

RESEARCH ARTICLE

Big pictures after *Dawn*: ‘ontology’ for historians and utopians

John Tresch

Warburg Institute, University of London, UK
Email: treschj@gmail.com

Abstract

This essay approaches the history of science’s ‘big pictures’ through the study of cosmograms, or concrete representations of the universe as a whole. It draws on two recent developments in anthropology: first, Graeber and Wengrow’s sweeping overview of social forms in *The Dawn of Everything: A New History of Humanity*, and second, the controversial ‘ontological turn,’ which takes seriously ethnographic reports of alternate realities, refusing any shared metaphysical baseline for evaluation. Both approaches have a utopian bent and claim radical political implications, yet they clash in fundamental ways. Combining these approaches produces a tension between the general and the particular. I suggest that historians of science may productively and thoughtfully inhabit this tension by studying cosmopolitics, political ontology and cosmograms – big pictures in action.

What is the ‘big picture’ in the history of science today? My current research deals with cosmograms, or concrete representations of the universe: how they’re made and what they do.

Though they’re intrinsically fuzzy, cosmograms get concretized as books, diagrams, slogans, courses of study, rituals, monuments – and T-shirts, as in the dorm-room classic shown here ([Figure 1](#)).

Historians of science interested in the ‘big picture’ can benefit from studying cosmograms and the ways they work. As James Secord put it, people ‘need unifying narratives and a sense of large connections’.¹ If there is a big picture orienting the history of science, it’s tied up with the ever-contentious big picture of what science is. This is inseparable from questions of what nature, or the universe, or the cosmos, is like. This in turn is wrapped up with the big picture of modernity, the West, and – alas – the course of human history.²

We can get some help in tracking these entanglements – epistemological, ontological, political, civilizational – by studying cosmograms. These are big pictures in action. Cosmograms pin broad, general concepts down to specific objects. They are made in particular places for particular reasons. Unlike cultures, world views, conceptual schemes or

1 James A. Secord, ‘Knowledge in transit’, *Isis* (2004) 95, pp. 654–72, 656.

2 Andrew Cunningham and Perry Williams, ‘De-centering the “big picture”’: the origins of modern science and the modern origins of science’, *BJHS* (1993) 26, pp: 407–32.



Figure 1. Wearable cosmogram. 'You Are Here' design © Harrell Graham 1981, image at www.etsy.com/uk/listing/1418028721/vintage-90s-you-are-here-by-harrell.

ontologies, cosmograms are public and observable, open to empirical study as well as to debate and revision. They may be more or less accurate, complete or acceptable; they may have a long effect, becoming a lasting reference point, or they may appear and disappear just as quickly. Though they have widely varied forms, contents and uses, these curious objects exist in every society.

In this essay I approach the history of science's big picture – both its earlier, strictly demarcated focus, and the wider vistas it now stretches to embrace – through some of its cosmograms. Any big picture of history of science today faces three demands. First, it needs an account of how one view of knowledge and the universe – as mechanical, material and objective, or 'MeMO' for short – took shape and came to be widely seen as the only true reality, one and the same for everyone. Second, it must directly and respectfully deal with robust, viable and at times radically different ways of ordering society and nature, both within the knowledge projects that have been called 'Western science' and in other traditions. Finally, it needs ways of making sense of the interactions (overlaps, frictions, negotiations, tacit agreements or open conflicts) between knowledge that presents itself as standard and other ways of knowing. In short, the emerging big picture must contend with the major, dominant MeMO view of science; with minor, non-standard forms of knowledge (both 'Western' and 'non-Western'); and with the ways they interact.³ I see cosmograms as useful for these challenges.

I take inspiration from two recent developments in anthropology: first, *The Dawn of Everything: A New History of Humanity*, by the late anthropologist David Graeber and the archaeologist David Wengrow, a sweeping overview of social forms stretching back to prehistory; and second, the much-debated 'ontological turn'.⁴ Both have a utopian bent. Both claim radical political implications. Yet they differ in revealing ways. The first emphasizes the similarity of human experiences, encouraging comparison and alliance between groups. The second insists on the singularity of ways of life, and the challenge that their 'radical alterity' poses to

³ Major and minor here indicate a difference in scale and power (majority versus minority, dominant versus subaltern, hegemonic versus counterhegemonic), as well as a qualitative difference (foundationalist versus anti-foundationalist, closed versus open); Gilles Deleuze and Félix Guattari, 'What is a minor literature?', *Mississippi Review* (1983) 11, pp. 13–33.

⁴ David Graeber and David Wengrow, *The Dawn of Everything: A New History of Humanity*, New York: Farrar, Straus and Giroux, 2021.

basic Western assumptions. Taking both of these approaches seriously means inhabiting a tension inescapable in the human sciences: between generalizing and particularizing tendencies. I suggest that studying cosmograms is a way to do this thoughtfully and productively.

Before opening *The Dawn of Everything* I was already intrigued. Graeber was the benevolent teaching assistant for Marshall Sahlins's course on 'Culture' which I took as an anthropology undergraduate; we often crossed paths as he moved into his extraordinary role as theorist, activist, anarchist and public intellectual. His death in 2020 was a sobering shock. *Dawn's* central thread is a scathing rejection of a dominant 'big picture' in political, economic and sociological histories. Against the widespread assumption that agriculture and urbanisation lead inevitably to social inequality, Graeber and Wengrow offer a variety of counterexamples from prehistory and non-literate societies: experiments in agriculture without permanent settlement, cities without authoritarianism, organized and complex societies without states. I see their 'encyclopedia of social forms' as an instructive model for historians of science.⁵ It offers political lessons from the range of ways people have found to live together and – less centrally for *Dawn*, but crucially for historians of science – ways people have understood knowledge and nature. The book can inspire a reframing of the history of science, reinvigorating the direction and meaning of our production line of case studies.

My interest in cosmologies has also made me receptive to anthropology's 'ontological turn'.⁶ While the phrase applies to several distinct approaches, a shared theme is that modern science's MeMO understanding of the world – material, mechanical, the same for everyone – is not the only valid description of reality.⁷ Advocates of the ontological turn embrace the idea that there are multiple ways for people and things to exist, and that different knowledge worlds contain entities, forces, relations and concepts that are impossible or merely imaginary according to modern science.

The ontological turn has been subject to a number of critiques. Some argue that its insistence on radical alterity – akin to Thomas Kuhn's notion of incommensurability – makes genuine engagement with other knowledge worlds impossible, and rules out political critique or alliance. David Graeber was fiercely critical of anthropology's ontological turn along these lines.⁸ So the question arises: is it possible for historians of science to draw inspiration from *The Dawn of Everything's* political insight and urgency, and at the same time follow ontological anthropology's attention to thoroughly different ways of being in the world?

My answer is yes. For support I turn to a third strand of anthropological argument connected with another late-lamented ancestor, Bruno Latour. The theory of 'cosmopolitics' which Latour developed in conversation with Isabelle Stengers highlights political and ontological dimensions of disagreements about nature and attempts to compose a common world.⁹ The 'political ontology' developed by anthropologists Marisol de la Cadena and Mario Blaser adds important nuance, by postulating a 'world of many worlds', where shared action and alliance may be possible despite parties' fundamental divergence.¹⁰

5 Rémi Hadad and Matthew Carey, 'An encyclopedia of political forms: the dawn of everything according to Graeber and Wengrow', *Social Analysis* (2023) 67, pp. 61–79.

6 John Kelly, 'Introduction: the ontological turn in French philosophical anthropology', *HAU: Journal of Ethnographic Theory* (2014) 4, pp. 259–69.

7 Casper Bruun Jensen, 'New ontologies? Reflections on some recent "turns" in STS, anthropology, and philosophy', *Social Anthropology* (2017) 25, pp. 525–45.

8 David Graeber, 'Radical alterity is just another way of saying "reality": a reply to Eduardo Viveiros de Castro', *HAU: Journal of Ethnographic Theory* (2015) 5, pp. 1–41.

9 Bruno Latour, 'Whose cosmos, which cosmopolitics? Comments on the peace terms of Ulrich Beck', *Common Knowledge* (2004) 10, pp. 450–62.

10 Marisol De la Cadena and Mario Blaser (eds.), *A World of Many Worlds*, Durham, NC: Duke University Press, 2018.

Cosmograms are particularly relevant here: they aim to make distinct cosmological wholes explicit, while allowing us to see the disagreements, power struggles and rival conceptions of social and natural order with which they contend, both within and between collectives. To highlight these themes I present a cosmogram from an ‘ambiguous utopia’ of the late twentieth century.¹¹ Throughout I point to the range of projects an expanded version of history of science should be able to address, as well as the internal fractures and ‘uncommons’ that prohibit any simple new picture from replacing the old.

Civilization without agriculture or states

The Dawn of Everything challenges the common wisdom that humanity has passed through an inevitable sequence of social evolution to arrive at the contemporary world of globally stratified industrial capitalism: from hunter-gathering, to pastoral grazing, to agriculture, and finally to the modern world of empires, states and liberal exchange. Late nineteenth-century anthropology retold this trajectory as the passage from magic to religion to science, from savagery to barbarism to civilization, from bands and tribes to chiefdoms and states. The underlying scheme persists as a common-sense explanation for why the world is (and must remain) the way it is.¹²

This narrative, *Dawn* argues, was crystallized in stadial histories produced in eighteenth-century Scotland and France. It took polemical form in Rousseau’s *Discourse on the Origin of Inequality*, which indicted agriculture (and metallurgy) as the root of human misery: ‘it was iron and corn, which first civilised men, and ruined humanity’.¹³ For Rousseau, seasonal planting of crops ended the free movement of nomads and shepherds. Agriculture led to private property and enclosures, creating a surplus for a parasitic ruling class, petrifying enormous artificial inequalities. In a clever twist, Graeber and Wengrow argue that Europeans’ Enlightenment-era denunciations of inequality were inspired by the ‘Indigenous critique’ launched by Native American thinkers, including the Huron-Wendat commentator Kandiaronk, who observed the unhappiness of land-hungry settlers.¹⁴

Graeber and Wengrow demonstrate how social theorists and historians have endorsed stadial schemes, agreeing with Rousseau that state violence and economic inequality are simply the price that must be paid for ‘civilization’. To challenge this big picture, they provide a huge range of counterexamples. They find societies experimenting with agriculture and abandoning it, some spending half the year as settled gardeners and half as nomadic gatherers; they show societies which trade extreme hierarchy in winter for a fluid egalitarianism in summer; they detail forms of life among Plains Indians in which

11 Ursula K. Le Guin, *The Dispossessed: An Ambiguous Utopia*, London: Gollancz, 1974. Le Guin’s science fiction explored an anarchism close to Graeber’s: ‘Not the bomb-in-the-pocket stuff, which is terrorism, whatever name it tries to dignify itself with; not the social-Darwinist economic “libertarianism” of the far right; but anarchism, as prefigured in early Taoist thought, and expounded by Shelley and Kropotkin, Goldman and Goodman. Anarchism’s principal target is the authoritarian State (capitalist or socialist); its principal moral–practical theme is cooperation (solidarity, mutual aid).’ Le Guin, *The Wind’s Twelve Quarters*, New York: Harper & Rowe, 1975, p. 285. Both Le Guin and Graeber took inspiration from Alfred Kroeber’s depiction of pre-Columbian California as a landscape of diverse, densely interacting social forms.

