

2021-08-30

Necessity, Teleology, and Darwin: A Defense of Aristotelian Essentialism

Schoepfer, Andrew

Schoepfer, A. (2021). Necessity, Teleology, and Darwin: A Defense of Aristotelian Essentialism (Master's thesis, University of Calgary, Calgary, Canada). Retrieved from <https://prism.ucalgary.ca>.
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Necessity, Teleology, and Darwin: A Defense of Aristotelian Essentialism

by

Andrew Schoepfer

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF ARTS

GRADUATE PROGRAM IN PHILOSOPHY

CALGARY, ALBERTA

AUGUST, 2021

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Aristotle Indicted: On Modern Science and the Question of Essences

In practical philosophy Aristotelian ideas remain important to contemporary discussions.¹ But even among those who are sympathetic to Aristotle's philosophy in general, there is a persisting belief that his natural philosophy has been superseded. If this belief only implies that over the course of several millennia we have managed to come to a collective understanding of the world which is better than Aristotle's was, then this is banal. However, often a more insidious implication is affirmed: that fundamentally Aristotle's approach to understanding the natural world was too flawed for his positions to now be anything but history. Core tenets of his work, the four causes, most importantly his teleological "final cause", the contrast of form and matter, and – the core topic of this thesis – his essentialism, were – and to no small degree still are – dismissed out of hand. What happened? As the narrative goes: during the Early Modern period, in accordance with the rise of experimental science, core features of Aristotle's philosophical system, where applied to nature, were rightly rejected due to internal incoherencies and because they conflicted with newly found empirical facts. The Aristotelian philosophy of the era was overcome by an intellectual revolt waged against it.

1 Some famous philosophers indebted to Aristotle in this regard include: Alasdair Macintyre, G.E.M Anscombe, and Hans Georg-Gadamer. See, Hursthouse, Rosalind and Glen Pettigrove, "Virtue Ethics", *The Stanford Encyclopedia of Philosophy* (Winter 2018 Edition), Edward N. Zalta (ed.) and Malpas, Jeff, "Hans-Georg Gadamer", *The Stanford Encyclopedia of Philosophy* (Fall 2018 Edition), Edward N. Zalta (ed.).

Just as this indictment has been built piece by piece, it will have to be dismantled piece by piece; and this work belongs to a species of adversarial cases designed to dismantle such narratives.² Here I will briefly elaborate on the charges made against Aristotelianism with reference to three figures: the physicist Steven Weinberg, the father of Sociology: Auguste Comte, and the theorist of Natural Selection: Charles Darwin. I will try both to rebut such charges against Aristotelian philosophy, and demonstrate where they go wrong in understanding both Aristotle's philosophy and the developments that have supposedly refuted it. Examining these charges will lead the reader through the necessary background for the specific path I will take here: defending Aristotelian Essentialism. Aristotle is nearly synonymous with essentialism, and I believe that his version is well conceived, and unjustly cast aside.

Weinberg, a Nobel Prize winner and best selling author, echoed the aforementioned sentiment about the Aristotelian philosophy and science which existed prior to the Early Modern period. In the forward of his chapter on the scientific revolution in the Early Modern period in "To Explain the World: The Discoveries of Modern Science" he emphasized a sharp distinction between the work done on the natural world before the period and afterwards:

² See: Feser, Edward, comp. *Aristotle on Method and Metaphysics*. Palgrave Macmillan, 2013, for an overview of the work of some contemporary Aristotelian philosophers, and Feser, Edward. *Aristotle's Revenge: the Metaphysical Foundations of Physical and Biological Science*, 2019. One could also see Nancy Cartwright's anti-realism about most laws of nature, and insistence on an Aristotelian ontology, as being in the same vein, though more distant. See: Cartwright, Nancy. *How the Laws of Physics Lie*. Oxford: Oxford University Press, 1983, 19.

With a few bright Greek exceptions, science before the sixteenth century seems to me very different from what I experience in my own work, or what I see in the work of my colleagues. Before the scientific revolution science was suffused with religion and what we now call philosophy, and had not yet worked out its relation to mathematics. In physics and astronomy after the seventeenth century I feel at home. I recognize something very like the science of my own times: the search for mathematically expressed impersonal laws that allow precise predictions of a wide range of phenomena, laws validated by the comparison of these predictions with observation and experiment.³

In Weinberg's view Aristotle's philosophical principles had to be unlearned by later thinkers for Science to emerge.⁴ One example cited by Weinberg is Aristotle's supposed naive acceptance of the appearances of things. Weinberg believes that Aristotle failed to take account of the possibility that things are different from how they seem *prima facie*.⁵ Weinberg dismissed Aristotle's attachment to teleologically robust explanations as a vague and fruitless ascription of "purpose" to all things. This too had to be unlearned. Weinberg concedes that it is perhaps a natural consideration – to ask about purpose – for one deeply interested in zoology, like Aristotle, but a hinderance when considering force and motion. Moreover, with the discovery of Natural Selection, teleological explanations became unnecessary for understanding organisms anyways.⁶

3 Weinberg is directly responding to Thomas Kuhn's "relativism", and Pierre Duhem, who held that there was no discontinuity between Medieval science and Early Modern science. On historical continuity, the 14th century 'Oxford Calculators' demonstrated "that the distance traversed by a uniformly accelerated motion is the same as that traversed by a uniform motion in the same time interval at the mean degree between the two extreme velocities of the first motion," a supposed innovation of Galileo. See: Sylla, Edith Dudley. "The Oxford Calculators' Middle Degree Theorem in Context." *Early Science and Medicine* 15, no. 4–5 (2010): 338–70, 338. and Weinberg, Steven. *To Explain the World: the Discovery of Modern Science*, 2016, 145.

4 Weinberg, Steven 2016, 23.

5 Ibid, 27.

6 Ibid, 24.

Weinberg concludes that Aristotle's approach to understanding the natural world was fundamentally flawed. Unlearning his approach was the key for the progression of human knowledge, and "this progress has been something objective, not just an evolution of fashion. Is it possible to doubt that Newton understood more about motion than Aristotle, or that we understand more than Newton? It never was fruitful to ask what motions are natural, or what is the purpose of this or that physical phenomena". Now, given the successes of modern science, Aristotle's program is beyond saving.⁷

Weinberg's progressivist narrative was held by thinkers who lived far earlier than contemporary scientists like himself. For example, the founder of Sociology – Auguste Comte – had his own progressivist narrative that dismissed the intellectual work done prior to the Early Modern period. This served as the basis for his philosophy of "Positivism".

... when the human mind was astir under the precepts of Bacon, the conceptions of Descartes, and the discoveries of Galileo. Then it was that the spirit of the positive philosophy rose up in opposition to that of the superstitious and scholastic systems that had hitherto obscured the true character of all science. Since that date...no rational mind now doubts that the revolution is destined to go on to its completion – every branch of knowledge being sooner or later brought within the operation of positive philosophy.⁸

Comte was also a believer in the total overcoming of the scholastic past and the triumph of the new science. In his "Course on Positive Philosophy" he outlined his belief in three stages of the human intellect. The stages correspond to intellectual immaturity,

⁷ Weinberg, Steven, 2016, 29-20.

⁸ Comte, Auguste, "Course of Positive Philosophy", "Account of the Aim of This Work; View of the Nature and Importance of the Positive Philosophy", 1842. Taken from: Lenzer, G. (Ed.). (1998). Auguste Comte and Positivism: The Essential Writings (1st ed.). Routledge, 76.

development, and maturity. Comte believed that mankind had reached the final stage of intellectual development, having begun in a childlike theological stage, then having developed into an adolescent metaphysical stage, and then finally having matured into a “positive” stage, which he associated with recent advancements in Science.⁹ Due to the maturation of the human mind, the philosophers' insistence on searching for the causes of phenomena, a causal foundation for the universe, and a teleological end for the universe and its inhabitants was cast aside as fruitless speculation.¹⁰ A totalizing assimilation of all fields of human knowledge into Positivism and the new science was from that point on inevitable.¹¹

As this story goes, prior to philosophers like Aristotle, man would grasp at phenomena by explaining it away with the activity of Gods. Crops failed because of an angry God foiling the crops. Children were born healthy due to their blessings. Explanations were anthropomorphic. This mode of thought reached perfection in monotheism, due to the efficiency of reducing all phenomena to the product of a single explanation – the one true God.¹² What it is to be some thing, where it came from, and what it's purpose was, could all be explained by a singular divine origin.

As Comte saw it, the metaphysics of the pre-scientific philosophers were an innovation based on the explanations given in the first theological stage. They shifted the source of causal power to new explanatory entities, now neutral and abstract, instead of anthropomorphic.

9 Comte, Auguste, 1842, 72.

10 Ibid, 75.

11 Ibid, 81.

12 Ibid, 72.

This mode of thought reached its peak with the idea of a unified 'nature' whose regularities determine all phenomena.¹³ From there the path to the positive stage opened up.

In the final, the positive, state, the mind has given over the vain search after absolute notions, the origin and destination of the universe, and the causes of phenomena, and applies itself to the study of their laws—that is, their invariable relations of succession and resemblance. Reasoning and observation, duly combined, are the means of this knowledge. What is now understood when we speak of an explanation of facts is simply the establishment of a connection between single phenomena and some general facts, the number of which continually diminishes with the progress of science.¹⁴

From there on Positivism and Science would engage in subsuming all knowledge into fewer and fewer laws. The metaphysics of the past and its religious genealogy would fade away in the wake of the increasingly powerful and unified understanding of reality through scientific laws. The third stage, and human intellectual history, would be completed.

Often the best way to defend Aristotle is to reveal that what was being attacked was not him, but a strawman. This can be achieved by explaining what his views actually were. Part One of this thesis will outline Aristotle's general understanding of Science and essences, the causal explanations he gives of things in relation to their essences, and a novel ontological feature of his essences. In the process of doing this I will combat some general philosophical critiques of Aristotle's scientific project, clarify some misconceptions, and defend the general viability of his position.

13 Comte, Auguste, 1842, 72.

14 Ibid.

In Part Two of the thesis I will focus on an important challenge to Aristotelian Essentialism that was mentioned by Weinberg: Darwin's theory of Natural Selection. To many Natural Selection is a standard of coherency for considering the organic world. Due to this, reconciliation, or at least being able to fend off attacks from its vantage point is vital for any position that deals with our understanding of organisms. An inability to survive attacks from Darwinism, even if one skeptical or does not hold it in high prestige, is dialectically fatal. Aristotle's own philosophical method was to confront the popular and respected views of his day with seriousness. He would assume that there must be some truth to be found in them and that one must deeply consider such views when coming to their own.¹⁵ Aristotle would have likely felt the need to situate his beliefs in relation to this prestigious paradigm.

I believe that Aristotelian Essentialism, when applied to species, does cohere with Darwin's theory of Natural Selection. But it is true that Darwin was explicitly against species essentialism as he understood it. He held that abandoning the belief in species essences is a liberating prospect, even if coming to a new and more mature understanding of the artificiality of species will induce some growing pains.

Systematists will be able to pursue their labours as at present; but they will not be incessantly haunted by the shadowy doubt whether this or that form be in essence a species... This may not be a cheering prospect; but we shall at least be freed from the vain search for the undiscovered and undiscoverable essence of the term species.¹⁶

15 Feser, Edward, comp. *Aristotle on Method and Metaphysics*. Palgrave Macmillan, 2013, Shields, Christopher. "The Phenomenological Method in Aristotle's *Metaphysics*", 7-27.

16 Lennox, James, "Darwinism", *The Stanford Encyclopedia of Philosophy* (Fall 2019 Edition), Edward N. Zalta (ed.).

Darwin's belief in the untenability of species essentialism has since been retained by his followers. Aristotle's essentialism, when applied to species, and modern accounts of species which invoke it, or resemble it, take on the role of regressive adversaries of Darwinism and scientific consensus.¹⁷ And to ascribe the practice of giving teleological explanations, the kind so favored by Aristotle, to a modern biologist, is akin to accusing: "an ethologist of anthropomorphism or a philosopher of sophistry."¹⁸

As I will attempt to show, the proposition "if Natural Selection is true then Aristotelian Species Essentialism is false" is false; perhaps more precisely, I will attempt to show that the core principles of Aristotelian Species Essentialism coheres with the core principles of Natural Selection. In order to justify Aristotle's position I will need to provide an account that incorporates evidence he did not have. The Aristotelian cannot afford to ignore cases where the empirical results of the sciences creates tension with their position. However, the best way forward is to 'play it straight', rather than trying too hard to sanitize Aristotle's views so that they will seem familiar and uncontroversial. Rather than cowering and apologizing for the striking differences between his views and assumptions and the views and assumptions of contemporary philosophers, the way forward is with confidence and the persistent championing of the fundamentals of Aristotelian metaphysics. Aristotle may have not conceived of his system as something static that required no further elaboration or alterations,

17 Wilkins, John S. "What Is a Species? Essences and Generation." *Theory in Biosciences = Theorie in Den Biowissenschaften* 129, no. 2 (2010), 143.

