

Of Other Natures: Heterotopias of 19th Century Science

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‘The world is One!’— the formula may become a sort of number-worship. ‘Three’ and ‘seven’ have, it is true, been reckoned sacred numbers; but abstractly taken, why is ‘one’ more excellent than ‘forty-three,’ or than ‘two million and ten’?

William James, “The One and the Many”¹

J’ai quitté Paris et même la France, parce que la tour Eiffel finissait par m’ennuyer trop. Non seulement on la voyait de partout, mais on la trouvait partout, faite de toutes les matières connues, exposée à toutes les vitres, cauchemar inévitable et torturant.²

Guy de Maupassant, *La Vie errante*

1. Monotopia, or the View from above

Is nature just one kind of thing, the same in all its parts? Is there just one kind of knowledge that deserves the name “science”? In the nineteenth century, most Western scientists, engineers, philosophers, and educators answered these two questions in one breath— and in the affirmative. In scientific works and popular writings, they proclaimed the unity of science and the unity of nature. The great expositions of the nineteenth century echoed and amplified this powerful *yes*, bringing people together to experience the progress of technical power and scientific knowledge, emphasizing the universal harmony among projects from distinct fields and nations.

¹ in *The Writings of William James: A Comprehensive Edition*. Edited by John Joseph McDermott. Random House, 1967, p. 496.

² Paris: Ollendorff, Paris: 1890, p. 1

Consider the Eiffel Tower, built for the Universal Exposition of 1889. A feat of mechanics and engineering, the tower was not only a monument to progress and a site of spectacle but a gigantic scientific instrument, eventually used for meteorology, radio, and the measurement of cosmic rays. From its top, you see the city and natural landscape gather together in a unity: a single, legible space. Visible in reduced size, boulevards and parkways radiate outward in straight lines and geometric figures, all open to analysis, replication, mastery.

The unified world of science was presented as an achievable *utopia*—a good place, little by little coming into existence. It was also a *monotopia*: a united, homogeneous space obeying the same laws everywhere. This unified cosmos went hand in hand with the notion of a unified science— a single method, body of knowledge, and set of values. In the Eiffel Tower and in similar spaces, a normative and unitary cosmology was summarized, built into the physical and intellectual landscape, and offered to the masses in palpable, breathtaking experiences.



Georges Garen (1889): *Embrasement de la Tour Eiffel pendant l'Exposition universelle de 1889. Le Champ de Mars, vue prise de la Tour Eiffel*; Brown Univeristy Library, ID 1303838067687502.

Some nineteenth century philosophers, however, dared to oppose the notion that science and nature were uniform, predictable, isomorphic in all their parts. Not only proto-existentialists such as Kierkegaard and Nietzsche, but the logician Charles Peirce saw contingency and chance

at work throughout the universe.³ Peirce's fellow pragmatist William James argued that "a world imperfectly unified still, and perhaps always to remain so," was a hypothesis that had to be "sincerely entertained."⁴ Like the pragmatists, Auguste Comte, the founder of positivism, set aside the "metaphysical" question of what the world was like *outside* of the ways in which we work with it; knowledge is always tied to human intentions, activities, and limitations. Further, he held that different parts of the world require different concepts and methods: the mechanical explanations of physics are useless for understanding organisms. For Comte— despite later notions attached to the term "positivism"— the edifice of science was at best an artificial, fragmentary whole. It was united not by nature or by a single method, but by humans' needs to know and to organize their milieu.

Such views anticipate recent histories in which Western science and the nature it discerns appear intrinsically incomplete: a patchwork of diverse ideas, methods, institutions and practices. Nevertheless, science, now as then, conveys powerful impressions of its unity and the seamless fabric it forms with nature— when predictions come true, when technologies work, in spectacles such as moon shots, bombs, the Eiffel Tower. To understand the growth and impact of modern science, then, we must grasp both the unified impression it gives as well as the plurality that undercuts it. Such has been the goal of much history of science of the past three decades.

The Eiffel Tower is an exemplary object for reflecting on the simultaneous unity and fragmentation of nineteenth-century science. But we might take the question of "the one and the many" further. Not only were there cracks in the pavement of modern science, but in some places, strange, barely recognizable vegetation was growing. In opposition to the "major" image of science projected by the Eiffel Tower, alternative theories and dissenting ways of knowing thrived. Cultural anthropologists, of course, make clear that this was true in other parts of the world, where long traditions and distinct lifeways flourished, some in complete indifference to Europe, others remaking themselves in response to contact and conquest. But within Europe itself, too, other cosmologies, alternative orders of nature took shape, breaking away from the dominant nature projected by monuments like the Eiffel Tower.

Like the "major" nature, these "minor" natures were partial and incomplete; yet many of them also sought to contain the cosmos as a whole, to become full-blown worlds. They used

³ Peirce, Charles Sanders. *Chance, love, and logic: philosophical essays*. U of Nebraska Press, 1998.

