is the urban ecology that can best support the linkage with urban design in a rapidly urbanizing world” (Pickett et al. 2013: 2–3). For Childers and coauthors (2015), urban ecology should, for instance, achieve “a transformative model that merges urban design and ecology” (Childers et al. 2015: 3774). Timon McPhearson and coauthors (2016) also advocated merging ecology with broader attempts to design a new “science of urban ecosystems” or even a “science of cities,” where ecological research questions and objects would meet and combine with those of other disciplines from social sciences.

The Ecology-Driven Agenda

To the promoters of the ecology-driven agenda, the study of cities does not require any new theories and should be driven by existing

disciplinary theories and approaches in ecology. To them, existing approaches in ecology were adequate to address the highly heterogeneous environments and landscapes that are typical of cities. Promoters of this second agenda included Jari Niemelä, a professor of urban ecology and specialist of ecosystems and environment research at the University of Helsinki and also a member of international science/policy organizations (i.e., the Intergovernmental Platform for Biodiversity and Ecosystem Services IPBES). Jari Niemelä published a paper entitled “Is there a need for a theory of urban ecology?” in which he wrote:

The question then arises whether a distinct theory of urban ecology is needed for understanding ecological patterns and processes in the urban setting. The answer is no, because urban ecosystems can be successfully studied using existing ecological theories, such as the metapopulation theory.¹⁶ (Niemelä 1999)

Cities thus provide ecologists with the opportunity to further develop existing theories and tools of branches of ecology such as population and community ecology, evolutionary biology, and landscape ecology. In particular, they make it possible to address the effects of urban spatial heterogeneity on the evolution of species, communities, and populations, through the investigation of urban patches and their mosaic of habitats and living beings.

More recent promoters of the ecology-driven agenda included Kirsten Parris, who was a former student of Mark McDonnell, now professor of urban ecology and specialist of conservation biology at the University of Melbourne. She has been leading the Clean Air and Urban Landscapes Hub and has been involved in citizen science and urban management in a range of Australian cities, including Melbourne. She published a paper entitled “Existing ecological theory applies to urban environments” in *Landscape and Ecological Engineering* (Parris 2018), which was clearly meant as an answer to promoters of the city-driven agenda. Her paper started with the observation that “a prominent school of thought within urban ecology holds that existing ecological theory is insufficient to understand the ecology of cities ... (e.g., Alberti 2008; McPhearson et al. 2016)” (Parris 2018: 201). For Parris, “many ecological theories, hypotheses and paradigms have been shown to apply to cities just as they do to other types of ecosystems ... The apparent novelty of urban ecosystems does not translate into the need for a novel ecological theory to understand their structure and function” (Parris 2018: 202).



To the promoters of the ecology-driven agenda, urban ecology should be viewed as an application and an extension of the tools and theories of the discipline of ecology. Cities merely provide a new context to address and enrich their understanding of classical research questions, such as population adaptation and species evolution, as they provide the conditions for rapid evolution and adaptation of living beings, even including the creation of new species (Johnson and Munshi-South 2017; Rivkin et al. 2019).

The promoters of the ecology-driven agenda agree that their findings could help design urban biodiversity conservation measures which may help plants and animals to adapt and evolve, and be more broadly useful to city planning and management needs. However, by contrast with promoters of the city-driven agenda, they remain committed to the idea that ecological theories and academic questions should drive urban research developments. In particular, they expect that researching cities would help them further refine ecological science, notably ecological approaches to the dynamics related to spatial heterogeneity.