18 Ghiselin, Michael T. "Darwin's Language May Seem Teleological, but His Thinking Is Another Matter." *Biology & Philosophy* 9, no. 4 (1994): 489–92, 490.

but if you remove a pillar from the base of a building it is likely that the whole building will fall over. And if one goes too far in the direction of 'saving' Aristotle's views then one may as well just say that they were inspired by him.

As mentioned, my defense of Aristotelian Essentialism will come in two parts. Part One will be on Aristotelian Essentialism in a general context. I will elaborate on just what the position is, and in doing so will also fend off some attacks against it that have less efficacy and importance than the ones rooted in Natural Selection. The elaboration of his views in Part One will be important for what will come next. Then I will move on to a second part. In this part Aristotelian Essentialism will be confronted by Natural Selection. I will then follow with a brief conclusion.

In Part One I will first deal with a deflationary claim set out against Aristotelian Essentialism. Aristotle's understanding of essences evolved out of a work on logic, explanation, epistemology, and scientific pedagogy, the *Posterior Analytics*. It has been claimed that Aristotle's views on essentialism were bound up in logico-linguistic considerations which caused him to confuse mere definitions with the objects of scientific inquiry. I will demonstrate that Aristotle's essences, when applied to things in the world, are neither common definitions, nor discovered by non-empirical means. This will also explain how essences are necessary and exclusive constituents of the kinds they inform. Weinberg's charge of naivete will also be dealt with, as Aristotle's awareness that common observations can lead us astray is highlighted in this work.

Next, I will turn to the kind of causal explanations given by Aristotelian Essentialism. I will expound Aristotle's doctrine of the "four causes", giving special attention to what he calls "final causes", which are teleological. I will emphasize the difference between the natural teleology that Aristotle subscribes to and the divine agent teleology of Intelligent Design theorists, and will point out, contra Comte, that teleology thrived during the Early Modern period. I will also give an argument for why teleology is indispensable to causation in general.

I will then explain how Aristotle's search for what substance is (i.e. the question of what exists most fundamentally) led him to change his belief that it was particulars: trees, rocks, fish, etc that were substances, to believing that essences are. However, Aristotle was, as it is commonly known, firmly against the existence of displaced immaterial universals. He held that substances were neither particulars nor universals, but a third type – dissolving what he took to be a fatal dichotomy. Here I will take aid from one of Aristotle's more idiosyncratic followers: John Duns Scotus – whose treatment of the Problem of Universals helps make more sense of this third kind of entity. This will be important for Part Two. To conclude Part One, I will give a brief elaboration on Aristotelian Essentialism based on the conclusions reached throughout the part.

I will introduce the second part of this thesis by giving more context for the challenges that Natural Selection presents to Aristotelian Essentialism. Following that, I will elaborate on how Aristotle understood the essences of species, and also how the diversification of the

members of species results from the activity of those essences. Then I will contrast Darwin's understanding of species with Aristotle's, and also elaborate on some points of unity between their positions. Then I will move on to three critiques of Species Essentialism from the Darwinist vantage point, and summarize the results of confronting the three critiques.

I will call the first critique of Species Essentialism "The Problem of Intrinsic Variance." Species Essentialism requires that species have some features that are intrinsic to them, found in all of them, and only them. This is untrue of species. I will demonstrate that this is true of species if they are informed by Aristotelian Essences. I will demonstrate how attempts to defeat the claim through appeals to microbiological reductionism are untenable.

I will call the second critique of Species Essentialism "The Problem of the Evolutionary Continuum." The process of evolution entails that species will go through gradual change over time. The boundaries between species and the species that they evolved from are vague. Species Essentialism requires clear cut boundaries between species. So, species essentialism is false. I will demonstrate that gradual change over time is coherent with Aristotelian Essentialism. This will be done by focusing on Aristotle's account of how species members are diversified.

I will call the third critique of Species Essentialism "The Problem of the Superfluousness of Essences." The processes entailed by Natural Selection can explain what species essences are supposed to explain: similarity at the group level. So species essentialism is unnecessary. I will demonstrate that the explanations given of similarity at the group level

through Natural Selection rely on assuming the phenomena that are explained by Aristotelian Essentialism. The upshot of Part Two is that it shows that the proposition “if Natural Selection is true then Aristotelian Essentialism is false” is false.

Part 1: Definition, Explanation and Ontological Status

I begin then with a general orientation of Aristotelian Essentialism, divided into three sections. The first section of this part will focus on methodological, epistemological and linguistic considerations involving Aristotelian Essentialism. In the second section I will focus on the kind of causal explanations Aristotle gives in relation to essences. In the third section I will elaborate on the unique ontological status of Aristotle's essences: that they are neither universals nor particulars. Finally, I will summarize the part in a conclusion, paying special attention to the most important features of Aristotelian essences that are touched upon throughout the part.

Essences and Language in the *Posterior Analytics*

Turning now to Aristotle's conception of Science and the methodology by which he conducts it. Here, I look to his *Posterior Analytics*.¹⁹ For it is in this work that Aristotle seems most guilty of basing his natural science on linguistic grounds rather than empirical ones. I will demonstrate that this is false. I will also briefly respond to Weinberg's charge that Aristotle only considered casual observations as starting points for Science. The picture provided is one of Aristotle merely reciting common beliefs and then theorizing about them, with no awareness that things may be quite different from what they seem to be *prima facie*. Refuting this misconception will help us understand what Aristotle thinks essences are.

¹⁹ APo, ix.

In the first book of the *Posterior Analytics* Aristotle sets out criteria for scientific knowledge. “Science” here entails any sort of system of knowledge – whether it be about living creatures, motion, the heavens, mathematics, etc. The most striking and often decried aspect of Aristotle's conception of Science is that the elaboration of a science should begin with necessary indemonstrable premises. From there, one should deduce from them so to produce scientific demonstrations.²⁰²¹

One important requirement for scientific demonstrations is that they start from premises which feature essential predication. Essential predication can be contrasted with *per accidens* predication and *per se* predication. An example of *per accidens* predication is “turtles are pets”, to be a pet is a property that is accidental to turtles. Not all turtles are pets, and all captive turtles could be freed. In *per se* predication a predicate must hold necessarily of its subject. Propositions like “turtles are cold blooded” are *per se*, since “being cold blooded” is necessary of turtles. But “turtles are cold blooded” is not suitable for scientific demonstrations, because turtles are cold blooded *insofar* as they are reptiles. It is a general feature of reptiles to be cold blooded and turtles are only a sub-division of reptiles. It may be true that turtles are necessarily cold blooded – but this does not grant enough specificity. Essential predication requires that we predicate based on what is necessary *and* unique to turtles. Then, by understanding what is necessary and unique to turtles we can come to

20 APo, x-xi.

21 The premises should also be universal, primary and immediate to the conclusion, better known than the conclusion, prior to the conclusion, and the cause of the conclusion. APo, 1, 71b20-25.

understand the 'what it is to be' – the essence – of turtles.²² Propositions which state what the essences of the things that are investigated by a science are are the starting points of the scientific demonstrations of that science.

What seems dubious is the idea that our scientific conclusions are ones that come about from necessities and are of necessity themselves. From a contemporary viewpoint it seems strange to believe that the fact that the earth revolves around the sun is necessarily so. One can imagine that with enough technical ingenuity we could cause the earth to break free from the sun's orbit and go find another sun to orbit. Nor must the earth revolve around the sun by necessity in order for all of our perceived phenomena of the sun in our sky to be the case. Divine interference could create those appearances without them representing reality. Is this not a fatal error? Jan Łukasiewicz thought so.

...Aristotle developed a logic of universal terms and set forth views on necessity which were, in my opinion, disastrous for philosophy. Propositions which ascribe essential properties to objects are according to him not only factually, but necessarily true... The Aristotelian a priori is analytic, based on definitions, and definitions may occur in any science. Aristotle's example "Man is necessarily a rational animal", based on the definition of "man" as a "two footed animal", belongs to an empirical science. Every science, of course, must have at its disposal an exactly constructed language and for this purpose well-formed definitions are indispensable...but they cannot replace experience. The analytic statement "I am a man" made by a man – analytic because "animal" belongs to the essence of man – conveys no useful information...If we want to know what the "essence" of man is...we cannot rely on the meaning of words but must investigate human individuals themselves...²³

22 Sorabji, Richard. *Necessity, Cause and Blame: Perspectives on Aristotle's Theory*. Ithaca, N.Y.: Cornell University Press, 1980, 188.

23 Taken from Borkowski, L., and J. Słupecki. "The Logical Works of J. Łukasiewicz." *Studia Logica: An International Journal for Symbolic Logic* 8 (1958): 7-56, 32.

It seems that Łukasiewicz takes Aristotle's insistence on Science requiring the deduction from necessary premises as its foundation to imply that it is through *de dicto* necessity that we come to understand the scientific object. Roughly speaking, *de dicto* necessity is linguistic, where *de re* necessity is metaphysically substantive. For example "necessarily all bachelors are unmarried" is true *de dicto*. That is to say, the proposition "all bachelors are married" is necessarily true. If by contrast, we were to try to understand the proposition "all bachelors are unmarried is necessarily true" *de re*, we would end up with nonsense. In the *de re* sense of necessity the proposition would entail some kind of impossibility for actual bachelors to go get married. The fact is, when a bachelor gets married they are no longer a bachelor. The necessity of "all bachelors are unmarried" gives us no new information about bachelors, it is just reiterating a definition.

And the hole that Aristotle digs for himself only seems to deepen under more investigation. Aristotle also describes essences as the 'formulas' of things,²⁴ and he claims that propositions about essences are such that: "...truth or falsity is as follows - contact and assertion are truth...and ignorance is non-contact."²⁵ The essence of some kind cannot be otherwise, since the kind is not what it is without its essence – so the essence is necessary of it. So if you predicate the essence of a kind incorrectly then you have missed the kind; you have failed to 'make contact' with it. The way in which essences are being described as necessary seems similar to the way that propositions such as "no bachelors are married" are necessary.

24 Met., 7, 10, 1035b10-20.

25 Met., 9, 10, 1051b20-30.

The phrase “married bachelor” refers to nothing, and it is impossible for it to. I would be 'missing the mark' if I tried to make a meaningful claim with it.

Bachelors of course, aren't something that someone finds out in nature, being a bachelor is something we ascribe to certain men based on conditions that *we* have decided to specify. One could very well make up a different word specifically for men who have been married exactly three times, and then engage in essential predication about them. This would have nothing to do with nature and everything to do with our linguistic practices. These premises seem like mere definitions.

This line of criticism 'misses the mark' and misinterprets Aristotle badly. He unambiguously states that “[it] is evident that if some perception is wanting, it is necessary for some understanding to be wanting too...”,²⁶ and also makes a distinction between positing some essence and knowing an actual essence. Goat-Stags could have an essential predication formulated of them – but we could only know what the essence of a Goat-Stag is if a Goat-Stag actually existed.²⁷ Furthermore, he holds that one cannot understand things through scientific demonstrations if they do not understand the indemonstrable premises which they are deduced from,²⁸ and is adamant that the premises of scientific demonstrations are arrived at through induction.²⁹ He describes this as the process:

26 APo, 1, 81a35-40.

27 Sorabji, Richard, 1980, 200.

28 APo, 2, 99b20-25.

29 APo, 2, 100b5.

So from perception there comes memory, as we call it, and from memory (when it occurs often in connection with the same thing), experience; for memories that are many in number form a single experience. And from experience, or from the whole universal that has come to rest in the mind...< there comes> a principle of skill and of understanding – of skill if it deals with how things come about, of understanding if it deals with what is the case.³⁰

As Jonathan Barnes points out, Aristotle's indemonstrable premises are the *results* of the data gathering activities of scientists.³¹ The demonstrations come afterwards. Aristotle's demand is that the sciences are to be “expounded in formal axiomatized systems”.³² This is the role that the demonstrations play in our knowledge. As Łukasiewicz admits: all sciences need clear definitions and a systematic means to utilize them, and Aristotle's is no different in this regard. Aristotle *does* hold an empirical basis for the premises of scientific demonstration.

Of course once an essence has been discovered, and through that essence we come to a precise definition through essential predication, then that definition will be *de dicto*. But that is because the definition is the essence's linguistic representation, not the thing itself. It is this that allows it to be an appropriate starting point for scientific demonstrations, which require necessary premises, and not just premises that posit necessities. And it does so in a way that still refers to necessary features of things that are discovered through induction. Aristotle's methodological constraints are based on informing our language about what the subjects of the sciences are really like. From one kind of necessity derives the other.

