

order as complexity¹

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There are a number of points in *Difference and Repetition* which serve to confirm that Deleuze is working with the notion of retardation in its fully Bergsonian sense. It is referenced in allusive fashion, for instance, in a discussion of what he calls ‘centres of envelopment’ – a term referring to those systems or sets of systems which reach a threshold or a coupling that serves to sustain a relatively enduring meta/stability. He highlights a dual aspect of such processes:

At the moment when they are explicated in a system (once and for all) the differential, intensive or individuating factors testify to their persistence in implication, and to eternal return as the truth of that

implication. Mute witnesses to degradation and death, the centres of envelopment are also the dark precursors of eternal return. (DR, 256)

Set, as it is, closely following a discussion of entropy, this dual aspect of 'degradation' and 'dark precursor' corresponds in detail to Bergson's distinction between entropic, mechanistic order and the open, vital order, entwined as tendencies within or between any given system(s). Death (equilibrium) as mechanistic condition is always immediate, a collapse, 'once and for all', yet forever deferred, retarded by the persistence of 'implication', the continuous intertwining of series.

Paradoxically, it is precisely this most Bergsonian duality which provides Deleuze once again with the impetus by which he departs from Bergson's text, folding, as it were, Bergson back against himself. In the insistence on the ontological priority of 'intensive' over 'qualitative' relations, Deleuze pronounces the Bergsonian critique of intensity 'unconvincing'.

Deleuze's departure from the Bergsonian schema is part and parcel of his motivation to provide a genetic account of becoming which evades any residue of hylomorphism, of form or essence imposed on an inert material substrate. As Deleuze makes clear, for him it is not enough that Bergson's 'differences in kind', or 'qualitative differences' are contrasted to 'quantitative differences', in the terms through which Bergson presents this contrast. For Bergson, qualitative differences cannot augment or develop without changing in nature, while quantitative differences remain in static relation to each other. Bergsonian 'quality' nevertheless retains too much of the flavour of essentialism to furnish the basis for continuous variation which Deleuze would locate as the root of all change.

Let us take seriously the famous question: is there a difference in kind, or of degree, between differences of degree and differences in kind? Neither. Difference is a matter of degree only within the extensity in

which it is explicated; it is a matter of kind only with regard to the quality which covers it within that extensity. Between the two are all the degrees of difference – beneath the two lies the entire nature of difference – in other words, the intensive. (DR, 239)

It is only in the process of *explication*, then, that quality is expressed. For Deleuze, it is this very expression which cancels out the operation of the intensive, masking under its own movement the more profound movement of intensity. Thus qualities may be perceived in extension, but intensities remain transcendental. And Deleuze is fully aware that these paired terms, difference of degree and difference in kind, are synonymous for Bergson respectively with mechanism and the vital, and quantity and quality. All these correspondences are at stake; Deleuze is effectively claiming that these differences, so important for Bergson, are epiphenomenal on the underlying intensity which produces them all, but only on condition of cancelling itself out in explication. There are two striking aspects of this departure from Bergson which should be noted, however.

The first is that the terms in which Deleuze performs this breach bear the very same rationale set out by Bergson himself, serving to relocate the analysis as a whole at a level of differential process below that of quality, rather than to disturb the philosophical machinery as such:

in the passage from one quality to another, even where there is a maximum of resemblance or continuity, there are phenomena of delay [*décalage*, ‘time-lag’] and plateau, shocks of difference, distances, a whole play of conjunctions and disjunctions, a whole depth which forms a graduated scale rather than a properly qualitative duration. Finally, if intensity were not there to attend to, support and relay quality, what would the duration attributed to quality be but a race to the grave, what time would it have other than the time necessary for

the annihilation of difference in the corresponding extensity, or the time necessary for the uniformisation of qualities themselves? (DR, 238)

This passage in effect re-allocates the function of retardation to intensity rather than to quality, or difference in kind. It is *intensity* which resists the entropic ‘race to the grave’ of Bergsonian mechanistic order, intensity which retards, rather than, as Bergson would have it, the vital. This shift is significant; indeed, for our present line of reasoning, decisive. As we shall see, it goes hand in hand with questions of ‘locality’ and ‘non-locality’ in post-relativistic physics.