Conclusion

Starting with the observation that researching cities required ecologists to shift from an ecology of distant, wild places and remote expeditions to an ecology of the near that focuses on the nature downstairs, this article aimed to unpack the politics of ecological knowledge at play with scientists' struggles to promote urban ecology as a new critical research agenda since the beginning of the 1990s. On the basis of a qualitative analysis of programmatic statements, we found that, in the second half of the 1990s, the rise of urban ecological research relied on collective efforts and struggles among ecological researchers and scientists to renegotiate the type of knowledge that matters in ecology. Importantly, these struggles were not merely about making some room for cities within ecology, but rather about the extent to which cities required transforming the ecological discipline as a whole. While promoters of a city-driven agenda went so far as to promote the "merging" of ecology into a "science of cities," making an alliance with interdisciplinary research communities that address global change and social-ecological systems, promoters of an ecology-driven science aimed instead to extend and develop ecology as a discipline by including urban environments, still meeting the classical boundaries of ecology as a science.



The controversy between the city-driven and the ecology-driven agendas suggests how ecologists' historical boundary work defining ecology as the science that studies nature as a place or system with its own autonomous laws and rules has been challenged and unsettled by the rise of sustainability, global change, and, more recently, issues of the Anthropocene since the 1990s—recognizing that “nature” is always, at least partly, impacted by human activities. Similar debates were already at stake in the 1980s with the implementation of the International Geosphere-Biosphere Programme (IGBP),¹⁷ which fostered a contested renegotiation of ecological research agendas around global change issues and human impacted environments (Kwa 1987). The divergence of agendas that we analyzed in relation to cities suggests that the urban question was a critical site for ecologists' struggles and efforts to unsettle the traditional focus of ecology on “nature” and to create new linkages with issues of sustainability, environmental change, and the Anthropocene, as well as new alliances with the research networks and communities that address them—thus also leading to disagreements and reactions from other ecologists willing to reaffirm the autonomy of ecology as a scientific discipline in itself. In that sense, our findings suggest more broadly the power of attraction of global change science communities and social-ecological system theories on the discipline of ecology and its significance for ecologists' shifting views of the knowledge that matters. They complement the literature in the history and sociology of science that analyses the recent shift of ecologists' quest for legitimacy and visibility, from imitating physics as a model of “big science,” to affirming new partnerships with climate and Earth sciences around the rising “great challenge” of global change (Calvert 2013; Granjou and Walker 2016).

Cities and urban ecology have thus crystallized older and ongoing debates and struggles among ecologists to access more visibility and legitimacy for their research in relation to the growing recognition of the accelerated impact of humans on the planetary environment, while also sustaining the expression of new conceptions of the type of research that matters in relation to a redefinition of the places that are of ecological interest. Our findings attest to an ongoing and still contested shift among ecological scientists and researchers from considering cities as “antilife” (Sukopp 1998) to promoting the creativity of “novel ecosystems” and emphasizing the “extent and value of ecosystems that have been irreversibly transformed by human activity” (Larson 2016). Jens Lachmund, as a conclusion to his book *Greening Berlin* (Lachmund



2013), emphasized how ecologist Herbert Sukopp's pioneering research in Berlin in the 1950s opened up to new views of cities as enabling the development of specific and valuable forms of nature, contrasting with earlier tendencies in scientific ecology to consider cities as artifacts where any real nature would be excluded (cf. Hunold 2017; Kaika 2004):

Since Sukopp's programmatic writings, it has been the mantra of Berlin's urban ecology that there was no opposition between nature and the city, and that the full spectrum of biotopes in the city should be valued ... the city figured not as destructive force but as a structuring principle that allowed nature to evolve in new spatial forms. Urban ecology invited its audiences to look differently at the city and thereby to cherish the resilience of nature. (Lachmund 2013: 225)

Our research further highlights the role of ecologists in the rise of new perspectives on cities as being a specific, hybrid and mixed but nonetheless natural milieu—suggesting how the promotion of the hybridization, contamination, and transformation of ecological knowledge by cities has not been the monopoly of human geographers and social scientists (Lorimer 2015). Unsettling romantic and dualistic views of the opposition between natural health and virtues and urban diseases and sins, urban ecological agendas carry with them a new focus on the imbrication of natural and social dynamics in urban environments (Salomon Cavin and Granjou 2021). Away from the “politics of purity” often associated with romanticized approaches to ecology and environmentalism (Shotwell 2016), they eventually convey new commitments to studying, managing, and living with those mixed, hybrid, and impure entanglements.