30 APo, 2, 100a5-10.

31 APo, X.

32 APo, XI.

One may recall Weinberg's claim that Aristotle based his science on casual observations.³³ Aristotle's views are believed to be faulty due to intrinsic problems with the methodology he used so to understand the world. Even if they are based on empirical investigation, if they are mired in a naive belief in the reality of appearances then the Aristotelian program is doomed to failure. After all, essentialism seems very 'common'. If you asked a random person on the the street if there really is something intrinsic about turtles that allows us to classify them all as turtles and exclude frogs from the group, the answer would most likely be "yes", without too much deliberation. Essentialism has an air of naivete to it, and it may seem to merely be the position that the categories that appear to us pre-scientifically are real, and that attempting to reduce these appearances into more occult entities, such as atoms, genes, etc removes something vital from our ontology. Essentialism need not reject the unfamiliar theoretical entities of modern mechanistic science, but it seems to at the very least vindicate a pre-scientific understanding of the world.

Yet if we look at Aristotle's examples of definitions for scientific demonstrations, while they may no longer be the most compelling scientific explanations of phenomena, they certainly do not seem obvious or common. Aristotle often used Anaxagoras' definition of thunder as an example: that thunder is the extinction of fire in clouds. Suppose that this is the essence of what it is to be thunder. This is far from obvious – as Comte mentioned earlier, many primitive peoples would likely ascribe to thunder something like "This god is yelling at

³³ Weinberg, Steven, 2016, 27.

us in anger”, or some other purely theological example. The idea of fire existing in clouds itself does not seem obvious to one who has merely seen clouds and has noticed the roar of thunder come from its vicinity. This definition is far from a common or obvious one.

Aristotle states: “What is Thunder? Extinction of fire in cloud. Why does it thunder? Because the fire in the cloud is extinguished.”³⁴ As Aristotle understands it, thunder, *prima facie*, is *that noise* that we repeatedly notice and want an explanation for, and through ascriptions of essence we identify what it is, and by doing so why *that noise*: thunder – is. We begin knowing thunder in only a limited sense, and may go through various stages of misidentification. For example, one may know that the noise we call “thunder” appears alongside clouds, but guess wrong about what is happening with the clouds that causes the noise we hear, such as the rapid expansion of air caused by temperature increases from the lightning that arises from the clouds. Only after more and better investigation may we be enlightened to the truth of Anaxagoras' definition and thereby understand the cause of the noise.³⁵

Aristotle also makes an interesting point about how some propositions may seem to be necessary *de re* as opposed to *de dicto* at first, but turn out not to be. For example, that “blood is necessarily hot”. Aristotle held that it was the substratum that blood was consistently found in that made it seem as if it was hot in itself – such that “blood is hot” would appear to be a necessary feature of blood and part of its essence, and yet was not.³⁶ Richard Sorabji illustrates

34 APo, 2, 93b 5-10.

35 Sorabji, Richard, 1980, 198.

36 Ibid, 203.

the point with an example. Say we call boiling water “H”. We can make a predication like “H is essentially hot” and this would be true of the name “H” but not true of the water itself, which may be boiled or cooled. Now suppose that we only ever knew of water when it was boiled. Sorabji suggests that this is how Aristotle understands blood – which appears to be hot essentially, but is not so. “H” cannot be a contender for an essential predication, as it is not something in itself, it is the water that is. “H” is a name that we give to water due to it being boiled.³⁷ Weinberg's claim that Aristotle did not consider the possibility that things may not actually be as they appear to us *prima facie* is a false one.

Aristotle's Natural Teleology

With scientific demonstrations about essences now behind us I will move on to talking about the way that essences provide causal explanations. For Aristotle essences are not just a means for defining kinds, but also a means for explaining the features of them, as their principle of unity. In the second book of the *Posterior Analytics* Aristotle lays out a diversity of ways that we can understand something: “Since we think we understand when we know the explanation, and there are four explanations (one, what it is to be a thing; one, that if certain things hold it is necessary that this does; another, what initiated the change, and fourth, the aim)...”³⁸

³⁷ While I have decided against putting it in the thesis, I believe that this example can be used to rebut Quine's celebrated “Mathematician-Cyclist” argument against essentialism. See Quine, W. V. *Word and Object*. *Word and Object* New ed. Cambridge, Massachusetts: The MIT Press, 2014, 182-183.

³⁸ APo, 2, 94a20-25.

Later in the *Physics* he revises this schema and introduces what has been come to be known as “the four causes”. Here, Aristotle lists four ways that something can be described as a cause. I have shifted the order of the first two forms of explanation when explaining the causes that evolved from them. There is a material cause, a formal cause, an efficient cause, and a final cause. A striking difference from our common understanding of causation is that for Aristotle causal *relata* are not events. Rather, things are causally affected by other things. Nor are causes necessarily temporally prior to their effects.³⁹ These four causes are also not exclusive causes of effects. Different features of one thing will be explained by different causes.⁴⁰

I will begin with the material cause. The material cause is what things come to be from and persist through: the matter. For humans this will be things like flesh, blood, and bone – and they are the sorts of matter that human beings are specifically made out of, and are necessary for them to exist. However, the same matter can exist in different things at different times. One could take some of my bones and make a statue out of them. In the first case the bones are some of my matter. In the second case they are the matter of the statue.^{41,42}

Aristotle describes the formal cause as the *ordering* done by the essence. It is the way that the essence imbues its structure on things. A formal cause determines how the different

39 Lear, Jonathan. *Aristotle, the Desire to Understand* /. Cambridge, England: Cambridge University Press, 1988, 30.

40 Barnes, Jonathan. *Aristotle*. Oxford: Oxford University Press, 56.

41 Lear, Jonathan, 1988, 28.

42 Jonathan Barnes suggests that “if certain things...” in the list of kinds of explanations. stands for deductive premises. Analogously, the premises are the “matter” of the demonstration. But it still fits as an explanation of the features of objects that come about from actual matter: If men are necessarily made of flesh and bone, and to be made of flesh and bone makes one necessarily mortal, then men are necessarily mortal APo, 215-216.

parts and activities of members of a kind will coalesce so to manifest the essence in the particulars that it informs. When the mind grasps the order of a thing it is due to that thing's essence.⁴³ The bone – the matter of man – also has an order by which we can know it. It also has a material cause itself, and the ordering by formal causes informs matter 'all the way down'. For Aristotle there is no matter itself other than as a concept. All matter has some form informing it.⁴⁴ On its own matter has no explanatory power because form grants matter intelligibility.

Form and matter serve as the basic constituents of objects in the world. Barnes describes them as “structure” and “stuff”.⁴⁵ Through them Aristotle provides an account of change. To be generated is for some composite of form and matter to be granted a new form which destroys the old composite by replacing the form. For example: making a bed out of a tree. To gain a property is for a composite to take on a form which does not alter what it is. For example: Socrates getting a tan. To lose some property is for a composite to lose a form that is not essential to what it is, like Socrates losing his tan.⁴⁶ We should not take the matter to be the 'physical' stuff, and the form to be something 'non-physical'. They are both just complimentary aspects of objects.⁴⁷

Aristotle's efficient cause is most like the contemporary notion of cause. It is the agent *qua* essence acting as a source of a change. When a teacher teaches a student the teacher uses

43 Lear, Jonathan, 1988, 28-29.

44 Ibid, 28.

45 Barnes, Jonathan, 1982, 48.

46 Ibid, 46-47.

47 Ibid, 48.

their ability to pass on wisdom so to induce wisdom in the student. Only by the student learning can the teacher actually be teaching, and only through the ability to teach is a teacher a teacher. It is what the essence of being a teacher is. The teacher changes himself from a state of not teaching to a state of teaching, and by doing so causes change in the student. The teacher passes on some form to the student in the process. An efficient cause either grants a patient a new form, or it may generate something new by taking some existing thing and ordering it so to become something new.⁴⁸

The last way that something can be a cause is by being that which something is directed towards, or either necessary or good for: its *telos(end)*. This is the sense in which a cause is a final cause. The essence orders things towards its realization. By doing so the essence determines what kind of activity will come about so that it may be realized. However, in the case of natural objects, this is not any sort of mental activity, nor a vitalistic force. Aristotle also denies the existence of any sort of divine or intelligent creator of nature who imbues things within it with purpose.⁴⁹ Aristotle believes in natural teleological activity in living and non-living things.

Comte and Weinberg had both identified the rejection of final causation with the rise of early modern mechanical philosophy, what they consider to be the foundation of modern science. However, Ockham and other scholastics had attacked natural teleology several centuries earlier, and it has also been well documented that thinkers like Newton, Boyle,

48 Lear, Jonathan, 1988, 31-32.

49 Lear, Jonathan, 1988, 35.

Gassendi, Leibniz – and many others at the forefront of Early Modern mechanical philosophy agreed that final causes were indispensable features of explanation. Even Descartes, who explicitly rejected final causes, could not help but posit the need for bodies to *seek* compatible states when they collide and contain incompatible modes.⁵⁰

What is distinctive about early modern mechanical philosophy is the primacy of theistic final causes, and the novel intellectual context in which they operate. Where Aristotle's theory was that objects had natural capacities which caused them to tend toward their ends, and the scholastics generally held that they had those capacities due to God's continual sustenance of them, the early modern mechanical philosophers commonly relied on the direct action of God so to direct objects to their ends. This resulted from their tendency to see matter and material objects as intrinsically inert. Laws ordained and executed by God were needed to account for the regularities of nature, since natural objects had no intrinsic ends of their own.⁵¹

In light of this theistic dimension of Early Modern mechanical philosophy, we can see that Comte's progressivist narrative is deeply flawed. He believed that man had progressed

50 Johnson, Monte Ransome. *Aristotle on Teleology*. Oxford: Oxford University Press, 2005, 27-33.

51 See: Osler, Margaret J. "From Immanent Natures to Nature as Artifice: The Reinterpretation of Final Causes in Seventeenth-Century Natural Philosophy." *The Monist* 79, no. 3 (1996): 388–407. Boyle in particular held this exact view. See: MacIntosh, J. J., and Boyle, Robert. *The Excellencies of Robert Boyle*. Peterborough, Ont.: Broadview Press, 2008, 54. Though, as J.J. MacIntosh pointed out to me, there was some dissent: "It is not so decorous in respect of God ... that he should ... set his own hand ... to every work, and immediately do all the meanest and triflingest things himself drudgingly." "However, if God did things immediately "The slow and gradual Process that is in the generation of things ... would seem to be a vain and idle Pomp or trifling Formality ... an Omnipotent Agent would always do its Work infallibly and irresistibly" [John Ray, *The Wisdom of God Manifested in the Works of the Creation* (London, 1691), 32-5, following Ralph Cudworth, *The True Intellectual System of the Universe* (London, 1678, repr. Stuttgart-Bad Cannstatt: Friedrich Frommann Verlag, 1964), 149-150]. (Citation is his)

from a highly theological stage, to a metaphysical stage intrinsically related to theology, and then the rise of modern science and natural laws allowed mankind to dispose of past theological influences in thought. This is the opposite of what actually happened in the case of the development of beliefs about teleology. Aristotle's teleology was the least theological, and the early modern's teleology was the most theological.

It is common to emphasize a dichotomy between the scientific heritage of the modern world and the kind of theistic Intelligent Design arguments made by some creationists. From the Aristotelian perspective these two hostile camps are operating under the same core presumptions. As Edward Feser points out, intelligent design arguments rely on the belief that what we find in the world is so complex and efficiently ordered that it must be the craftwork of some sort of intelligent being. For example, the intelligent design theorist will say that eyeballs are so complex and so “fine tuned” to the function of sight that it is unlikely that they could have come about by mere chance. The greater the complexity and “fine tunedness” of something, the less likely it is that it could have naturally come about. Natural objects with low degrees of complexity usually don't count as evidence – such as fingernails.⁵² The intelligent design theorist is working from a mechanical worldview in which nothing has its ends or any of its properties inherently, they are all contingent according to God's dictates. Everything is an artifact on this view, inert, a material 'mechanism', some temporarily ensouled. These are the same presuppositions that founded modern science.⁵³

52 Feser, Edward (2010). *Teleology: A Shopper's Guide*. *_Philosophia Christi_* 12 (1):142-159, 154.

53 “In the 17th century such arguments flourished. They can be found in every eminent writer of the period, including Boyle and Newton, Leibniz and Locke, and of course, Descartes.” MacIntosh, J. J., and Boyle, Robert,

According to Aristotle final causes apply everywhere, even to the simplest activity. For Aristotle only artifacts, like beds, are generated with a craftsman's mentally determined ends in mind.⁵⁴ Aristotelian teleology differentiates between natural beings and artifacts created by an intelligent agent, and the complexity of the structures involved have nothing to do with it. Aristotelian teleology conceives of all natural beings as having essences and ends intrinsically. We can know those essences and their teleological processes without making any consideration of what, if anything, determined them to be that way. Aristotle's thought is outside of theistic conceptions of inert and necessitated matter versus purposeful immaterial spirit.

