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The Unbecoming of Being: Thermodynamics and The Metaphysics and Ethics of Entropic Decay

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Abstract

Like the Copernican revolution which initiated the Modern project, there has been a thermodynamic revolution in the empirical sciences in the last two centuries. The aim of this paper is to show how we might draw from this revolution to make new and startling metaphysical and ethical claims concerning the nature and value of reality. To this end, this paper employs Aristotle's account of the relation of the various philosophies and sciences to one another to show how we might assert a new theory of being, moral value, and practical action from the primacy of entropic decay asserted in the contemporary mathematical sciences. This paper proceeds to show how, from what the contemporary sciences have concluded concerning the primacy of entropic decay within reality, unbecoming might be forwarded as a new account of the essence of existence: i.e., the first cause and motivating principle of reality's formal, material, efficient, and final nature. The paper concludes by arguing that a new and surprising account of universal ethical value and normative duty can be deduced from such a metaphysics of decay.

Keywords

Metaphysics, Thermodynamics, Entropy, Decay, Ethics, Aristotle

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The Question of First Philosophy and the Possibility of the Good:

Towards the start of Book IV of his *Metaphysics*, Aristotle makes a seemingly innocuous observation. It is an observation, however, which organized and framed the subsequent history of Western philosophy. According to Aristotle, though "there are as many parts of philosophy as there are kinds of substance, […] there must necessarily be among them a first philosophy," or a "primary science," which endeavours to explain what is observed within and gleaned from the other philosophical sciences by theorizing some unifying principle or substance which stands behind, above, and between all other observable things binds them together, motivates their activity, guides their potentialities, and gives them form and purpose.[1] This first philosophy or primary sciences is, of course, what we now call metaphysics, that mode of inquiry which, as he puts it "investigates the first principles and causes" of the nature, movement, structure, and form of every things which exists.[2]

Note that for Aristotle, the priority of metaphysical inquiry in relation to the other sub-fields of philosophy and theoretical science is not, however, *chronological*. By his reckoning, one need not study metaphysics *first* before turning their attention to the other sciences, as if in fulfilment of a prerequisite which clears the way for the analysis of "higher level" material. Metaphysical inquiry is not for him a prelude to or condition for the other theoretical sciences, like mathematics and physics. To the contrary, he insists, in many ways these other sciences are in fact "more necessary than" metaphysics for the study of reality.[3] Indeed, he argues, it is only from what we learn in and through them that we can even begin to make any sufficiently grounded conclusions concerning the metaphysical first principles which, he thinks, must logically organize the world which they observe. Metaphysics, it follows for Aristotle, therefore merely *logically* precedes the other theoretical sciences. In fact, he argues, it is the study of these other sciences which should *chronologically* precede one's forays into metaphysics. This is perhaps why Aristotle's own reflections on the nature of this "first philosophy" come after (*meta*) his explorations of the nature of material reality itself in his *physics*. From this it becomes clear that though Aristotle identifies metaphysics as "first philosophy," for its analysis of that which possess a *theoretical priority* over reality, nevertheless, it is physics and mathematics that should *actually* be attended to first if we are to understand the whole of reality properly.

The supremacy of metaphysics as "first philosophy" for Aristotle is therefore merely the logical

1 Aristotle, *Metaphysics*, trans. W.D. Ross, in *The Complete Works of Aristotle: The Revised Oxford Translation*, Volume Two, ed. Julian Barnes (Princeton: Princeton University Press, 1984), BK IV (Γ), 1004a 1–5 & 1004a 25–30, 1585 & 1596.

2 Aristotle, *Metaphysics*, Book I (A), 982b 8–9, 1554.

3 Aristotle, *Metaphysics*, Book I (A), 983a 10, 1555.

consequence of what he thinks it pursues: the *primal* cause, *fundamental* nature, or architectural structure of that which is observed within and accounted for by mathematics and physics. Its "priority" over these other sciences comes merely for him, in other words, from the fact that metaphysics attempts to move from what is observant of material reality (*hyle*) and its mechanical movements (*kineo*) to ascertain the formal order (*eidos*) and final aim (*telos*) motivating, structuring, and guiding its nature and movement; or, as Aristotle calls it "the good, i.e. that for the sake of which," everything else happens.[4] It is only for this reason, then, that Aristotle places metaphysics above the other theoretical sciences; for it is only from its study, he concludes, that we can finally know not merely the *what* of observable reality (its material cause) and the *whence* of its movement (its efficient cause), but the *why* of its being and the *for the sake of which* of its movement (its formal and final causes, respectively). Nevertheless, as he makes clear, the capacity to speculatively contemplate this *why* and *for the sake of which* is possible only if we have properly understood the *what* and the *whence* first. In other words, we can only proceed to metaphysics through the door of mathematics and physics. It is the study of these theoretical sciences which, he thinks, must therefore precede and condition the study of metaphysics.

It is only through the proper ordering of these theoretical sciences in relation to one another, Aristotle thinks, that we can then apply ourselves to the study of the other, more practical sciences and sub-fields of philosophy, like ethics and politics. Hence Aristotle's claims that while a proper understanding of mathematics and physics must precede and condition the study of metaphysics, the study of metaphysics must in turn precede and condition the study of ethics and politics.[5] After all, according to Aristotle, how can we claim to know how someone or something *ought* to be, either singularly (in and through ethics) or collectively (in and through politics), if we do not know both the formal (*eidos*) and the final (*telos*) causes of its being? In other words, to know what is *good* for something, one must know *why* to what *purpose* it is, and moves, and has its being. And, as he further details, this knowledge requires not merely an understanding the first causes of its individual *physical/material* existence (its *hyletic* substance) and the nature of its singular *efficient* action (its *kinetic* cause), but a proper understanding of the whole of existence itself (its *eidetic* structure and *telic* aim). Only through such a metaphysical appreciation of the formal unity of the whole of existence, Aristotle thus concludes, can we hope to know the way in which that individual being might fulfil its function *effectively* or *well* (*eû*); that is, be good. In this regard, the study of metaphysics must not only precede and condition the study of the practical sciences like ethics and politics, but moreover there must be some metaphysical unity to ensure the possibility of goodness in the first place! Without the existence of this primal organizing structure operating over, within, throughout, and between all that is, not only would it be impossible to

4 Aristotle, *Metaphysics*, Book I (A), 982b 9–10, 1554.

5 For an example of Aristotle's analysis of the implications of metaphysics within ethics see: Aristotle, *Metaphysics*, Book IV (Θ), part 9, 1660.

regulatively order reality through ethics and politics, there would be no order to justify these normative endeavours. Indeed, there would be no right or wrong at all.