12 George Stocking, *Victorian Anthropology*, New York: Simon and Schuster, 1991; Frank Palmeri, ‘Conjectural history and the origins of sociology’, *Studies in Eighteenth-Century Culture* (2008) 37, pp. 1–21.

13 Jean-Jacques Rousseau, *The Social Contract and Discourses*, London: J.M. Dent, 1761, p. 207. Also, ‘The first man who, having enclosed a piece of ground, bethought himself of saying *This is mine*, and found people simple enough to believe him, was the real founder of civil society ... Beware of listening to this impostor; you are undone if you once forget that the fruits of the earth belong to us all, and the earth itself to nobody’. *Ibid.*, pp. 215–16.

14 Graeber and Wengrow, *op. cit.* (4), pp. 48–67.

a police force was only temporary, summoned into existence to assist the seasonal buffalo hunt, otherwise having little more power than clowns.¹⁵

These examples show that there is no necessary link between agriculture, permanent settlement and the violently enforced hierarchy that modern states take as natural and inevitable, and – in line with Graeber’s anarchist convictions – that the state is not the *sine qua non* of ‘civilization’.¹⁶ The modern state itself, the authors argue, is an arbitrary compound. Weber defined it as a monopoly on violence, Marxists saw it as a tool of the ruling class, and for functionalists it was a response to complexity. Graeber and Wengrow identify three distinct ‘possible bases of social power’: control of violence (or sovereignty), control of information (associated with administrative and esoteric knowledge) and individual charisma (demonstrated in heroic victories in war, sport or political competition).¹⁷ Modern states combine these three traits in the police and military, civic administration and the popularity contests of elections.

These three elements, Graeber and Wengrow argue, have existed in quite different combinations. For the Olmec, active in Mesoamerica between 1500 and 1000 BCE, ritual sporting contests appeared to be the main object of government. Chavín society, a first-millennium BCE precursor to the Inca, was dedicated to the control of shamanic, psychotropic knowledge and had no obvious role for charismatic rulers or a military. The Natchez in early eighteenth-century southern Louisiana recognized a sovereign so powerful that his subjects kept as far away as possible. This vast variety contradicts the seemingly inevitable laws of stadial progress leading to a single kind of state.¹⁸ Playfully adopting the broad scope of civilizational histories of the early twentieth century while subverting their grand narratives, one of the book’s motifs is the unstoppable force of human social creativity, including certain groups’ decisions to avoid or reject ‘developments’ such as slavery or cities.¹⁹ *Dawn* offers an unconstrained vision of the past and a wide open future.

It may also bring a feeling of recognition for historians of science. Its rejection of the entrenched narrative of social evolution echoes our attempts to dismantle our own big picture. In *Dawn*, ‘agriculture’ and ‘the state’ play roles analogous to ‘the scientific revolution’ and ‘modern science’ for us. *Dawn* also provides a vocabulary and examples that could help us expand and refine our thinking about correlations between knowledge projects and different social orders, including the institutional, ethical and political aspirations (authoritarian, liberal, communalist, anarchist or otherwise) with which they align or clash.²⁰

Yet for all its detail on ‘concepts of the proper ordering of society’, *Dawn* is only glancingly concerned with conceptions of the order of nature.²¹ The authors make intriguing

15 Graeber and Wengrow, op. cit. (4), pp. 108–10.

16 The Latin root, *civilis*, simply refers to the virtues and skills needed to live harmoniously with others. Graeber and Wengrow, op. cit. (4), p. 432; David Wengrow, *What Makes Civilization? The Ancient Near East and the Future of the West*, Oxford: Oxford University Press, 2018.

17 Graeber and Wengrow, op. cit. (4), pp. 365–57

18 Graeber and Wengrow, op. cit. (4), pp. 384–6, 386–91, 393–5. They also postulate three fundamental forms of freedom: to move, to disobey orders, to reorganize social relations. *Ibid.*, p. 362.

19 ‘What happens if we treat the rejection of urban life, or of slavery, in certain times and places as something just as significant as the emergence of those same phenomena in others?’ Graeber and Wengrow, op. cit. (4), p. 523.

20 Despite a welcome insistence on ‘the social’ and political conflict in histories of science since Steven Shapin and Simon Schaffer’s *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton: Princeton University Press, 1985), there is still a long way to go in exploring how and in what different ways science is social. *Dawn*’s range of political possibilities and its controlled comparisons can powerfully combine with our field’s attention to diverse political configurations of knowledge.

21 Graeber and Wengrow, op. cit. (4), p. 197.

observations about the ethnomathematics of a neolithic Ukrainian village's ground plan, and reframe Lévi-Strauss's 'science of the concrete' as 'play farming' – improvisations with plants, animals and soils, likely by women.²² But where they deal with cosmological representations, it is often to highlight the gap between an official cosmology and ordinary people's attitudes and practices.²³ Graeber and Wengrow are likewise sceptical about many dramatic cosmograms in the archaeological record. They imagine a future from which people will look backwards, to trace big-picture histories with alternative landmarks:

Aspects of the remote past that now seem like anomalies – say, bureaucracies that work on a community scale; cities governed by neighbourhood councils; systems of government where women hold a preponderance of formal positions; or forms of land management based on care-taking rather than ownership and extractions – will seem like the really significant breakthroughs, and great stone pyramids or statues more like historical curiosities.²⁴

Insisting that both the future and the past are still to be written, this scale-shifting, retrospective panorama from a future, better society is the closest *Dawn* comes to fixing its own new big picture.

The big picture as civilizational narrative and cosmogram

Before thinking about how historians of science might apply *Dawn*'s example, we have to reckon with our discipline's role in defining, stabilizing and reinforcing its own big picture of knowledge and the universe. A template was set in 1948 by Herbert Butterfield in lectures published as *The Origins of Modern Science*. To convey the impact of 'the so-called "scientific revolution"', Butterfield also deployed a scale-shifting, retrospective panorama:

Since that revolution overturned the authority in science not only of the middle ages but of the ancient world – since it ended not only in the eclipse of scholastic philosophy but in the destruction of Aristotelian physics – it outshines everything since the rise of Christianity and reduces the Renaissance and Reformation to the rank of mere episodes, mere internal displacements, within the system of medieval Christendom.²⁵

From the late 1940s to the early 1960s, history of science's big picture was concerned with how science reached maturity in this 'scientific revolution', which Butterfield characterized as a shift to experiment and mathematical analysis, disinterested observation, and the view of the ultimate constituents of reality as particles of inert, passive matter, linked by efficient (mechanical) causality, existing independent of any humans – MeMO, in short. Butterfield's colleagues and successors, including Alexandre Koyré, Rupert Hall, Marie Boas Hall, I. Bernard Cohen, Eduard Dijksterhuis, Charles Gillispie and Richard Westfall, elaborated these views.²⁶

²² Graeber and Wengrow, op. cit. (4), pp. 295, 239–41.

²³ Graeber and Wengrow, op. cit. (4), p. 430: 'this gap between what elites claim they can do and what they are actually able to do'.

²⁴ Graeber and Wengrow, op. cit. (4), pp. 523–4.

²⁵ Herbert Butterfield, *The Origins of Modern Science*, London: George Bell and Sons, 1957, pp. 7–8.

²⁶ Peter Dear, 'What is the history of science the history of? Early modern roots of the ideology of modern science', *Isis* (2005) 96, pp. 390–406.

They also shared Butterfield's civilizational narrative: that a quest for causal knowledge drove the progress of humanity, reaching its apex in Europe. Marwa Elshakry has highlighted this narrative's ethnic and racial underpinnings, and the 'golden ages' marking its course: Middle Eastern and Indian seeds took root in Greece, were watered in Baghdad and Andalusia and pruned in monasteries and universities, and finally flowered in Europe. Modern science was cast as definitively 'Western,' the property of Europe and its settler descendants.²⁷ Soviet-aligned historiography showed the same early progression, though progress passed through (or leapt over) capitalism to state communism. Other than its end point, the big picture of science as a civilizational history was remarkably similar on both sides of the Cold War.²⁸

In Butterfield's words, the new science transformed 'the whole diagram of the physical universe'; it 'changed the character of men's habitual mental operations [and] the very texture of human life itself. The history of that change was also a new diagram – or representation – of the universe, a narrative of what exists, how it is known, and how a certain set of its (human) inhabitants came to know and control it. Though made of paper and words, folded into lectures, university curricula and subsequent books, this history was a cosmogram.²⁹ It resonated with other cosmograms of the time that used other materials, including audiovisual mass media and public events.

Consider the IBM-sponsored Information Machine. Designed by Eero Saarinen, this giant egg imprinted with the letters IBM – like a 'Selectric' typewriter ball – welcomed thousands per day at the 1964 New York World's Fair (Figure 2).³⁰

Once inside, visitors interacted with 3-D models in the Mathematica exhibition designed by Charles and Ray Eames. In 'Celestial Mechanics', pinballs spiralled down a Bakelite vortex to demonstrate 'Kepler and Newton's planetary and gravitational theories'.³¹ After filing into a steep rack of seats, viewers were thrust by hydraulic pistons into the heart of the egg, to watch the multi-screen spectacle 'Think'. Films and slide projections displayed everyday activities (traffic, American football, a dinner party) and their underlying mathematical principles, made more efficient by computers.

This immersive ritual made the scientific revolution a precursor to the information revolution. The World's Fair itself – one of the last projects of urban planner Robert Moses – presented a deliberately controlled reality. 'Think' projected gendered, white, middle-class domestic scenes, with men in suits commuting and women planning parties, while outside the fair protesters decried the limited employment it gave to African Americans.³² Curating a cosmos grounded in 'universal, disembodied' knowledge – in the forms of mid-century American capitalism – the Information Machine was a representation that accomplished work. It explained, justified and enforced a universe compatible with post-war US expansion, technocracy and racialized liberalism.³³

This MeMO universe was echoed and reinforced by action-oriented images of a science-centred world in other academic disciplines. W.W. Rostow's manual of US-led

27 Marwa Elshakry, 'When science became Western: historiographical reflections', *Isis* (2010) 101, pp. 98–109.

28 David Joravsky, 'Soviet views on the History of Science', *Isis* (1955) 46, pp. 3–13; Loren Graham, *Science in Russia and the Soviet Union: A Short History*, Cambridge: Cambridge University Press, 1993.