To further elaborate I will illustrate a case of natural teleology: lungs enabling breathing so as to allow the person they belong to to take in air. The teleological explanation of why a person has lungs is that it is good or necessary for the person to breathe, and therefore live. We can say that the end of the activity of the lungs is the person breathing, and this explains why humans have lungs. Teleological explanations explain the presence or activity of something by reference to what it is good for, or what it is necessary for. There is also a metaphysical notion of teleological 'directedness'. This is what causes the lungs to act towards their end of breathing, and that lungs are generated in humans so that they can breathe. That this directedness is natural to the lungs is the reason why lungs have a tendency towards acting in ways conducive to breathing, and have a structure that is conducive to

2008, 304.

⁵⁴ Lear, Jonathan, 1988, 40.

breathing.

Some may accuse Aristotle of anthropomorphizing nature according to our understanding of how we as agents affect the world. Aristotle holds that we are the ones imitating nature when directing things towards our desired ends. It is apparent to us that this can be done because in nature we see the realization of natural ends. By understanding that lungs are for breathing we can understand that to imitate lungs we can order matter in a similar way and direct it so to achieve the imitation.⁵⁵

It is now widely thought that natural teleology should be rejected. In line with this view, efficient causation has come to be seen as being identical with causation in general. Here I will attempt to show that efficient causation requires final causation. I will use a thought experiment based on the definition of efficient causation: “the source of a change”. Take a case of efficient causation. And bar any talk of final causation. We will use the more easily simplified and familiar language of events. Although this would work no differently if were we to use Aristotle's more strict ascription of things being causal *relata*.

Here we will use the act of throwing a ball at a bottle and knocking it over. Throwing the ball is the efficient cause of the movement of the bottle. However, at any spatio-temporal point between the throwing of the ball from its beginning to the bottle actually being moved God could obliterate creation and there would be no effect. Even if we were to posit a spatio-temporal chunk directly connected to the bottle being knocked over, we can locate the middle

⁵⁵ Lear, Jonathan, 1988, 40.

point of that chunk so to divide it in half, and God could obliterate creation at that point of the process. This holds no matter how small the chunk. This means that the cause cannot be a cause until the effect actually exists. Simultaneous causation is required for anything more than the possibility of causation.⁵⁶

So, in what sense can the throwing of the ball be the cause of the change? Change entails two states: one in which the effect has taken place, and one in which it has not. The throwing of the ball must be causally relevant in both states so to be a cause of the change. In the first state it's obvious how it is relevant: the force by which the bottle moves comes from the ball's contact, that force was passed on to the bottle in that moment the change took place. But what of the state prior to the effect?

Is it that throwing the ball necessitates the motion of the bottle? No, as we have shown, until the effect comes about there is no actual causation, and therefore there is no necessity of causation before the effect comes about. Is it that throwing the ball was necessary for the motion of the bottle? No, many other things could have caused that motion (though something like it in regards to being able to destabilize the bottle certainly is), and citing something that was merely necessary for an effect to arise does not explain why instead of remaining a mere possibility that that possibility was realized. How about that it was

⁵⁶ This argument was inspired by a slight variation on an argument by Bertrand Russell, in which he proposed that causation is not possible and should be removed from our philosophical systems. He argued that the criterion for causation – that causes be temporally prior to their effects – would entail that no instance of causation could actually occur. He supported this with a variation of the paradox of the line. In a lecture J.J. MacIntosh had pointed out that it could also be used to show that causation required simultaneity. See, Russell, Bertrand. "On The Notion of Cause." In *Mysticism and Logic and Other Essays*. London: Undwin, 1917, 135.

sufficient for the effect? If it were sufficient for the effect then the effect would exist alongside it. And again, that throwing the ball is sufficient to allow for the effect to exist in the future is not enough to explain how we moved from the possibility to the actuality of the effect's realization in this particular case.

The situation becomes even more dire when we consider the predictive power of the proposition "throwing a ball towards a bottle will move it". There are innumerable cases which vindicate it. And we can both reliably identify and predict the kinds of things which would make the proposition false in some instances, such as another person catching the ball, or God destroying his creation before the effect came to be. But what holds for this particular case also holds for every other case in the innumerable set. So, this must all be the result of an improbable accidental regularity. That we can reliably predict this about the world needs an explanation and an accidental regularity does not explain it.

The Aristotelian can explain how it is that throwing the ball at the first state of the change prior to the realization of the effect is causally relevant. It is causally relevant to the effect at that state before it comes about because the throwing of the ball is *directed* towards the realization of that effect: the movement of the bottle. We are justified in treating the realization of the effect as the normal case and identify those things that could stop the effect from coming about as diversions from the norm. This is because the directedness towards the realization of the effect by the cause allows for the realization of the effect to take primacy over cases of failure for the effect to be realized. In this way throwing the ball can actually be

an efficient cause, as the ball is directed from the first state to being the cause at the next state

What holds for one case also holds for the innumerable set of other cases. Our correct predictions are explained by a real causal generality. Of course, in many cases, that there is a directedness to the ball is uncontroversial, like in the cases where people are choosing to knock over the bottle with it. But this argument holds just as well for cases where unchoosing automatons are throwing a ball in the same way, or unintentional spasms of people's arms creates the same kind of motion. The directedness is what is present in the first state that closes the gap with the second one and allows for the change to normally happen in all of those kinds of cases.

The motion of the bottle follows from the motion of an object that was moved towards the bottle, so an objector could argue that no metaphysical teleology is required in these cases due to Newton's Law of Inertia. Newton defines the law like this:

Definition 3: Inherent force of matter is the power of resisting by which every body, so far as it is able, perseveres in its state either of resting or of moving uniformly straight forward .⁵⁷

Law 1: Every body perseveres in its state of being at rest or of moving uniformly straight forward except insofar as it is compelled to change its state by forces impressed.⁵⁸

The Law of Inertia entails that once moved a body will continue to move in a straight line until it is stopped. So, we don't need any sort of teleology to determine why the first state in

⁵⁷ Newton, Isaac. *The Principia: The Authoritative Translation and Guide : Mathematical Principles of Natural Philosophy*, 2016, 404.

⁵⁸ Ibid, 416.

these instances of change are causally relevant. The causal relevance comes from the law which applies to the object in the first state. Once bodies are moved, they will move perpetually in that direction unless they are somehow stopped. Therefore, we can also treat the effect coming about as the default state, since unless it is stopped it will keep moving forward until it hits the water bottle. That neatly explains everything! The problem with this response though is that it requires what it is supposed to explain way. The Law of Inertia is essentialist if taken in naturalistic terms, and teleological whether it is or is not.

It is commonly held that the Law of Inertia makes the Aristotelian Principle of Motion: that that which is moved must have a cause of its motion, defunct.⁵⁹ But how could this be? After all it seems only to state that bodies *will* continue to retain their motion unless acted on by an external force.⁶⁰ The answer is that the continual motion of bodies is the normal state, so an explanation is required for why they stop moving, not why they continue to move. But all this means is that bodies are essentially such that when moved they will be directed towards perpetual motion. In effect, by abstracting out friction and the like, the Law of Inertia holds that bodies are essentially such that they will not cease moving once they are moved. Newton even described it as an “inherent force of matter” to be directed towards sustaining a state of motion once moved in his first definition. This is an essentialist claim about the teleological properties of bodies acting *qua* body.⁶¹ One could claim that instead, it is not the bodies which

59 Feser, Edward, 2013, 384.

60 MacIntosh, J. J., and Boyle, Robert, 2008, 66.

61 For such an eminent hero of the scientific revolution and mechanistic philosophy, Newton seems like a complex case. As J.J. MacIntosh pointed out, there is evidence that in order to come to an account of the coherence of solid bodies he adopted the position that it “ ‘may well be due to “attractive virtues” that decrease

are the source of the direction towards sustaining a state of motion once moved, but rather an external entity like a universal or a divine being. But the most naturalistic position is that it is the bodies we experience moving which do the directing for themselves; that they have essences which cause their teleological activity.

Let's look at another example, someone's falling ill. Their doctor gives them a pill and says that it should make them better. The pill does make them better. When they are asked what made them better they cite taking the pill. So, in what sense can taking the pill be the cause of the change?

Is it that taking the pill necessitates the curing of the illness? No, until they were actually cured there was no effect, and until then the universe could have been destroyed. Likewise, other people had probably taken the pill for the same illness but were not cured. Is it that taking the pill was necessary for curing the illness? Unlikely, usually there is more than just one single thing that can cure an illness, and even if the medicine was necessary they could have taken it through an IV. On top of that, that it was necessary for the curing of the illness doesn't explain why the curing went from being a possibility to really being the case. Was taking the pill sufficient to cure the illness? No, or else the illness would have been cured right there. What grounds did this doctor have for thinking that the patient taking the pill was a good idea? Because the pill was directed towards the curing of the illness. And this

with distance by an inverse power greater than the fourth. These would decrease so rapidly that "great bodies composed of such particles shall not attract one another sensibly" (McMullen 1978, 88)." MacIntosh, J. J., and Boyle, Robert, 2008, 65. The combination of traditional metaphysics and mechanistic considerations is compelling.

works just the same if we don't use a pill for this example, but instead replace it with some herb found in nature.

Aristotle's natural teleology is far from the vague ascription of "purpose" to the natural world that Weinberg supposed. It is neither naive nor anthropomorphic. It is rather a correct understanding of what is necessary for us to account for change through causation. Repeated instances of the same kind of teleological activity gives us explanations of the causal generalities that allow us to make correct predictions about how one kind of thing will affect another. The directedness of natural teleology is a metaphysically basic notion that cannot be reduced to an intelligent being deliberating or some sort of vital force. Through natural teleology, Aristotle's essentialist program thrives, and contributes to a sound understanding of causation. As it has been shown, it is not so easily disposed of, even by the heroes of the scientific revolution. Rejecting natural teleology leads to a radical – and unrealistic – consequence of the impoverishment of our causal knowledge about the world.

Substances and Essences

At this point I will soften my polemical orientation so to make an important clarification about Aristotle's essences. With the explication of Aristotle's understanding of causation and how it factors into his essentialism done, I will go into more detail on what the ontological status of essences are for Aristotle. How essences are explanatory has been elaborated on, but exactly what an essence *is* still has not. What may seem strange to new readers of Aristotle is that for him essences are neither particulars nor universals. This will be

justified. But first, I must explain why it is that for Aristotle essences are the primary ontological units in nature. Or rather, why the mature Aristotle believed them to be so.

Aristotle noticed that many terms are ambiguous. Some are due to sheer homonymity, such as the English “spring”, “rock”, or “right”. However not all terms are ambiguous for this reason. Aristotle considers the term “healthy”. Aristotle is healthy, Aristotle’s glowing complexion suggests his health, and his walking is healthy for him. Walking preserves his health, his complexion is a sign of his health, and he possesses health. Despite the different meanings there is one concept – health – that they are all related to.⁶²

Aristotle noticed that “existence” and “being” are terms just like this. Qualities exist in one way, quantities exist another way, particular objects in another, etc. Aristotle wanted to know what the primary way that something exists is, the one that all other kinds relate to. The things that existed in this primary way is what Aristotle called “substances”.⁶³ Over his continued philosophical practice his views developed – both on the nature of substances and on essences. In his earlier logical works – *The Organon* – the two were distinct, and after his studies into nature and through his mature *Metaphysics* Aristotle came to unify the two and grant ontological primacy to essences.