⁴ William James, "The One and the Many," .p.417.

more than ideas and representations to do so. In concrete spaces, they cultivated regular experiences and stable representations, with recurrent *dispositifs* of objects and actions, and communities of shared practice. In relation to science's monotopia, the spaces in which these other natures appeared were *heterotopias*: sites apart, contradicting the dominant and normative order. Juxtaposing these major and minor spaces lets us see Western science as a form of *cosmopolitics*, a multi-frontal campaign to establish an order for the cosmos, waged in part through encounters with rival conceptions. Some of these meetings resulted in refusal or mutual unintelligibility; others produced intriguing syncretisms; many were resolved by brute force.⁵

Paris's famous tower embodied the levels at which the Western-based "monotopia" was sedimenting itself, extending across the globe and universe. Yet in its shadow, other natures persisted and made their own claims to universality. To reckon with nineteenth century science on its own terms and in its global and historical contexts, we need to examine both the fault lines running through the seemingly monolithic nature of modern science, as well as the dialogical relations it entertained with other natures within and outside it.⁶

2. A Straw Man of Iron

While the idea that science is the best way to understand the natural world might seem self-evident now, it took centuries to form and take root. Furthermore, historians and anthropologists have shown that there have been and remain other plausible, coherent ways of putting the world together. We might shed light on the mononature of 19th century science by considering some of the other modes of assembling a cosmos that have been retrieved by anthropologists. For example, Philippe Descola has recently set "naturalism"—the name he gives to the cosmology exemplified by modern science—as one among four possible "ontological routes," divided according to the connections they establish between humans' inner and outer reality and that of other non-human beings. In *animism*, observed among many Amazonian peoples, nonhumans are taken to have different kinds of bodies than humans, but have the same sort of internal subjectivity; parrots and jaguars understand themselves as humans, while for them humans appear as other animals. *Totemism*, practiced in Australia and among the

⁵ Stengers, Isabelle. "Cosmopolitiques." *La Découverte* (2001).

⁶ Bakhtin's notion of dialogical discourse is useful for its contrast with monological "authoritative discourse"—for example military commands or scientific statements, which seek to restrict all possibility of ambiguity. Bakhtin, M.M. *The Dialogic Imagination*. Austin: University of Texas, 1981.

Ojibwa, recognizes an essential identity, interior and exterior, between humans and certain nonhumans (the animal or plant with which they identify). *Analogism*, observed in ancient China as well as early modern Europe, involves seeing differences at every level, internally and externally, among all things. To prevent chaos, order is imposed on these differences in the form of vast analogies between realms— between earth and heaven, between government and nature, microcosm and macrocosm.⁷

The modern West largely takes for granted the fourth route, *naturalism*. Naturalism posits single exterior physical and material substance that humans share with all other entities, while humans possess an internal soul or mind which distinguishes them from all other beings. Naturalism insists on a dualist universe divided between thinking substance and extended substance, spirit and matter, subjects and objects. It also assumes that matter is analyzable in terms of quantifiable “primary qualities” including mass, size, location, movement, and mechanical causes. The mind, in contrast, is the preserve of feeling, memory, and meaning. Naturalism’s congruence with earlier ways of organizing the world, going back to Platonic and Christian dualism, let it exert a magnetic pull on Western thought. Descola’s account (merely sketched here) is compelling for its refusal to reduce non-naturalist experiences of the cosmos to “versions” or “interpretations” of the one objective reality that science grasps. Instead, he presents the ontology of modern science as just one plausible “schemata” for organizing the relations between humans and nonhumans, and brings other, robust alternatives vividly to life.

Cosmology resides in endless actions, attitudes and utterances, in fragmentary and often self-contradictory habits and intuitions, in distinct schemes of classification and modes of relation; inevitably, Descola’s summary of the cosmologies of all cultures worldwide involves some simplification. But it is not only anthropologists and historians who must make recourse to generalizations and simplifications to present cosmologies: the people they study do so as well. At certain times, for various reasons, people seek to make explicit their sense of the universe and their place within it by creating *cosmograms*: concrete and publicly visible maps, performances, epics, or monuments that inscribe the natural and human orders. These acts of public generalization are a valuable resource for students of cosmology. While they obviously cannot convey every aspect of the structures of experience of any group, they do make certain priorities and attitudes clear.

⁷ Descola, Philippe. *Par-delà nature et culture*. Paris: Gallimard, 2005.

For late nineteenth century naturalism, it is hard to imagine a more fitting cosmogram than the Eiffel Tower.⁸ There was certainly none taller: it was the highest man-made structure on earth. Eiffel said that it was “not only the art of the modern engineer, but also the century of Industry and Science... prepared by the great scientific movement of the eighteenth century and by the Revolution of 1789, to which this monument will be built.”⁹ A metal skeleton with no need for flesh, the tower proclaimed a engineer’s brutal anti-aesthetic, with geometric form and structural dynamics leaping from an architectural diagram into three dimensions. Rudely phallic, the tower asserted the conquest of the past: Eiffel compared it to the pyramids, and in its denial of the ornamental forms of its epoch, it stood for an emerging international infrastructure of interchangeable parts and interlocking communications, transport, exchange, and information. It flaunted technical proficiency: over a thousand general drafts and more than three thousand drafts of the specific parts, micro-engineered to 1 second of arc, were produced; its construction was also abundantly documented. It was a solid argument that naturalism and rationalism, with their emphasis on analysis, proportion, reduction, and mechanism, had descended from utopian aspiration into iron reality.

Of course, a cosmology is more than any mere representation, no matter how imposing. Fittingly, the tower was both symbolically and physically part of the march of 19th century knowledge. Advances in physics— structural mechanics, thermodynamics, Maxwell’s unifying equations— came to the aid of engineers building bridges, canals, and infrastructures of electrical power. Precision, proportion, and technical mastery also marked chemistry in new industrial compounds and Mendeleev’s encompassing organization of elements. Out of Cuvier’s functional classifications and the discovery of deep time by geologists, Darwin made natural selection the mechanism for regulating variations and improving species. The social sciences identified laws of progress and statistical norms. Across fields there was a growing sense of a shared method— identifying regularities and underlying mechanical laws, through detached

⁸ The tower features on the cover of two Science Studies texts: on *Making Natural Knowledge: Constructivism and the History of Science* (Jan Golinski, University of Chicago Press, 2008), the photo of the half-built tower emphasizes construction, while the Eiffel Tower snowglobes on the cover of Latour’s *Paris ville invisible* emphasize scale and multiplicity (Latour, Bruno, Emilie Hermant, and Susanna Shannon. *Paris ville invisible*. Paris: La Découverte, 1998).