From this it should be clear that for Aristotle the supremacy of metaphysics over the other theoretical sciences, not to mention its propaedeutic value to the practical sciences, hinges on the speculative assertion that some universal "eternal unmovable substance," exists which infuses, motivates, directs, and gives purpose to the existence of everything which is observed and studied in and through mathematics and physics.[6] This primary "uncaused cause" or "first metaphysical substance," this "perfectly actual" and, as he identifies it, "unmoved mover" of reality, is therefore for him both the proper domain of metaphysical inquiry and the necessary precondition for the possibility of the meaningful order, shared purpose, and ethical significance of reality. Hence his observation that "if there is no substance other than those which are formed by nature, [then] natural science will be the first science," for, he thinks, if there is no unifying essence or singular being which organizes the otherwise disparate and nominal motion and existence of observable reality, then no substantial meaning or value could be attributed to the beings which constitute it.[7] And, if this is the case, then not only must we abandon metaphysics as a useless enterprise, but so too must we jettison the other practical sciences, both ethics and politics alike; for no logical ground would exist for the normative regulation of the activity of reality. After all, he argues, if there is no unifying formal structure (*eidos*) which guides, directs, and gives purpose (*telos*) to the movement (*kineo*) of each and every observable being in its material singularity (*hyle*), then the existence of those beings would consist solely in what is observable of their being alone. In other words, each object would have to be understood on its own, as if existing wholly independently of its other, with nothing but emptiness reigning over, above, behind, and between its activity and the activity of every other being. In such a world, each being would exist as if suspended within a void, wholly alone, separate, and distinct from every other existent object, much less reality as a whole.

Hence Aristotle's assertion that if there is no principal being which exists behind and between every existent object, uniting, motivating, ordering, and directing their activity in relation to one another, then not only is metaphysics a meaningless enterprise, but so too is ethics and politics. Indeed, he notes, if this were the case, then all we could do with what we learn from the theoretical sciences (i.e., mathematics and physics) would be how to apply our understanding of material reality (*hyle*) to some efficient (*kineo*) end, which is the aim what he calls the productive sciences (e.g., agriculture, medicine, transportation, etc.). For Aristotle, then, the existence of this formal unifying and organizing first principle over, within, and between all apparent beings is what makes possible not only a metaphysical

6 Aristotle, *Metaphysics*, Book XII (Λ), 1071b 5, 1693.

7 Aristotle, *Metaphysics*, Book VI (E), 1026a 28–29, 1620.

understanding of the unity of reality, but the idea that beings can be more than merely useful but can also be directed towards some theoretical good. Hence his conclusion that without some primal unified being "the good is impossible."[8]

Fortunately, he assures us, this "primary cause" and "immovable substance," *does* exist—indeed, he claims, it *must* exist. Thus, he promises us, that the ethical value of reality is secure, and we are free to investigate the practical duties we might have within and to reality as a whole.[9] In order to ground and justify his account of this possible good, Aristotle starts by using what he knows from the mathematics and physics of his day to speculatively surmise what he thinks the underlying metaphysical and universal structure of reality—that is, the essence of existence—must be. According to Aristotle, given the testimony of the sciences as he understood it, the unifying structure of reality must be: 1) fully *actualised*, 2) sound and *eternal*, and finally 3) unmoving and *static*.[10] Hence his identification of this unifying being as the "unmoved mover" of reality. On the basis of these conclusions, he goes on to argue that every other thing which exists must be a finite and singular expression and extension of this one metaphysical being and, as such, understood as: 1) the *potentiality* to become fully actualized like its metaphysical ground, something which he thinks it attempts to achieve by way of 2) growth, increase, and *change*, such that it is, by definition, 3) *dynamically* moving towards its true and final form. In as much as each individual being can be said to move according to its own nature thusly, in pursuit of its dynamic potentiality, Aristotle thinks, it can be considered virtuous and good. For these reasons, Aristotle argues that despite the various ways in which each individual being might become incombered in its development such that its growth becomes stalled or its movement perverted, ultimately, he concludes, every element of reality is organized (*eidos*) towards the final goal (*telos*) of its own flourishing (*eudaimonia*); that is, towards that which is, in the end, good (*eû*) for it.

The problem, of course, is that much of the physics which Aristotle used to develop his metaphysical conclusions and, from them, his ethical and political systems, was overturned by the subsequent history of scientific development. This fact calls into question, therefore, both his metaphysical conclusions concerning the overall structure and nature of reality, as well as the alleged moral value of reality. The aim of this paper, then, is to update Aristotle's metaphysics and ethics by asking: 1) what new metaphysical conclusions concerning the formal organizing principle (*eidos*) and final aim (*telos*) of reality might be developed from the testimony of the contemporary mathematical and physical sciences regarding the structure of material nature (*hyle*) and the efficient motion (*kineo*) of reality as we understand it today; and, 2) what, if any, moral conclusions might be developed from such a new metaphysics? To these ends,

8 Aristotle, *Metaphysics*, Book XII (Λ), 1072b 13, 1695.

9 Aristotle, *Metaphysics*, Book VI (E), 1026a 29–31, 1620.

10 Aristotle, *Metaphysics*, Book IX (Θ), 1050b 6-1051a 3, 1659–1660.

we must first understand what the contemporary sciences have to say about the fundamental nature and motion of the universe.

The Thermodynamic Revolution of the Contemporary Sciences:

Commensurate with the so-called "Copernican revolution" which initiated and inspired so many of the developments in modern philosophy from the 16th century onwards, there was a veritable "thermodynamic revolution" in the empirical sciences of the 19th and 20th centuries which inspired its own set of philosophical conclusions.[11] Our aim is to extend and expand those conclusions to metaphysics and ethics by examining them within the framework of Aristotle's account of the systematic relation of the various modes of scientific and philosophical study. For this thermodynamic revolution has yielded a set of first principals which are so universally accepted in the mathematical and empirical sciences today that Frank Wilczek, a Nobel laureate in physics, has suggested that in many ways they can be treated as a new set of "fundamental" truths or first principles from which every other subsequent principle and truth should measure and relate itself.[12] It is only through an understanding of this new set of fundamental truths and its various applications then, that we can attempt to reconstruct an Aristotelian account of the metaphysical essence of being and endeavour to extract from it a new account of the moral value of reality.

The general study of thermodynamics, that is the analysis of the movement and exchange of heat energy, has been around since as early as the 18th century when it was first developed to improve the efficient operation of steam engines. It was not until the early 19th century, however, when Nicolas Leonardo Sadi Carnot, the so-called "father of thermodynamics," defined the first of the underlying laws which govern the flow of heat energy (now counted as the 2nd law of thermodynamics), that thermodynamics was formalized as an area of study and a more systematic account of energy exchange was eventually developed by Rudolf Clausius and William Thomson, the 1st Baron of Kelvin. Thereafter, through the work of J. Willard Gibbs, James Clerk Maxwell, and eventually, most famously, Ludwig Boltzmann, the statistical methods needed to measure heat exchange were clarified and the thermodynamic sciences slowly grew into what they are today. Since then, the field has only improved and expanded to the point that in recent years it has become increasingly relied upon in nearly every scientific discipline to explain the nature of the transformation and operation of energy in and between its various forms,

11 For an excellent survey of where and how the scientific principles of thermodynamics have been employed within 19th and 20th century philosophy see: Shannon Mussett, *Entropic Philosophy: Chaos, Breakdown, and* Creation (London: Rowan and Littlefield, 2022).