29 See Nasser Zakariya, *A Final Story: Science, Myth, and Beginnings*, Chicago: The University of Chicago Press, 2017.

30 Ben Highmore, 'Machinic magic: IBM at the 1964–1965 New York World's Fair', *New Formations* (2003) 51, pp. 128–48.

31 *Mathematica: A World of Numbers and beyond Exhibition, 1960–1*, the Henry Ford Museum of American Innovation, at www.thehenryford.org/collections-and-research/digital-collections/artifact/406979 (accessed 1 May 2024).

32 Highmore, op. cit. (30), pp. 145–6.

33 Aziz Rana, *The Two Faces of American Freedom*, Cambridge, MA: Harvard University Press, 2014.



Figure 2. Queuing up for the 'ovoid', New York World's Fair 1964–5. Reprint courtesy of IBM Corporation ©.

international development, *The Stages of Economic Growth: A Non-communist Manifesto* (1961), gave the scientific revolution stunning prominence: 'A traditional society is one whose structure is developed within limited production functions, based on pre-Newtonian science and technology'.³⁴ In William McNeill's *The Rise of the West* (1963), 'the general prosperity and success of European society' gave scientific thought 'extraordinary fertility and variety'; thus the West rose.³⁵ Evolutionary anthropologist Leslie White placed human civilization's inflection point in eighteenth-century England, where the steam engine 'tremendously increased the amount of energy under man's control and at his disposal for culture-building'.³⁶ Newtonian science and its application in machines set the course of history.

The big picture in history of science confirmed these authors' view of the direction of history, the make-up and best ways of knowing the universe, and their positions as mandarins of a rising empire. Further confirmation was found in ubiquitous machines. Writing on the 1952 invention of the bubble chamber by physicist Donald Glaser, Andrew Pickering observes, 'That we are, in modernity, surrounded by free-standing machines like that, and that our social worlds are built around them, goes a long way toward explaining the hold that a taken-for-granted dualism has over us. Our made world echoes an asymmetric dualism back to us'.³⁷

³⁴ W.W. Rostow, *The Stages of Economic Growth: A Non-communist Manifesto*, Cambridge: Cambridge University Press, 1961; Guy Ortolano, 'The typicalities of the English? Walt Rostow, the stages of economic growth, and modern British history', *Modern Intellectual History* (2015) 12, pp. 601–31.

³⁵ William McNeill, *The Rise of the West: A History of the Human Community*, Chicago: The University of Chicago Press, 1991 (first published 1963), p. 689.

³⁶ Leslie White, 'Energy and the evolution of culture', *American Anthropologist* (1945) 45, pp. 335–56, 345.

³⁷ Andrew Pickering, 'The ontological turn: taking different worlds seriously', *Social Analysis* (2017) 61, pp. 134–50, 141.

Since the 1970s academic historians of science have tried to leave the mid-century's big picture behind, but as Mario Biagioli put it, 'The scientific revolution is undead'.³⁸ This zombie narrative now thrives in popular door-stopping 'big histories'. Jared Diamond's 1997 *Guns, Germs, and Steel* was framed as the answer to 'Yali's question', asked by a New Guinea politician in the early 1970s: 'Why you white man have so much cargo and we New Guineans have so little?'.³⁹ Diamond congratulates himself for not perpetuating the racist assumptions of earlier explanations of Western supremacy. Instead he offers geographical, technological and immunological determinisms, noting the happy clime which enabled settled agriculture, giving Eurasians herd immunity, technical specialization, better tools and weapons, and the ability to conquer much of the rest of the world. (The motive goes unquestioned.)

Big histories which have followed Diamond's add new spice to a stale recipe: a base of Smithian competition and Darwinian struggle, a pinch of genetic double-talk – DNA doesn't explain everything, except when it does – with sticky layers of environmental, microbial and technological determinism folded in. Joseph Henrich's *The WEIRDest People in the World: How the West Became Psychologically Peculiar and Particularly Prosperous* turned to early modern European marriage customs for its yeast.⁴⁰ Though 'the West' now appears less secure in its victory – and often more lucky than clever – the scientific revolution remains a turning point in big history's Diamond Age.

In Ian Morris's *Why the West Rules – For Now*, science appears as applied technology, rather than the reverse: 'By the point that two-handed clocks had become the norm Europeans would have to have been positively obtuse not to wonder whether nature itself was a mechanism'.⁴¹ *Origin Story: A Big History of Everything* by David Christian (blurbed by one of evolution's big winners, Bill Gates) portrays science unfolding since the Big Bang: 'Scientists did not begin to understand how fundamental these rules were until the scientific revolution in the seventeenth century. Today, we describe these rules as the fundamental laws of physics'.⁴² Evolutionary inevitability drives Yuval Harari's *Sapiens*, whose drily prophetic tone added enough quirky insight to sell 45 million copies. His final section, 'The scientific revolution', details 'the feedback loop between science, empire, and capital [that] has arguably been history's chief engine for the past 500 years'.⁴³

The end point is now less clear. Steven Pinker affirms constant progress in *The Better Angels of Our Nature* and *Enlightenment Now* (downturns such as the Second World War are mere blips), while in *Civilization: The West and the Rest*, Niall Ferguson, like Morris, foresees China's ascent if it masters the West's 'six killer apps': competition, modern medicine, work ethic, property, consumerism and science.⁴⁴ For Harari, apocalypse waits: 'humans seem to be more irresponsible than ever. Self-made gods with only the laws of physics to keep us company'.⁴⁵

38 Mario Biagioli, 'The scientific revolution is undead', *Configurations* (1998) 6, pp. 141–8.

39 Jared Diamond, *Guns, Germs, and Steel: The Fates of Human Societies*, New York: W.W. Norton & Company, 1997, p. 14. See P. Kerim Friedman, 'What's wrong with Yali's question', *Savage Minds*, 5 July 2007, at <https://savageminds.org/2005/07/25/whats-wrong-with-yalis-question> (accessed 1 May 2024).

40 Joseph Henrich, *The Weirdest People in the World: How the West Became Psychologically Peculiar and Particularly Prosperous*, New York: Farrar, Straus and Giroux, 2020.

41 Ian Morris, *Why the West Rules – for Now: The Patterns of History, and What They Reveal about the Future*, New York: Farrar, Straus and Giroux, 2010, p. 476.

42 David Christian, *Origin Story: A Big History of Everything*, New York: Little, Brown and Company, 2018, p. 35.

43 Yuval Harari, *Sapiens: A Brief History of Humankind*, London: Vintage, 2011, p. 306. *Sapiens* was blurbed by Barack Obama – and Bill Gates.

44 Steven Pinker, *Enlightenment Now: The Case for Reason, Science, Humanism, and Progress*, London: Penguin, 2018; Pinker, *The Better Angels of Our Nature: The Decline of Violence in History and Its Causes*, London: Penguin, 2011 (Gates blurbs again!); Niall Ferguson, *Civilization: The West and the Rest*, New York: Penguin, 2011.

45 Harari, op. cit. (43), p. 466; David Nye, 'Harari's world history: evolution toward intelligence without consciousness?', *Technology and Culture* (2021) 4, pp. 1219–28.



Figure 3. The Millennium Dome, Greenwich, UK. James Jin 2004, Creative Commons, www.flickr.com/photos/jamesjin.

Despite such tweaks, the twentieth-century big picture of science is still echoed and revived in other cosmograms: in science museums, advertisements and films, from *The Martian* and *Hidden Figures* to *Iron Man*, along with the cycles of Silicon Valley hype. As a latter-day successor to the IBM egg, consider London's Millennium Dome (Figure 3), with its world's-fair ambitions and cosmological symbolism.

The twelve poles jutting through its roof – harpoons pinning a whale – represent the months and hours of universal Greenwich Mean Time set nearby. Exhibitions in its inaugural Millennium Experience carved up the universe among corporate sponsors: *Who We Are* (Body, L'Oréal), *What We Do* (*Journey*, Ford Motor Company), and *Where We Live* (*Home Planet*, British Airways). Ridiculed at its launch as an ill-planned boondoggle, the Dome is now seen as a precursor to Tony Blair's drive to war against Iraq with the US-led (and UN-unsanctioned) 'coalition of the willing'.⁴⁶ The consequences of this neo-imperial, petroleum-driven spree have been crippling for UK politics and devastating for the Middle East.⁴⁷

History against anti-utopianism

As these examples suggest, science's enduring big picture (BP for short?) has played a huge role in justifying the technological, economic and military ventures through which North Atlantic societies seek to secure hierarchies within and between nations. It is a myth we live by, a key component of our cosmology.⁴⁸

Historians of science and STS scholars have shown how much the MeMO big picture gets wrong about science. We pick apart science's different styles, methods, paradigms,

⁴⁶ Iain Sinclair, *Sorry Meniscus: Excursions to the Millennium Dome*, London: Profile, 1999; Imogen West-Knights, 'Was the Millennium Dome really so bad?', *The Guardian*, 12 March 2020.

⁴⁷ Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil*, London: Verso, 2011; Hugh Gusterson and Catherine Besteman, 'Cultures of militarism', *Current Anthropology* (2019) 60, pp. S3–S14.

⁴⁸ Gregory Schremp, *The Ancient Mythology of Modern Science: A Mythologist Looks (Seriously) at Popular Science Writing*, Montreal: McGill-Queen's University Press, 2012.

ideals and ways of knowing, often detailing these in focused case studies.⁴⁹ We show how emotion, aesthetics and values are central to science's functioning, and that its various arguments, instruments and objects don't add up to a gleaming, united world, but rather a messy, incomplete patchwork, in need of constant repair and maintenance.⁵⁰ Our current big picture might be seen as one of principled disunity – for which Feyerabend's 'anarchist theory of knowledge' and Kuhn's view of different paradigms as 'different worlds' remain relevant guides.⁵¹ Yet the MeMO cosmograms which flourish outside the academy – including Diamond Age big histories – keep the big picture intact.

Here is where *The Dawn of Everything's* example becomes vital for historians of science. *Dawn* stands on the same front table of Waterstone's as the latest big-picture histories, yet it is dedicated to reversing their basic assumptions. Its use of case studies resembles the history of science's focus on diverse local (and increasingly global) sites since the 1970s and 1980s. But there is a difference. If countercultural impulses lay behind early critiques of the previous big picture – feminism, the struggle for racial equality, opposition to the Vietnam war and atomic weapons, and growing ecological awareness – today the struggles have shifted. Motivations are more diffuse. We lack a strong collective sense of why to document this variety, and where the project of collecting case studies leads.⁵²

Dawn gathers case studies for a clear purpose: to enrich the social imaginary, to show that there have been liveable, long-lasting alternatives to violent and stratified states. It conveys a burning sense that there is nothing inevitable about a society defined by rigid hierarchies and inequalities, and that people should be able to choose the kinds of community they want to inhabit. The book's political force is directly linked to Graeber's well-known anarchist commitments.