⁹ *La Tour Eiffel*. Roland Barthes, André Martin. Paris: Seuil, 1989; Loyrette, Henri, *Gustave Eiffel*, New York Rizzoli, 198, p. 116; *L’Exposition de 1889 et la tour Eiffel, d’après les documents officiels*. Gombault et Singier. Exposition internationale (1889 ; Paris); *La Tour Eiffel*. Marc Gaillard. Flammarion, 2002,

observation of physical reality— and of a single natural world susceptible to analysis.¹⁰ The tower spoke this emerging universal language; it was built from it.

It also told a story of upward progress. Science and technology had become hallmarks of civilization, while the universal concepts of seventeenth century natural philosophers became effective realities. Just as interchangeable parts enabled the expansion of industry, scientists were obsessed with the creation of standard units and the criteria by which to calibrate them. Planners, reformers and revolutionaries framed territories as uniform spaces by means of cadastral surveys, standardized weights and measures, national presses and education systems.¹¹ They formatted diverse regions and entities to make them susceptible to identical laws and procedures of administration— stars, trees, and corn as much as microbes, cells, and people.¹² Coordinated and disciplined technical practices linked labs to spaces near and far.¹³ European expansion into Asia, the Americas, and Africa, spurred and justified by the ideology of a “civilizing mission,” knitted together a global space that carried ships, telegraphic signals, radio waves, and civilization, a single nature progressively mapped, inventoried, collected, and brought to order.¹⁴

One word helped hold these networks together: “science.” The assembling of the Prussian and eventually German state accompanied the rising prestige of *Wissenschaft* and new institutes for teaching and research. In Britain, a gang of reformers—including Babbage and Herschel, and Whewell—promoted the idea of the unity of science in an inductive method. In France, “*la science*” became an organizing slogan of educational reform in the second half of the century, while savants made their work indispensable to the state; in the US, a small but

¹⁰ Gillispie, Charles Coulston. *The edge of objectivity: an essay in the history of scientific ideas*. Vol. 52. Princeton University Press, 1960., David, ed. *From natural philosophy to the sciences: writing the history of nineteenth-century science*. University of Chicago Press, 2003.

¹¹ Scott, James C. *Seeing like a state: How certain schemes to improve the human condition have failed*. Yale University Press, 1998. Porter, Theodore M. *Trust in numbers: The pursuit of objectivity in science and public life*. Princeton University Press, 1996.

¹² See Cronon, William. *Nature's metropolis: Chicago and the Great West*. WW Norton & Company, 1992; Alder, Ken. *Engineering the Revolution: arms and Enlightenment in France, 1763-1815*. University of Chicago Press, 2010. Wise, M. Norton, ed. *The values of precision*. Princeton University Press, 1995.

¹³ Schaffer, Simon. *Late Victorian metrology and its instrumentation: A manufactory of Ohms*. SPIE Optical Engineering Press, 1992; O'Connell, Joseph. "Metrology: The creation of universality by the circulation of particulars." *Social studies of science* 23, no. 1 (1993): 129-173. Wise and Smith, *Energy and Empire, La Mésure de l'Etat*, O'Connell.

¹⁴ Williams, Rosalind. *The Triumph of Human Empire*. Chicago: University of Chicago Press, 2013.

powerful group of activists sought to create at once a public taste for science and the institutions that would harbor it.¹⁵

The Eiffel Tower wove together these diverse layers of naturalism— conceptual, technical, ideological, institutional— and exposed them to universal admiration. Seen from the ground, it embodied the naturalist nature of mechanically integrated and interchangeable parts. Looking down from its platform, visitors experienced a god-like but man-made view, the objectivity of the cartographer, the classifier, the engineer. Though it by no means captured every aspect of the culture or sciences of its age, the tower powerfully condensed many of their most salient aspects. It was a center of resonance, the central square in a mandala or virtual diagram connecting diverse but linked and isomorphic sites, practices, objects, and modes of experience: the radiating rings of a unified cosmos.¹⁶

Yet if this tower and the cosmology it embodied appeared solid— made of iron, sunk thirty meters into the earth— recent historians of science suggest that it was a straw man, an *épouvantail*. They have pointed out the gaps in the seamless, integrated conception of science and its world, as promoted in the expositions and their “scientific” ideology. Instead of listing great discoveries, historians investigate controversies, highlighting disagreements not only over theories and interpretations of phenomena, but over epistemic values, relations of knowledge to the state and to the public, the proper order of science and society, the religious divisions still at work. They examine the different rationalities enacted in different research programs and institutions, the subtle shifts in scientific practice from one technical or political regime to the next, the difficulties encountered in reproducing results from one setting to another.¹⁷ Focusing on human-sized settings, science emerges as a local accomplishment, a regulative ideal, a unity

¹⁵ Morrell, Jack, and Arnold Thackray. *Gentlemen of science*. Oxford: Clarendon Press, 1981.; Cahan, David. *An Institute for an Empire: The Physikalisch-Technische Reichsanstalt, 1871-1918*. Cambridge University Press, 2004.; Carnino, Guillaume. "L'invention de" la science" dans le second XIXe siècle. *Epistémologie, technologie, environnement, politique*." Thèse de doctorat, EHESS (2011). Fox, Robert. *The Savant and the State: Science and Cultural Politics in Nineteenth-Century France*. JHU Press, 2012; Daniels, George. *American science in the age of Jackson*. University of Alabama Press, 1994.