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Notes

1. Our research addresses a particular form of “urban ecology,” thus excluding other intellectual projects that use this label, such as social science traditions interested in urban functioning or urban planning sectors devoted to green areas and urban agriculture.

2. <https://www.society-urban-ecology.org/>

3. Urbio was the first European network devoted to urban biodiversity and design (see: <https://www.urbionetwork.com>)

4. Miller and Hobbs show that, between 1995 and 1999 in the journal *Conservation Biology*, fewer than 6 percent of the papers were conducted “in urban, suburban or exurban areas,” suggesting how, for ecologists and conservationists, “value was accorded to ecological systems in proportion of the perceived absence of anthropogenic influences” (Miller and Hobbs 2002: 331).

5. See for instance: “In the science of ecology, scientists and practitioners have ... ignored and even disdained urban environments” (Botkin and Beveridge 1997: 4); “Urban areas were not worth studying with regard to ecology” (Sukopp 1998: 3); “ecologists shunned urban areas for most of the 20th century” (Grimm et al. 2008: 756).

6. Following Palinkas et al. (2005), purposeful sampling is “a widely used methodology in qualitative research for the identification and selection of information-rich cases related to the phenomenon of interest” (Palinkas et al. 2005: 533). It aims “to compare and contrast, to identify similarities and differences in the phenomenon of interest.” Our sampling strategy was close to the strategy referred to by authors as “emergent or opportunistic strategy,” which allows researchers to “take advantage of the opportunities for additional data as they arise when it is impossible to identify a population from which a sample should be drawn at the outset of a study” (ibid.: 535).

7. This includes a round-table chaired by two authors of the present paper with four ecologists working on cities (Chalmandrier and Granjou 2021).

8. Coauthors are participants in the project “When ecology goes to town,” funded by the Swiss National Science Foundation (2018–2022).

9. See: <https://lternet.edu/site/baltimore-ecosystem-study/> and <https://sustainability-innovation.asu.edu/caplter/>.

10. Discussions within our coauthoring group allowed us to add a few more publications based on a quantitative review of literature in urban ecology carried out by Flaminio et al. (2022) using WebofScience, JStor, and ScienceDirect. The review came up with 156 publications, from which we selected programmatic statements.

11. The rise of landscape ecology in the 1980s illustrates ecologists’ growing distance from theory of nature equilibrium, as landscape ecology does not view humans in terms of “perturbation” of ecosystems, but considers them as one of many drivers of ecological change and spatial complexity.

12. Other authors emphasized the capacity of cities to foster biodiversity adaptation and evolution, due to the high level of urban landscape heterogeneity: “Humans and cities may be emerging as among the most important drivers of evolutionary innovation in nature,” leading them to qualify cities as laboratories to study species adaptation and evolution, since “evolutionary ecologists now recognize that cities are living laboratories ideally suited to study evolution” (Rivkin et al. 2019: 390).

13. Our insights thus confirm the findings of Young and Wolf (2006), who observed the rise of transdisciplinary enterprise, and a more recent tendency toward disciplinary orientations in a sample of articles published between 1975 and 2006 in *Urban Ecology* and *Urban Ecosystems*.

14. Collins et al. (2000) suggested that both agendas may be pursued in parallel: “The challenge of understanding urban ecosystems will require disciplinary specialists, but it will also require at least some individuals willing to think in interdisciplinary and multidisciplinary ways—a task that can be difficult to accomplish” (Collins et al. 2000: 425).

15. <https://www.resalliance.org/>.

16. Metapopulation is a population (i.e., same species) in which individuals are spatially distributed in two or more subpopulations. Metapopulation theory states that such a population is mostly stable over a large area.

17. The Man and the Biosphere Program that was implemented in the 1970s also contributed to consolidating the emerging field of urban ecology by developing ecological research on cities with a strong emphasis on urban planning and management (McDonnell 2011: 8).

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