In the *Categories* Aristotle’s starting definition of “substance” was: “...that which is [not] said of a subject...,”⁶⁴ e.g. the individual man or the individual horse. In this Aristotle is concerned with logico-linguistic considerations, in particular, that of predication. When we

62 Barnes, Jonathan, 1982, 42.

63 Barnes, Jonathan, 1982, 42-43.

64 Cat., 5, 2a11.

say that Socrates is walking or that Socrates got a tan we are talking about some subject: Socrates, and saying something about him. Predicates need something to be predicates of. The individual subject, on the other hand, is not predicated *of* things. We say “ Socrates is a man” but not “Man is a Socrates”. This grants the individual subject its priority over the predicates. Each predicate requires a subject for its existence, but the subject exists even without the predicates, that is why one subject can have one predicate predicated of it at one time and a contrary one predicated of it at another. So the individual subject is the primary thing: substance.⁶⁵

It is possible that even the considerations about explanation and demonstration found in the *Posterior Analytics* were not meant to directly cohere with the *Categories*, but rather were written after the fact, as Aristotle thought more deeply about knowledge and the world. If Aristotle had to consider terms like substance and essence again later in life, after conceiving of the structure of the sciences in the *Posterior Analytics*, and then attempting to come to scientific knowledge of nature in his later works, his more ontologically robust essentialism that I am defending may have required changing up formerly held views. So what is Aristotle's reason for the change? It is because he had come to a greater understanding of what those particular objects in the world were, and in doing so he found that they were not explanatorily basic, but had explanations themselves.⁶⁶

65 Cat., 5, 2a19.

66 Lear, Jonathan, 1988, 271.

I will follow Jonathan Lear's interpretation of the following topic. As mentioned: in order to come to an account of change in the *Physics* Aristotle had come to see particular beings: cats, cups, clams, etc as composites of form and matter. These correspond to the formal and material causes mentioned earlier. Form is the definable content that makes the thing what it is, the matter is the substratum by which those forms are realized. If something is made wet from dry, something must remain in existence from being dry to become wet, or else there would just be dryness and then wetness. We can understand the nature of change this way. Through one thing with a form essential to it losing it, and the matter persisting in a new thing with a different form essential to it: we have generation. From something that has a certain form to it having another form it formerly lacked, or from losing a form that is not essential to it: a property change. Or from something losing a form that is essential to it: being destroyed.

This is troubling though. Particulars are now derivative of their ontological foundations: their form and matter. They can no longer be seen as substances. And it seems that the bearer of properties is now matter. When some particular matter takes on a form of humanity, we point to the clump of matter and say that "this is a man". Matter is what we predicate of in that sense, and we don't predicate matter of anything. So an even bigger problem reveals itself: matter itself is not a 'something', in itself it is just substratum, and can only exist due to some form informing it. Yet now it seems as if it must be substance, which

must exist in an underived manner.⁶⁷ He would solve this dilemma in the *Metaphysics*.

Aristotle holds that the world is intelligible. And if the world is intelligible then whatever is ontologically fundamental to the world is intelligible as well. This means that whatever substance is, it should be definable. He also retained the condition that substance must be something that exists in an underived manner. It should not be something that only exists in a subordinate manner to something, like being white. Whatever is fundamental to reality cannot be something that relies on something else for its existence.⁶⁸ But essences are both what are definable and thus intelligible, and something that exists in virtue of itself, as an essence is the 'what it is to be' of each thing. Both metaphysically and epistemologically everything else relies on essences.⁶⁹

So essences are substances, but are they universals or particulars? Essences can't be particulars because you can't define a particular. For example: the sun. Say we retained geocentrism and defined the sun as "the hottest celestial body which rotates around the earth." Even if the sun was no longer in our orbit it would still be the sun. Even if some other celestial body took its place that body would not therefore be the sun.⁷⁰ But essences can't be universals either, because according to Aristotle universals are just concepts which we predicate of concepts of particulars. So they cannot have an underived existence.⁷¹ Aristotle's solution to his dilemma – that essences cannot be universals nor particulars – is that essences

67 Lear, Jonathan, 1988, 271.

68 Ibid, 273.

69 Ibid, 275.

70 Ibid, 288.

71 Ibid, 284.

are neither universals nor particulars.⁷²

So to clarify this subtle distinction I am going to divert from Aristotle himself and utilize an explication of this by one of his Medieval followers: John Duns Scotus, known as “The Subtle Doctor”. Scotus is often seen as a champion of realism about universals, but this is overstated. While an opponent of nominalism, Scotus believes in “Common Natures” which are conceived of as universals by the mind, but are neither universal nor particular in themselves. I find Scotus' treatment of the issue concise and easily intelligible. As far as I can tell this explication requires no modification of Aristotle's own position on what essences are.

Scotus has us consider Socrates, Plato, and a line. All three are distinct from one another as singular discreet particulars. In this they are also indistinct from themselves. Scotus calls this a “numerical” mode of distinction and unity. However, there is also a way in which Socrates is more similar to Plato than the line. Socrates and Plato are indistinct from one another according to their humanity, the essence that informs them. In this both are distinct from the line to the same degree, which has its own distinct essence informing it. Scotus claims, correctly, that the indistinction of Socrates and Plato must be of a non-numerical sort if it is to be at all. So the essence must be a non-numerical unity.⁷³

If there is an indistinction that holds then this implies that there is a distinction that exceeds the limits of the indistinction, just as a definition implies that there is something

⁷² Lear, Jonathan, 1988, 286.

⁷³ Duns Scotus, John, (*Ordinatio II, dist. iii, pt.1 qu1*). Taken from: Bosley, Richard N., and Martin M. Tweedale. *Basic Issues in Medieval Philosophy: Selected Readings Presenting the Interactive Discourses among the Major Figures*. 2nd ed. Peterborough, Ont.: Broadview Press, 2006. 375.

which does not fit the definition. Therefore the existence of non-numerical unities implies the possibility of non-numerical distinctions. Scotus holds that Socrates is distinct from humanity in a non-numerical manner. Scotus calls this a “formal distinction”. He contrasts this with what he calls a “real distinction”. A real distinction is one in which if something is separated from another at least one of the two still exists. For example: Socrates is really distinct from his tan. But because the common nature of humanity is not something that Socrates or Plato could lose while still existing, while we can correctly abstract out their humanity mentally it is not something that is really distinct from them. Socrates and Plato are both formally distinct from their essence, which is really indistinct – as a unity – from itself. This allows the two to be distinct from one another as particulars while sharing a common essence.⁷⁴

Scotus holds that universals are numerically singular concepts that we predicate of groups of disparate individuals so to account for their commonality in our thoughts and language. After a mind experiences some particulars with a shared essence it abstracts out their shared essence so to create the numerically singular universal concept. Scotus is only a ‘realist’ about universals in the sense that he locates the commonality that allows us to engage in universal predication successfully in the essences of things. Unlike many realists he does not believe that essences exist as immaterial ideal versions of things in the world.⁷⁵

Though Aristotle does not have as elaborate of an account of how it works, Scotus' position coheres with his: that essences are neither particulars nor universals. Exceeding the

⁷⁴ Bates, Todd Christopher. *“Duns Scotus and the Problem of Universals.”* ProQuest Dissertations Publishing, 2003, 70.

⁷⁵ Duns Scotus, John, 377.

universal/particular dichotomy in our ontology gives us the metaphysical grounds for utilizing the required universal premises in scientific demonstrations without the difficulties of positing the existence of real universals. Essences need not be universals, nor particulars. They can be like universals in their generality without being either separate from particulars or identical with particulars. Essences are an aspect of those particulars that allow us to unify them as a kind in our thoughts, and are intrinsic constituents of them.

The formal distinction between particulars and their essences also leads to an important clarification. It may seem like in cases of efficient causation that it would be the essence – rather than the individual insofar as they are informed by the essence – that was doing the causing. However, Aristotle emphasizes that: “The universal causes, then, of which we spoke do not exist. For the individual is the source of individuals. For while human is the cause of human universally, there is no universal human here, but here Peleus [is] the cause of Achilles, and your father of you...”⁷⁶ It is the father *qua* his indistinction from the essence of humanity by which he generates human offspring. It is vital that we understand Aristotle on his own terms, and he does not view essences as beings really distinct from the particulars informed by them.

From these considerations we come to our basic understanding of Aristotelian Essences: they are (1) the most fundamental kinds of beings. (2) neither particulars nor universals. (3) constituents of every member of a kind and only that kind, such that no

76 Met., 12, 5, 1071a19-24.

member of the kind could be what it is if the essence was not a constituent of it. Furthermore, they (4) causally affect members of a kind, and so are suitable explanations of their characteristics, (5) account for the kind's teleological activity, and (6) allow for definitions of the kind.

Through this elaboration I have shown that Łukasiewicz's argument against Aristotelian Essentialism relies on a misunderstanding of what it is. Through this and my vindication of the teleological foundation of Aristotle's understanding of nature, I believe that I have also shown that two of the charges put against Aristotle in the introduction of this thesis are misguided. Weinberg's claim that Aristotle was fundamentally naive is far overstated, and Comte's belief that metaphysical theories like Aristotle's have been definitively superseded by non-teleological science is far from evident, both metaphysically and historically. Now we move on to a greater challenge for Aristotelian Essentialism: Darwin's theory of Natural Selection.

Part 2: Generation, Species, and Telos

If there is any subject matter that would seem to be well fitted for some kind of teleological essentialism, it would be the parts and behaviors of organisms. Why do giraffes have long necks? So they can eat from tall trees. Why do birds have wings? So they can fly. Why do tigers have fangs? So they can eat other animals. Birds also engage in migration, which requires flight, which requires wings. Nature is full of examples of groups with members with similar parts and behaviours that are good for them or necessary for them. Different kinds of organisms are diversified from one another in this way as well. Fish don't need wings for their activities, but they do need fins. Different kinds of organisms develop and act in ways that seem to contribute to achieving certain ends. And they do so in ways that repeat consistently across large groupings of organisms, who tend to live and reproduce together. The systematic goal directed unity present in different kinds of organisms seems to demand for the teleological orientation of nature that Aristotle believes in.

Yet, due to Darwin's pioneering theory of Natural Selection, Aristotle's teleological essentialism is said to belong in the dustbin of history. Darwin's theory of Natural Selection explains what species are and how they behave without recourse to Aristotelian essences, or any kind of essences at all. Furthermore, Darwin's theory is believed to entail that species cannot be defined according to anything intrinsic to each member, and that grouping individuals into strictly divided species is at odds with the process of Natural Selection. Nor

does Natural Selection utilize teleology for explanations of this diversity.⁷⁷ So Aristotelian Essentialism, when applied to species, is either totally untenable, or at least outmoded by Darwinian explanations.

An example of this view is found in the *Stanford Encyclopedia of Philosophy* entry on species: “Since Aristotle, species have been paradigmatic examples of natural kinds with essences...Darwinism offers a different view of species. Species are the result of speciation. No qualitative feature—morphological, genetic, or behavioral—is considered essential for membership in a species...”⁷⁸ In the remainder of the thesis I aim to establish that Aristotelian Species Essentialism can survive this Darwinist challenge.

I will first establish the specific way that Aristotle applied essentialism to the organic world, and will focus on his account of individuation among species members just as much as his account of the essential unity of the members of a species. I will then briefly investigate Darwin’s theory of Natural Selection so to situate him in relationship to Aristotle’s views on the organic world. This will reveal that the two positions share some striking similarities.

Then I will defend Aristotelian Species Essentialism from three species of arguments against Species Essentialism in general. The first I will call “The Problem of Intrinsic Variance”: Species Essentialism requires that there is something intrinsic to species that allows us to cleanly differentiate them from other species. There is nothing of the sort to be found in actual species. The second problem I will call “ The Problem of the Evolutionary

⁷⁷ Ghiselin, Michael T, 1994.

⁷⁸ Ereshefsky, Marc, "Species", *The Stanford Encyclopedia of Philosophy* (Fall 2017 Edition), Edward N. Zalta (ed.).

Continuum”: through evolution species gradually change over time and eventually become new species. This means that is impossible to select a non-arbitrary point on the continuum of generations so to cleanly differentiate one species from another. The third problem I will call “The Superfluosity of Essences ”: Biologists use Darwinian explanations to explain what Species Essentialism is used to explain. So species Essentialism should not be adopted. I will show that these critiques are not successful if applied to Aristotelian Species Essentialism.

Aristotle on Species and their Members ⁷⁹

Aristotle's understanding of the essences of species is not chiefly concerned with strict logical definitions of taxonomic types. Rather, Aristotle was concerned with uncovering causal generalities that underlie what is necessary for developmental and functional types.⁸⁰ In the course of doing this he relaxed the requirements of essential predication as they had been articulated in the *Posterior Analytics*. Rather than defining organic species according to a necessary genus and a necessary *differentia*, Aristotle instead determines what a species is by first attempting to divide groups of organisms out from one another according to sets of

⁷⁹ One way Aristotle did get things wrong was in believing that species are fixed. Devin Henry explains that Aristotle likely did not understand that environments could drastically change. The reason for this is that in Aristotle's cosmology, a perpetual thorn in the side of those sympathetic to him, the motions of the heavenly bodies determine what environments on earth are like. Aristotle believed that these motions are perpetual and unchanging. So although, as I will demonstrate, Aristotle did understand that organisms are affected by their environments, and even understood in relation to them, the fixity of the environment would entail the fixity of the species. Given that cosmological revision is clearly required for a contemporary follower of Aristotle, due to the evidence we now have of heliocentrism, so as long as it plays no important role in his essentialist theory about the organisms themselves, his essentialism should not be threatened by this change. Henry, Devin. “Aristotle on the Mechanism of Inheritance.” *Journal of the History of Biology* 39, no. 3 (2006): 454-455.