¹⁶ Deleuze, Gilles, and Félix Guattari. *A thousand plateaus: Capitalism and schizophrenia*. U of Minnesota Press, 1987.

¹⁷ See related arguments in *Geographies of Nineteenth-Century Science*, Ed. David Livingstone and Charles Withers, University of Chicago Press. 2011; Galison and Stump *The Disunity of Science*; Minnesota, *Scientific Pluralism*. Galison, Peter Louis, and David J. Stump, eds. *The disunity of science: Boundaries, contexts, and power*. Stanford University Press, 1996; Gieryn, Tom F. "Three truth-spots." *Journal of the History of the Behavioral Sciences* 38, no. 2 (2002): 113-132; Kohler, Robert E. *Landscapes and labs: Exploring the lab-field border in biology*. University of Chicago Press, 2002.

in abstraction. Its generality is not the result of the world's uniformity but of the circulation and coordination of standard tools, terms, and practices.¹⁸

In these new perspectives, “science” has taken on a mosaic quality, shifting from a fixed and monolithic unity to a mobile plurality.¹⁹ Nevertheless the idea of the unity of nature and science rested on experiences as persuasive as the satisfaction of receiving a telegram sent from the other side of the Atlantic, as palpable as the exhilaration of the climber of the Eiffel Tower who saw something no previous generation could. The oscillation between the impression of unity and the great difficulty of achieving and maintaining it makes the history of science a fascinatingly complex, elusive object. It also lends strength to the anthropological conviction that other cosmic orders might also be reasonable and coherent— if equally incomplete— ways of organizing the world.

3. Pivotal Sites and Heterotopias

In 1888 a group of artists— Guy de Maupassant, Alexandre Dumas fils, Charles Garnier, Leconte de Lisle and others—printed an enraged protest against Eiffel's new Tower of Babel, “vertigineusement ridicule, dominant Paris, ainsi qu'une noire et gigantesque cheminée d'usine.” After it was built, Maupassant would eat in the restaurant on its ground floor: the only place in Paris from which he wouldn't have to see it.²⁰ Against the smug materialism of the sciences, the tribe of avant-garde artists united under slogans of *poésie pure* and the cult of art. Underneath the symbol of the dominant nature— forced underground, as it were—lurked another set of principles for organizing thought, practice, sociability, and nature itself.

¹⁸ Bourguet, Marie Noëlle, Christian Licoppe, and H. Otto Sibum, eds. *Instruments, travel and science: itineraries of precision from the seventeenth to the twentieth century*. Routledge, 2004; *The science studies reader*. New York: Routledge, 1999, Biagioli, Mario, ed., introduces key arguments and concepts from this field: the standard, the network, stabilizing entities, thought collective, trading zone, boundary objects, cultural mapping.

¹⁹ Pickering, *Science as Practice and Culture*. Pestre, Dominique. “Pour une histoire sociale et culturelle des sciences. Nouvelles définitions, nouveaux objets, nouvelles pratiques.” *Annales. Histoire, Sciences Sociales*. 50e année, N. 3, 1995. pp. 487-522. “les productions scientifiques sont traitées comme des systèmes de propositions et actions— comme des cosmologies constituées localement...” p.490. Golinski, Jan. "Is It Time to Forget Science? Reflections on Singular Science and Its History." *Osiris* 27.1 (2012): 19-36. Dear, Peter. "Science Is Dead; Long Live Science." *ibid*, 37-55.

²⁰ Collectif d'artistes, « Les artistes contre la tour Eiffel », *Le Temps*, 14 février 1887. Barthes, Roland. *The Eiffel Tower and Other Mythologies*. Tr. Howard, Richard. Berkeley: University of California Press, p.1.

This *détournement* of the space of the tower echoes the duality between science as unified monolith and as pluralistic mosaic. Take another example. The Academy of Science since its origins was a normative site, aligned with the state, where the legitimate contours of “nature” were traced and defended: the 1784 commission which condemned Mesmer is a well-known case.²¹ In 1830, François Arago, astronomer and Permanent Secretary of the Academy, opened its meetings to the press. Arago was part of a loose network of scientists, philosophers, artists and engineers— including Geoffroy Saint-Hilaire, Balzac, and followers of Saint-Simon— who put forward a new cosmology in the three decades before 1848: their “romantisme mécanique” privileged aesthetic experience, holistic interactions between diverse domains, and utopian hopes for technology’s ability to remake natural and social organization. By transforming the rules of debate and publicity at the Academy— months before the Revolution of 1830— Arago shifted it from a space aligned with the established powers to one that encouraged reformist politics and an active, modifiable nature tightly woven into human intentions.²²

The Academy pivoted from a normative site to a *heterotopia*: the name given by Foucault to places set apart and marked as special, which contradict those spaces that communicate the society’s dominant values, presuppositions, and norms.²³ As examples, he mentioned prisons, hospitals, asylums, brothels, ships, children’s forts, literature, magic carpets and holiday camps. Foucault said little about the normative spaces they oppose, but one might think of government and judicial buildings, state archives, and schools, as well as monumental sites such as the Eiffel Tower, which embody and reinforce standard expectations of time, space, and subjectivity. Cathedrals served such a schematizing function in the high middle ages. While cathedrals anchored a virtual diagram linking theological texts, the university, and scholastic practices such as the *disputatio*, the Eiffel tower resonated with the nineteenth century’s large public works, technical infrastructure, engineering schools, and physics textbooks, and large public works.²⁴

²¹ Darnton, Robert. "La fin des lumières." *Le mesmérisme et la Révolution*, Paris, Perrin (1984).

