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Experimental Spaces: Knowledge Production and its Environments in the Long Nineteenth Century

Abstract: This introduction conceptualizes man-made social environments as experimental spaces and arenas for scientific observation. First, it offers a broad definition of the term environment following Etienne Benson's conceptualization of environments as relational, mental and physical realms that exerted influence on various entities. It then discusses the investigative framework of experimental spaces including both a physical and discursive dimensions as well as the embedding of this special section in the history of knowledge. The central part of this introduction refers to the historiography on experiments in Science and Technology Studies (STS) and highlights how our approach is distinct linking conceptualizations of experiments with recent scholarship on intentional settlements as sites of knowledge production. We relate Bruno Latour's concept of the laboratory to practices of knowledge production in intentional settlements and agricultural communities. The third part addresses the entanglements between experimental spaces and settler colonialism, discussing a) how knowledge production could support imperial expansion, even for regions that were not (yet) imperial powers, b) how colonial infrastructures and a colonial mindset of settlers aided knowledge production in intentional settlements and c) how historiographical research about colonies as laboratories of modernity emphasizes that colonies became enabling spaces for utopian settlement projects in itself.

Keywords: Experiments, observation, knowledge production, colonialism, environments, laboratories

Introduction

In the aftermath of the French Revolution and the onset of industrialization, reformer and social scientist Charles Fourier conceptualized cooperative settlement colonies intended to serve as a testing ground for the new social order.¹ Fourier

¹ This special section emerged from discussions held during the retreat of the Konstanz Working Group on the History of Knowledge, focusing on "Utopias and Colonialism" in the summer of

clearly conceived of these “trial cantons” as experimental spaces while viewing the social realm as a subject of investigation and drawing upon epistemologies from the natural sciences to guide these experiments.² Approximately a century later, in 1911, Wolf Dohrn, a co-founder of the German garden city of Hellerau, characterized the settlement and its theater as a “Versuchsfeld” – a field for trials where reformers sought solutions to social issues through artistic practices.³ Dohrn’s use of the term “experimental space” to describe the community resonates with Fourier’s approach in terms of outlining the *phalanx* a century earlier. They both viewed these spaces as arenas for observing, studying, and scrutinizing human interactions within their environments while employing methodologies and epistemologies akin to those used by natural scientists when studying bacteria in laboratories.

These two conceptualizations, designing man-made social environments as experimental spaces and as arenas for scientific observation, serve as the framework of this special section. This section endeavors to explore experimental spaces and the discourses surrounding them, analyzing how the concept of experimentation influenced knowledge production practices during the era of imperialism. In essence, the articles in this section investigate the role of experimental environments as sites for knowledge production extending beyond the confines of traditional academic institutions, such as academies, laboratories, and universities. They seek to understand how notions of experimentation shaped knowledge production across various contexts during the long nineteenth century, thereby positioning experimental environments as alternative settings for knowledge production beyond the natural sciences.

Experimental Spaces and Its Environments

This approach necessitates a broad understanding of the term “environment.” In our delineation in this section, we adhere to Etienne Benson’s recent exploration

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² Charles Fourier, *The Theory of the Four Movements* (Cambridge: Cambridge University Press, 1996 [1808]), 318; see also Anne Kwaschik’s contribution to this special section.

³ Wolf Dohrn, *Die Bildungsanstalt für Musik und Rhythmus Jaques-Dalcroze in Dresden-Hellerau. Ein Bericht mit 8 Abbildungen* (Jena: Eugen Diederichs, 1910), 9–10. Music Department, Staatsbibliothek Berlin, cited from Anne-Sophie Reichert’s article in this special section.

of the environment as a subject of knowledge and concern over an extended historical period. Benson defines environments in a relational manner and conceptualizes them as mental and physical realms that not only exert influence but also produce decisive effects on entities.⁴ According to Benson, such a “notion of environment calls our attention to the material conditions that are essential for any entity, including a concept, to emerge and persist.”⁵ Our objective in choosing the case studies in this special section was to investigate the intertwined social, natural, and aesthetic aspects of environments. These include considerations of climate (Roesch), geology and flora (Marktanner, Mazzoli), and social environments (Kwaschik, Reichert).