⁸⁰ Richards, Richard A. “The Transformation of Aristotle.” Chapter. In *The Species Problem: A Philosophical Analysis*, 17–48. Cambridge Studies in Philosophy and Biology. Cambridge: Cambridge University Press, 2010, 27.

differentia. What differentiates species from one another is a shared systematic causal unity in each species that proceeds from the species' essences. The essence of a species is posited as a theoretical entity used to explain the unity shared among the species members, even if the essence manifests itself in complicated and imperfect ways in the members of the species. As Richard A. Richards explains:

Aristotle did not see essences as the basis for species groupings in the modern sense. He saw them as the basis for understanding the functioning, development and flourishing of organisms in environments. Essential properties are necessary for a particular lifestyle in an environment. Accidental properties are not. This is clearly not the property essentialism orthodoxy usually attributed to Aristotle, for it does not involve using his logic of division to arrive at definitions of animal species kinds expressed in terms of their intrinsic properties.⁸¹

Likewise, John Wilkins claims that "species" in the Aristotelian corpus is closer to the generic term *kind*, as opposed to our contemporary taxonomic concept of biological species.⁸² But even with this clarification, Aristotle is still an essentialist about species. His species may not map out onto ours in a clean manner, but he still does posit principles of unity among groups of organisms, which differentiates them from other kinds, and explains their shared features. With this clarification behind us we can begin to understand how Aristotle applied his essentialism to the biological world.⁸³

81 Richards, Richard A, 2010, 28.

82 Wilkins, John S, 2010, 143.

83 As far as I know Aristotle's surviving biological works are dedicated to animals alone. I am assuming that his views on animals are generalizable to all organisms, save ones involving specific features of animals that plants lack.

Underlying his account of the essences of different species is Aristotle's understanding of what is common to all organisms.⁸⁴ Aristotle holds that what is common to all organisms is their engagement in nutrition, self maintenance, and reproduction. These activities are the ends in which a teleological explanation of specific organisms and their activities begins from.⁸⁵ In accordance with this, parts, processes, capacities, and behaviors necessary for the living, growing, and reproducing of the species are the most important in determining a species' essence.

To begin the process of determining what the different species of organisms in nature are, Aristotle divides out groups of organisms according to the general ways in which they differ in parts, processes, capacities, and behaviors important for nutrition, self maintenance, and reproduction, and then increases the specification within those groups so to come to more specific types. So, if we restrict ourselves here to parts for the sake of simplicity, on his method, once one determines a set, like say: beak, feathers, being bipedal, and having wings, they will then notice an analogy of these parts with analogous parts of different species.⁸⁶

...[these kinds] are correctly defined in this way. For those animals that differ by degree and the more and the less have been brought together under one kind, while those that are analogous have been kept apart. I mean, for example, that bird differs from bird by the more or by degree (for one has long feathers, another short feathers), while fish differs from bird by analogy (for what is feather in the one is scale in the other).⁸⁷

84 GA, 2, 734b15-735a5.

85 Johnson, Monte Ransome, 2005, 199.

86 Lennox, James, "Aristotle's Biology", *The Stanford Encyclopedia of Philosophy* (Fall 2021 Edition), Edward N. Zalta (ed.).

87 PA, 1, 644a15-25.

What a bird does with its beak a fish does with its mouth, the role of feathers for birds is the same role that scales in fish have, and so on. Differentiation among the birds is fine, their parts will come in a wide range, all that matters is that they have some sort of parts of the right types for the way birds interact with their environment so to live. We can understand birds through the overall systematic unity of how the parts of birds work together and benefit whole birds.

Sorabji points out that in addition to the parts of the body Aristotle lists other kinds of differentia by which he categorizes organisms, such as (1) activities, including bodily functions, (2) the way of life, e.g. feeding habits, (3) psychological character.⁸⁸ These features of species *generally* work together for the flourishing of the members of the species. For example: a tiger will have sharp fangs, a stomach well suited for digesting meat, will prey on other animals, and will be disposed towards predation. Likewise: the developmental processes normal for the species will be present in younger members of the species for the sake of manifesting the normal state which is found in mature members of the species. The presence of these features working together for the flourishing of the species sets out the way for knowing what the normal state of the species is, as it allows us to determine which features have causal priority.

Not all features found in the normal state of a species are equally important though. Aristotle also includes features that are necessitated – but not necessary – for the species. For

⁸⁸ Sorabji, Richard, 1980, 156.

example: humans, so to be human, require the nutrition of food, and thus a stomach, but the generation of bile in the stomach, while not necessary for the same end, is necessitated by the processes used to reach that end. There are also features which are not necessary for the species, but provide some benefit for the species. Kidneys, while not strictly necessary for humans, are helpful for generating waste, something necessitated due to the nutritive function. There is a priority of explanation that constitutes a chain from the end set out by the essence to the processes needed to achieve that end, to what arises from those processes, or are good for them.⁸⁹

This seems to be a sensible starting point for ensuring that we have the right features for understanding the normal state of a species. After all, the point of Species Essentialism is determining what exactly it is that species share among themselves and differentiates them from other species. Human beings have far more variety in general disposition, or in eye color, than they do in the way they gain nutrition, heal themselves, and engage in reproduction. As far as I know, no humans successfully lay eggs or photosynthesize. Likewise, where my eye color has minimal functional importance for nutrition, maintenance, and reproduction, or even the rest of the less important systems of the body, differing in the nutritive capacity will usually cause many problems to arise when operating with the rest of the systems of the body in day to day activity.

⁸⁹ Johnson, Monte Ransome, 2005, 197-198.

It is true that no species has members all of whom have identical features, but through this analysis of the end directed system that members operate by, we can determine a normal state with sufficient accuracy. From the last chapter we know that Aristotle holds that revision may always be necessary when determining essences. But nevertheless a hierarchy of features by which we can posit a normal state arises without arbitrariness. But how can we know that the eye is for seeing when it could be used for so many other things, as Monte Ramone Johnson points out, like eating or selling? We can do this by figuring out what the specific requirements for some functional activity are, and then see if the eye would be necessary for it. There are many other organs that one could eat or sell. But one would be hard pressed to see without a working eye.⁹⁰

The parts of tigers function in a way that supports the habits of tigers, and those habits allow for the nourishment and maintenance of those parts. The efficient, formal, and material causal generalities that make up what it is to be a tiger are *for* the ends of tigers. The teleological process guides imperfect realization across the multitude of particulars that the essence informs.⁹¹ When a tiger is being generated, its form – the essence – unifies the disparate matter and creates the means for efficient causation during morphological processes so to produce the parts of a tiger that it will use to do as tigers do and eventually produce more tigers.⁹²

90 Johnson, Monte Ransome, 2005, 201.

91 PA, 1, 645b15–40.

92 GA, 4, 778b5-10.

Any feature of the normal state of a species may be absent from some member or another; just as an archer may continually try to hit a bullseye without the arrows all landing in the exact same place. The essence provides a guided structural unity which explains the similarities we can find among species without necessitating any particular feature. Instead, we can infer a real indistinctness among these beings through identifying an imperfect harmony most similar to the imperfect harmony found among others of the species, and between the features found in members of the species, such that they all seem to work together for the member's survival and the perpetuation of the species. Aristotle's organic essentialism is not validated by perfect epistemological delineation, but rather, identifying shared structures through which we can come to a sound causal understanding of the parts and activities of species of organisms. But, a definition of a species will imply that there are organisms that do not fit in with the definition, who will use a different set of features, analogous in function to that set, so to live.

However, Aristotle is also aware that the accidental features of individual organism will require explanations based not only on the essence's formal and teleological activity, but also according to efficient and material causal explanations uniquely applied to the individual. While the essence will determine a normal state with a set range of variation, several sets of material and efficient causes will act on individuals so to manifest members of the species who are diverse within that range. Aristotle gives an example of human eyes. Human beings require eyes, and eyes will be some color or another, which color is fairly

incidental though, and we look at the efficient and material causes for these features in individuals.⁹³

Aristotle also has a theory of generative inheritance. He notices the way that offspring take on features not just normal to the species, but specifically shared by their ancestors. He develops a theory based on the essence's activity and other extrinsic causal features, which together can cover the full range of possible inheritances.⁹⁴

We must lay down as general principles that which we stated just now, for one (viz., that some of the movements are present in <the seminal substance> potentially, others in actuality), and also two others: (a) that which gets mastered departs from type and passes into its opposite; (b) that, however, which relapses passes into the movement next to it in order: if it relapses a little, into the movement which is close by, if more, into that which is further removed.⁹⁵

Contained in semen (or its analogue) are “movements”: powers to bring about a set of formal manifestations, unique to the father who produced the semen.⁹⁶ Contained in the set are not just the means to bring about features found in the father, but also his ancestors, sex, ones natural to the species in general, and ones natural to animals and to organisms in general. Of all these features though, the ones specific to the father are most efficacious, as he is the actual individual engaging in reproduction.⁹⁷ From there, the prominence of influence decreases with the “movements” from each generation going back.⁹⁸ Likewise, the uterus

93 GA, 4, 778a-778b.

94 GA, 4, 769a5-10.

95 GA, 4, 768a5-10.

96 Henry, Devin, 2006 436.

97 GA, 4, 767b30-768a.

98 GA, 4, 768a20-25.

being inseminated also contains powers to manifest traits of the mother and her ancestors, along with the more generic ones aforementioned. The ancestral movements on the mother's side also decrease in prominence the further back you go.⁹⁹

From here the activity of the “movements” result in different ones gaining “mastery” or “relapsing”. It is described like a tool, say a pick, bouncing off its target instead of chipping away at it. “Relapsing” is the cause of an offspring resembling a more distant ancestor rather than the parent. If it “relapses” then the next in the ancestral line takes a shot.¹⁰⁰ However, the powers in the uterus may also end up taking primacy in actual development. Different powers on each side are disjunctive in terms of what they manifest, like say, the father’s nose shape or the mother's.¹⁰¹ In each case of possibly manifested features ,the one that is successful in the process gains “mastery.” Aristotle uses this theory to generate explanations of inheritance like this:

Supposing (3) the movements relapse: if (i) the male “faculty” stands fast but the movement from Socrates relapses into that of his father, then the offspring will be male and take after its grandfather or some other more remote ancestor [according to this principle]; if (ii) the male-faculty gets mastered, the offspring will be female, and usually will take after the mother; but supposing this movement also relapses, it will take after the mother’s mother or some other more remote ancestor on the same principle.¹⁰²

Aristotle also has an account of abnormal cases: for example, a chicken born with four legs and four wings. He also takes environmental factors, like nutrition, into account for

99 GA, 4, 768a35-768b5.

100 GA, 4, 768a10-768a20.

101 GA, 4, 768b5-15.

102 GA, 4, 768a30-768b5.

which powers gain mastery, and also claims that such factors could cause cases of offspring who looked nothing like their parents whatsoever, as failures to gain general mastery on all sides could lead to “ill-assorted parts”.¹⁰³ Defects are accounted for by failures of the formal causes to be realized correctly during the morphological processes. We can always understand how some defect came about through reference to the normal teleological processes of the species' generation. By considering the normal state we can identify how certain efficient and material causes caused the process to go astray.¹⁰⁴ In the case of the eight limbed chicken he explains that:

Of these twin-eggs, those in which the yolks are kept apart by the membrane develop into two separate chicks, and there is nothing extraordinary about them; those in which the yolks are continuous, with nothing to hold them apart, give rise to chicks that are monstrosities: they have one body and one head, but four legs and wings, the reason for which is that the upper parts of the body are formed out of the white and before the rest, the nourishment being dispensed to them from the store in the yolk, whereas the lower part (a) is formed afterwards, (b) its nourishment is uniform and homogeneous.¹⁰⁵

The degree to which the material cause exceeds what is necessary to achieve the ends of the morphological process can also lead to redundancies. Similar to the explanation of the eight limbed chicken, Aristotle explains that during normal generative processes certain kinds, and amounts, of matter will be necessary so to realize certain forms. If there is an excess of the necessary matter then it is possible that an extra redundant part could be formed as well, like developing an extra ear on one side.¹⁰⁶

103 GA, 4, 768b-769a.

104 Johnson, Monte Ransome, 2005, 199.

105 GA, 4, 770a15-25.

106 GA, 4, 772b15-25.

This all demonstrates the level of variability that Aristotle allows within a species' manifestation, and the more sophisticated non-disjunctive understanding of differentiation in comparison to the normal state. Failure to achieve the normal state of an organism comes in degrees, rather than the contrast between normal and abnormal being absolute. The abnormality is an abnormality precisely to the degree that it negatively impacts the chance for the organism to flourish. So in a species the range between the normal and defective terminates at the point where an individual member can't function and dies.¹⁰⁷

Aristotle was aware that organic development is an intricate process. The essence is blind, and directs the processes without any sort of deliberation. Efficient and material causes may not be the main operative forces, but they will heavily influence morphological outcomes through their activity with the formal and final causes. Factors external to the organism in question can cause a large range of disturbances.¹⁰⁸ But the range is constrained by what can be produced from the causal activity inherent to the normal state. Despite the primacy he places on the unity of species through their shared teleological activity, there is still room for a large range of differentiation within the unity prescribed by the essence. Including outright failures to manifest.