²² Levitt, Theresa. *The Shadow of Enlightenment: Optical and Political Transparency in France 1789-1848*. Oxford University Press, 2009.

²³ Foucault, Michel. “Des espaces autres.” *Empan* 2 (2004): 12-19; Johnson, Peter. “Unravelling Foucault’s ‘different spaces’.” *History of the Human Sciences* 19, no. 4 (2006): 75-90.

²⁴ Panofsky, Erwin. *Gothic Architecture and Scholasticism: An Enquiry into the Analogy of the Arts, Philosophy, and Religion in the Middle Ages*. New York: New American Library, 1976.

The fact that Foucault included sites of discipline and surveillance, including asylums and hospitals, suggests an intriguing instability: even normative sites could be considered heterotopias. All depends on use. The cathedral and the Eiffel Tower condensed the preponderant values and assumptions of their societies into immediate graspable form, but they also fostered experiences distinct from the normal and everyday: vertigo, intimations of divine or state power, the jubilation of the pilgrim or tourist. In other words, they pivoted between monotopia and heterotopia.

This ambivalence is important when considering the nineteenth century spaces in which research into nature was undertaken: laboratories, observatories, universities, libraries, and museums as well as mountaintops, ships, country houses and hot air balloons. All were heterotopias: special places, removed from everyday affairs in various ways, with special rules of access. They were in contact with an *outside*: researchers in laboratories and field stations produced new objects, while visitors and researchers in museums and libraries met specimens and narratives from remote times and places. Nevertheless, these encounters were part of highly disciplined routines, tightly structured institutions, and established norms. In such pivotal sites—we might call them scientific heterotopias—new knowledge and experiences could be generated, but with the imperative of bringing it into line with existing knowledge and values: technical certainty, scientific truth, historical progress. Such sites differed from the existing order only, ultimately, to reaffirm it. A remarkable fact about the West in the 19th century was its ability to proliferate, like spores across the globe, scientific heterotopias that encountered novelty in order to reinforce the impression of a monotopia.²⁵

But not every outside could be so easily folded back into the existing order. A heterotopia might not simply question a norm, but establish new norms. It might provide the space in which an entirely different nature takes root. Such sites are more than punctual interruptions or disjunctions within the major, naturalist space; they may harbor enduring cosmologies of their own, with their own standards of coherence, their own criteria of evaluation, their own “felicity conditions.”²⁶ Some took shape by transforming norms of rationality or shifting the mode of existence of central scientific sites--- as in the hybrid formations and “other rationalities” of

²⁵ Raj, Kapil. *Relocating modern science: circulation and the construction of knowledge in South Asia and Europe, 1650-1900*. Basingstoke: Palgrave Macmillan, 2007.

²⁶ See the reinvention of this key term from Austin’s theory of speech acts in Latour, Bruno, *An inquiry into modes of existence*. Harvard University Press, 2013.

colonial settings, or in the mechanical romanticism of Arago and his allies in the 1830s and 40s, which briefly redefined the conditions for knowledge and discovery.²⁷

Others appeared in new sites, in gaps within or beyond the dominant order. As minor examples of the minor natures of the nineteenth century, we may consider three such heterotopias: sites of the cult of art; the spiritualist séance; and ethnographic encounters. At times these places produced interesting friction, provocative satire, or troubling difference with regard to the dominant nature. At other times, they framed coherent, robust alternatives, proposing and enacting dissenting worlds.

Just as we would be disappointed if we looked for utter certainty or uniformity within the spaces of naturalism, we should not expect the natures sheltered by these heterotopias to offer perfect coherence. Yet, in symmetry with the “major” nature, these “minor” natures had techniques of composition and routines of validation that functioned as criteria of order and robustness. They were cosmopolitical laboratories aiming to invert the relation of minor and major, to become universals of their own.

4. Cults of Art

The century began with romanticism. A central early theme of this movement of philosophy, art and literature was resistance to the mechanistic absolutism that held sway under Napoleon. Romanticism offered a passionate voice of refusal and negation. It formulated a language of individuals and organisms, fragments and worlds, the hidden and the manifest. In pursuit of the absolute and the sublime, it pointed both to the limits of human faculties and the terrifying unknowability of what lay beyond. For romanticism, poetry and art were privileged modes of truth, raising the imagination, will, and emotions above calculating reason; it revealed the power of minds, senses, and actions to create worlds.²⁸

But for all its idealism, romanticism’s heterotopias were grounded in the concrete: the printed word, the salons, and new spaces of mass spectacle. The transition between normative

²⁷ Tresch, John, *The Romantic Machine: Utopian Science and Technology after Napoleon*. Chicago, 2012. On other modernities and their rationalities, see Mitchell, Timothy, ed. *Questions of modernity*. Minnesota, 2000.