In these five case studies, intentional communities, colonial gardens, agricultural colonies, and artistic colonies are examined as experimental spaces. Consistent with Hans-Jörg Rheinberger’s observation regarding the influence of space on an experimental system, we recognize the significance of incorporating environments into the exploration of experimental practices and discourses, particularly when analyzing the emergence of experimental settlements. Writing in German, Rheinberger distinguishes between “Orte” (physical spaces) and “Räume,” which encompass discursive spaces and cultural techniques such as note-taking, laboratory journals, labeling, etc. He suggests utilizing these written remnants of experiments as a foundational element when investigating laboratory cultures.⁶

Following Rheinberger, this special section adopts a comprehensive conception of “experimental spaces” encompassing both physical and discursive dimensions. Rather than adhering to a rigid definition of experiment, we embrace a heuristic and actor-centered approach. Rather than applying established definitions of experiments, we begin our inquiry from the contextual frameworks and the actors involved, exploring their own accounts regarding the development of knowledge discourses and practices. This methodology places significant emphasis on the assertions and perspectives of historical actors, who perceived experiments as processes involving descriptions and adhering to specific protocols of setup and documentation, rather than mere attempts with contingent outcomes. They viewed experiments as rational techniques for generating new insights in relation to the social and natural world.

4 Etienne Benson, *Surroundings: A History of Environments and Environmentalisms* (Chicago: University of Chicago Press, 2020), 9, 12.

5 *Ibid.*, 10.

6 Hans-Jörg Rheinberger, “Wissensräume und experimentelle Praxis,” in *Bühnen des Wissens. Interferenz zwischen Wissenschaft und Kunst*, ed. Helmar Schramm (Berlin: Dahlem University Press, 2003), 367.

To give an example, engineer and settlement founder John A. Etzler explained this process when describing how a rational observer (whom he envisions as a male) came to recognize the use of steam power: “he mistrusts his judgment, suspects errors, goes back again to the most simple elements of conceptions, pursues again and again the course of his reasoning with the minutest attention to discover errors, compares his theory with experiments, and sees finally compelled his reason to admit the discovered truth.”⁷ In his pamphlet *The Paradise within the Reach of Men* (1833), Etzler suggests applying this process to finding new sources of energy and building intentional settlements on the North American continent. Addressing the US government, he promised that the “first and simplest experiments in their application will powerfully excite the minds and facilitate emigration and settling in wildernesses in a degree unexperienced yet.”⁸ Here, Etzler clearly described settlements on the US-American frontier as experiments in the use of technology, their economic setup, and their experimentation with new social orders in general.

To summarize, our section thus aims to develop a distinct perspective rooted in the history of knowledge, wherein experiments are conceptualized both as a category employed by actors and as a methodological concept. Our analysis begins with the recognition that experiments inherently establish spatial and organizational parameters within a defined setting, thereby shaping relationships with the surrounding environment, which we seek to explore. While we investigate the significance of contemporary experimental discourses – encompassing understandings of and attitudes toward experiments – the core emphasis of our articles lies in examining the implementation and configuration of experimental spaces in diverse environments.

Histories of Experiments in Science and Technology Studies and Beyond

This approach builds on prior research concerning various aspects of the extensive history of experiments, which has traditionally focused heavily on the natural sciences. Although our special section does not position itself in the history of science, it uses the definitions of experiment from this scholarship, which extends

7 John Adolphus Etzler, *The Paradise within the Reach of All Men, without Labor, by Powers of Nature and Machinery. First Part* (Pittsburgh: Etzler and Reinhold, 1833), 17–18. See also Claudia Roesch’s contribution in this special section.

8 *Ibid.*, *Second Part*, 4.

to its exploratory functions. The history of science has intensively researched the use and notion of experiments.⁹ In this historiography, Francis Bacon's paradigmatic formulations became crucial. Bacon had abandoned the Aristotelian separation of artifacts and natural things in the *New Organon* (1620) and theorized, demonstrated, and justified the rational explanation of nature through experiments. In line with ideas of the Scientific Revolution, scholars in the history of science placed the "experiment" at the center of European science and thus turned it into a major component of their own disciplinary history.¹⁰ In his analysis of early research on electrodynamics, Friedrich Steinle enhances the reflection on experimentation in the field and moves away from the traditional idea of hypothesis-based experiments.¹¹ He uses the term "exploratory experiments" to stress the importance of experiments in terms of generating new theories and concepts in contrast to its traditional role of subsequent justification and review. Literature on the history of the social sciences has pointed to the significance of the experiment for the establishment of their field as well.¹²