In a 2004 pamphlet, Graeber laid out the agenda for the 'non-existent science' of an anarchist anthropology. Its first principle was to be 'against anti-utopianism'.⁵³ Graeber took for granted that there are better, more just, more satisfying ways of living together than under coercive governments and corporations; imagining them would be useful to bringing them about. Many historians of science would like their work to contribute more than curiosities or conceptual clarifications, and to help a more free, equal and creative society unfold within the current one. They might even endorse core ideas of a non-vanguardist, cooperative anarchism: for instance, that 'institutions like the state, capitalism, racism and male dominance are not inevitable; that it would be possible to have a world in which these things would not exist, and that we'd all be better off as a

49 Ian Hacking, "'Style" for historians and philosophers', *Studies in History and Philosophy of Science Part A* (1992), pp. 1–20; John Pickstone, *Ways of Knowing: A New History of Science, Technology and Medicine*, Manchester: Manchester University Press, 2000; Lorraine Daston and Peter Galison, *Objectivity*, Cambridge, MA: Zone, 2007.

50 Simon Werrett, *Thrifty Science: Making the Most of Materials in the History of Experiment*, Chicago: The University of Chicago Press, 2019.

51 Paul Feyerabend, *Against Method: Outline of an Anarchistic Theory of Knowledge*, London: Humanities Press, 1975; Thomas Kuhn, *The Structure of Scientific Revolutions*, 2nd edn, Chicago: The University of Chicago Press, 1970, p. 193; Peter Galison and David Stump, *The Disunity of Science: Boundaries, Contexts, and Power*, Palo Alto: Stanford University Press, 1996. In *Stop Thief! Anarchism and Philosophy*, London: John Wiley & Sons, 2023, Catherine Malabou reproaches post-structuralist philosophers for failing to affirm the political anarchism their thought implies.

52 On depoliticized 'contextualist boilerplate' see Steve Fuller, *Thomas Kuhn: A Philosophical History for Our Times*, Chicago: The University of Chicago Press, 2002.

53 David Graeber, *Fragments for an Anarchist Anthropology*, Chicago: Prickly Paradigm Press, 2004, p. 10. *Dawn* pursued much of this agenda: distinguishing forms of rulership from the mechanics of rule, examining forms of hierarchy and their counterimages which fend off abuses, a theory of the state and 'political entities that are not states'. Elsewhere Graeber elaborated its other desiderata: a theory of capitalism based on varied forms (*Debt: The First 5000 Years*, London: Penguin UK, 2012); diagnosis of useless labour (*Bullshit Jobs: The Rise of Pointless Work, and What We Can Do about It*, London: Penguin Books, 2019).

result'.⁵⁴ *Dawn's* insights about political orders, oppression and political creativity could bring a welcome impulse to our dispersed case studies of diverse, globally arrayed knowledge worlds. It could stoke a rising interest in the relationship between science, capitalism and liberalism, as well as the ongoing concern for science's role in colonialism and empire.⁵⁵ It reminds us that our work contributes to large-scale narratives, and can change them.

Wanting to get rid of the old big picture doesn't mean rejecting science. Medicine often eases suffering, sometimes dramatically. We need to be able to document the effects of pollution, and cite evidence for the effectiveness of social policies. Radios and telephones are useful, movies are fun and it's nice to know when eclipses are coming. But the regularities involved in such knowledge and inventions don't add up to a single method or a single world. There's no one great clock whose gears we're getting closer to controlling. The findings of different sciences form overlapping but incomplete meshes, with dense knots here and there – a 'dappled world' in Nancy Cartwright's phrase.⁵⁶ MeMO's reductionism and determinism bring an attitude of confrontation, control and domination; it justifies colonial and neocolonial projects, discrediting and dismissing other peoples' forms of life as 'traditional', 'backwards', 'irrational' or 'superstitious'. We need to be open to other possibilities: ways of knowing that are excluded by science, conceptions of science other than the simplifications of MeMO – perhaps even a science without nature.⁵⁷

The history of European science is rife with radically varied conceptions of the universe and how we know it, more than was dreamt of in sixteenth-century Wittenberg or twentieth-century textbooks. Scientific common sense at one point accepted the spirits and vegetative forces of alchemy and allowed discussion of demons and angels in the Royal Society's *Transactions*; it entertained preformed animalcules, a hollow earth and psychical research; it now welcomes spooky action at a distance, gravity waves and observer effects. Each strand of MeMO is spun of many others, with the nature of machines, matter and objectivity contested and dissected, aligned with divergent worlds of knowledge. The variety historians show within European knowledge – the ideas, practices and social orders that harbour distinct cosmological orders – proves the insufficiency of the MeMO big picture.

What's more, *Dawn's* global scope and confident comparative framework are well suited to our discipline's turn toward science beyond the West, weaving larger stories that include astral and humoral medicine in ninth-century Baghdad and its cosmological coordinates, mathematics in medieval India, engineering in the Ming court and talismanic science in West Africa.⁵⁸ Historians show that science took decisive modern forms in colonial situations, placing Europe within *longue durée* relations of exchange, conquest and

⁵⁴ *Fragments* rejects the 'vanguardist' idea that change requires leaders to define the perfect society and use any means to achieve it. Instead, it advocates that we 'look at those who are creating viable alternatives, try to figure out what might be the larger implications of what they are already doing, and then offer those ideas back, not as prescriptions, but as contributions, as possibilities'. Graeber, *Fragments*, op. cit. (53), pp. 10–12. See also Murray Bookchin, *Post-scarcity Anarchism*, Berkeley: Ramparts Press, 1971.

⁵⁵ Lukas Rieppel, Eugenia Lean and William Deringer (eds.), *Science and Capitalism: Entangled Histories, Osiris* (2018) 33; conference on Science and Liberalism organized by Isabel Gabel, Steph Dick and Marc Adinoff, April 2023, at <https://scienceandliberalism.event.uchicago.edu/events> (accessed 1 May 2024).

⁵⁶ Nancy Cartwright, *The Dappled World: A Study of the Boundaries of Science*, Cambridge: Cambridge University Press, 1999.

⁵⁷ Lorraine Daston, *Against Nature*, Cambridge, MA: MIT Press, 2019.

⁵⁸ David Pingree, 'The logic of non-Western science: mathematical discoveries in medieval India', *Daedalus* (2003) 132, pp. 45–53. Ousmane Kane, *Beyond Timbuktu: An Intellectual History of Muslim West Africa*, Cambridge, MA: Harvard University Press, 2016.

settlement, shaped by go-betweens and mestizo knowledge.⁵⁹ Scholars attend to the herbs and cures of Indigenous healers, reading covert practices between the lines of travellers' and colonial administrators' accounts.⁶⁰ At times such work connects with earlier approaches in philology and religious or area studies which considered bodies of knowledge from regions and civilizations seen as distinct from Europe – Chinese, Islamic, Babylonian, Indian.⁶¹ Other 'global' approaches investigate the cultural emphases shaping reinventions of 'modern' science.⁶² Some argue that science's past as much as its future – in India, China, Brazil – lies outside the West.⁶³ Many historians of science now argue that modern 'Western' forms of science should no longer be the norm against which others are measured.⁶⁴

Case studies will continue to multiply. *Dawn* shows that it is possible to gather them together along provocative lines of comparison and contrast, to dispel the illusion (powerful and effective though it is) of a single telos and necessary way for things to be, and to clear paths toward other possibilities. Such historical and geographical variety would serve the project of reimagining the order of knowledge, its social coordinates and the cosmos itself.

Taking other ontologies seriously

Further help for reframing our big picture in this way – in part by multiplying big pictures, through the cosmologies we study and the cosmological narratives we frame – can come from the 'ontological turn', which is dedicated to taking radically different knowledge worlds seriously. Ontology is a near synonym to cosmology, a term well known to historians of science both as the science of the physical universe – back to Ptolemy and Copernicus – and in its anthropological sense, as a collective's assumptions about the components of the universe and their relations, origins and moral and aesthetic valences. Grounded in theories of order and classification proposed by Durkheim and Mauss, the anthropological sense of cosmology played a role in the emergence of the sociology of scientific knowledge of the 1970s and 1980s.⁶⁵ Anthropological examples enlivened debates about rationality, with Kuhn and Popper conversing with James Frazer, E. Evans-Pritchard and Mary Douglas.⁶⁶ These discussions in turn handed historians of

59 James Poskett, *Horizons: A Global History of Science*, London: Penguin UK, 2022; Kapil Raj, *Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia and Europe, 1650–1900*, Cham: Springer, 2007.

60 Pablo Gómez, *The Experiential Caribbean: Creating Knowledge and Healing in the Early Modern Atlantic*, Chapel Hill: University of North Carolina Press, 2017; Londa Schiebinger, *Secret Cures of Slaves: People, Plants, and Medicine in the Eighteenth-Century Atlantic World*, Palo Alto: Stanford University Press, 2017.

61 Sheldon Pollock, Benjamin Elman and Ku-ming Kevin Chang (eds.), *World Philology*, Cambridge, MA: Harvard University Press, 2015; Francesca Rochberg, *Before Nature: Cuneiform Knowledge and the History of Science*, Chicago: The University of Chicago Press, 2019.

62 Marwa Elshakry, *Reading Darwin in Arabic, 1860–1950*, Chicago: The University of Chicago Press, 2019; Fa-ti Fan, 'Redrawing the map: science in twentieth-century China', *Isis* (2007) 98, pp. 524–38.

63 James Delbourgo, 'The knowing world: a new global history of science', *History of Science* (2019) 57, pp. 373–99.

64 Benjamin Elman, *On Their Own Terms: Science in China, 1550–1900*, Cambridge, MA: Harvard University Press, 2005; Douglas Falen, *African Science: Witchcraft, Vodun, and Healing in Southern Benin*, Madison: University of Wisconsin Press, 2018; Projit Mukharji, *Doctoring Traditions: Ayurveda, Small Technologies, and Braided Sciences*, Chicago: The University of Chicago Press, 2016.

65 Emile Durkheim, *The Elementary Forms of Religious Life*, London: George Allen & Unwin, 1915; Emile Durkheim and Marcel Mauss (tr. Rodney Needham), *Primitive Classification*, London: Cohen & West, 1963 (Rodney Needham translated Lévi-Strauss in the same period); Mary Douglas, *Natural Symbols: Explorations in Cosmology*, New York: Pantheon Books, 1970.