²⁸ *L’Absolu littéraire: théorie de la littérature du romantisme allemand*. Editions du Seuil, 1978; Richards, Robert J. *The romantic conception of life: science and philosophy in the age of Goethe*. University of Chicago Press, 2002; Abrams, Meyer H., *The mirror and the lamp: Romantic theory and the critical tradition*. Oxford University Press, 1971.

spaces and worlds ruled by other laws was a recurrent theme in “la littérature fantastique”—perfected by E.T.A. Hoffmann in Germany and extended by Gautier, Nerval, Poe, Hawthorne, and Gogol. Often the passage was brought by inert objects that seemed to come to life; by machines, or automata, that didn’t behave in the deterministic way expected of machines. Nineteenth century literature and arts provided mass audiences with the uncanny experience of transport from the world of ordinary naturalism into another world. Poetry brought ecstatic, transcendent elevation. Spectators voyaged into dream spaces in the phantasmagoric theatrical experiences performed for growing audiences including Daguerre’s diorama and the new tradition of Parisian grand opera memorably launched by the special effects, both visual and sonic, of Meyerbeer’s *Robert le diable*. In the spaces opened up by the fantastic arts, naturalist expectations gave way to experiences of animism.²⁹

By the late nineteenth century, three notable literary modes had emerged, each with distinct heterotopic relations to scientific naturalism. *Realist fiction* mirrored standard consensual reality: in Zola’s works, the perspectives of physiology and the historical sciences heightened the verisimilitude of depictions of trans-generational misery. *Science fiction*, honed by Jules Verne, likewise maintained the laws of “naturalist” reality, projected into the future and extreme locations (the moon, underwater, the South Pole). The *symbolist poetry and painting* of Baudelaire, Leconte de Lisle, Verlaine, Rimbaud, Odilon Redon and Gustave Moreau played on the ephemeral musicality of words and colors to establish secret harmonies with scents, sounds, vibrations, and ideal forms. They proposed subtle correspondences between the apparent, material world and a hidden world of spiritual essences. In the space of art— between the mind, the canvas, and the printed page— the analogist cosmology resounded within modernity.³⁰

Symbolist analogies and animist stage-machinery combined in the transcendent collective ritual of the total artwork: the opera of Meyerbeer, Verdi, and Wagner. With the “moving pictures” of the cinema, new animist technologies produced voyages to other worlds. As a technique both of doubling the world with realist representation and of modifying it through

²⁹ Dolan, Emily I., and John Tresch. "A Sublime Invasion: Meyerbeer, Balzac, and the Opera Machine." *The Opera Quarterly* 27, no. 1 (2011): 4-31.

³⁰ Valtat, Jean-Christophe. "Reproduction, simulation, performance. *L'Ève future de Villiers de l'Isle-Adam*." *Tracés* 1 (2009): 151-164.

fantastic special effects, the late nineteenth century cinema vulgarized the cult of art, making it a public laboratory for the production of other worlds.³¹



Richard Wagner, "Die Feen" : Munich Hoftheater / image by G. Franz.

5. Spiritualist Séances

Other heterotopias that defied naturalism were those in which or “mesmerism” and “spiritualism” played out. In the 1820s through 40s, a new generation of magnetizers, including Puysegur, Mathieu, and Bertrand conducted public trials and clinical investigations at the Salpêtrière and other hospitals.³² At mid-century, triggered by the Fox sisters, spiritualism took over. While mesmerized adepts might perceive what was occurring in a neighboring room or in the mind of an audience member, spirit mediums claimed to report back from that other world hidden behind this one.

³¹ Schroeder, David P. *Cinema's illusions, opera's allure: the operatic impulse in film*. Continuum, 2002.

³² Méheust, Bertrand. *Somnambulisme et médiumnité, 1784-1930: Le défi du magnétisme animal*. Vol. 1. Institut Edition Synthelabo, 1998.

Spiritualist séances involved a regular arrangement of objects, personnel, and actions in a controlled space: the darkened room, the circle of seekers holding hands around a table, and the medium, the living human vessel for otherworldly spirits. When tables turned, when mysterious knocks were heard, ontological frames wobbled. Séances provoked non-dualist epistemologies. The medium, far from heightening her distance from her objects, was invaded by them. To explain uncanny phenomena, cosmological systems were elaborated, incorporating living things, multiple worlds, imponderable fluids and subtle ethers. Spirits were subtle matter; matter was condensed spirit; ether mediated between the two. Theosophy wove such theories together with Vedic cosmologies. Adding Swedenborg to the mix—the eighteenth-century mystic and natural historian who proclaimed the existence of invisible worlds and correspondences among animal, vegetable, and mineral kingdoms—many former naturalists came to espouse variants of both animism and analogism.³³

³³ Lachapelle, Sofie. *Investigating the Supernatural: From Spiritism and Occultism to Psychical Research and Metapsychics in France, 1853-1931* (Baltimore: Johns Hopkins University Press, 2011).



Lord Kelvin claimed in 1900 that physics was nearly complete, except for the small matter of black body radiation and the luminiferous ether. Yet late nineteenth century anomalies in physics, concerning radioactive decay and emissions, created even more puzzles for standard approaches of naturalism. Some physicists proposed theories of hidden dimensions and identities among energy, matter, and mind; many were deeply involved in research into spiritualist phenomena, including Oliver Lodge, William Crookes, Camille Flammarion, and Charles Richet. While some used experimental methods to test spiritualist claims, others brought spiritualist concepts back into physical theory. At the end of the century, the Society for Psychic Research repositioned the field, brought more rigorous protocols to the practices of spiritualists, bringing the wilder forms of epistemic and ontological contestation under control. Perhaps not

surprisingly, once it had been adopted by Oxbridge and Harvard dons, spiritualism faded into new forms and new sites.³⁴

6. From Human Zoo to Participatory Relativism

Imperialism intensified across the century, with European powers scrambling to carve up the globe with growing vehemence. Travelers, traders, officers and administrators returned with increasing accounts of strange beliefs and practices. Sciences emerged with the goal, bluntly, of explaining why it had been so easy to conquer so much of the planet. Both physiological and intellectual answers were provided. Racist science including craniometry and variants on phrenology were early obsessions of the Société d’Ethnographie in Paris; the polygenist thesis of separate creations developed by Samuel Morton and Josiah Nott was used to defend slavery; later in the century sciences eugenics emerged, aided by statistics and Social Darwinism.³⁵ Intellectually, British anthropologists ranked other belief systems on a scale that correlated magic, religion, and science with savagery, barbarism, and civilization. A fascination with “fetishism” (a term of abuse for non-Westerners, Catholics, and deluded consumers) expanded into anthropology’s quest for the “elementary form” of religion, whether totemism (from the Ojibway) or the theories of a universal spiritual force called “mana” by Melanesians. All these approaches systematically denied of the value of indigenous knowledge or civilization, as famously expressed in Macaulay’s dismissive “Minute on Indian Education”.