In contrast to these specific references, we engage with research perspectives in relevant literature on social experiments, such as in reform projects in Victorian England or in modernization projects in colonial settings.¹³ Recent research, such as the study by Bartek Blesznowski, offers a deeper examination of the concept of social laboratories, thereby expanding our understanding of experimentation

9 See, for instance, Steve Shapin and Simon Schaffer, *Leviathan and the Air Pump: Hobbes, Boyle, and the Experimental Life* (New Jersey: Princeton University Press, 1985).

10 Hans-Jörg Rheinberger, "History of Science and the Practices of Experiment," *History and Philosophy of the Life Sciences* 23, no. 1, (2001): 51–63. For a critique of the development of this discipline from a global perspective, see Kapil Raj, "Thinking without the Scientific Revolution: Global Interactions and the Construction of Knowledge," *Journal of Early Modern History* 21, no. 5 (2017): 445–458.

11 See, for instance, Friedrich Steinle, *Exploratory Experiments: Ampère, Faraday, and the Origins of Electrodynamics* (Pittsburgh: University of Pittsburgh Press, 2006).

12 Anne Kwaschik, "Zwischen Wissenschaft und Utopie. Zur Plausibilisierung von Gesellschaftswissen im frühen 19. Jahrhundert," in *Vorläufige Gewissheiten. Plausibilität als soziokulturelle Praxis*, eds. Thomas Kirsch and Christina Wald (Bielefeld: Transcript Publishing, 2024), 97–114; Robert Brown, "Artificial Experiments on Society: Comte, G.C. Lewis and Mill," *Sociology Lens* 10, no. 1 (1997): 74–97.

13 Fierce debates raged about sociopolitical reform measures with welfare state elements, which affected areas as diverse as the Poor Law experiments of Thomas Chalmers (1780–1847). Between 1813 and 1837 he launched a new system of poor relief to combat pauperism, and the model prison in Pentonville (1842), which was intended to establish a new penal policy. For a brief overview of literature on "colonial laboratories," see Guillaume Lachenal, "Le médecin qui voulut être roi," *Annales HSS* 65 (2010): 121–156.

within the realms of social psychology and cooperativism in Poland.¹⁴ Błesznowski investigates how experimentation in conjunction with observation emerged as primary methodologies borrowed from the natural sciences, which contributed to establishing a distinct research field in the early nineteenth century.

Our selection of case studies is informed by recent sociological scholarship on intentional settlements as collaborative endeavors. These settlements bring together individuals with shared intentions – be they religious, ethnic, or socialist – to explore communal living arrangements. Scholars such as sociologist Michel Lallement have analyzed these settlements as tangible experiments (“*expérimentations réelles*”) whose physical manifestations allow for empirical studies.¹⁵

Even though this section adopts a historical approach distinct from the perspectives found in Science and Technology Studies (STS), it is imperative to acknowledge the significant contributions made by these scholars in the realms of sociology and cultural anthropology with regard to research on the laboratory as a locus of knowledge production. This line of inquiry seeks to delineate the intricate mechanisms underlying knowledge production and the manner in which laboratory sciences attain legitimacy and influence societal transformations.¹⁶ A prominent example is Bruno Latour, who illustrates how microbiologist Louis Pasteur’s laboratory, alongside his discoveries regarding microbes, profoundly impacted agricultural practices, the social hygiene movement, and French society at large.¹⁷

While the articles in this section do not align with an STS framework, which we perceive as less conducive to a nuanced description of historical developments compared to our heuristic and actor-based approach, they are nonetheless influenced by Latour’s suggestion that there are no clear boundaries between the scientific and social dimensions of laboratory practices.¹⁸ Latour posits that laboratory scholars such as Pasteur exerted their transformative power not solely within the confines of a secluded laboratory but also through a dynamic interplay

14 Bartłomiej Adam Błesznowski, “Experimental Utopia: Edward Abramowski’s ‘Applied Social Science,’” *Utopian Studies* 34, no. 1 (2023): 80–99.