66 Bryan Wilson (ed.), *Rationality*, London: Wiley-Blackwell, 1970; Martin Hollis and Steven Lukes (eds.), *Rationality and Relativism*, Cambridge, MA: MIT Press, 1982.

science the term ‘cosmology’ as a way to approach clashes between holistic conceptions of combined natural and social orders, anomalies, pollution, the sacred and the moral force of scientific categories.⁶⁷ Like cosmology, ontology refers to understandings of the universe and its basic components. Anthropologist Souhmya Venkatesan usefully distinguishes the two: while ontology concerns ‘the nature of being and the positing of fundamental entities or categories that are mutually exclusive and often not further divisible’, cosmology addresses ‘the way in which the core ontological entities interact, and are ordered, to generate the various human and non-human inhabitants of the universe’.⁶⁸

Another salient difference between ontology and cosmology for many current authors lies in the sense that ‘cosmology’ – like ‘culture’, ‘world view’, or ‘symbolic structure’ – is primarily concerned with ideas and interpretations, in line with Kant’s distinction between representations (or categories) and things in themselves. This theory of knowledge, when applied in anthropology, assumes that all human groups have their own (often confused) ‘interpretations’ of the world, while Western science is the unique system of representations that progressively comes closer to grasping nature.⁶⁹ Authors associated with the ontological turn reject terms such as ‘culture’, ‘world view’ or ‘conceptual scheme’ for reinforcing this ‘representational bias’. Instead, ontology refers to the way things exist in a direct, lived, palpable and self-evident mode. The entities of an ontology (and the concepts that address them) are not ‘interpretations’ or ‘representations’ of the world; they simply are, they are *real*.

Recent talk of ontologies has roots in phenomenology – particularly Heidegger’s reading of Cartesian and Kantian epistemology, adapted by Foucault, that a confrontation between subject and object is just the way in which being reveals itself in modernity.⁷⁰ But the present multiplication of ontologies began in STS. Latour highlighted ‘variable ontologies’ in scientific practice, following objects’ shifts from confused masses of observations to stable, ‘black-boxed’ facts.⁷¹ Annemarie Mol’s *The Body Multiple* showed hospitals generating multiple ontologies of disease through distinct, not always commensurable, instruments, measures and protocols, while Charis Thompson traced the ‘ontological choreography’ required for biomedicine’s many ways of knowing to unfold as apparently coherent treatments and identities.⁷²

The actor-network theory (ANT) that Latour developed with Michel Callon was itself a new way of speaking about what exists – literally, an ‘ontology’. In *We Have Never Been Modern* Latour described what scientists and engineers were actually doing in terms of hybrids, quasi-objects and natures–cultures (notions resembling Donna Haraway’s

67 Steven Shapin and Barry Barnes (eds.) *Natural Order*, Beverly Hills and London: Sage, 1979; David Bloor, ‘Durkheim and Mauss revisited: classification and the sociology of knowledge’, in Bloor, *Society and Knowledge*, London: Routledge, 2017, 67–92.

68 Souhmya Venkatesan, ‘Auto-relations: doing cosmology and transforming the self the Saiva way’, in Alan Abramson and Martin Holbraad (eds.), *Framing Cosmologies*, Manchester: Manchester University Press, 2016, pp. 77–94, 77. In this collection and elsewhere, the ontological turn has accompanied renewed interest in cosmologies; see also Eduardo Viveiros de Castro, ‘Cosmological deixis and Amerindian perspectivism’, *Journal of the Royal Anthropological Institute* (1998) 4, pp. 469–88.

69 Alan Abramson and Martin Holbraad, ‘Introduction: the cosmological frame in anthropology’, in Abramson and Holbraad, op. cit. (68), pp. 1–28, 7; on the two ‘great divides’ see Bruno Latour, *We Have Never Been Modern*, Cambridge, MA: Harvard University Press, 1993, pp. 94–106; on ‘multinaturalism’ see Eduardo Viveiros de Castro, ‘Cosmological perspectivism in Amazonia and elsewhere’, *HAU: Journal of Ethnographic Theory* (2011) 1, pp. 1–25.

70 John Tresch, ‘Technological world-pictures: cosmic things and cosmograms’, *Isis* (2007) 1, pp. 84–99.

71 Latour, op. cit. (69), p. 88.

72 Annemarie Mol, *The Body Multiple: Ontology in Medical Practice*, Durham, NC: Duke University Press, 2002; Charis Thompson, *Making Parents: The Ontological Choreography of Reproductive Technologies*, Cambridge, MA: MIT Press, 2005.

‘material semiotics’), and traced the social strategies, interpretations and negotiations enmeshing humans and non-humans. In contrast to the official ‘modern’ epistemological scenography, in which active, thinking subjects confront passive, material objects, he presented a ‘non-modern’ picture of science as a long, messy and open-ended process of mixture, with a ‘purification’ into objects and subjects only arriving at its end.

While inspired by Deleuze and Guattari, Michel Serres, and the philosophies they reworked, Latour’s approach – which granted agency to non-humans, and followed the creation of networks and assemblages – kindled a firestorm of ontological theories. In a recent paper, Julia Turska and David Ludwig distinguish two strands within the ontological turn. The first proposes ‘first-order’ alternative ontologies.⁷³ Like ANT, these theories of being reject the standard dualist framework (modern, Western, scientific, European, MeMO), proposing in its place a broadly ‘non-dualist’ (or monist, or pluralist) ontology. Despite compelling distinctions, we might place under the broad umbrella of ‘first-order’ ontologies Donna Haraway’s material semiotics (and troubled, multispecies Chthulucene); Andrew Pickering’s mangle of practice, with dances of agency between humans, machines and other non-humans; Jane Bennet’s vital materialism and other strands of New Materialism; Tim Ingold’s embodied, sensory and evolutionary approach to knowing and making; Karen Barad’s agential realism, proclaiming ‘the ontological inseparability of intra-acting agencies’; and Eduardo Kohn’s ecological expansion of Peircean semiotics.⁷⁴ These theories reference each other in a cross-disciplinary lingua franca which anthropologist Michael Scott glosses as ‘relational non-dualism’.⁷⁵

The second strand of the ontological turn is the work of anthropologists whom Turska and Ludwig see ‘making second-order claims about ontological frameworks, often without explicitly committing themselves to a particular one’.⁷⁶ Like the ‘first-order’ theorists, these scholars reject the idea that modern science provides the only valid ontology. But instead of advocating for an alternative, they introduce non-Western, ethnographically based understandings of being and reality which exceed or undermine scientific materialism, causality and divisions between subjects and objects.

One eminent example is French anthropologist Philippe Descola, who distinguishes four main ontological types. Alongside the Cartesian dualism of Western *naturalism*, Descola juxtaposes *totemism*, which identifies certain humans with some limited set of external entities; *animism*, which aligns interior and exterior realities according to isomorphic resemblance; and *animism*, in which animals and other non-human beings are seen to have conscious capacities akin to those of humans, despite their different

73 Julia Turska and David Ludwig, ‘Back by popular demand, ontology: productive tensions between anthropological and philosophical approaches to ontology’, *Synthèse* (2023) 202, pp. 39–61; ‘alternative ontology’ comes from Martin Holbraad and Morten Axel Pedersen, *The Ontological Turn: An Anthropological Exposition*, Cambridge: Cambridge University Press, 2017.

74 Donna Haraway, *Staying with the Trouble: Making Kin in the Chthulucene*, Durham, NC: Duke University Press, 2016; Andrew Pickering, *The Mangle of Practice: Time, Agency, and Science*, Chicago: The University of Chicago Press, 1995; Tim Ingold, *The Perception of the Environment: Essays on Livelihood, Dwelling, and Skill*, London: Routledge, 2000; Jane Bennett, *Vibrant Matter: A Political Ecology of Things*, Durham, NC: Duke University Press, 2010. Eduardo Kohn, *How Forests Think: Toward an Anthropology beyond the Human*, Berkeley: University of California Press, 2013; Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham, NC: Duke University Press, 2007, p. 44.

75 Michael Scott, ‘The anthropology of ontology (religious studies)’, *Journal of the Royal Anthropological Institute* (2013) 19, pp. 859–72.

76 Turska and Ludwig, op. cit. (73); ‘second-order’ analysis often leads to ‘first-order’ claims about what the world must be like to be able to sustain multiple and contradictory worlds; this is a guiding theme in Pickering, op. cit. (37), and in evocations of a pluriverse (see below). In analytical philosophy compare David Chalmers, David Manley and Ryan Wasserman (eds.), *Metametaphysics: New Essays on the Foundations of Ontology*, Oxford: Oxford University Press, 2009; and Michela Massimi, *Perspectival Realism*, Oxford: Oxford University Press, 2022.

bodies.⁷⁷ Another dazzling ontological theorist is Brazilian anthropologist Eduardo Viveiros de Castro – like Descola, a dedicated reader of Lévi-Strauss. Focused on the animism associated with hunting and shamanism among Amazonian groups, Viveiros de Castro has presented a complex Indigenous theory of embodied perspectivism in which all creatures see themselves as people, though possessed of different bodies. If Descola serenely unfolded ontologies as classifiable ‘types’, then Viveiros launched Amazonian ‘multinaturalism’, and its radical reversals of figure and ground, nature and culture, as a ‘bomb’ to explode Western concepts.⁷⁸

Viveiros de Castro became a standard-bearer for a severe version of ontological anthropology, with support from Martin Holbraad and Morten Pedersen.⁷⁹ They argue that there is no stable baseline from which to evaluate and compare the different worlds humans inhabit, nor any unequivocal language in which to define their elements. Instead, they insist that we take seriously interlocutors’ reports of separate realities as a means of unsettling our own assumptions. Too often, according to Viveiros de Castro, ‘When a shaman shows you a magic arrow extracted from a sick man, a medium gets possessed by a god, a sorcerer laboriously constructs a voodoo doll, we only see one thing: Society (belief, power, fetishism)’.⁸⁰ Rather than explain away beliefs as the expression of social relations, psychological drives or biological needs, the ethnographer should describe their interlocutors’ worlds and alien concepts in ways that members of the group under study ‘do not find offensive or ridiculous’.⁸¹ This version of the ontological turn presents itself as a revolutionary challenge to Western philosophy: by engaging radically different worlds of Indigenous thought, it activates concepts and ways of being that undermine scientific dualism and the privilege of knowledge over things. It offers a vision of possible realities whose explication supports ‘ontological self-determination’ and ‘the permanent decolonization of thought’.⁸²

Though historians usually don’t conduct fieldwork with living humans, the people we study were immersed in self-evident realities.⁸³ Adopting an ontological approach in history of science would mean taking seriously the claims of past knowledge worlds and tracing the habits and practices, the communal forms, the values and standards of reality, the objects and the aesthetics that held these worlds together. Arguably, STS and history of science have already led the way in cultivating a disciplinary sensibility for the lived-in-ness of worlds, imaginatively conveying the things, practices, values and trainings that compose them, as well as making clear how the make-up of both nature and society is at stake in scientific controversies. This is what I take the term ‘ontology’ to mean, and why its arguments can reinforce and intensify what historians of science already do.⁸⁴

77 Philippe Descola, *Beyond Nature and Culture* (tr. Janet Lloyd), Chicago: The University of Chicago Press, 2013.

78 Eduardo Viveiros de Castro, *Cannibal Metaphysics* (tr. Peter Skafish), Minneapolis: Univocal, 2014; Bruno Latour, ‘Perspectivism: “type” or “bomb”’, *Anthropology Today* (2009) 25, pp. 1–2.