The second striking aspect of this departure from Bergson – especially from this, the most astute of his commentators – is that it may plausibly be said to carry force only by dint of a blind spot in Deleuze’s reading here. A blind spot the more notable since lacking elsewhere. Deleuze’s stated object of attack is Bergson’s critique of intensity. This is almost certainly a reference to the first chapter of *Time and Free Will*, with its reflection on the work of what Bergson calls the ‘psychophysicists’, among whom the chief target is Fechner. Bergson takes issue with intensity in the sense that Fechner’s work entails the idea of *magnitudes of intensity* as the basis for analysing changes in affect and percept. Bergson counterposes his notion of quality as free of this quantitative approach. As Christian Kerslake points out in *Immanence and the Vertigo of Philosophy*, it can be argued that the root of Bergson’s argument here is entirely a resistance to the use of the term ‘magnitude’ understood by analogy to extensive/quantitative relations. The oxymoron ‘intensive quantity’ conveys precisely the mistake in misrecognising one form of order (the qualitative/vital) for another (the quantitative/mechanistic) which Bergson will lay at the feet of scientific method in *Creative Evolution*. It is a contradiction in terms, and hence, as Kerslake has it, Bergson ‘is in effect using the notion of an intensive relation to argue against what he calls “intensity”’.²

Deleuze's blind spot here has something of a wilful character, then, when we recognise that elsewhere he fully appreciates Bergson's allusions to intensive processes, and indeed their underwriting of qualitative phenomena; he cites Bergson on the dependence of the perception of qualities on 'trillions of vibrations', for instance, in *Bergsonism*.³

This marking of the hermeneutic scorecard points beyond simple scholarly monomania, however, since it serves to foreground the real site of contention for Deleuze's departure from Bergson. It is not, as professed, the relative priority of 'intensity' over 'quality'; the real schism lies elsewhere, and moreover marks a significant future line of travel for Deleuze. There is indeed a deep subterranean shift taking place, which we might now see rather as a Deleuzian commitment to implications from within the Bergsonian schema which Bergson himself did not fully countenance. If, as Deleuze insists, differences in kind (quality) and differences in extensity, or degree (quantity), are both produced by the movement and explication of intensity, what place does this leave for the mechanistic order *tout court*? We have seen that Deleuze displaces the retardative function to the level of intensity ('phenomena of delay and plateau'). This is certainly the first import of the assertion here, but a closer reading reveals more. Where Bergson held *mechanism* culpable for entropic degradation, this charge is broadened out by Deleuze's twist, in a kind of reciprocal default, to include Bergson's 'quality'. And in effect, this renders the mechanistic and vital orders equivalent in this explanatory framework. Both are harbingers of the grave. And, according to the dual correspondence we have been upholding between the vital as complexity and the mechanistic as entropy, we must expect any subsequent development in Deleuze's thought to reflect this foreshortening. We should be alert to the recalibrations in the relations between complexity and entropy. To follow this thread first entails a discussion of the second term at stake here: delay. Some care must be taken to distinguish between the concept of 'retardation', with its Bergsonian particularities, and the concept of 'delay'. Both of these concepts recur in

Deleuze's writing, though he does not go so far as to topicalise either term as such, or confer on either the weight of a technical term within his own philosophy of difference.

Jay Lampert, whose work has astutely foregrounded the concept of 'delay' in philosophy, tracing the thematic issue from the Greeks through Husserl, not least highlighting its importance in understanding the Deleuzian event, draws our attention to a passage in Hume's *A Treatise of Human Nature*. It so closely resembles the Bergsonian analysis of mechanism as to offer the neatest possible parsing between retardation and delay:

Now if any cause may be perfectly co-temporary with its effect, 'tis certain ... that they must all of them be so ... The consequence of this wou'd be no less than the destruction of that succession of causes, which we observe in the world; and indeed, the utter annihilation of time. For if one cause were co-temporary with its effect, and this effect with its effect, and so on, 'tis plain there wou'd be no such thing as succession, and all objects must be co-existent.⁴

Lampert glosses the implications on Hume's behalf: 'One might almost say that a delay is one of the causes in the causal series.'⁵ And so much is true too for Bergsonian retardation, we would conclude. Yet, in the absence of the counter-principles of 'life' and 'complexity', we may choose to reserve the term 'retardation' to account for the causal character of physical action. This serves as an initial distinction. Therefore, although the two concepts 'retardation' and 'delay' seem to be motivated by the same intuition, yet the explanatory corollaries may be very different indeed, allowing us to parse the two moments of this thought as it develops in Deleuze's work.