12 Frank Wilczek, *Fundamentals: Ten Keys to Reality* (New York: Penguin Press, 2021), xiii.

whether mechanical, acoustic, thermal, chemical, electrical, nuclear, or electromagnetic/radiant.[13] As a result of this work, today the laws of thermodynamics are used to explain nearly everything we know about the nature and movement of the material world, from the formation and eventual dissolution of stars, galaxies, and the universe as a whole, to the emergence and evolution of life therein, not to mention its basic function and even its eventual fate.[14]

Indeed, given their nearly universal use in the contemporary sciences, eminent physicist Carlo Rovelli has gone so far as to propose that the history of scientific development in the 20th century can in many ways be accounted for as the history of the expansion and application of the laws of thermodynamics: "In the course of the twentieth century," he writes, "thermodynamics (that is, the science of heat) and statistical mechanics (that is, the science of the probability of different motions) were extended to [even include] electromagnetics and quantum phenomena."[15] As a result of this extension, he goes on to note, thermodynamic principles have subsequently come to dominate nearly every branch of the material sciences.[16] Thus, the same basic notions that were first used by Carnot in 1824 to improve the efficiency of steam engines and were then formalised into laws by Clausius in 1865 have increasingly become viewed as the singular regulating principle of "*all* material systems," as Addy Pross puts it.[17]

The universality of the application of laws of thermodynamics within and across the contemporary sciences is so complete, in fact, that none other than Albert Einstein noted that "it is the only physical theory of universal content concerning which I am convinced that, within the framework of the applicability of its basic concepts, will never be overthrown."[18] Einstein's confidence in the profound constancy and universal power of thermodynamics to explain the order and operation of reality was so great that he even determined them to be the "firm and definitive foundation for all physics, indeed for the whole of natural science."[19]

13 For more on the history of the development and application of thermodynamics see: Robert Hanlon, *Block by Block: The Historical and Theoretical Foundations of Thermodynamics* (Oxford: Oxford University Press, 2020).

14 See, for example: Peter Atkins, *Four Laws that Drive the Universe* (Oxford: Oxford University Press, 2007), v–vii.

15 Carlo Rovelli, *Seven Brief Lessons on Physics*, trans. Simon Carnell and Erica Segre (New York: Riverhead Books, 2014), 57–58.

16 Rovelli, *Seven Brief Lessons on Physics*, 57–58.

17 Addy Pross, *What is Life: How Chemistry Becomes Biology* (Oxford: Oxford University Press, 2012), 80.

18 Albert Einstein, *Autobiographical Notes*, trans. and ed. Paul Arthur Schilpp (Chicago: Open Court Press, 1991), 31.

19 Einstein, *Autobiographical* Notes, 19.

The Content of the Thermodynamic Revolution:

At first glance, the content of the basic laws of thermodynamics is relatively straightforward and easily understood. When those simple laws are applied to diverse systems, however, their meaning and significance becomes extraordinarily profound. The first of these laws, known as the law of the conservation of energy, states that energy, as motion, matter, or heat, can neither be created nor destroyed within a closed system, but can only ever change states within that system. Thus, while the total amount of energy within a system may appear to lessen as matter dissipates, motion slows down, and/or things cool off; the total amount of energy within that system is in fact always constant, albeit manifest in different forms. It is upon this law that Einstein famously established his equation governing the conversion of matter into energy and it is upon this same law that we can predict the productive power of every heat engine, from the small machines which sputter away inside of backyard mowers to the nuclear fusion which fuels the twinkling of stars.

The second and perhaps most famous law of thermodynamics states that statistically energy flows within any given system in such a way that over time it becomes evenly distributed across that system, moving generally from more organized and concentrated towards being increasingly less integrated and more dissipated. This tendency towards disorder, known as entropy, means that every closed system tends towards a state of absolute energy equilibrium where no one thing in the system possess any more or less energy than any other thing in that same system, whether as motion, matter, heat, etc. It is this law which physicists use to explain that, in the words of William Butler Yeats, "things fall apart," and that time moves in one direction only: towards disintegration—which is to say, energy distribution.[20] It is this same law, moreover, which physicists use to explain the material differences between the past, the present, and future and which undergirds what we experience as the "arrow" or "flow" of time. In fact, it is on the basis of this law that the operant understanding of temporality in contemporary physics is founded, for it is this law which guarantees that reality proceeds as it appears to, from one causal step to another, such that, in the words of Steven Hawking, while we may reasonably expect a cup which has fallen from a table onto the floor to shatter into a number of smaller pieces with the movement of time, we cannot reasonably expect "[to] see broken cups gathering themselves together off the floor and jumping back onto the table" as time progresses.[21] The second law of thermodynamics assures us, to the contrary, that as the entropic disorder of a system increases everything within that system will likewise "shatter" into increasingly smaller parts until everything within that system is relatively equal in energic size and all disequilibrium has been "destroyed." It is from the regular governance of the

20 William Butler Yeats, "The Second Coming," in *The Collected Poems of Y.B. Yeats* (London: Wordsworth Editions, 1994), 158.

21 Stephen Hawking, *The Illustrated a Brief History of Time* (New York: Bantam Books, 1996), 191.

second law of thermodynamics, then, that our contemporary scientific understanding of the *nature* and *operation* of not only time, but existence itself emerges.

An extension of this law ensures us that since entropy must necessarily increase within every closed system in the way outlined above, the only logical *end* to this perpetual dissipation and collapse is a state in which every existent thing possesses the lowest total amount of complex energy possible, and no further energy exchange or distribution is necessary to achieve energy equilibrium. The ultimate expression of this state is, of course, a system in which there are no complex forms of energy at all, like mechanical motion nor even classical objects themselves, but only a low-level background radiation which is evenly distributed across a system. It is this application of the second law of thermodynamics which allows us then to know with absolute certainty that while energy can neither be created nor destroyed, in keeping with the first law of thermodynamics, it can nevertheless "burn out," as it were, and reach a state in which it has no effective mechanical power, demonstrate no motion or change, nor contain within it any potential for objective existence as we understand it.