79 Holbraad and Pedersen, op. cit. (73); all three authors cite the work of Marilyn Strathern and Roy Wagner’s studies of Melanesia as precursors.

80 Eduardo Viveiros de Castro, ‘Who is afraid of the ontological wolf? Some comments on an ongoing anthropological debate’, *Cambridge Journal of Anthropology* (2015) 33, pp. 2–17, 12.

81 Viveiros de Castro, op. cit. (80), p. 14.

82 Martin Holbraad, Morten Axel Pedersen and Eduardo Viveiros de Castro, ‘The politics of ontology: anthropological positions’, *Cultural Anthropology*, 2014, at www.culanth.org/fieldsights/462-the-politics-of-ontology-anthropologicalpositions (accessed 1 May 2024).

83 John Tresch, ‘On going native: Thomas Kuhn and anthropological method’, *Philosophy of the Social Sciences* (2001) 31(3), 302–22.

84 Ian Hacking, *Historical Ontology*, Cambridge, MA: Harvard University Press, 2002, regrettably confines his discussion of ‘historical ontology’ (the constitution of objects that did not previously exist) to the human sciences. For engagements with anthropology’s ontological turn in history of science see Stéphane van Damme, *Seconde nature: Rematieriser les sciences de Bacon à Tocqueville*, Paris: Les presses du réel, 2020; John

Seriously?

The revolutionary claims of the ontological turn (and its occasional all-or-nothing proclamations) have led critics to argue that it adopts a remote, speculative stance which diverts attention from suffering, exclusion and marginalization, from global patterns of capitalism and the legacies of colonialism.⁸⁵ For Lucas Bessire and David Bond, in ‘ontologically inflected anthropology, politics no longer refers to operations of domination or to struggles that lay claim to what is (i.e., goods, rights, or meaning). Politics, instead, becomes a principled assertion of how things could be.’⁸⁶ By focusing on analysis of idealized Indigenous worlds – while, as Zoe Todd notes, rarely citing the works of Indigenous scholars – the ontological turn overlooks the contradictions in which people live.⁸⁷ Bessire and Bond remark that ‘the awe of alterity’ means that ‘Coca-Cola cans, shotguns, soccer balls, evangelical icons, petrochemical pollution, trinkets for tourists, and T-shirts from Grand Rapids – to name a few of the things we have encountered in far-flung Indigenous villages – are brushed aside.’⁸⁸ Enthusiasm for Indigenous conceptions of non-human agency rarely extends to what Kim Fortun calls the ‘toxic vitalism’ of industrial exploitation, chemical catastrophe and deforestation.⁸⁹ Exegesis of the ‘strange’ ideas in Indigenous thought echoes the exoticizing discourse of earlier anthropology – and presents the West in equally reductive, homogenizing terms. It neglects the creative and reflexive ways in which people challenge or reappropriate anthropological models in constructing political identities.⁹⁰ Taking informants’ claims as all equally true forbids critical analysis of ideology, false consciousness or structural determinations.⁹¹

In 2015 Graeber joined this chorus. His prompt was a lecture in which Viveiros de Castro singled him out for denying that a certain Malagasy charm – Ravololana – can actually stop hailstorms.⁹² Graeber’s refusal to take his interlocutors seriously revealed, according to Viveiros de Castro, that ‘not all political anarchists accept ontological anarchy, i.e. the idea that the only viable political meaning of ontology in our times depends on accepting alterity and equivocation as “unsubsumable” by any transcendent point of view’.⁹³ Taking up the gauntlet, Graeber argued that ontological anthropology’s

Tresch, ‘Des natures autres: Hétérotopies de la science du XIX^{ème} siècle,’ in Dominique Pestre, Kapil Raj and Otto Sibum (eds.), *Une nouvelle histoire des sciences*, vol. 2: *Le XIX^{ème}*, Paris: Seuil, 2015, pp. 143–64.

85 Arthur Kleinman, Veena Das and Margaret M. Lock (eds.), *Social Suffering*, Berkeley: University of California Press, 1997; João Biehl, *Vita: Life in a Zone of Social Abandonment*, Berkeley: University of California Press, 2013; Achille Mbembe, *On the Postcolony*, Berkeley: University of California Press, 2001.

86 Lucas Bessire and David Bond, ‘Ontological anthropology and the deferral of critique’, *American Ethnologist* (2014) 41, pp. 440–56, 441.

87 Zoe Todd, ‘An Indigenous feminist’s take on the ontological turn: “ontology” is just another word for colonialism’, *Journal of Historical Sociology* (2016) 29, pp. 4–22.

88 Bessire and Bond, op. cit. (86), p. 447.

89 Kim Fortun, ‘From Latour to late industrialism’, *HAU: Journal of Ethnographic Theory* (2014) 4, pp. 309–29.

90 Audra Simpson, *Mohawk Interruptus: Political Life across the Borders of Settler States*, Durham, NC: Duke University Press, 2014.

91 Similar objections have been raised against Latour, and the ‘postcritique’ he inspired (Bruno Latour, ‘Why has critique run out of steam? From matters of fact to matters of concern’, *Critical Inquiry* (2004) 30, pp. 225–48); see R.H. Lossin, ‘Neoliberalism for polite company: Bruno Latour’s pseudo-materialist coup’, *Salvage* (2019) 7, pp. 131–55. In my reading, Latour’s point was not to ban all criticism, but rather to caution against the unreflective assumption that we’ve done our job when we point out exploitation or deception, and that the received terms of critical theory or social science (class, alienation, commodification) are sufficient points of leverage. These may be useful ‘black boxes’, but must be reopened and adjusted for changing realities. Mario Blaser and Caspar Bruun Jensen, ‘Political ontology and practical ontology: continuing of a debate’, *Berliner Blätter* (2023) 84, pp. S1–S18.

92 Graeber, op. cit. (8).

93 Viveiros de Castro, op. cit. (80), p. 9.

elaboration of self-enclosed worlds and insistence on the inseparability of things and concepts are ‘indistinguishable from classical philosophical Idealism’.⁹⁴ Its politics, he suggested, are confined to the imagination: he noted a collection of essays on ‘the politics of the ontological turn’ that never mentioned the keywords ‘serf, slave, caste, race, class, patriarchy, war, army, prison, police, government, poverty, hunger, inequality’.⁹⁵ Taking all reports ‘seriously’ leaves modern science and Western ideology unchallenged within its own world.⁹⁶

Graeber further pointed out that the group to whom an ontology ‘belongs’ is elusive; individuals adhere to divergent identities at different moments, denying or inventing affiliations and ancestries as circumstances require. How does an ethnographer decide which representative of a community to take seriously? When dealing with notions such as magic and power, ‘insiders’ are themselves often uncertain about whether and how they work. This ambivalence, he argued, is a condition of belief: ‘being able to say that certain forms of magic don’t really work is what makes it possible to say that other forms of magic do’.⁹⁷

In Graeber’s view, taking interlocutors seriously means ‘starting from the recognition that neither party to the conversation will ever completely understand the world around them, or for that matter, each other’.⁹⁸ Against the claim that different people ‘literally inhabit different worlds’, he endorsed the ‘critical realism’ of Roy Bhaskar, which holds that there is one real world, but reality is ‘precisely that which we can never know completely’.⁹⁹

A similar light-touch realism is at work in *Dawn* – in the credit the authors give to recent scientific refinements, and in their presentation of the concerns of ancient Sumerians, pre-Columbian Maya, eighteenth-century Wendat and twenty-first-century Europeans as more or less the same, or at least mutually understandable.¹⁰⁰ Much of the book’s appeal lies precisely here: in conveying the impression that despite minor differences of interpretation and different social orders, all humans everywhere basically share the same reality. This makes its remote examples available for political reflection, critique and imaginative remobilization today.

Yet these gestures towards universalism might set historians of science (and ontological anthropologists) on alert, given our concern for ‘actors’ categories’ and avoiding cultural bias, anachronism, or ‘Whig history’. The worry is that *Dawn*’s down-to-earth universalism might flatten out into the common sense of twenty-first-century readers – a ‘natural attitude’ easily recaptured by the claims of science-backed realism and MeMO. How do we distinguish a universal common sense from a culturally dependent self-evidence?

These debates around ontology reveal an ongoing tension between universalizing and particularizing that is inherent in cultural or historical comparison.¹⁰¹ Anthropological

94 Graeber, op. cit. (8), p. 21

95 Graeber, op. cit. (8), p. 32 n. 46.

96 Graeber, op. cit. (8), pp. 7–8, 35, referencing ‘Introduction: thinking through things’, in Amira Henare, Martin Holbraad and Sari Wastell (eds.), *Thinking through Things: Theorizing Artefacts Ethnographically*, London: Routledge, 2007, pp. 1–31.

97 Graeber somewhat dubiously explained his denial of Ravololana’s efficacy as ‘an intervention in an ongoing Malagasy conversation. If it came off as slightly cavalier, it was only because I identified so thoroughly with my informants that I felt I could express myself as one of them might have done’. *Sure, Jan*. Graeber, op. cit. (8), p. 10.

98 Graeber, op. cit. (8), p. 27

99 Graeber, op. cit. (8), p. 24; Roy Bhaskar, *Plato etc.: The Problems of Philosophy, and Their Resolutions*, London: Verso, 1994.

100 Graeber and Wengrow, op. cit. (4), p. 252: ‘Archaeological science has changed all this’; see also *ibid.*, pp. 525–6, correcting ‘the mythic substructure’ of social science.

101 Michel-Rolph Trouillot, *Anthropology and the Savage Slot: The Poetics and Politics of Otherness*, New York: Palgrave Macmillan US, 2003; Matthew Engelke, *Think Like an Anthropologist*, London: Penguin, 2017.

and historicist thought oscillates between (a) the imperative to show that remote or exotic practices and ideas can be understood – because humans are all fundamentally alike – and (b) the imperative to recognize that those practices and ideas are genuinely alien – because all groups should be understood in their own terms. Graeber shifted from (a) toward (b) when, despite his many objections, he confessed sympathy with the overall intent of ontological anthropology, restating its approach in a form he could support: ‘Radical alterity can never be contained by our descriptions, the argument goes, and we cannot understand it through deductive reasoning; rather, the ethnographer’s task is a creative, experimental, even poetic project – an attempt to give life to an alien reality that unsettles our basic assumptions about what could exist.’¹⁰² This olive branch suggests that the ontological turn’s insistence on difference and singularity need not be seen as totally at odds with the comparative project of *Dawn* and other politically engaged approaches in the humanities and social sciences. It also suggests that the ‘experimental, even poetic projects’ of both researchers and those they study should be part of that alignment.