The evolutionary ranking of peoples merged with evolutionary conceptions of the animal kingdom. Both were topics of wide public curiosity, a fact exploited by zoo pioneer Carl Hagenbeck. Inspired by P.T. Barnum’s “freak shows,” Hagenbeck captured both animals and humans and put both on display in his zoo: first Nubians, and Inuit soon after.³⁶ The Jardin

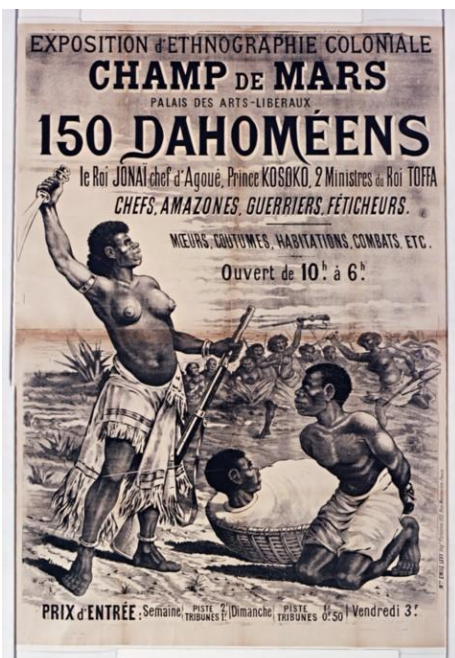
³⁴ Noakes, Richard. "The ‘world of the infinitely little’: connecting physical and psychical realities circa 1900." *Studies in History and Philosophy of Science Part A* 39, no. 3 (2008): 323-334; Natale, Simone. "The medium on the stage: Trance and performance in nineteenth century spiritualism." *Early Popular Visual Culture* 2011: 9.3: 239-25; Staley, Richard. "Worldviews and physicists’ experience of disciplinary change: on the uses of ‘classical’ physics." *Studies in History and Philosophy of Science Part A* 39.3 (2008): 298-311; Bensaude-Vincent, Bernadette, and Christine Blondel, eds, *Des savants face à l’occulte 1870-1940*, Paris, La Découverte, 2002.

³⁵ Gould, Stephen Jay. *The mismeasure of man*. WW Norton & Company, 1996; Staum, Martin S. *Labeling People: French Scholars on Society, Race, and Empire, 1815–1848*. Vol. 37. McGill-Queen's Press-MQUP, 2003.

³⁶ Sadiya Qureshi. *Peoples on Parade: Exhibitions, Empire, and Anthropology in Nineteenth-Century Britain*. Chicago: University of Chicago Press, 2011. Nigel Rothfels, *Savages and Beasts: The Birth of*

d'Acclimation in Paris followed suit in 1877, and, by the time of the 1889 exposition, behind the pavilions of the Champ de Mars—with its imitation pagodas and cast reliefs of Angkor Wat and other colonial holdigns— were the “villages nègres” where peoples from the colonies were seated for the gawking public. Four hundred people were put on display, from Ghana, Angola, Senegal, Indochina, Gabon, Tahiti, and Tierra del Fuego—the latter kept in cages and touted as cannibals.

Inside the exposition, visitors saw displays of the progress of labor: a pair in furs and skins knapping stones, a Chinese porcelain workshop, Egyptian weavers, Mesopotamian scribes, Greek potters. Yet the first stop was a room with a cut-away anatomical statue of a light-skinned human in a glass case, elevated above two skinned gorillas. The entrance to this room was framed by portraits of “Esther Hottentot” and “Billy Australian,” standing above glass cases with bones of human ancestors. The result was a visual merger of the African and Aboriginal Australian with pre-human animality.



Source gallica.bnf.fr / Bibliothèque nationale de Fra



the Modern Zoo. Baltimore: Johns Hopkins University Press, 2002; Éric Baratay, "Le frisson sauvage : les zoos comme mise en scène de la curiosité", *Zoos Humains*, La Découverte, Paris, 2004.

³⁷ *Exposition universelle, Paris: 1889. Histoire du Travail et des Sciences Anthropologiques, Section I, Anthropologie-Ethnographie*. 10 phot. des objets. BNF.

These spectacles were hardly “other natures”: they were obscene, dehumanizing displays of European supremacy, evidencing the violent ideology of racial and civilizational hierarchy and suppression. The human zoos subjected living people to “naturalist” objectification for sensationalism and profit. At the foot of the Eiffel Tower, they revealed the Western monopia as a nature imposed by one group, denying others both their way of life and basic dignity.