Empowered by the basic laws of thermodynamics contemporary scientists have been able to speculatively construct a nearly complete picture of our universe and explain the *origin*, material *order*, mechanical *operation*, and *final end* of almost everything observed in the various branches of the material sciences, from the initial rapid expansion of the cosmos themselves roughly 13.7 billion years ago, as is testified to by the background radiation of the cosmos, to the advent and evolution of life on this planet around 3.5 billion years ago, as is testified to by the radio-carbon dating of fossil matter, to the eventual explosion of the star around which our planet revolves in approximately 5 billion years, through analysis of the ½ life of its chemical composition—an event, incidentally, which will eradicate any life still left upon our planet at that time and erase every evidence that life ever existed and flourished here in the first place.

Indeed, within astrophysics, the laws of thermodynamics have allowed contemporary scholars to estimate the age of the cosmos within which all this has and will occur, explain the nature of its sudden appearance and expansion, from an extremely dense, hot, and low entropic singular point in time/space to the ever expanding and cooling state in which it exists today, and even account for the formation of all of the relatively less entropic material objects we find therein, like galaxies, nebulae, black holes, quasars, stars, planets, moons, meteors, and asteroids. Not only can astrophysicists use the laws of thermodynamics to explain the accretion, nature, and celestial movement of such objects, they can use them to predict their relative distribution within the universe as well as the eventual collapse of all these things into relatively simpler energetic forms all through application of the same basic statistical models that Boltzmann pioneered in the 19th century to establish the constancy of heat dissipation across any given system.

And, as we have already seen *in breve*, it is from these same laws that the very understanding of the nature and operation of *time*, in which this expansion, distribution, and collapse will occur, has been developed. Hence Sean Carroll's conclusion that, ultimately, the "property of entropy is responsible for *all* of the difference between past and future that we know about. Memory, aging, cause and effect – all can be traced to the second law of thermodynamics and in particular to the fact that entropy used to be low in the past."[22] It is from this law then that anything and everything that has, will, and can even *potentially happen* can be understood as an expression of the arrow and operation of time, as that wherein the very concept of *happening* itself occurs.

On a much smaller scale, Erwin Schrödinger was the first to endeavour to show how the laws of thermodynamics might govern, ground, and structure even the seeming random nature of quantum systems.[23] His ground-breaking work to this end has more recently developed into one of the most dynamic areas of contemporary physics, "Quantum Thermodynamics," which was first pioneered by John Von Neumann in his 1932 classic *Mathematical Foundations of Quantum Mechanics*.[24] There, Von Neumann proposed a new model of entropic decay which was more equipped to predict quantum motion than Boltzmann's original atomic model. As a result of this work, the vast majority of contemporary physicists agree that it will be by increasing our understanding of the operation of thermodynamic principles at the sub-atomic level that the ultimate ground and condition for quantum laws and phenomena will eventually be explainable within the existing laws operant at the atomic level and the long sought "Grand Unified Theory" of reality might eventually be discovered.[25] So it is within the laws of thermodynamics that most contemporary theoretical physicists turn to discover and account for the founding principles which govern the order and operation of the entirety of material reality itself, from macro to micro. In this way, the laws of thermodynamics have steadily come to pervade and reign in nearly every field of contemporary physics, from the most practical to the most theoretical.

Within chemistry, through the innovative application of Willard Gibbs analysis of the movement of energy within thermodynamic systems, Gilbert N. Lewis, Merle Randall, and eventually E. A. Guggenheim were able to determine and define the total set of laws which govern chemical reactions, laws which are

22 Sean Carroll, *The Big Picture: On the Origins of Life, Meaning, and the Universe Itself* (New York: Penguin, 2016), 59.

23 Erwin Schrödinger, *What is Life? The Physical Aspects of the Living Cell* (Cambridge: Cambridge University Press, 1967), 57.

24 John Von Neumann, *Mathematical Foundations of Quantum Mechanics*, trans. Robert T. Beyer, ed. Nicholas A. Wheeler (Princeton: Princeton University Press, 2018).

25 See, for example: Johnjoe McFadden and Jim Al-Khalili, *Life on the Edge: The Coming Age of Quantum Biology* (New York: Crown, 2014), 291.

still taught in chemistry labs across the globe today.[26] Even more famously, Marie Skłodowska-Curie used the laws of thermodynamics to identify and define the principles which give rise to radioactive decay within chemical structures and show how those laws allow us to predict with absolute certainty the slow dissolution and transformation of chemical elements into more basic elementary components through a process which could be described as a kind of entropic alchemy. And it is of course these same principles which were subsequently used to explain the emergence of every existent chemical compound and substance in the first few moments of our universe as well as to predict their eventual dissolution into pure heat energy at the distant end of time.

Perhaps nowhere has the explanatory power of the laws of thermodynamics been more controversial and impactful however than within biology where they have become increasingly relied upon to explain both the basic nature and function of living organisms as well as their initial development from inorganic matter and subsequent evolution into more complex forms. Such an application was of course first suggested by Erwin Schrödinger in his 1944 lectures *What is Life*; but, it was through the detailed lab work of Jacques Monod and others that the role of thermodynamic exchange in the evolution of living DNA self-replicators from mechanical RNA engines, and from that the explosions of complex life *in toto*, that the application of thermodynamics fully flourished within the biological sciences.[27] Today, thermodynamic principles are the bedrock of every accepted scientific account of the nature, operation, and evolution of life.[28] Indeed, contemporary biologists are increasingly convinced that life is best understood as nothing more than the consequence of thermodynamic principles in certain conditions. Hence contemporary bio-chemist Nick Lane's conclusions that life itself might be defined as little more than a highly complex "dissipative structure;" one which is, in the end, merely "the visible product of sustained far-from-equilibrium conditions."[29]

Read through the lens of the laws of thermodynamics, most contemporary biologists in fact agree that not only does complex life appear to be an effect of the dissipation of energy across a system; but, moreover, that all living things are best understood as ultimately highly complex and efficient agents of entropy—little more than more than a highly effective way in which energy can be broken down into its simplest structures and evenly dissipated and distributed across the cosmos. As bio-physicist

26 J. Bevan Ott and Juliana Boerio-Goates, *Chemical Thermodynamics: Principles and Applications* (Amsterdam: Elsevier, 2000), 1–2.

27 Scrödinger, *What is Life*, 68; and, Jacques Monod, *Chance and Necessity: An Essay on the Natural Philosophy of Modern Biology*, trans. Austryn Wainhouse (New York: Vintage Books, 1971), 123.

28 Eric D. Schneider and Dorion Sagan, *Into the Cool: Energy Flow, Thermodynamics, and Life* (Chicago: University of Chicago Press, 2002).

29 Nick Lane, *The Vital Question: Energy, Evolution, and the Origins of Complex Life* (New York: W. W. Norton and Co., 2016), 94–95. See also Pross, *What is Life*, 118.