Lampert's treatment characterises the term delay far more thoroughly than this initial default distinction. He develops the concept in counterpoint to the (often fraught in both science and philosophy) concept of simultaneity:

In its simplest form, simultaneity consists of two or more events at one time, and delay consists of one event at two or more times. By varying the formal relations between the unity and multiplicity of events, and the unity and multiplicity of time, we might deduce forms of simultaneity and delay.⁶

In the concluding chapter of *Simultaneity and Delay*, Lampert systematically parses the possible formal relations, furnishing eight possible combinations in all, from ‘one event in one time’ to the disjunctive relation ‘one *or* two events in one *or* two times’. With respect to what is most germane to the philosophy of Deleuze, Lampert emphasises the simultaneous co-existence of his three syntheses of present, past and future. This simultaneity is of course more than the common-sense conception of states-of-affairs occurring at a punctum – Lampert treats in detail the numerous sources in philosophy and contemporary science which problematise this picture; the co-existence of the three syntheses, he claims, serves to make explicit what is already implicit in Bergson, that simultaneity does not serve to halt the flow of time: ‘it is precisely’, he says, ‘simultaneity that constitutes flow’. In other words, simultaneity is best conceived as a syncopated oscillation between multiple time-signatures, which may operate over significant, potentially infinite distances of Chronic, linear time. Lampert emphasises that this is due, for Deleuze, to a ‘model of delayed reaction’, so to speak, a theory of delay. He is referring here to the nature of the Deleuzian event, which is never exhausted in any here and now, but retains the potential to re- emerge in combination with continuously varying series in the passage of nature:

it is not that there exist two events separated in time, the potentials in the earlier event getting resolved in the later, or the later reacting to the earlier. Instead, there is one event occurring at two distant moments in time at once.⁷

We are dealing not with succession as such when we talk of the Deleuzian

temporality of the event; indeed, in all that we are offered in the three syntheses of *Difference and Repetition* and with respect to the nature of Aionic time in *The Logic of Sense*, events are to be seen as intimately imbricated in connected series both forward and back in linear time. It is Lampert's nuanced construal of the three syntheses in terms of simultaneity and delay which is of most interest here, helping to open up the distinction between 'delay' and 'retardation':

in its multiplicity, simultaneity is delayed. If we live our lives at different temporal levels at the same time in different ways, each moment of life has its lived time at many times later than the time it is formed. The very structure of simultaneity is delay.⁸

Let us articulate the contrast. Firstly, for both Bergson and Deleuze after him, *retardation* is identified with those factors in the passage of nature which resist the onward, downward encroachment of entropy. And for both, the attainment of equilibrium achieved on a cosmic scale would produce not merely a moribund state of inactivity, but the cessation of existence as such. What retardation retards, so to speak, is the 'degradation' of available free energy for systems, in the direction of equilibrium or disorder. It is 'life' or complexity which performs this retarding function; the tendency of nature to envelop material processes in higher order, stable or metastable structures.

This resistance in the circuits of the world is not nearly so evident with respect to the concept of delay. Rather, delay as such serves to characterise the identity-as-difference of events through their own internal rhythms, the syncopation of multiple time-signatures. This is every bit as much a form of complexity, no doubt, but one which is directly predicated on a temporal rather than a material enfolding. Retardation of necessity endures the weight, the friction and the braking effect (as Serres would have it) of explication; it belongs to locality, it furnishes the world with location. Delay belongs to non-locality.

The idea of retardation, clearly identifiable within Deleuze's own philosophy of difference up to the time of *Difference and Repetition*, undergoes a subtle, implicit, rather than openly topicalised, transformation in later work. This *implicit* character of the change is a result of this concept's subordinate role in relation to the more *explicitly* thematised developments Deleuze performs on Time (which will come increasingly to be viewed as a multiplicity of relative speeds) and 'Life' (which comes increasingly to be viewed as transcending the organism, and indeed the organic as such). In the shifting triangulation between these major developing features of the Deleuzian landscape, 'retardation' undergoes its own silent translations, which bear on the interrelations between entropy and complexity. By the time of *A Thousand Plateaus*, retardation has been obscured by delay. With respect to the first theme, Time, references to relative speeds abound in this work, governing the means by which such concepts as 'stratification' are characterised – a tendency which persists in *What Is Philosophy?*, where 'relative speed' becomes the question of the various orientations of the arts, science and philosophy to the infinite speeds of chaos.