Embodiments of alternative ontologies

The great appeal of ‘ontology’ is its implication of the sensory presence, obduracy, thickness, tenacity, embodiment and embeddedness of particular cosmological milieus. It matters that there were deep divides between Leibniz and Newton; between Spencer and Kropotkin; between Spanish miners, rubber planters, missionaries, settlers and the Indigenous South Americans in their way; between the botany, navigation and imperial ambition driving Captain Cook’s voyage and the knowledge practices of the Hawaiians who greeted them. Some disagreements or ‘misunderstandings’ are bridged through translation, syncretism, cooperation and alignment of horizons. But there is more at stake than finding the right words. Disagreement is also located in distinct technologies; practical routines; years of habituation; moral, aesthetic, and epistemic values; social forms; and foundational understandings of the universe.¹⁰³ Encounters are often conflictual, bound up with questions of power, political alliance and resistance, and threats or acts of violence. We need to allow the possibility that opposed ‘views’ rise to the level of distinct forms of life, worlds, cosmologies – or ontologies. If we don’t acknowledge how very different realities can be, and make ourselves familiar with a range of variations, we may wind up taking MeMO for granted and insist, like generations of modernizers, that everyone just needs to be reasonable – in the ways our sciences, corporations and militaries determine.

As the critics above urge, however, we have to avoid the ontological turn’s most extreme suggestions: that ontological worlds are bounded, unanimous and timelessly coherent, or that there is an insurmountable incommensurability between them. We can attend to frictions and layerings, threads of connection, overlaps within and between worlds, noting how they sometimes exaggerate and sometimes downplay their differences.¹⁰⁴ As *Dawn* suggests, the sense of a possible shared reality, however provisional and tenuous, allows both comparison and hope for alliance.

Cosmograms are a way to work within – without resolving – the tension between the particularizing fascinations of the ontological turn and the generalizing tendency of politically engaged, comparative projects such as *Dawn*. Studying cosmograms puts big pictures in the plural. These objects can be a concrete starting point for comparing

102 Graeber, op. cit. (8), p. 22.

103 Jacques Rancière, *Disagreement: Politics and Philosophy*, Minneapolis: University of Minnesota Press, 1999.

104 Anna Tsing, *The Mushroom at the End of the Universe: On the Possibility of Life in Capitalist Ruins*, Princeton: Princeton University Press, 2015, p. 292 n. 7.

knowledge worlds, grounded in particular, open-ended settings, with the possibility of radical alterity. They focus attention on the cosmological and ontological commitments of those who make them – but without assuming that these are fully accurate, complete and sharp-edged, or that they will be shared by everyone they address. In line with *Dawn's* example, recovering diverse knowledge worlds and their cosmograms – whether to celebrate, condemn or borrow – becomes meaningful and powerful when guided by utopian hopes. Analysing how other orders of nature and knowledge get composed and instituted shows the concrete actions through which worlds have been unmade and remade. Juxtaposing multiple cases may spark new orientations and provide matter for imagining a more just and liveable cosmos. They might suggest ways for us to put the brakes on our Darwinian, individualist, techno-solutionist, productivity- and growth-obsessed high-speed train.

Despite its utopian possibilities, the concept of 'cosmogram' is politically neutral. Some cosmograms propose worlds that promise better ways of living than ours; others mark a wrong turn, or convey worlds we might find repellent or misguided. The point is the ever-present possibility of change, and the human creativity demonstrated by the variety of cosmological orders and their histories. We have already considered several cosmograms of modern science: big-picture narratives of progress from Butterfield to Harari, as well as monuments of MeMO, such as the IBM egg, bubble chambers and the Millennium Dome. We also noted the dissent these 'holistic' representations have provoked: protestors outside the 1964 World's Fair, tone-lowering historians of science from the 1970s onward, Graeber and Wengrow's book.

As noted above, Graeber and Wengrow are sceptical of large-scale monuments and their cosmological claims:

Inscriptions or objects designed to project an image of cosmic power – palaces, mausoleums, lavish stelae with godlike figures announcing laws or boasting of their conquests – are precisely the ones most likely to endure, thereby forming the core of the world's major heritage sites and museum collections today. Such is their power that even now we risk falling under their spell. We don't really know how seriously to take them.¹⁰⁵

But even anti-authoritarian and anti-state collectives create cosmograms. To take one example, Graeber and Wengrow's questions apply in intriguing ways to the Matrimandir (Mother Temple) in south India (Figure 4), begun in 1971 and completed in 2008. This anarchist cosmogram visually rhymes with the IBM egg and the Millennium Dome, while convening and conveying a radically different universe. It also underlines the expanded geographical, political and ontological range with which the history of science now contends.¹⁰⁶

¹⁰⁵ Graeber and Wengrow, op. cit. (4), p. 430.

¹⁰⁶ This brief account of a 'real, existing' modern, non-dualist ontology in action echoes treatments of cosmograms at work in Shinto techno-animism, in British and Chilean cybernetics, and French engineering before 1848. See Casper Bruun Jensen and Anders Blok, 'Techno-animism in Japan: Shinto cosmograms, actor-network theory, and the enabling powers of non-human agencies', *Theory, Culture & Society* (2013) 30(2), pp. 84–115; Andrew Pickering, *The Cybernetic Brain: Sketches of Another Future*, Chicago: The University of Chicago Press, 2010; Eden Medina, *Cybernetic Revolutionaries: Technology and Politics in Allende's Chile*, Cambridge, MA: MIT Press; John Tresch, *The Romantic Machine: Utopian Science and Technology after Napoleon*, Chicago: The University of Chicago Press, 2012. On the direct links between Auroville and experimental religions at California's Esalen Institute see Jeffrey Kripal, 'The evolving siddhis: yoga and tantra in the human potential movement and beyond', in Knut Jacobsen (ed.), *Yoga Powers*, London: Brill, 2011, pp. 479–508; on domes, spheres, and their variable



Figure 4. Matrimandir, Auroville. © Auroville Foundation, 2004.

Covered in golden disks with twelve stone ‘petals’ around it, the Matrimandir is the centrepiece of the ‘galactic’ urban design of Auroville, an intentional community in Tamil Nadu. Like the globe proposed by anarchist geographer Elisée Réclus for the 1900 Paris International Exhibition, the Matrimandir is a symbol and instrument of human unity, ecological harmony and egalitarian relations.¹⁰⁷ These material arrangements support non-material aims: Auroville is ‘a centre of accelerated evolution where man must begin to change his world by means of the power of the inner spirit’.¹⁰⁸ Based on cooperative work without private property, Aurovillians call their political order ‘Divine Anarchy’.¹⁰⁹

Auroville, the ‘City of Dawn’, aims to realize the vision of Aurobindo Ghose and his platonic partner, ‘the Mother.’ Ghose was born in 1872 in Calcutta and studied in Cambridge. Returning to India, he became an activist for independence. While jailed for insurrection in 1908, he received a mystical visit from the late sage Vivekananda.¹¹⁰ He began to develop ‘Integral Yoga,’ adapting Vedic texts into an evolutionary framework that combined the renunciative orientation of Vedanta and the active, embodied path of Tantra. He fled to Pondicherry and started an ashram. Now known as Sri Aurobindo, he met Mirra Alfassa, a French Egyptian theosophist. During the 1930s Alfassa – by then ‘the Mother’ – took charge of the ashram’s educational and organizational work; after Aurobindo’s death in 1950, she focused on Auroville until her own death in 1973.

cosmopolitical meanings, see Benjamin Anderson, *Cosmos and Community in Early Medieval Art*, New Haven, CT: Yale University Press, 2017.

¹⁰⁷ Soizic Alavoine-Muller, ‘Un globe terrestre pour l’Exposition universelle de 1900: L’utopie géographique d’Élisée Réclus’, *Espace géographique* (2003) 2, pp. 156–70. On modernist architectural globes see www.bubblemania.fr (accessed 1 May 2024).

¹⁰⁸ ‘Message from the Mother, 03.08.68’, at <https://auroville.org/page/the-mother-on-matrimandir-and-religions> (accessed 1 May 2024); Peter Heehs, ‘Sri Aurobindo and his ashram, 1910–2010: an unfinished history’, *Nova Religio: The Journal of Alternative and Emergent Religions* (2015) 19, pp. 65–86.

¹⁰⁹ Suryamayi Aswini Clarence-Smith, *Prefiguring Utopia: The Auroville Experiment*, Bristol: Bristol University Press, 2023, pp. 57–79.

¹¹⁰ Ruth Harris, ‘Vivekananda: Indian swami and global guru’, *Religions* (2023) 14, pp. 1041–55.

The Mother taught that Auroville belongs to no one and to no religion. The city fosters scientific research about the site's ecology and topics 'from the desalinization of sea water to the realization of human unity'. Unlike 'the big laboratories of the United States or Europe', Auroville focuses on 'critically urgent research ... on the fundamental properties of consciousness'.¹¹¹ The Matrimandir has spaces within it for contemplation, but doesn't host regular group meditation; individuals find their own paths. Their practical, goal-directed enquiries draw down the force of what Sri Aurobindo called 'Supermind'. Echoing Vivekananda, he urged his students, 'Let all thyself be bliss, this is thy goal. Transform the divided individual into the world-personality; let all thyself be the divine, this is thy goal.'¹¹²

This cosmogram is self-consciously modern and scientific but proclaims a very different ontology from MeMO. Its ontological choreography engages divinely authorized docents, Supermind and communication with dead sages. It draws together minor traditions of European thought (anarchism, mutualism, Lamarck, ecology, psychic research, esotericism), continuously reinvented Indian traditions and the unruly precursor of global Theosophy to form a new non-dualist milieu, in which individuals may incarnate the world. But, as we will see below, the Matrimandir is not only a site of unity but a focal point for disagreement. Today it stands at the centre of conflicts in which the composition of the universe is at stake.