Peter Hoffman explains, "[l]iving systems are 'dissipative systems' because they continuously dispute free-energy into high-entropy energy."[30] This basic insight has inspired contemporary bio-physicist, Jeremy England, to model in his lab how the dissipation of heat across a system in accordance with the second law of thermodynamics might lead to the self-organization of atoms into the kinds of structures necessary for the development of life and to show thereby how the laws of thermodynamics might be used to explain the evolution of life into its more complex forms.[31] This work has led England to conclude that ultimately the only satisfactory explanation for the "*why*" of life is that it is the "aim" or teleonomic function of all life is to aid entropy. Life, England therefore argues, is simply a kind of dissipative machine, one which uses its complexity to destroy other complex energetic forms by breaking them down, through consumption and metabolization, into simpler forms, like heat and mechanical motion, that can be more quickly dissipated and distributed across the system. In this regard, he concludes, life is nothing more than a product of and aid to the eventual dissolution of matter into heat and, through this, the eventual collapse and destruction of the universe as it currently exists and the steady progress of its relentless march towards a null state at the distant end of time in which no matter or mechanical motion will existence.

As England puts it "many of the properties of living things might be explainable as 'dissipative structures' that arise from a general thermodynamic tendency to reduce the rate of entropy production."[32] "Thus," England concludes, "the empirical biological fact that reproductive fitness is intimately linked to efficient metabolism now has a clear and simple basis in physics."[33] "[S]uch a process," he writes, "must invariably be fuelled by the production of entropy." Hence Sean Carroll's assessment that the "purpose" of life, from a material and scientific perspective, in keeping with the application of the laws of thermodynamics across the field, might be, in the end, nothing more than the destruction of matter through its conversion into higher entropic energy states in the service of its dissolution and dissipation across our system. Indeed, he notes, the ultimate "purpose of life" might be summed up in a single word: *metabolism*, "essentially 'burning fuel."[34] This makes sense, he concludes, given the simple fact that living organisms, "[l]ike no other chemical reactions or combinations thereof, proceeds

30 Peter Hoffmann, *Life's Ratchet: How Molecular Machine's Extract Order from Chaos* (New York: Basic Books 2012), 86.

31 Jeremy England, *Every Life is on Fire: How Thermodynamics Explains the Origins of Living Things* (New York: Basic Books, 2020).

32 Jeremy England, "Dissipative Adaptation in Drive Self-Assembly," *Nature and Nanotechnology*, vol. 10 (November 2015), 920.

33 Jeremy England, "Statistical Physics of Self-Replication," *The Journal of Chemical Physics*, vol. 139 (2013), 141.

34 Sean Carroll, *The Big Picture: On the Origins of Life, Meaning, and the Universe Itself.* New York: Penguin, 2016, 264.

by converting free energy into disordered energy."[35] Or, as Nick Lane, puts it, "[l]ife is not much like a candle; more like a rocket launcher."[36] In fact, England has suggested, there appears to be few agents of entropy which are more effective to this end than living organisms, few things which are as efficient as us at transforming energy from a low entropic state, like matter, into a relatively high entropic state, like heat, in such a way that it can be more quickly and evenly distributed across a system.

It is thus through the application of the laws of thermodynamics within biology that we have finally discovered that life does not in the end violate or work against the laws which govern the inorganic physical universe, nor does it operate in obedience to what Erwin Schrodinger initially thought must be some "other," or "higher," set of laws, despite appearances to the contrary.[37] Life is not, in other, more poetic words, "a struggle against entropy," as Vaclav Havel put it.[38] To the contrary, everything that life is and does is perfectly explained according to the same basic principles which were first identified by Carnot, Clausius, Gibbs, and Boltzmann as governing the order and efficient operation of steam engines. Like those engines, and every other heat engine which exists, life is powered by the exchange of energy according to the laws of thermodynamics which necessitate the even distribution of energy across any given system and between every existent object within that system. In this regard, life, in the end, is little more than an agent of entropy, one which works alongside other existent objects towards the eventual end of everything—that coming null state in which no further energy exchange or action can or will occur. So it is that Peter Hoffman has concluded that "[l]ife does not exist despite the second law of thermodynamics; instead, life has evolved to take full advantage of the second law whenever it can."[39] Or, as Sean Carroll has it, "complex structures can form, not despite the growth of entropy but *because* entropy is growing. Living organisms can maintain their structural integrity not despite the second law but because of it."[40]

In this way, the apparently "negentropic" nature of life first suggested and theorized by Erwin Schrödinger in the early 1940s, and subsequently explored philosophically by Bernard Stiegler and others—the appearance that complex living organisms seem to employ the power of entropy negatively "to compensate the entropy increase it produces by living," in such a way that they appear to "maintain [themselves] on a stationary and fairly low entropy level"—has been thoroughly explained by contemporary

35 Carroll, *The Big Picture*, 274.
36 Lane, *The Vital Question*, 64.
37 Schrödinger, *What is Life?* 68.
38 Vaclav Havel, "Letter to Dr. Gustav Husek," in *Vaclav Havel: Living in Truth* (London: Faber and Faber, 2000), 23.
39 Hoffmann, *Life's Ratchet*, 87.
40 Carroll, *The Big Picture*, 240.

biologists as a product of entropic decay.[41] Indeed, as we have seen, complex living organisms are not only a direct and natural product of entropic decay, but they function *not* "to compensate the entropy increase it produces," but to *accelerate* that decay. As a result, we might conclude that complex living organisms are ultimately less an expression of something like negentropy, but rather something like hyperentropy!

Thermodynamics and the End of Existence:

Interestingly, this application of the laws of thermodynamics across diverse fields of scientific inquiry from the 19th century onwards has not only been used to explain the emergence, growth, increase, and operation of seemingly negentropic complex objects, but to speculatively deduce the ultimate end of all those objects as well—indeed, the very end of everything.[42] Within biology, of course, this end is already well known. All living things must die. This simple fact is an inherent and inexorable element of material life, structured and determined as it is by the second law of thermodynamics. Despite our best efforts and all of the ingenuity of the modern sciences, death inevitably awaits every living thing. It is in fact this constant decay within and around us which is the very condition for the possibility of life, as we have already seen. What's more, it is this same constant decay which defines the nature of our growth and apparent flourishing in the meantime, fuelling as it does our need to eat, work, and reproduce. So it is that the perpetual entropic decay which will eventually conclude in our complete collapse drives not only the *final* conclusion of life, but it also appears to *motivate* its secret heart and ultimate *essence* as well. Put in Aristotelian terms, entropic decay could in many ways be seen as the material power (*hyle*), motivational drive (*kineo*), defining structure (*eidos*), and eventual end (*telos*) of all that we are and do.