With respect to the second theme, Life, there is an unmistakeable expansion of its role in the later work, a direction marked by the foregrounding of the concept of in- or an- organic life in *A Thousand Plateaus*. Indeed, if the final known short piece by Deleuze, 'Immanence: A Life' can be considered summative, life ultimately comes to characterise the entire domain of the virtual and the immanent as such.⁹ If the assertions of *A Thousand Plateaus* leave room in their phrasing for a domain outside of life, a something beyond inorganic life, that corner is painted over by this last work.

This brings us to the key set of questions for this line of enquiry: What room is there left in Deleuze's line of travel for Bergson's 'inert matter' and 'mechanism', even as a never-fully realised ideal? If all nature is increasingly marshalled under one emblem of order alone, 'Life', the complex, then it appears there is nothing (in Bergsonian terms) for this order to push against, no entropy to retard.

Equally, if the vectors of time are without direction, as we are led to conclude by the end of the third synthesis in *Difference and Repetition*, if 'the very structure of simultaneity is delay', if the dimensions of present, past and future are governed more by the logic of their own defining forms of synthesis than succession as such, then in what direction could 'degradation' be said to occur? These questions are of course different view- points on the same paradox: the arrow of time is commonly understood to be synonymous with the increase in entropy ostensibly displayed by the universe as a whole. And the reader of Deleuze is left in no doubt as to his standpoint on both aspects: entropy is a transcendental illusion, applicable in principle only on the level of the actual, never to the virtual. The arrow of time is merely the stamped imposition of 'good sense' in search of ordered causality in the labyrinth of a paradoxical, recursive nature, a need for the general (indifferentiation) to emerge out of the particular (differentiation), for equilibrium to replace disparity. As such, all these correspondences contribute to Deleuze's *critique* of representation, not to his positive position.

A first step on the way to working these questions through is to note that, in the dramatisations of *A Thousand Plateaus*, by far the most prevalent characterisation of time is not with reference to the three syntheses as such, but to relative speed and slowness. It is by no means the case that the kind of resistance in the circuits of nature to the death represented by equilibrium has disappeared from the discussion; on the contrary, *A Thousand Plateaus* is bristling with figures of sedimentation, of stratification, along with the counter-principles of de-stratification, lines of flight, epistrata. Striated space is counterposed against smooth. It is merely that these structurations and destructurations are subordinate to the interrelations of relative speeds. 'Speed and slowness, movement and rest, tardiness and rapidity subordinate not only the forms of structure, but also the types of development' (ATP, 255). There is a notable shift of emphasis, more of an insistence that it is *only* relative speeds which constitute the underlying condition of the world.

In any case, there is a pure plane of immanence, univocality, composition, upon which everything is given, upon which unformed elements and materials dance that are distinguished from one another only by their speed and that enter into this or that individuated assemblage depending on their connections, their relations of movement. A fixed plane of life upon which everything stirs, slows down or accelerates. (ATP, 255)

What motivates this change of emphasis with respect to time? And to what extent does it parallel the shift from ‘retardation’ to ‘delay’? I would argue that the intuitions and formulations of *Difference and Repetition* have paid forward, so to speak; the language, the imagery, of entropy, of the ‘race to the grave’, was already explicitly problematised in the text of *Difference and Repetition*. Entropy as such (as opposed to thermodynamic concepts) was consigned to the status of a transcendental illusion. At the end of the working through of the three syntheses, however, we have definitively arrived at a new scenario; if ‘the very structure of simultaneity is delay’, if the three syntheses co-exist, then there is no obvious direction of time in which ‘degradation’ may be said to occur. Strictly speaking, series can be spoken of in terms of relative speeds, but not relative direction; Alice may get bigger ‘at the same time’ as she becomes smaller; there is no sense in saying that forward orientating series may interact with backward orientating series; all are both at the same time. Which is as much as to say that there is no direction to the arrow of time. In this light, the phrasing which reflects this is the language of relative speed.¹⁰

This is another way to say that the scientist looking to derive the arrow of time as a function of entropic processes can at most labour under an illusion. In addition, any customary attempt to characterise the vector of time in the direction of the descent from order to disorder is effectively ruled out of court; again, this is highlighted in interesting ways in terms of the mutation from the regime of ‘retardation’ to the regime of ‘delay’, but this time best unpacked with respect to the development of the second major theme, that of ‘Life’. It

can serve only as a surface reading to equate Bergson's 'vital' with Deleuze's conception of Life. The difference is again decisive.