Yet out of this same *dispositif*, a new possibility appeared: slight, but with significant later effects. Franz Boas, credited with dismantling anthropology’s racist and hierarchical assumptions, clashed early in his career with museum administrators, insisting that anthropological displays should assemble the diverse artifacts of a single cultural group together, rather than grouping types of tools or other artifacts from various locations. The holistic unity of distinct cultures, and not the “stages of civilization,” he argued, was the rightful object of study. Boas asserted his perspective again at the Chicago World’s Fair in 1892, accompanied by fourteen members of the Kwakiutl, the Indian group with whom he had done fieldwork. Rather than sit them mutely before the gaze of the curious, he asked them to perform the skilled artisanship, work tasks, and rituals that were characteristic of their tribe.³⁸ Boas later wrote: “as all races have contributed in the past to cultural progress in one way or another, so they will be capable of advancing the interests of mankind if we are only willing to give them a fair opportunity.”³⁹ With Boas, the exposition of peoples pivoted ever so slightly from a naturalist objectification and dehumanizing physiology into a participatory appreciation of a radically other cosmological order. It was a somatic appeal to visitors, an invitation to enter empathically into a different mode of thought and action. This invitation to explore a plurality of ontologies and modes of existence was repeated and amplified in later, militantly egalitarian works of anthropology, from then till now.⁴⁰

³⁸ Isaac, Gwyneira. 2010. “Anthropology and its Embodiments: 19th Century Museum Ethnography and the Re-Enactment of Indigenous Knowledges.” *Etnofoor*. 22(1): 11-29.

³⁹ Boas, Franz. *The Mind of Primitive Man*. New York: MacMillan, 1921 p.278.

⁴⁰ Boas, Franz. *A Franz Boas Reader: The Shaping of American Anthropology, 1883-1911*. University of Chicago Press, 1989; Buettner-Janusch, John “Boas and Mason: Particularism versus Generalization.” *American Anthropologist* 59, no. 2 (1957): 318-324; Penny, Glenn. *Kindred by Choice: Germans and American Indians Since 1800*. Chapel Hill: University of North Carolina Press, 2013.

7. Pluralist Architectures, or the View from the Hall

For all the triumphalist bombast of the 1900 Paris Exposition, it took just one bullet to pop. At the Pan-American Exposition in Buffalo, New York, Leo Szoglosz, moved by the anarchist speeches of Emma Goldman, shot and killed the American President William McKinley in 1901. Out of safety concerns, the Paris exposition closed, eventually for good. McKinley was notorious for his protectionist policies, his expansion of the US empire into the Philippines, Cuba, and Hawaii, and his defense of the gold standard beloved of financiers. The anarchist's bullet sought to puncture monopoly capitalism's growing polarization of wealth worldwide; it foretold decades of discord and violence ahead.

The monotopia, then, was far from invincible. But neither was it a tissue of sheer contingency. If we look between the extremes of absolute order and utter anarchy— if we are “fair to both the unity and the disconnection”— we see the gaps, the incompleteness, the insistent localism and fragility that belied 19th century aspirations and declarations of a pristine universalism under centralized, European command.⁴¹ Through the crevices appeared multiple partial wholes and new visions of history, assembled through practices of social and technical coordination. Some of these other natures aligned easily with the monolithic conception of naturalism; others differed at significant points; still others proposed radically other forms of life and modes of experience. There was a continuous dialogue between these other natures and Europe's well-documented and constantly-renewed efforts to impose a monotopia.

Many in the nineteenth century knew this perfectly well. Longstanding philosophical discussions of “the many and the one” played out not only in texts but in concrete spaces; monoliths like Eiffel's stood against pluralist architectures. Let us return to our examples from the start of this paper. Auguste Comte's positivism is often misread as homogenizing, reductive, and rationalist. Yet not only did he advance a pluralist epistemology that foreshadowed science studies, in his later writings he argued that a return to an earlier intellectual state was required in order to end war and economic competition. He sought to organize society and science through a return to animism, presenting humanity as “the great being” and the earth as “the great fetish” demanding care and devotion. This new faith was summarized in the heterotopia of the Temple of Humanity built by his Brazilian followers in Rio de Janeiro in 1881, a cosmogram which brought its members through the stages of humanity, the fields of the sciences, the nations of the

⁴¹ James, “A World of Pure Experience,” op. cit., p. 197.

world, and held these worlds together only in a partial, fragmentary order, a totality recognized as necessary but emergent and ultimately artificial.⁴²

But despite its internal heterogeneity, perhaps Comte's system still appears too constricting, too monological-- thanks perhaps to the reductive legacies of "positivism." Consider then another building, at once concrete, imaginary, and mythical, hovering in an Escheresque in-between. William James, explorer of experiential variety and one of the founders, in 1899, of the Anti-Imperialist League, borrowed a simile from his Italian fellow-traveler, Papini, to summarize their shared philosophy. The pragmatist method, James wrote,

lies in the midst of our theories, like a corridor in a hotel. Innumerable chambers open out of it. In one you may find a man writing an atheistic volume; in the next someone on his knees praying for faith and strength; in a third a chemist investigating a body's properties. In a fourth a system of idealistic metaphysics is being excogitated; in a fifth the impossibility of metaphysics is being shown. But they all own the corridor, and all must pass through it if they want a practicable way of getting into or out of their respective rooms.⁴³

In the early 21st century, we are forced to realize the impacts of naturalism's assertion of a radical difference between humans and their environment: consumption, competition, destruction. The naturalist monotopia— relentlessly driven by scientific, nationalist, and capitalist monomanias— has upset the balance between humans and their surroundings. Naturalist nature is now unnatural. Perhaps other cosmological orientations— saved in history, channeled in anthropology, occupying the shadows of the skyscrapers— offer better guides for mapping and inhabiting this altered, no longer idle earth.

⁴² Tresch, "Technological World-Pictures." *Isis* 98.1 (2007): 84-99.

⁴³ James, "What Pragmatism Means," op. cit., p.380.