While we may hope, and perhaps even strive to delay the eventual fulfilment of our final end through diet, exercise, and the machinations of medicine, leaning in, in these ways, to our apparently negentropic potency, we must come to terms with the inescapable and assured fact that despite all our best efforts, we will perpetually lose ground before the steady march of entropic decay, disintegration, and dissolution within us and will necessarily contribute to the acceleration of the entropic decay of our immediate environment, even in and through all of these efforts. Indeed, through the application of the laws

41 Schrödinger, *What is Life?* 73. For an example of how the concept of "negentropy" has been operationalized by philosophers see, for example: Bernard Stiegler, *The Neganthropocene,* ed. and trans. Daniel Ross (London: Open Humanities Press, 2018), 51–75.

42 For more on how the concept of heat death was developed and variously applied in 19th century philosophical thought see: Mussett, *Entropic Philosophy*, 83–105.

of thermodynamics as they are currently understood, we can know with certainty that our ultimate demise must eventually come—is, in fact, always already coming—even in and through our desperate attempts to keep it at bay. For, as the contemporary biological sciences assure us, this perpetual death is integral to and inexorable from the very nature and definition of life as such. All of this is well understood. What is less well known, however, is how much the second law of thermodynamics allows us to understand the order (*eidos*), operation (*kineo*), and perhaps even purpose (*telos*) of material (*hyle*) life in the meantime. And yet, as we have just seen, from the pioneering work of Jeremy England and others, we now understand that with every beat of our heart and pull of our lungs we increase the dissipation of energy across our universe. In this regard, even the most complex lifeform is, from the perspective of contemporary biology, an incredibly efficient entropic engine, despite all negentropic appearances to the contrary. Nevertheless, it is now clear that the second law of thermodynamics circumscribes the whole of our existence, from beginning to end, top to bottom, order and operation, aim and accomplishment. We exist, we must now acknowledge in accordance with the testimony of contemporary biophysics, by virtue of entropic decay and live merely to serve its ultimate aim: to accelerate decay in the accomplishment of the eventual end of everything.

Within chemistry, as we have already seen, the second law of thermodynamics can be used both to explain the origin and formation of elementary particles into their current stable chemical structures as well as the conditions for the possibility of the construction of more complex compounds. It can also be used, however, to predict the eventual collapse of every such compound and element into its simplest energetic form, a process which will eventually result in a homogeneous soup of elementary particles and low-level radioactivity at the distant end of time. In fact, by measuring the extremely low level radioactive output of even the most stable elements, chemists can speculatively predict the eventual entropic collapse of the entirety of chemical matter itself, and from this the eventual conclusion of chemical activity in the distant future, a time they refer to as the cosmological "dark era."[43] "In this bleak epoch," the astrophysicists Fred Adams and Greg Laughlin write, "the universe [will be] composed only of the smallest types of elementary particles and radiation of extremely low energy and long wavelengths. Protons [will] have long since decayed and no ordinary baryonic matter [will] remain."[44] So it is in accordance with the second law of thermodynamics within inorganic matter that chemists can predict that "[i]n the far future, the universe [will] contain no complex structures," for "all conventional composite entities [will] have decayed away."[45] In that distant future, the cosmologist Lawrence Krauss notes, "matter will disappear, and the universe will approach a state of maximum

43 Fred Adams and Greg Laughlin, *The Five Ages of the Universe: Inside the Physics of Eternity* (New York: Touchstone Books, 1999), xxviii.

44 Adams and Laughlin, *The Five Ages of the Universe*, 155.

45 Adams and Laughlin, *The Five Ages of the Universe*, 155.

simplicity and symmetry."[46]

This process further allows contemporary astrophysicists to predict the eventual end of our cosmos as a whole.[47] As the theoretical physicist Alan Lightman puts it, as a result of the entropic directionality assured by the second law of thermodynamics, physicists today know with absolute certainty that "the universe is relentlessly wearing down, falling apart, [and] driving itself toward a condition of maximum disorder."[48] As such, they can predict, in the words of the science reporter Philip Ball, that "[e]ventually all the universe will be reduced to a uniform, boring jumble: a state of equilibrium, wherein entropy is maximized and nothing meaningful will ever happen again."[49] There is, of course, still robust debate amongst physicists exactly *how* and *when* this eventual collapse will occur. The various positions within this debate hinge on whether the universe should be interpreted as an open or closed thermodynamic system, a distinction which depends in turn on whether the universe is still expanding at a constant rate or whether its expansion is slowing down and, if so, why, how, and what will happen once that expansion ends. In fact, in recent years a virtual cottage industry has cropped up within physics predicting which of these apocalyptic ends awaits our universe.

However, this debate might eventually be settled, nearly every contemporary physicist is in complete agreement that the end of everything will eventually come, all in accordance with the laws of thermodynamics. Thus, while some cosmologists, like Lawrence Krauss and Glenn Starkman, argue for what has been called the eventual "heat-death" of the universe on the basis of the "most recent cosmological observations," which, they argue, "suggest that [the] universe will continue to expand forever," while other cosmologists, like Steven Frautschi, conclude the opposite, arguing that "heat-death" will not occur, and that a "big-freeze" is more likely, a condition in which the "universe [will] 'die' [...] in the sense that the entropy in a comoving volume asymptotically approaches a constant limit," all parties are in complete agreement that the cosmos must, in accordance with the laws of thermodynamics, eventually come to a complete and total end.[50] Thus, as the noted biologist and science writer Richard Dawkins has concluded, however it might eventually happen, eventually, "finally, and

46 Lawrence M. Krauss, *A Universe from Nothing: Why There is Something Rather than Nothing* (New York: Atria Books, 2012), 179.

47 See, for example: Katie Mack, *The End of Everything (Astrophysically Speaking)* (New York: Scribner, 2020).

48 Alan Lightman, *The Accidental Universe: The World You Thought You Knew* (New York: Pantheon Books, 2013), 26.

49 Philip Ball, "How Life (and Death) Spring from Disorder," *Quanta Magazine* (January 26th, 2017).

50 Lawrence M. Krauss and Glenn D. Starkman, "The Fate of Life in the Universe," *Scientific American* (November 1999), 60-61; and, Steven Frautschi, "Entropy in an Expanding Universe," *Science* 2017, no. 4560 (August 13, 1982), 597.

inevitably the universe will [be reduced] into a nothingness that mirrors the beginning. Not only will there be no cosmologists to look out on the universe, there will be nothing for them to see even if they could. Nothing at all. Not even atoms. Nothing."[51] This eventual annihilation is guaranteed with complete certainty given the absolute and universal reign of entropic decay over and within existence, whether living or non-living, organic, or inorganic.