Cosmologies together and apart

Cosmopolitics and political ontology offer further suggestions for a delicate alignment between the ontological turn's insistence on radical alterity and *The Dawn of Everything's* down-to-earth, engaged universalism. Latour proposed a 'parliament of things' which would expand democracy to include non-human nature: representatives for rivers, oceans and endangered species which are as much affected by human political and economic decisions as humans. In elaborating this politics of nature, he borrowed Stengers's term 'cosmopolitics', applying it to matters of concern 'in which what is at stake is precisely what is *common* in the common world to be built'.¹¹³

Stengers's own 'Cosmopolitical Proposal' contrasted the bureaucratic stance of disembodied, universal judgement – which knows in advance what kinds of entities and forms of life are reasonable – with attention to 'the ecology of practices': the practical, technical, even emotional set-ups involved in producing scientific knowledge. She urged scientists and activists to slow down the automatic machinery of disqualifying judgement, and allow all the parties affected by the outcome of an enquiry to be present and party to its negotiation. This creates 'a space for hesitation', without advance certainty of what kind of world might be the result: 'In the term cosmopolitical, cosmos refers to the unknown constituted by these multiple, divergent worlds and to the articulations of which they could eventually be capable'.¹¹⁴

111 Anonymous, 'Auroville', *CrossCurrents* (1972) 22, pp. 67–111, 111.

112 Sri Aurobindo, 'Aphorisms: the goal', in *Essays on Yoga and Philosophy*, in *The Collected Works of Sri Aurobindo*, vol. 13, Sri Aurobindo Ashram Press, 1952, n.p., available at <https://incarnateword.in/cwsa/13> (accessed 1 May 2024).

113 Latour, op. cit. (9), p. 455; Bruno Latour, *Politics of Nature*, Cambridge, MA: Harvard University Press, 2004; Latour, *War of the Worlds: What about Peace?*, Chicago: Prickly Paradigm Press, 2002. Pickering notes Latour's (widely overlooked) dedication to modernity: a well-ordered politics of nature will conclude with 'matters of concern' resolved once more into matters of fact. Andrew Pickering, 'The politics of theory', *Journal of Cultural Economy* (2009) 2, pp. 197–212.

114 Isabelle Stengers, 'The cosmopolitical proposal', in Bruno Latour and Peter Weibel (eds.), *Making Things Public: Atmospheres of Democracy*, Cambridge, MA: MIT Press, 2005, pp. 994–1003, 995.

Marisol de la Cadena and Mario Blaser suggest a departure from Latour and Stengers, questioning whether a ‘common world’ can be the end point for such polarized encounters. In conversation with Viveiros de Castro, these anthropologists accept the possibility that ontological divides may never be fully overcome, while they describe the concepts, objects and spaces which enable imperfect partial agreements – what Australian anthropologist Helen Verran describes as ‘the politics of working Indigenous worlds and other cosmologies together and separately’.¹¹⁵

For example, De la Cadena writes about inhabitants of the Andes for whom mountains are personified beings who require attention, ritual respect and even modern political rights. She describes Indigenous groups’ protests against mining interests which threaten such earth-beings, and explores the fragile alliances they make with politicians and with environmentalists who hold a radically different, scientific view of what they are defending. On the way to a protest against a mining project, her friend Nazario alludes to the different wishes and ways of appeasing Machu Picchu and Ausangate: ‘We were clearly talking about the same “things”’, she explains, but ‘in my world they were mountains; in Nazario’s they were beings. Participating in our partially connected worlds, each was more than one but less than two entities’.¹¹⁶

Blaser likewise documents a situation in Newfoundland where state environmental authorities observed a decline in caribou populations. The ‘reasonable’ solution was to ban hunting, including by the Indigenous Innu. But what foresters call hunting caribou, the Innu call preserving relationships with *atiku* and their spirit master in the forest, whom they appease through hunting in a traditional manner, including expressions of gratitude for animals killed and careful burial of remains. Traditionalist Innu hold that the *atiku* will flourish only through restoring these more careful ways of hunting. Both groups want the caribou/*atiku* to return, but have diametrically opposed views of how to make that happen.¹¹⁷ In the end, blunt economic logic overrode the subtle negotiations: the prospect of a multibillion-dollar dam development bypassed the state’s concern for *atiku*.¹¹⁸

Rather than working toward a commons, De la Cadena and Blaser consider how such meetings produce an ‘uncommons’ – a pragmatic collaboration between divergent worlds, theorized as participants in a ‘pluriverse’.¹¹⁹ Speaking of a landscape guarded by ‘naturalist’ environmental activists, and the earth-beings defended by Indigenous Andeans, De la Cadena writes, ‘Their shared interest – to defend nature, or the environment – is not “only” the same interest: their natures exceed each other; their agreement is also underpinned by uncommonalities’. This ‘alternative alliance’ includes ‘the parties’ constitutive divergence’; it doesn’t require the parties to sacrifice their specific ontological commitments.¹²⁰ The concept of a pluriverse, a world of many worlds, makes the coexistence of these contradictory realities thinkable.¹²¹

115 Helen Verran, ‘The politics of working cosmologies together while keeping them separate’, in De la Cadena and Blaser, op. cit. (10), pp. 112–30, 112.

116 Marisol De la Cadena, ‘Indigenous cosmopolitics in the Andes: conceptual reflections beyond “politics”’, *Cultural Anthropology* (2010) 25, pp. 334–70, 351; Marilyn Strathern, *Partial Connections*, New York: AltaMira, 2004.

117 Mario Blaser, ‘Is another cosmopolitics possible?’, *Cultural Anthropology* (2016) 31, pp. 546–71.

118 Blaser, op. cit. (117), p. 563.

119 On the relevance for such encounters of the philosophy of William James, associated with the terms ‘pluriverse’ and ‘multiverse’, see Martin Savransky, *Around the Day in Eighty Worlds: Politics of the Pluriverse*, Durham, NC: Duke University Press, 2021.

120 Marisol De la Cadena, ‘Uncommoning nature’, *e-flux Journal* (2015) 65, at www.e-flux.com/journal/65/336365/uncommoning-nature (accessed 1 May 2024).

121 Mario Blaser and Marisol de la Cadena, ‘Introduction: pluriverse, proposals for a world of many worlds’, in De la Cadena and Blaser, op. cit. (10), pp. 1–22, 2.

Concretely, the actors in these gatherings made use of objects which helped define and communicate their universe and its components: banners and ritual dances on a mountain pilgrimage, bundles of food burned as offerings to Pachamama ('the source of life'), an Environmental Impact Assessment, an aerial resource map, a balance sheet.¹²² The interaction between the groups and their ontologies plays out in the alternating and overlapping deployment of these tokens of totality.

At the scale of the universe, cosmograms play similar roles. The fact that cosmograms communicate specific cosmological orders makes them focal points for ontological politics. While ontologies or cosmologies are abstract and diffuse, cosmograms are visible, concrete and observable. They are 'representations' that perform work.¹²³ Exactly what they do, how they get made and where different individuals and groups situate themselves in relation to their proposals demands close enquiry.

To return to the example of the Matrimandir: the city in whose centre it stands, Auroville, has a complex legal existence. It was originally autonomous but was brought under partial supervision of the Indian government in 1988. About half of its population is Tamil and most others are European and American, who contribute to the city's coffers, as do sales of ecological goods and crafts to tourists. Though it holds up an ideal of egalitarian anarchism, its residences are more luxurious than those in nearby villages which supply low-paid labourers. Despite Auroville's ideals of internationalism and religious pluralism, the BJP has recently claimed Sri Aurobindo and Auroville for Modi's Hindu nationalist narrative. Government officials push for 'development' and seek foreign investment.

Auroville's internal governance, a tangle of councils and committees, has been riven by factions in recent years, with a plan to create a 'crown road' surrounding the Matrimandir – originally mapped by the Mother – provoking ecological protest. Accusations fly over financial corruption and tax evasion. Astro-turf demonstrations using 'sepoi' hired protesters are promoted and exposed online.¹²⁴ Tensions rage between old and new residents – each decrying the others' distance from the true Aurovillian vision embodied in the Matrimandir – while 'the city the earth needs' continues to draw spiritually and politically curious tourists from around the world.¹²⁵

Knowledge architectures for the pluriverse

We might see this temple, like other cosmograms, as an uncommons unto itself: a site in which different realities intersect, align or clash. The Matrimandir draws in national and international cosmopolitics as well as its immediate neighbours, striving toward its own contested ends as multiple histories unfold through it, at times threatening its survival. It

122 Blaser, op. cit. (117), pp. 555, 559; De la Cadena, op. cit. (116), pp. 337–8; Anna Tsing considers such practices 'worldings', or the 'attribution of world-like characteristics to scenes of social encounter'. Anna Tsing, 'Worlding the Matsutake diaspora: or, can actor-network theory experiment with holism?', in Ton Otto and Nils Bubandt (eds.), *Experiments in Holism: Theory and Practice in Contemporary Anthropology*, London: John Wiley & Sons, 2011, pp. 47–66, 48.

123 This point reworks Pickering's persuasive shift from an *idiom of representation* (concerned with theories that are true or not) to a *performative idiom* (focused on 'practice, performance, and agency – doing things'), Pickering, op. cit. (37), p. 136. Pickering's 'archipelagos' and 'islands of stability' (ibid., pp. 139–44) are touchstones for cosmograms.

124 'The Auroville files', at www.aurovillefiles.in (accessed 1 May 2024).

125 Jessica Namakkal, 'European dreams, Tamil land: Auroville and the paradox of a postcolonial utopia', *Journal for the Study of Radicalism* (2012) 6, pp. 59–88; Hannah Ellis-Petersen, 'Bulldozers, violence, and politics crack an Indian dream of utopia', *The Guardian*, 16 January 2022, at www.theguardian.com/world/2022/jan/16/bulldozers-violence-and-politics-crack-an-indian-dream-of-utopia (accessed 1 May 2024).

aims to become a global centre for human evolution – perhaps *the* cosmic centre – but has been beset by delays, confusion and calls for renewal. Like all utopian projects. Like all projects.

Andrew Cunningham and Perry Williams described big pictures as ‘both necessary and desirable’:

if our subject is to provide not merely accumulated information or discourse without meaning, but vision, growth, understanding and liberation – as our students have a right to expect of us and as we have a right to demand of ourselves – then we need to think explicitly about the overall picture of the history of science which we present and within which we work.¹²⁶

Big pictures are works in progress, demanding upkeep, revision and reinvention. Our societies have long been captivated by a limiting and misleading image of science as MeMO: unified and abstract, the one way of knowing the one true world. For decades, historians of science have worked to decentre it, by focusing on local and specific variations, unravelling science’s many distinct styles and methods, grounding them in social dynamics and particular moral values.

The big picture of history of science on the horizon would put cosmograms such as the Matrimandir into tentative and imperfect dialogue with other cosmological objects and the cosmic milieus and ecologies of practice that support them: an IBM egg, Newtonian orreries, the periodic table, bubble chambers, trees of descent, Shinto shrines, the double helix, *atiku* burial rites, science museums, shamanic songs, the Eiffel Tower, atom bombs, the front page of an online newspaper, overheating data centres, mountain pilgrimages, hockey stick graphs of ecological crisis. The pluriverse has room for all these objects, and for the worlds they try to hold together. Historians of science can make space for them too.

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126 Cunningham and Williams, op. cit. (2), p. 407.