As is well known, the centres of envelopment of most interest in *A Thousand Plateaus* are organisms; as in a sense they are in *Difference and Repetition*, but more provisionally now, still 'mute witnesses to degradation and death' while remaining now more, now less, open to the plane of immanence, to the body without organs. But let us follow the thread once again; for the regime of retardation, it is life, the vital, the complex, which serves to slow the fiat of mechanism, the race to the grave. It is not that order in the Bergsonian schema is under the threat of being devoured by disorder; on the contrary, the mechanistic and the vital are two antagonistic forms of order; there is no such thing as disorder; order is opposed to, intertwined with, complexity. But the order that is opposed to complexity is the order of entropy, of inert matter, of equilibrium; so to speak, too much order all at once.

And so too, we find this sense of 'too much order all at once' in the dramatisations of *A Thousand Plateaus*. The will to the body without organs is the will to maintain the maximum number of open connections to the plane of immanence, to productive difference; this is one definition of complexity, not dissimilar to the notion of 'self-organisation' in chaos and complexity theory. Yet Deleuze and Guattari also acknowledge that for an organism (indeed, a centre of envelopment more generally) to become more complex is for it to 'interiorise', enfold, increasing numbers of productive differences. The tension between the organism and the body without organs arises when this interiorisation goes too far, when there is too much order all at once: 'The BwO howls: "They've made me an organism! They've wrongfully folded me! They've stolen my body!"' (ATP, 159). Yet now this thanatic howl of the enfolded organism, the enclosed system, is tempered by the existence of anorganic life:

What movement, what impulse, sweeps us outside the strata (metastrata)? Of course, there is no reason to think that all matter is confined to the physicochemical strata. There exists a submolecular, unformed Matter. Similarly, not all Life is confined to the organic strata; rather, the organism is *that which life sets against itself in order to limit itself*, and there is a life all the more intense, all the more powerful, for being anorganic. (ATP, 503, emphasis added)

Finally, it is *this* formulation which comes to seem inevitable retrospectively: 'that which life sets against itself in order to limit itself'.

In the departure from the Bergsonian schema, what perhaps comes to constitute its real meaning is not so much the shift from 'quality' to 'intensity' as the elision of inert matter, the equilibrial, the entropic mechanism. And if we read 'complexity' there where Deleuze writes 'life', then these triangulations of life and temporality, retardation and delay, seem inevitably to lead us to this substitution of one formula for another; no longer the antagonism of order versus complexity, of the mechanistic versus the vital, but life, the vital, versus *itself*, which is as much as to say, the complex versus the complex.

The foregoing reading of the philosophy of difference has served to foreground features of Deleuze's philosophy which are largely unaddressed in the literature and which deserve both attention and consolidation. Most significantly, there are three interrelated conclusions which bear at once on the remit of natural philosophy and of science: the first is that the line of development of Deleuze's thought increasingly rules out any, even ideal, role for inert matter; life (or complexity) is what limits itself, not inert, mechanistic matter; the second, potentially much more contentious, conclusion is that the philosophy of difference appears on this reading to entail a truncation of distinctions which have served natural philosophy and science indispensably; the demarcations between states of disorder, order and complexity are abolished in favour of one sole term, the complex. It should be said that this diagnosis, while drawn