A Thermodynamic Metaphysics of Decay:

From this survey of the content and consequence of the thermodynamic revolution in the contemporary sciences it becomes clear how entropy holds fast over the whole of reality and determines all that is, all that can be, all that will ever happen, as well as the end of every possible happening. In this regard, it is not hard to speculatively deduce from the testimony of the contemporary sciences a new theory of universal being as Aristotle first suggested. Only, from what we have seen, this being can no longer be asserted as something which is perfectly *actual*, s*tatic*, and *eternal* as Aristotle would have it. Instead, from what we now know concerning the reign of entropic decay over and within all that is, we can only speculatively conclude that this being can must be counted as: 1) a destructive *potency* that achieves its aims by 2) *unbecoming* in and through all that is, and is therefore, also, 3) fundamentally and irrevocably *finite*. Being, we might conclude, appears to be something which is steady slouching towards its ultimate obliteration in and through the growth and increase of everything which it generates. The logical consequence of a proper reckoning with the content of the theoretical sciences today, in other words, is not the affirmation of the metaphysics proposed by Aristotle, but a new metaphysics—a metaphysics of entropic decay, a metaphysics of annihilation and unbecoming.

Within such a metaphysics we must acknowledge that while at present beings may appear to proliferate and grow in complexity, operating negentropically to maintain themselves against the flow of entropy towards its eventual abolition, ultimately this development is not an act of rebellion or resistance against the inviable slide of being towards absolute zero. Instead, it is the very condition and practical way, which is to say the material nature and efficient mechanism, in which this nihilation is operational and actualizes itself fully. Indeed, as we have seen, the growth and proliferation of existent beings within the cosmos are therefore nothing more than the *material* (*hylectic*) and *efficient* (*kinetic*) modes in which the nihilative order (*eidos*) of this ultimate null-state end (*telos*) is achieved. Even complex living beings then, which seem to function, at least temporarily, negentropically, must be seen as ultimately

51 Richard Dawkins, "Afterward," in *A Universe from Nothing: Why There is Something Rather than Nothing* by Lawrence M. Krauss (New York: Atria Books, 2012), 188.

little more than modalities of the dissipation, expiation, and ultimate extinction of being itself. Within such a metaphysics it becomes clear, in other words, how existent objects like ourselves are, in the end, simply agents of oblivion.[52]

These seemingly counter intuitive metaphysical conclusions are simply the logical extension of the current understanding of the universe as it is accounted for within the contemporary sciences. They are, in other words, merely an extension of what we now know from the absolute reign of the laws of thermodynamics over and within all material systems. If we are to follow Aristotle's advice, then, and guide our pursuit of some primal substance with the testimony of the "more necessary" theoretical sciences, then we can only conclude that such a metaphysics of decay is likely and that being itself is best understood as something that is fundamentally unbecoming. For, as we have just seen, this metaphysics of decay follows necessarily from the contemporary scientific account of reality in its *material* structure (*hyle*), *efficient* driving force (*kineo*), *formal* organizing principle (*eidos*), and ultimate teleological *aim* (*telos*). So it is that entropy can be read as the very *essence* of existence in the Aristotelian sense: the universal ground and first principle of all that is. For these reasons we are justified in concluding that *to be* is nothing more than *to unbecome*—to unravel, decay, dissolve, and destroy.

The Moral Value of Being and the Ethics of Resistance:

Being, it seems, contrary to all appearances, is not something which is ordered towards actualization and flourishing. To the contrary, it is an unbecoming and devouring beast—one that consumes itself over time, slowly digesting all that it is until nothing at all remains. And, in this endeavour it is fundamentally antagonistic not only to its own perpetuation and development, but to the growth and development of every other existent being as well, each of which is generated according to reality's ultimate entropic aim: to destroy itself and everything else with it. In this regard, this ultimate or primal being, qua unbecoming, might be framed as opponent to itself; one that produces singular beings only to toy with them for sport in the ring of reality before eventually dispatching with them forever. In this way, the universal aim of being, to steadily winnow itself away into nothingness in pursuit of ontic annihilation, is slowly and painfully achieved. Within such an account of being it becomes clear that even the most complex and seemingly negentropic beings are not created ultimately to thrive and flourish, but solely to destroy and to be destroyed and, moreover, to experience this destruction, where they have developed the complexity to sense and respond to their environs, as rot, ruin, sickness, and death; in a word, suffering. For these reasons, we might conclude with Arthur Schopenhauer, one of

52 Schneider and Sagan, *Into the Cool*, 299 & ff.

the first philosophers to wrestle with the potential metaphysical and moral significance of the then newly emergent science of thermodynamics, that suffering and anguish could be counted as "the closest and most immediate goal of life."[53] Being, it would indeed seem, is *unbecoming* in every sense of the word. Such a pessimistic evaluation of the meaning and value of life in particular and being in general appears to be a natural consequence of this speculative extension of the laws of thermodynamics into metaphysics. Indeed, Fredrick Beiser has argued that much of the pessimism which appeared in the early 19th century emerged precisely from such an attempt to explore the metaphysical and ethical implications of material laws, including those which would eventually become fully formulated in the laws of thermodynamics.[54]

After all, from what we now know, at least one thing is certain: everything eats and is eaten. Everything destroys and is destroyed. If any ultimate *aim* (*telos*) or order (*eidos*) of being as whole can be deduced from the contemporary scientific account of the *operation* (*kineo*) of material reality (*hyle*) then, it is this: that we, and indeed everything else, exists solely to consume, exterminate, and eventually annihilate; and, in this way, to ultimately obliterate being itself; and that this process is experienced by sensate complex beings as suffering. From this perspective, beings are best framed as cogs in a giant cataclysmic machine, and that living, organic matter is merely one of the many pistons organized by the entropic principle of reality to achieve this ultimate and final aim more efficiently. What's more, we might say that suffering is simply how sensate living organisms experience the very essence of their being. In this regard, it is an essential element of their being – an inescapable and necessary fact and consequent of their complexity. So it is that we might conclude that not only is being fundamentally and irrevocably *finite*, structured as it through its *unbecoming*, but moreover that existence is fundamentally *antagonistic* to itself, both metaphysically and existentially, requiring as it does that each being maintain itself negentropically through the destruction of other existent beings, a process which ultimately accelerates the entropic decay of the system as a whole.[55] What this means concretely is that the only discernible meaning and purpose we might deduce from the testimony of the contemporary theoretical sciences concerning the nature of being is that to be is to decay, dissolve, and disappear and to dismantle, damage, and destroy every other being in the process—and, for us and every other sensate animal, it is to suffer this agonizing process until all our complexity is used up and we collapse.

53 Arthur Schopenhauer, *Parerga and Paralipomena: Short Philosophical Essays, vol. 2*, trans. and ed. Adrian Del Caro and Christopher Janaway (Cambridge: Cambridge University Press, 2015), 262.

54 See, for example: Frederick C. Beiser, *Weltschmerz: Pessimism in German Philosophy, 1860–1900*, (Oxford: Oxford University Press, 2016), 8–10 & 38.

55 For more on this idea see, for example: Joel White, "Outline to an Architectonics of Thermodynamics: Life's Entropic Indeterminacy," in *Contingency and Plasticity in Everyday Technologies*, eds Natasha Lushetich, Iain Campbell and Dominic Smith (Maryland: Rowman and Littlefield, 2022), 189.