15 He describes intentional communities as “*expérimentations réelles qui se cristallisent dans des pratiques empiriquement observables.*” See Michel Lallement, *Un Désir d’Égalité. Vivre et travailler dans des communautés utopiques* (Paris: Éditions du Seuil, 2019), 20–21.

16 Karin D. Knorr-Cetina, “The Couch, the Cathedral, and the Laboratory: On the Relationship Between Experiment and Laboratory in Science,” in *Science as Practice and Culture*, ed. Andrew Pickering (Chicago and London: University of Chicago Press, 1992), 113–138.

17 Bruno Latour, “Give Me a Laboratory and I Will Raise the World,” in *Science Observed: Perspectives on the Social Study of Science*, eds. Karin D. Knorr-Cetina and Michael Mulkey (London and Beverly Hills: Sage, 1983), 141–170.

18 *Ibid.*

between the internal and external realms of the laboratory, spanning from the micro-level of the Petri dish to the macro-level of agricultural settings. This involved scaling shifts from the grand to the minute but also using inscriptions and statistics to visualize and simplify their successes for broader audiences.¹⁹

In order to grasp the relationship between theory and practice at play here, we define “experiments” in line with Latour’s concept of the “laboratory,” while we relate his concept of knowledge production to practices in intentional settlements and agricultural colonies. We do this (a) by conceptualizing the establishment of experimental spaces as a cultural technique and technology of knowledge production, (b) by investigating the discursive and material spaces in which these experiments occur, and (c) by investigating the movement between the inside and the outside, the micro- and the macro-level, and the scaling of scientific experiments while using the documentation of these as a source for our analysis.

The Impact of Colonialism

The circulation between the interior and exterior of experimental spaces is particularly significant in our research contexts. Historians of knowledge have consistently underscored that circulation represents one of the most crucial attributes of knowledge.²⁰ Knowledge not only circulates within national borders but also transcends various imperial boundaries, albeit with constraints. This raises questions regarding the impact of colonialism. Recent historiography has frequently examined the interplay between colonial spaces and knowledge circulation, thereby highlighting colonial constraints in the utilization and neglect of indigenous knowledge. The knowledge traversing between the periphery and the metropole often corresponds to the perspectives of the informed European bourgeois gaze and carries substantial cultural, political, and economic significance.²¹

¹⁹ Latour, “Give Me a Laboratory,” 163.

²⁰ Daniel Speich-Chassé and David Gugerli, “Wissensgeschichte. Eine Standortbestimmung,” *Traverse: Zeitschrift für Geschichte* 19 (2012): 85–100, 90; see also Johan Östling, David Larsson Heidenblad, and Anna Nilsson Hammar, “Developing the History of Knowledge,” in *Forms of Knowledge: Developing the History of Knowledge*, eds. Johan Östling, David Larsson Heidenblad, and Anna Nilsson (Nordic Academic Press: Falun, 2020), 9–26, 15.

²¹ David Arnold, *The Tropics and the Traveling Gaze: India, Landscape, and Science, 1800–1856* (Delhi: Permanent Black, 2005), 6; Harald Fischer-Tiné, *Pidgin Knowledge. Wissen und Kolonialismus* (Diaphanes: Zurich, 2013).

Different strands of research have developed in order to explain these processes of knowledge production and exclusion.²² Three findings in previous research are particularly relevant for this thematic section. First, we have research offering the insight that colonial knowledge production and support of imperial projects were not the result of a formal national colonial structure. With regard to the German case, Sebastian Conrad has shown that German-speaking scholars, merchants, and settlers supported imperialism long before the German Empire, mainly through colonial knowledge production and by participating in large-scale population schemes.²³ Once formal German and Italian empires had been established, as shown in the articles by Marktanner and Mazzoli in this volume, colonial scientists often followed British examples of establishing research stations or colonial gardens as centers of knowledge production.

Second, analyzing imperial infrastructures provides us with research on how the practical desires of the colonial powers to build technical infrastructures and the interests of social activists, scientists, and other colonial actors intersected on the ground.²⁴ However, as wide-ranging and specific as this research is, it has rarely addressed the relationship between colonialism, utopianism, and intentional communities.²⁵ One exception is Stephen Stoll's *The Great Delusion*, which at great length discusses the colonial mindset of German American engineers trying and failing to set up a colony in Venezuela.²⁶ Intentional communities and research gardens are especially linked to settler colonialism, as many nineteenth century social reformers set out to establish these in the colonies of the French and British empires. They viewed colonial landscapes as empty spaces where they could easily obtain land, often for free, and conduct experiments in the service of colonial powers and their own grander visions.