from central threads of the Deleuzian corpus, is subject to certain caveats; the argument runs only if we track the development of Deleuze's thoughts with respect to order and complexity against the genesis and development of more explicit and developed themes. Indeed, there are points in the Deleuzian text where he implicitly acknowledges such a useful formal distinction; he speaks of complexity remaining evident within the operation of (simplifying) differentiation; elsewhere he defines the complexity of an organism in terms of the number of connections it maintains with the body without organs.¹¹ In this sense, the question of order and complexity pursued in this thesis is one which dwells in the folds and pleats of the Deleuzian fabric, not on the surface. Nevertheless, the implication that complexity is the sole *modus operandi* of nature, if taken in any strong sense, is in danger of removing considerable conceptual traction on the passage of nature; the perhaps almost ubiquitous understanding of the development of the world is predicated on an evolution from simple to more complex forms of being; this tendency has been dubbed 'the arrow of complexity', in that it is taken to confer a direction of time, an index that is most often, though not uniquely, understood to be correlated with the thermodynamic arrow of entropy. Given these (and other) entailments, it may well be that to forego these distinctions of form would be at best unpalatable and at worst nonsensical for those who wish to conceptualise natural processes.

Finally, the third foregrounded aspect: Deleuze's orientation toward the notions of limit and constant. Once again, this is an aspect which enjoys its own subtleties and displays apparent contradictions at different junctures of the Deleuzian corpus. We have touched upon one side of this question with respect to Deleuze's resistance to the reliance of scientific method on constants as such; this is certainly so in *Difference and Repetition*, and is revisited in *What Is Philosophy?* We are left in little doubt that the constants and limits in question refer to those purporting to determine the scope of nature's possible unfolding: absolute zero, the speed of light, etc. And once again, this

may represent a stumbling block for many wishing to explore the productive application of Deleuzian philosophy to scientific frameworks. Yet it would be mistaken to interpret Deleuze's resistance to limits and constants as a simple denial of their existence. Indeed, we encounter passages which assign them a productive place, as in *What Is Philosophy?* 'Every limit is illusory and every determination is negation, if determination is not in an immediate relation with the undetermined' (WP, 120). Indeed, 'limiting' may be seen to have a necessary role in the multivalent processes of differentiation for Deleuze; to claim that 'life is what limits itself' is to offer an answer to the question of how series get caught up in centres of envelopment in the first place. The phrasing of the quotation above from *What Is Philosophy?*, however, indicates a resolution to the apparent contradiction here; it is *negation* which is rejected, rather than limitation as such; the phrasing marks an enduring commitment to Bergson: 'We see, therefore, how all the critical aspects of Bergsonian philosophy are part of a single theme: a critique of the negative of limitation, of the negative of opposition, of general ideas' (B, 47). But what is the positive form of limitation which seems to be implied here?

There are ways in which these potential objections may be addressed, to align them with respect to conceptual developments in modern physics, and to outline the productive role the philosophy of difference may occupy with respect to that ongoing development. Certain figures in the philosophy of science whose work bears a notable affinity to Deleuze's own will be invaluable in this respect: Alfred North Whitehead, David Bohm and Lee Smolin.

In terms of aligning the philosophy of difference with physics after the quantum revolution, the first implication we have voiced through Deleuze is surely the most easily supported: the claim that inert matter does not exist. Indeed, there is no place for it; the very notion is problematised in any number of ways. Young's famous wave/particle duality effectively forces explanation in terms of interference patterns, even in those cases where the experimental set up imposes a 'particle-like' scrutiny, and this even in

cases where it is a single particle under consideration. This is a paradox routinely noted in most introductions to quantum physics – that the wave-like nature of particles dictates that their wave-fronts are capable of producing interference *with them- selves*. Since the beginning of the quantum age, it has been implausible to represent the action of particles in the manner of statistical mechanics, which deals effectively with the atomic scale as though it were essentially composed of tiny objects, each with its own momentum and speed which remain unchanged until some physical collision with another particle. As Young’s slit experiment demonstrates, even single particles are in complex, resonating relations to their associated field. Richard Feynman’s formulation of quantum electrodynamics problematises the notion of a ‘bare charge’ for the particles associated with electromagnetic phenomena, the photon, electron and positron. The bare charge is to be understood as a basic or least energy state. However, due to the continual fleeting production of ‘virtual particles’ around an electron – a kind of cloud of positively and negatively charged particles of vanishingly fleeting existence associated with the ambient field, pushing and pulling the central particle according to charge – this bare charge is understood to be definitively cloaked. The value is nevertheless derived through a calculation referred to as ‘renormalisation’, which amounts to a cancellation of infinities. Roger Penrose comments: ‘Another point of view is to regard the *bare* charge as being no more than a conceptual convenience, and to take the standpoint that the notion of “bare charge” is actually “meaningless”, because it is “unobservable”.’¹² However interpreted, the bare charge, understood as the value in effect in absence of interaction with other charges, is far from thereby unproblematically inert. More generally, the energy state of any particle is theoretically derivable only in reference to its ‘ground state’, its state of least possible activity. This in turn, however, can only be derived by subtracting the energy inherent in its ambient field, entailing another cancellation of infinities. In a Deleuzian register, the construal of quantum particles as enduring patterns of associated fields serves to write disparity into the account at the most fundamental level; all