If we are to follow Aristotle's suggestions that the practical sciences like ethics and politics—and, indeed, moral value itself—must flow from the metaphysical conclusions which are suggested by the testimony of the other theoretical sciences, then we might tentatively suggest that, contrary to Aristotle's claims, being cannot be evaluated as good (i.e., organized toward our actualisation and flourishing). Neither can we maintain the much more palatable modern claim that existence must be fundamentally value neutral. Contrary to these conclusions, given the entropic antagonism which seems to be inherent to reality as it is accounted for within the contemporary theoretical sciences, we might more naturally conclude that the moral value of existence is less than zero. Indeed, if any moral value can be speculatively extracted and rationally deduced from this account of being qua unbecoming which we have speculatively derived from the testimony of the contemporary sciences, then it is this: that existence is *evil*. This is, of course, precisely what Schopenhauer himself concluded from his own analysis of the testimony of the sciences concerning the reign of entropic collapse within and across all material systems. Indeed, as Schopenhauer makes clear, the order and operation of material nature according to the laws of thermodynamics suggests that it can only be evaluated as the very essence of practical evil itself; or, "radically evil."[56]

To see how such a pessimistic evaluation of the moral status of being qua unbecoming might be justified further clearly requires more work, work I have attempted elsewhere.[57] But it should be sufficient from what we have seen here to conclude, at the very least, that the testimony of the contemporary sciences requires that we break with Aristotle's classical metaphysical conclusions, and therefore too his ethical evaluation of the moral status of existence. Indeed, against his assertion that it is good to be, it is much more logical to assert that it is *not* be good to be, as I have argued in greater detail elsewhere.[58]

It is important to note, however, before concluding, that this analysis of the potential moral value of being as a radical evil does not preclude the possibility of developing some practical politics and ethics from this metaphysics of decay; that is to say, these conclusions do not forestall the possibility of developing legitimate and logical philosophical claims concerning the practical pursuit of the good, i.e., normative ethics.[59] To the contrary, it is entirely possible to deduce some practical good from such

56 Schopenhauer, *Parerga and Paralipomena: Short Philosophical Essays, vol. 2*, 196 & 274; see also, Arthur Schopenhauer, "On Will in Nature," in *On the Fourfold Root of the Principle of Sufficient Reason and Other Writings*, trans. and ed. David E. Cartwrights, Edward E. Erdmann, and Christopher Janaway (Cambridge: Cambridge University Press, 2012), 444.

57 To see how this might be worked out in more detail see my forthcoming: Drew Dalton, *The Matter of Evil: From Speculative Realism to Ethical Pessimism* (Northwestern University Press, 2023).

58 See, again: Dalton, *The Matter of Evil*, 4–7 & 127–136.

59 See, for example: Dalton, *The Matter of Evil*, 275–286.

a moral evaluation of being qua unbecoming *negatively*, as Schopenhauer first suggested; namely, as a potential which can be pursued negentropically, in resistance to the consuming maw of reality. To wit: if it is demonstratively evil to be, then goodness might be defined as that which actively kicks against the nature and structure of reality, however flutily. So it is, that we might follow Schopenhauer in defining goodness as that which endeavours to bend the entropic thrust of existence back upon itself in such a way that it is momentarily neutralized; for example, in acts of compassion or ascetic renunciation.[60] But, there might be other, more active ways to achieve this end as well, as Philip Mainländer has argued, and I have outlined elsewhere.[61]

No matter how it is practically achieved, when we envision and pursue goodness negatively in this way, as something which is only possibilised through the dialectical *negation* of reality via its own potency for and tendency towards destruction, we might justify the pursuit of a universal ethical good negatively and ground in this way a new, potentially universal and practical normative ethics. To aspire to do good within such a metaphysical system would mean fighting to dismantle, resist, and rearrange every structure which exists within us, as well as the sociopolitical order of our day, that is complicit in the dissipative, destructive, and violent will of nature. Only by pursuing the possibility of goodness negatively in this way, as the duty to perpetually resist that which works alongside and with the trajectory of being itself, might we reanimate an account of universal ethical normativity from this thermodynamically informed metaphysics of decay.

Ultimately, of course, such a pursuit of the good is destined to fail. In a universe entirely governed and determined by the principle of entropy, every project which strives to maintain life and well-being against the destructive will of nature and the suffering will prove to be futile. No matter how fully we may ethically commit ourselves to act negatively in perpetual resistance against the forces of nature, we must acknowledge the irrefutable fact that we can never transcend or escape the conditions of our own existence. No supernatural power can aid us in this project, nor can any rational hope be maintained for some final or transcendental salvation from the brutal facts of our own nature. So it is that within the logic of the metaphysics asserted here evil must ultimately win the day. And we cannot work towards any good which is deducible from this system under the false pretense that we might somehow extricate ourselves from the evil of existence or expiate ourselves from the suffering

60 See, for example, Arthur Schopenhauer, "Prize Essay on the Freedom of the Will," in *The Two Fundamental Problems of Ethics*, trans. and ed. Christopher Janaway (Cambridge: Cambridge University Press, 2009), 57. See also, Arthur Schopenhauer, "Prize Essay on the Basis of Morals," in *The Two Fundamental Problems of Ethics*, trans. and ed. Christopher Janaway (Cambridge: Cambridge University Press, 2009), 200.

61 See, for example, Dalton, *The Matter of Evil*, 235–243 & 273–274.

and destruction that existence itself seems to entail for sentient animals. Such moral purity, ethical perfection, or virtuous blamelessness should never be the aim of any practical normative ethics which is derived from this metaphysics of decay. Its aim must be instead merely to resist however possible the tyranny of decay negatively in the hopes that we might achieve and provide some temporary respite from the otherwise relentless march of being towards nothingness, a march which, as we have seem, is experienced as suffering by sufficiently complex organisms. Such an ethics of resistance would therefore define its aims not in the construction of anything positive, but in the opposition to everything which contributes to the annihilative death march of being towards its final goal: absolute obliteration. The aim of such an ethics of resistance, in other words, must be only to use the entropic power of nature to dismantle, disassemble, and dissolve its own structures, however fleetingly, such that some passing sense of relief, calm, and peace might be wrested negatively, if only momentarily, from the otherwise ceaseless progress of being towards nothingness.

Within such a metaphysics and ethics, it becomes clear that though existence is a fixed match, one that we're all destined to lose, this should not prevent us from getting a few good licks in along the way. And it is here, in the possibility of striking back at the moral horror of existence, that a new universally normative ethics might be developed from the unbecoming of being which is assured by a metaphysics of entropic decay. So it is that we can conclude with the claim that the only *ought* which we might speculatively deduce from what we now know *is* the case, is that it is our duty to strike back at the universe, not merely in spite of the utter futility at doing so; but precisely because of it.

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