What Aristotle's essences explain are the appearance of organic groups with sets of *differentia* that distinguishes them from other groups, and the repeated unity of features found in the members of the groups. Morphological processes are explained teleologically in

107 GA, 4, 770b35-771a15.

108 GA, 4, 767a30-45.

reference to generating the parts which require these processes or are good for them. The parts are explained teleologically in reference to the behaviors which require these parts or they are good for. The individual member's causal efficacy is used to explain how it is that this process is actually directed in them so to realize the end, rather than remaining merely potential.

With Aristotelian Species Essentialism established we can now move on to the patron saint of contemporary biology. Charles Darwin changed biological thinking for good, and for the better. However, we will see that the dichotomy between Darwin and Aristotle found in the common lore is far overstated. We will then engage with three critiques of species essentialism that ought to be damning to Aristotelian Species Essentialism. Each critique has its foundation in post-Darwinian biology, and are telling against the basic presuppositions of species essentialism. I will argue against each one individually and then in a conclusion to this part I will summarize the gains made for Aristotelian Species Essentialism throughout.

Darwin on Teleology and Speciation

Darwin's world was very different than Aristotle's was, and so his perspective was also. Despite this, both noticed that kinds of organisms have features that are beneficial to the kind, and had a desire to explain the origins of these features.¹⁰⁹ Aristotle explains these features through a source of teleological activity intrinsic to the members of the kind: their essences. The environment in which the kind lives provides a set of material and efficient

¹⁰⁹ Darwin, C., 1859, 2.

causes which affects the success of the members of the kind in manifesting their essence. But for Darwin the presence of beneficial traits in the kind is not something intrinsic to them, but rather is provided for by causal mechanisms external to the kind that are found in the kind's environment.

To understand Darwin's views on Aristotle as a biologist, one can look at his letter to William Ogle – who sent Darwin his translation of Aristotle's *Parts of Animals* – in which Darwin is enthusiastic and says:

You must let me thank you for the pleasure which the introduction to the Aristotle book has given me. I have rarely read anything that has interested me more; though I have not read as yet more than a quarter of the book proper. From quotations which I had seen I had a high notion of Aristotle's merits, but I had not the remote notion of what a wonderful man he was. Linnaeus and Cuvier have been my two gods, though in very different ways, but they were mere school-boys to old Aristotle.¹¹⁰

This was not an isolated occurrence. Darwin had praised Aristotle prior to writing this letter based on quotations he had read from the works of others.¹¹¹ However, in fairness, it must be noted that Darwin only seriously engaged with Aristotle well after his ground breaking *Origin of Species* was written, and died only a few months after finally reading some of Aristotle's work directly.¹¹²

Darwin's greatest achievement was his theory of Natural Selection. The principles of Natural Selection explain why it appears that over stretches of great geological time species

110 Gotthelf, Allan. "Darwin on Aristotle." *Journal of the History of Biology* 32, no. 1 (1999): 3-30, 4.

111 Gotthelf, Allan, 1999, 16.

112 Gotthelf, Allan, 1999, 21.

have transformed into other species.¹¹³ In doing so Natural Selection broke with the notion of species being intrinsically and strictly distinct. James Lennox summarizes Natural Selection in nine points:

1. Species are comprised of individuals that vary ever so slightly from each other with respect to their many traits.
2. Species have a *tendency*¹¹⁴ to increase in numbers over generations at a geometric rate.
3. This *tendency* is checked, to use the language of Thomas Malthus' *On the Principle of Population*, by limited resources, disease, predation, and so on, creating a struggle for survival among the members of a species.
4. Some individuals will have variations that give them a slight advantage in this struggle, variations that allow more efficient or better access to resources, greater resistance to disease, greater success at avoiding predation, and so on.
5. These individuals will tend to survive better and leave more offspring.
6. Offspring tend to inherit the variations of their parents.
7. Therefore favorable variations will tend to be passed on more frequently than others and thus be preserved, a tendency Darwin labeled 'Natural Selection'.
8. Over time, especially in a slowly changing environment, this process will cause the character of species to change.
9. Given a long enough period of time, the descendant populations of an ancestor species will differ enough both from it and each other to be classified as different species, a process capable of indefinite iteration. There are, in addition, forces that encourage divergence among descendant populations, and the elimination of intermediate varieties.¹¹⁵

113 Lennox, James, "Darwinism", *The Stanford Encyclopedia of Philosophy* (Fall 2019 Edition), Edward N. Zalta (ed.).

114 Emphasis is mine.

115 Lennox, James, "Darwinism", *The Stanford Encyclopedia of Philosophy* (Fall 2019 Edition), Edward N. Zalta (ed.).

On this picture, organisms are the way they are due to the traits found in some members of their ancestors. Not every member of the ancestor species was able to survive, due to their, and every other species', perpetually increasing numbers necessitating scarcity and intense competition. Those members which had more beneficial traits for survival would pass them on to future generations, and those that had less beneficial traits would die without the chance to. Beneficial traits for survival found in the ancestors explain the proliferation of those traits in the descendants. On this view each individual is not a member of a strictly bound group, but rather just one similar individual who is like others with shared ancestors. The closer the shared ancestor, the more similar the set of traits will generally be between any two.

Take some event in which a species was divided into two groups due to a meteorite striking the earth and making an impassable crater. Despite initially sharing many traits, from this point on the two groups migrated to different locations with different environments and corresponding environmental pressures. Over many years of adaptation to different environments, the two groups will have become differentiated enough so to be considered different species. The traits by which they differ can be explained through the traits of their more direct ancestors who passed on these traits to them. Where they are similar, we can point to the traits of their shared ancestors.

Darwin gives us a means to locate the temporal origins of beneficial traits found in species. Aristotle, on the other hand, attempts to find the source of the beneficial traits by

locating an ontological source of these traits, which directly causes their manifestation in the actual species members: their essence. Aristotle's theory does not tell us anything about the history of a species, and Darwin's theory does not tell us anything about the metaphysics behind how species members actually produce those beneficial features. Under close investigation Darwin and Aristotle do not actually answer the same question.

Nevertheless, there are some striking points of coherence between Darwin's account and Aristotle's. I have emphasized the term "tendency" in the second and third principles of Natural Selection. This is because the picture given by them, perhaps unintentionally so, is the same teleological one that Aristotle emphasized as a baseline for understanding all of the activity of organisms. It is a *given* that organisms will 'strive' to survive and reproduce. This is the normal state of all organisms. Deviation from this intrinsically sourced directed activity is viewed as a deviation from what is generally a given. The language of Natural Selection invokes teleological essentialism on the level of organisms acting *qua* organism.

Darwin emphasizes this many times over. "What checks the *natural tendency* of each species to increase in number is most obscure..."¹¹⁶ "There is no exception to the rule that every organic being *naturally* increases at so high a rate, that if not destroyed, the earth would soon be covered by the progeny of a single pair."¹¹⁷ "In looking at nature, it is most necessary to keep the foregoing considerations always in mind - never to forget that every single organic being around us may be said to be *striving* to the utmost to increase in numbers".¹¹⁸ It

116 Darwin, C., 1859, 50.

117 Darwin, C., 1859, 47-48.

118 Ibid, 49.

is only some external force getting in its way, like predation, competition, or other environmental pressures, which can mitigate this natural directedness. But this is the same picture of a teleological normal state which Aristotle subscribes to.

One could try to reduce this “tendency” mentioned in the principles to a metaphor, or a mere appearance of teleology in nature. But even if it was intended to just be metaphorical, it is taken for granted that organisms are such that they are directed towards continually surviving and procreating. The metaphysical directedness that can be found in Aristotle’s teleology is taken to be a brute fact in the theory of Natural Selection, just like it is with the Law of Inertia. However it was meant to be taken, the theory relies on the propositions that make up the theory. It is this directedness towards survival and unrestrained procreation that ensures that resources will become scarce and that therefore the struggle for survival *will* take place. Natural Selection requires teleology.¹¹⁹

Likewise, Asa Gray praised Darwin for reviving teleology: “Let us recognize Darwin's great service to natural science in bringing back to it teleology: so that instead of morphology versus teleology, we shall have morphology wedded to teleology.”¹²⁰ Darwin's response was: “What you say about teleology pleases me especially and I do not think anyone else has ever noted that”.¹²¹ Gray’s own interpretation of Natural Selection was one in which it was guided by theistic agent teleology. Lennox holds that Darwin was uncomfortable with this

119 This is not to say that a Neo-Darwinian could not revise the theory in some way.

120 Gray, Asa "Scientific Worthies: Charles Darwin," *Nature* 10 (June 4, 1874): 81.

121 Gotthelf, Allan, 1999, 23.

interpretation.¹²² One can see why. Natural Selection shows how the beneficial traits we can find in species need not come about through the purposeful craftsmanship of an intelligent agent who intends to confer what is advantageous. Natural Selection can explain the presence of beneficial features through reference to which ancestors had those beneficial features, and thus were able to live and pass those features on. Natural selection can select 'blindly' while also selecting features that are good for organisms.

Yet, Darwin consistently used the language of "final causes", Aristotle's language, and declined advice from contemporaries to drop the term "selection" from his theory due to its teleological connotations.¹²³ While he may have not been fond of Gray's interpretation of his theory, perhaps he was happy with the idea of his theory having wed morphology to teleology. Allan Gotthelf suggests that Darwin's seemingly positive assessment of teleology as a feature of Natural Selection is due to Natural Selection explaining the presence of features in an organism through reference to those features having been good or necessary for the survival and reproduction of that organism's ancestors. Saying that some feature is present in the average member of a species because it confers beneficial effects to its members is the same kind of teleological explanation that Aristotle gives for features found in the normal state of a species. The difference here is that Darwin's teleology explains the presence of those beneficial features in an organism according to the features' past benefit for distant, or near, efficient causes of the organism's generation: its ancestors.

122 Lennox, James G, 418.

123 Ibid, 410-411.

An example of Darwin's commitment to teleological explanation is found in his explanation of why sexual dimorphism is present in the *Primula Veris*. Lennox points out that Darwin first notes that dimorphism “increases heteromorphic crosses and decreases homomorphic fertilization.”¹²⁴ Next, Darwin points out that of the two, heteromorphic crosses tend to be more fertile and produce more vigorous offspring. It follows then that dimorphism would cause the plants to be favored in the process of natural selection. If there was some divergence in a population of ancestors the dimorphic group may be favored over the non-dimorphic group due to the superior reproductive capacities of the one over the other. Darwin concludes that the explanation for the sexual dimorphism in the *Primula Veris* is due to it facilitating heteromorphic crosses.¹²⁵ As Gotthelf suggested, the presence of some feature in an organism: the dimorphism, is explained by that feature being present in an ancestor and having been good for it in the struggle for survival.

But, where Aristotle locates the directedness of teleology: the metaphysical component, as opposed to just the explanatory component, on the levels of organisms in general and in individual species, Darwin's theory locates it only at the level of organisms in general. More specific features of groups of organisms are necessitated by external efficient and material causes. The process of Natural Selection is not itself teleological, but teleology still has a place in the theory and in explanations given through it. Here Weinberg and his ilk most definitely have it wrong. The theory of Natural Selection did not banish teleology from biology, rather,

124 Lennox, James G, 1993, 418.

125 Ibid, 412-414.

it expanded on it.

Darwin and Aristotle shared a tendency towards teleological explanation. Darwin also has teleological presuppositions at the core of his theory of Natural Selection. Both theories explain the “source of beneficial traits in species” according to different senses of the phrase. The *explanandum* they explain are not the same. And yet Aristotelian Essentialism has become synonymous with a stance on species that Natural Selection supposedly laid to rest. From here I will lay out three major critiques of Species Essentialism from post-Darwinian biology so to see if they really do refute Aristotle's version of Species Essentialism. I believe that they do not. Aristotle's theory remains intact even if one accepts Natural Selection and the accomplishments of post-Darwinian biology.