particles are in constant energetic tension with their fields. There is no such thing as inert matter.

A more challenging question is the one relating to the 'arrow of complexity' mentioned above. Taken at root, Deleuze's resistance to the idea of the heat death of the universe goes hand in hand with the associated idea that the universe as a whole must be capable of maintaining a steady measure of order, some distance from the disorder of equilibrium. This seems at first to be supported by the scientific account; complexity seems to be increasing as time goes on, from undifferentiated plasma states shortly following the Big Bang, to structured galaxies, clusters of galaxies and even 'megastructures' occupying significant proportions of the observable cosmos. Biological evolution has evolved from proto-cellular systems to sophisticated trillion-celled organisms. Given this history it seems the arrow of complexity should be able to constitute a kind of arrow of time; we could judge without knowing in advance whether such and such a cosmological state of affairs were earlier or later by some agreed measure of complexity (however hard-won that agreement might be). Most accounts, however, recognise that the development of increasingly complex conditions up to this point in the history of the world is no necessary indicator to the projected overall arc over the lifetime of the universe. The received view is that such accounts should be compatible with acceptance of the second law. For most, the arrow of complexity is expected to describe an arc, peaking somewhere around the midpoint of the cosmic lifetime and declining steadily toward the end, as free energy is depleted.¹³ There are dissenting accounts, however, notable among them being that of the complexity theorist Stuart Kauffman. He argues that the arrow of complexity could potentially rise indefinitely, as a function of the 'adjacent possible'. The 'adjacent possible' is that set of chemical products which are attainable given present conditions, but never yet actualised. The potential range and diversity of the universe might, he conjectures, rise indefinitely as a kind of force multiplier:

As the diversity of molecular species increases, there are always

proportion- ally more novel reactions into the adjacent possible. If we take the formation of a chemical species which has never existed in the biosphere, or perhaps the universe, as a breaking symmetry, then the more such symmetries are broken, the more ways come into existence by which yet further symmetries may be broken.¹⁴

In other words, complexity begets complexity. Kauffman recognises that this proposition contradicts the second law, but points to the dependence of that law on the essentially ergodic character of nature, and seeks to demonstrate that this does not apply to our universe. This is a significant standpoint in the context of the present argument, since we have identified a certain incongruence inherent in Deleuze's adoption of the argument from eternal return with respect to the ergodic hypothesis and its attendant principle of indifference. Having noted that chaos theory essentially renders untenable the principle of indifferenciation as utilised in classical thermodynamics (due to the tendency of particles to resonate in tandem under certain conditions, rather than indifferently to bounce off one another), we encounter here the stronger proposition that ergodicity itself is implausible. Kauffman's argument is predicated on two observations. The first is that the level of complexity of organic molecular species within our biosphere has 'exploded' over the course of the earth's history, from the modest tens or hundreds of varieties, including methane, cyanide, etc., to some hundreds of trillions if we include the diversity of genetic expression. The biosphere has expanded exponentially (far from indifferently) into its adjacent possible. The second observation is that the realm of the adjacent possible into which increasingly more complex molecular species could expand is vastly greater than those already realised. According to Kauffman's calculations: 'It would take the known universe, chunking along on the Planck timescale, 10^{39} times its current lifetime to make all proteins of length 200.'¹⁵ Nor are proteins of length 200 the upper bound of known forms of protein; the exponent rises accordingly for greater lengths. The conclusion is twofold: The universe is 'vastly nonergodic, vastly nonequilibrium at the level