22 For a brief overview, see Anne Kwaschik, "Scientific Colonialism: Zum konstitutiven Zusammenhang von Wissen und 'colonial governance'," in *Herrschaft und Wissen*, eds. Peter Weingart, Gunnar Folke Schuppert, and Roland Röhnhildt (Baden-Baden: Nomos-Verlag, 2022), 115–142.

23 Sebastian Conrad, "Rethinking German Colonialism in a Global Age," *The Journal of Imperial and Commonwealth History* 41, no. 4 (2013): 543–566; see also H. Glenn Penny, *German History Unbound: From 1750 to the Present* (Cambridge: Cambridge University Press, 2022), 50.

24 Dirk van Laak, *Imperiale Infrastrukturen. Deutsche Planung für die Erschließung Afrikas 1880 bis 1960* (Paderborn: Ferdinand Schöningh, 2004), 53–54.

25 For Fourierist settlements, see, for instance, Jean-Louis Marçot, "Les premiers socialistes français, la question coloniale et l'Algérie," *Revue d'histoire critique* 124 (2014): 79–95; Laurent Vidal, *Ils ont rêvé d'un autre monde. 1841* (Paris: Flammarion, 2014); Pamela M. Pilbeam, "The Colonization of Algeria: The Role of Saint-Simonians," *French History and Civilization: Papers from the 19th George Rudé Seminar, July 10–12, 2014*, ed. Julie Kalman 6 (2015): 189–196, available online: <https://h-france.net/rude/wp-content/uploads/2017/08/Title-PageVol6.pdf>.

26 Steven Stoll, *The Great Delusion: A Mad Inventor, Death in the Tropics and the Utopian Origins of Economic Growth* (New York: Hill and Wang, 2008), 108–116.

Third, this thematic section follows the critical readings of the influential and widespread language of colonies as “laboratories of modernity.” As lucidly demonstrated by Guillaume Lachenal when discussing primarily research in the field of colonial medicine, the majority of studies use the concept in a simplified and metaphorical fashion: they equate the rationalizing intentions (“gouvernementalité expérimentale”) with the final implementation in a way that is problematic.²⁷ In light of the fact that this discourse was used by the colonial authorities themselves, it should be all the more analytically delimited. Nevertheless, there is no question regarding the epistemological value of the concept of “laboratories of modernity.” It points to the function of the colonies as an enabling space (“espace d’opportunité”) for ambitious and utopian projects (as well as for the colonists’ racism and brutality). Moreover, the “colonial laboratory” calls for a closer examination of the failure of these experiments (“analytique d’échec”), which is rarely taken into account.

Structure of the Section and Summary of the Articles

Building on this research, we study the materiality and performativity of the “experiment” by employing the notion of “experimental spaces.” With a dual focus on experimental spaces in both spatial and discursive dimensions, the articles in this special section examine an array of environments ranging from colonial gardens to intentional communities and internal colonies, their objectives, and the perspectives of the various historical actors involved. The selection of five case studies aims to explore the social, natural, and artistic dimensions of knowledge production within experimental environments, thereby facilitating an investigation of spaces in which social order was constructed, contemporary societal ailments were identified, and new applications of natural resources were explored.

In **Claudia Roesch’s article “Talking about the Weather: Climate Knowledge as a Colonial Practice in Intentional Settlements,”** she views climate knowledge production as a precondition for social and botanical experiments in the Americas. The article examines the meteorological knowledge produced by the settlers in the context of intentional community projects in the Americas between the 1820s and the 1840s. Furthermore, it also investigates how religious, ethnic, and early socialist settlers collected meteorological data and climate infor-

²⁷ Lachenal, “Le médecin qui voulut être roi.”

mation and how they turned this into useful climate knowledge in order to make important decisions regarding colonialization and the cultivation of staple foods. The article shows how ethnic networks of German American settlers facilitated the exchange of climate knowledge and how they contributed to creating a discourse of the tropics as an experimental environment. Finally, it suggests that the settlers' preference for book knowledge and observations in ethnic networks over indigenous knowledge offers an explanation for the failure of many of their settlement plans.