of complex organic molecules'. And 'the total system "wants" to flow into the adjacent possible'. The two are interrelated. For Kauffman, the relationship between the actual and the adjacent possible is one of substrate to product; it is merely that the molecular species of the product has never yet occurred. As such, there is a displacement from the equilibrium conditions all systems seek (an overabundance of substrate components in proportion to product): 'The simple conclusion is that there is a real chemical potential from the actual to the adjacent possible.'¹⁶ The picture we arrive at is that of a 'sink', akin to the thermodynamic sense of a body which draws heat from the neighbouring body. The adjacent possible in effect provides a gradient down which the actual is inclined to flow. The substrate components will always outnumber the product, if not actually then adjacently; a situation which places the world out of equilibrium. The gradient will not resolve unless the 'total system' flows into the adjacent possible, yet that very expansion will in itself open up a new adjacent possible, deferring equilibrium to one remove in an ever-expanding 'workspace'. Complexity begets complexity.¹⁷ It seems in light of the foregoing that to subscribe to the philosophy of difference inclines us to those paradigms which do not rest on or presume the ergodic hypothesis.

NOTES

1. Excerpt from: Bill Ross, *Order and the Virtual: The Philosophy and Science of Deleuzian Cosmology* (Edinburgh University Press, 2024).
2. Kerslake, *Immanence and the Vertigo of Philosophy* (Edinburgh University Press, 2009), p. 164, fn. 108.
3. 'When we perceive, we contract millions of vibrations or elementary shocks into a felt quality' (Gilles Deleuze, *Bergsonism* (Zone, 1988), 87). Deleuze's phrasing echoes Bergson's: 'In the smallest discernible fraction of a second, in the almost instantaneous perception of a sensible quality, there may be trillions of oscillations which repeat themselves. The permanence of a sensible quality consists in this repetition of movements' (Henri Bergson, *Creative Evolution* (Macmillan, 1911), 317).
4. Hume, *A Treatise of Human Nature*, p. 54.
5. Lampert, *Simultaneity and Delay*, p. 79.
6. Ibid., p. 227.
7. Ibid., p. 169.
8. Ibid., p. 166.
9. Collected in Deleuze, *Pure Immanence: Essays on A Life* (Zone, 2012), pp. 25–33.
10. Deleuze is fully aware of the tension between his philosophy of time and the thermodynamic arrow of time: 'Now, good sense is said of one direction only: it is the unique sense and expresses the demand of an order according to which it is necessary to choose one direction and to hold onto it. This direction is easily determined as that which goes from the most differentiated to the least differentiated, from things to the primordial fire. The arrow of time gets its orientation from this direction, since the most differentiated necessarily appears as past, insofar as it determines the origin of an individual system, whereas the least differentiated appears as future and end' (Gilles Deleuze, *Logic of Sense* (Athlone, 1990), 75). 'Good sense' here is associated with the linear time of Chronos, and contrasted to the non-linear time of Aion, which escapes the need for choice of direction. Consistent with his claim that entropy is a transcendental illusion, this amounts to the claim that the thermodynamic arrow applies to the explicate world, but not the implicate. Elsewhere he links the arrow of time to the work of 'contraction' in passive synthesis: 'Passive synthesis or contraction is essentially asymmetrical: it goes from the past to the future in the present, thus from the particular to the general, thereby imparting direction to the arrow of time' (Gilles Deleuze, *Difference and Repetition* (Athlone, 1994), [DR], 71).
11. 'What is the formula for this "evolution"? The more complex a system, the more the values peculiar to implication appear within it. The presence of these values is what allows a judgement of the complexity or complication of a system' (DR, 255).
12. Roger Penrose, *The Road to Reality: A Complete Guide to the Laws of the Universe* (Vintage, 2005), p. 678.
13. See for instance, Sean Carroll, *From Here to Eternity: The Quest for the Ultimate Theory of Time* (Oneworld, 2011), pp. 225–7, and Murray Gell-Mann, *The Quark and the Jaguar: Adventures in the Simple and the Complex* (Little, Brown and Company, 1994), pp. 229–31.
14. Kauffman, *Investigations* (Oxford University Press, 2000), p. 244.
15. Ibid., p. 145.
16. Ibid., p. 143.
17. The argument is presented in full in chapter 7 of Kauffman, *Investigations* (Oxford University Press, 2000): 'The Non- Ergodic Universe: The Possibility of New Laws'.