Anne Kwaschik's article "Experimental Discourse and Fourierist Settlements" examines the Fourierist doctrine and movement as a socio-epistemic program, specifically focusing on its experimental discourse encapsulated in Fourier's concept of the *phalanstère*. The article emphasizes the dynamic interplay between conceptual frameworks and practical endeavors by investigating reflections on these *phalanstères* as social test units. In its exploration of experimental practices, the article highlights a frequently overlooked aspect of Fourierism and elucidates the infrastructural impact of colonialism. With a specific focus on the Union agricole du Sig in Algeria as a case study, the article demonstrates the intersection between Fourier's experimental model and the complexities of colonial realities. The experimental discourse is highlighted as a central aspect of Fourierism, emphasizing its role and legacy in shaping and redefining social norms and structures.

Alina Marktanner's "Experimenting for Empire" moves away from intentional settlements to imperial settler colonies as an experimental space for agriculture. Using phytopathology – the study of plant diseases – as a case study, this article places field study collaborations between scientists and planters within discourses on colonial economy, hygiene, and a "civilizing" mission of colonialism. It contends that plant pathology knowledge was a hybridized construct blending multiple disciplines as well as lay knowledge. The experimental sites were agricultural research stations in the West African colonies of the German Empire that were intended to make practical information available to planters and improve local farming practices, while providing a civilizing mission to indigenous populations. Researchers in these experimental gardens often adopted trial-and-error methods instead of relying on some kind of elaborate methodology. They also had to collaborate with local planters and indigenous farmers, even though they viewed the latter as in need of education and oversight by white men.

Gilberto Mazzoli in his article "Climates of Migration" approaches colonial agricultural knowledge through the lens of Italian American immigration, agricultural diplomacy, and its relationship to Italian colonialism in the early twentieth century. The article analyses discourses and practices surrounding migrants' gardening knowledge used to establish colonies for Italian immigrants in

the American South. Italian actors envisioned these as part of an informal Italian empire, while US-American commentators saw them as an opportunity to relocate Southern European agricultural laborers from the overcrowded East Coast cities to the South. The article highlights the role of these projects for the Italian Colonial Agricultural Institute in Florence and argues that both Italian and US-American scientists and government representatives viewed agricultural colonies as an experiment in managing population flows through transatlantic migration and gardening.

Anne-Sophie Reichert's article "Knowledge in Motion: Research and Experimentation at Hellerau's School for Rhythmik," contrary to the first four articles addressing the question of colonialism and experimental spaces in overseas colonies of Western European empires, approaches the garden city of Hellerau as a colony within imperial Germany. This case study shows how the environment of the garden city enabled experiments in Émile Jaques-Dalcroze's rhythm school, a place where dance choreographies were turned into new means of studying bodily movement and human physiology. The article examines the development of *Rhythmik* – a new method for rhythmical body movement – as a transdisciplinary effort uniting dancers, artists, social reformers, physiologists, and scientists. In a methodological reflection, the article argues that a process-oriented history of knowledge is useful for documenting a research community circulating its information through experimental research, teaching, and building networks.

In conclusion, the articles elucidate how the studied experimental spaces facilitated knowledge production and dissemination beyond the confines of traditional academic institutions, while fostering dialogues among various stakeholders, including activists, social reformers, practitioners, and scientists. Based on the results of the case studies, this special section underscores that settlements were not isolated entities but rather interconnected components within global networks of knowledge exchange spanning agriculture, botany, climatology, and the social sciences. Actors engaged in these networks and infrastructures both contributed to and drew upon knowledge, in addition to employing methodologies established by laboratory sciences in the preceding century, such as absorbing written knowledge, publishing in scientific journals, observational practices, and systematically recording and collecting experimental data. These interactions sometimes resulted in significant contributions to various fields. For example, the cultivation of bodily and sensory knowledge within the German *Lebensreform* movement illustrates how rhythmic movement emerged as a research practice that complemented and challenged mechanistic and rationalist approaches to understanding and transforming modern society. Internal colonies and imperial settlements in the long nineteenth century thus played a pivotal role in the transition of experimental methodologies

from academic laboratories to broader societal contexts, thereby signifying a notable evolution in the dissemination and application of such methodologies.

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