The Problem of Intrinsic Variance

Species essences allow for the intelligibility of species, and the differentiation of a species from another one through a shared intrinsic invariance. Essences account for what organisms are and what explains their features through this intrinsic invariance. Species Essentialism entails that there is some normal (or “natural”) state for each species. Variation within the species is treated as being accidental. However, modern biology rejects the idea that species are intrinsically unified, and thereby strictly differentiated from other species in this way. As Christopher Austin points out: the necessary invariability in species for Species Essentialism is rejected by both biological consensus and the process of Natural Selection itself.

...not only is it nearly universally agreed upon that the invariability posited by the natural state model is nowhere to be found, it is likewise agreed that such invariability runs counter to the very core of the evolutionary world-view: for the *sine qua non* of the process of natural selection is the existence of a substantial amount of phenotypic and genetic heterogeneity among (purported) members of the same species.¹²⁶

Natural Selection requires that the members of a species will be diverse enough so that some features will be selected and passed on to offspring, and some will not. Significant enough differences so to affect the chances of survival and reproductive success must be present. It is not 'survival of the fittest' - *per se*, but the persistence of some of those features in the members of the species that survived and passed on those features to offspring. With each generation some features will persist, some will be filtered out, and gradual change will occur over a very long stretch of time.

Furthermore, members of closely related species share the vast majority of their genes with one another, and there are no specific genes which can be found in only one species and not others. Also, on average, the members of each species have as much genetic variation, or more, between them than they do with members of different species.¹²⁷ Rather than intrinsic unity among species members, we find intrinsic disunity between them. So how could species have shared essences?

Aristotle holds that it is the whole that determines the parts, and the ends that determine the activities. He points out that teleological activity in the macro world *does* give

126 Austin, Christopher J. "Aristotelian Essentialism: Essence in the Age of Evolution." *Synthese* (Dordrecht) 194, no. 7 (2016): 2539–56, 2542.

127 Okasha, Samir. "Darwinian Metaphysics: Species and the Question of Essentialism." *Synthese* (Dordrecht) 131, no. 2 (2002): 191–213, 197.

us a means to know of distinct species. But an opponent may try to reduce the macroworld teleological activity by which Aristotle differentiates species to sets of features on the microbiological level. At this level the unity found in the macro world would be shown to be illusory, and the variability at the microbiological level to be all there really is. But as John Dupré points out: Aristotle's conception of the causal activity of the whole determining the features of its parts is far from alien to modern biology.

Downward causation seems a very natural way to think of much of what I have been saying about molecular biology. What causes the human genome to behave in a particular way it does – for example, various sequences being transcribed or not at varying rate, changes in confirmation and spatial relation of chromosomes, and so on – is a variety of features dispersed over the surrounding parts of the cell. The behavior of the part is to be explained by appeal to features of the whole.¹²⁸

According to Aristotelian Essentialism, parts, genetic properties, the cells in the body, etc, are not primary for determining the essence of a species. Rather, these things are what the essences of species utilize in order to imperfectly express their systematic teleological unity. Species members will tend to have parts and material structures that are quite similar. However, the differentiation will not come from these features, but rather from the fundamental end directed structure that motivates their presence and activity. This is why we may posit that an individual is still a member of a species even when missing some feature of the species' normal state. This seems well supported by the claim being made about downward causation in biology by Dupré.

¹²⁸ Dupré, John. *Processes of Life Essays in the Philosophy of Biology*. Oxford: Oxford University Press, 2012, 139.

A well documented problem with trying to reduce macroworld teleological activity to features at the microbiological level is that there is no consistent one to one mapping by which traits of an organism at the macro level can be correlated with a set of microbiological features. For example: Genes will correlate with different macro world traits depending on context. On top of that, because that which unifies species in Aristotelian Species Essentialism is a systematic unity of interrelated teleological activities, as opposed to simple descriptions of sufficient and necessary properties or parts, it becomes even less clear how the reduction could be done.¹²⁹ Aristotle provides us with principled reasons why it can't be done with his theory of the four causes. It is because it *is* a systematic unity that determines what species are, as opposed to some conglomeration or heap. When determining what something is one cannot neglect formal and final causes; only focusing on the efficient and material causes.

If the reduction of the macro world teleological activity by which Aristotelian Essentialism differentiates species to sets of microbiological features was possible, then a kind of materialist essentialism would be true. It seems to me, as I will try to show below, that any conceivable way of reducing Aristotelian species essences to sets of microbiological features would require that the conditions needed for essentialism would be present at the microbiological level.

Let's suppose that we have some group of organisms unified in their capacity for some macro world teleological activity. Say that the shared capacity could be reduced to some

129 Feser, Edward. *Aristotle's Revenge: the Metaphysical Foundations of Physical and Biological Science*, 2019, 384.

set of microbiological features present in those organisms. If there was some single set of such features present in the organisms wherever that capacity was present, then our being able to identify that same set of features in the organisms who had that macro world capacity would entail that just as the capacity was shared among the group and was exclusive to that group, so would that set of microbiological features. So a materialist microbiological essentialism would be true.

Now let's suppose that it isn't one set, but at least one of some set of sets of microbiological features by which the reduction can happen. Here, the capacity can be reduced to at least one of them under the right conditions. Then it would be the case that each set of microbiological features within the set would all share in the property of being able to manifest that capacity in an organism. Even if they required different conditions so to do so each one would share a capacity to manifest that appearance. Either way, there would be something shared among the group of organisms and exclusive to those organisms. So a materialist microbiological essentialism would be true.

If species essentialism was true at the level of the macroworld teleological activity, and it was true that that macro world teleological activity was reduceable to some set or set of sets of microbiological features then essentialism would be true at that level as well. Given the difficulty of reducing the invariance at the level of the macro world – which need not be perfectly expressed in every member due to how teleological activity works – the “what it is to be” of an Aristotelian Species Essence is not threatened by this critique.

The Problem of the Evolutionary Continuum

Marc Ereshefsky cites an argument from David Hull. Hull argues that Species Essentialism requires that species are precisely demarcated out from one another so that an essentialist definition can be given to them. When species evolve, one species gradually changes into another one over the course of many generations. Due to the change from one species to another in the process of speciation happening gradually, it is impossible to determine which generation is the one where one species has changed into another. So, no essentialist definition can be given.¹³⁰

Hull refers to an “Aristotelian Definition” in his paper which requires that essences are given definitions through essential predication.¹³¹ As has been shown though, Aristotle relaxes this strict definitional constraint from the *Posterior Analytics* in his biological works. Where the essentialist definition in the *Posterior Analytics* requires a single *differentia* by which we can demarcate out each essence so to define it, Aristotle identifies organic species according to sets of *differentia* which work together teleologically.

This is not enough for Aristotle to escape the charge that the vagueness of the boundaries between species across the evolutionary continuum entails that one cannot come to precise delineations of minutely varying organisms. But here epistemology and metaphysics breaks apart. Aristotle’s understanding of organic species does mean that our knowledge of the boundaries between species will actually be vague in some cases, but that we cannot be sure

¹³⁰ Ereshefsky, Marc, "Species", *The Stanford Encyclopedia of Philosophy* (Fall 2017 Edition), Edward N. Zalta (ed.).

¹³¹ Hull, David L. "THE EFFECT OF ESSENTIALISM ON TAXONOMY – TWO THOUSAND YEARS OF STASIS (I)." *The British Journal for the Philosophy of Science* 15, no. 60 (1965): 314–26, 317–318.

where one begins and one ends does not entail that one does not begin and one does not end.¹³²

If the metaphysical framework of Aristotle's account of species can accommodate evolution, then one can still hold that despite the epistemologically difficult cases, species do exist. But why would one do so? As I argued earlier, teleological capacities are required so to explain cases of efficient causation. Efficient causation is required in order to account for generative and behavioral processes in organisms. Likewise, because we can see one and the same teleological superstructure at work in determining the generation and activity of whole groups of organisms, we need an explanation of what it is that is determining that unity among the groups. If a group are generally the same in this regard – the life functions and reproductive behaviors of the group are organized in the same way such that they can live together and breed together – Aristotelian essences serve as suitable theoretical entities for explaining this.

Aristotle's teleological orientation allows for any particular feature to be absent while the essence is still informing some organism based on the normal state of the species. But it still explains the vast amount of unity in these more vital functions in the members of the species, which do tend to be present. Humans are air breathing mammals. Without technology we would be hard pressed to find living humans without lungs, and it requires science fiction to imagine a human who lays eggs; would it even be humans that we were imagining? Most

132 Feser, Edward, 2019, 405.

importantly, when considering the implications of evolution, the existence of Aristotelian Species Essences is coherent with such a wide range of possible manifestations that gradual change in actual expression should be possible.

Recall that the essence of a species is only formally distinct, not actually separable, from the members of the species. The essence is a constituent of the individual member that allows it to direct itself towards survival and reproduction according to the normal state of the species. It is according to this aspect that the individual is indistinct from other members of the species. The individual *qua* his species' essence is the efficient cause of other individuals. And in the process of inheritance, Aristotle holds that the nearest ancestor is the most efficacious for the outcome. So the features that any given member of a species has will be inherited from a parent, including ones from the normal state of the species, but the individual's unique ones have priority.

Species are differentiated from one another according to sets of analogous features, and are unified among themselves according to "the more or less", so ranges in say – beak sizes – is no issue.¹³³ The essence of a species will have a limited range of variation that may manifest in individuals of the species even when the features of the normal state are present. The offspring of a pig may never have wings, as the morphological features of pigs rule out that some pig could be born with functional wings. It is too incoherent with the normal state of pigs in order for it to come about.¹³⁴ But a more or less concave snout is well within the

133 Henry, Devin, 2006, 454.

134 Feser, Edward, 2019, 406.

range implied by the normal state. On top of this, parts only matter to the species insofar as they can be used for the teleological activity of the species, so any part that can be used sufficiently enough to achieve that end, like nourishment, is well within the range.¹³⁵ And too great of a failure in achieving the normal state will cause death. So the gradualism of evolutionary change is maintained.

To be directed is not to be necessitated. Some individuals of the species will not have some of the normal features. So what the parent passes on to the offspring, along with environmental pressures, may end up influencing them in the direction of failing to manifest normal features as well. The parent's features are the most efficacious influence after all. Inherited 'defects' are possible. The proliferation of these 'defects' could spread to the whole group over time. Due to a change in environment, slight divergences from the norms of the species among a sub-division of the species could cause that sub-division greater success in achieving the ends of the species than those of the species who were more exemplary of the normal state.

So as long as reproduction happens, the proliferation of 'defects', and the more normal examples dying out, is possible, despite the essence still being present. Due to this, the full loss of the normal state can result over time. As generations fall further and further away from their ancestors the features of the normal state can be filtered out and replaced in actuality, until the teleological unities of some generation are oriented around something

¹³⁵ Henry, Devin, 2006, 454.

beyond the limits of the original essence, and a new essence emerges. We can think of it as a gradual remission of the essence's role as a formal cause of the species. Aristotle's species essentialism is consistent with the process of evolution.

The theoretical reasons for positing Aristotelian Species Essences are good ones, and Aristotelian Species Essentialism is consistent with Natural Selection. The vague epistemic boundaries of species does not speak against positing Aristotelian species essences. We can still quite easily distinguish most species from one another. All that is lost is a thoroughgoing intelligibility of the natural world. But given that Aristotle was already willing to modify his program from the *Posterior Analytics* so to accommodate the messy realities of the biological world, this likely would have not been that big of an issue for him. Also, just like his example of blood seeming essentially hot, but turning out not to be so on closer investigation, Aristotle has no qualms with having to revise a definition of just what some essence entails for a species.

The Problem of the Superfluosity of Essences

The final critique of Species Essentialism is that Darwinian explanations make use of factors like ancestry, lineage, gene flow and environmental pressures so to explain both the unity and diversity of life. Species Essentialism contradicts Darwinian biological practice by attempting to explain species through intrinsic similarity instead of through explanations based on the theory of Natural Selection.¹³⁶ Essences are posited so to explain group level

136 Ereshefsky, Marc, "Species", *The Stanford Encyclopedia of Philosophy* (Fall 2017 Edition), Edward N. Zalta (ed.).

behavior, but biologists can do so without recourse to essences. So Species Essentialism should be rejected. Marc Ereshefsky gives an example.

With the advent of evolutionary theory, this kind of explanation of population phenomena is no longer needed. Instead of explaining population phenomena by citing essences and interfering forces, the populationist cites the frequency of traits in the previous generation of a population as well as the evolutionary processes that affect that population. So, for example, the populationist explains the frequency of tall organisms in one generation by citing the frequency of tallness in the previous generation and the occurrence of such processes as selection and mutation. The populationist does not, and need not, make any reference to the natural tendencies of organisms. Citing the gene frequencies of a population has replaced any reference to the natural states of organisms. Hence, population thinking has rendered the essentialist mechanism for explaining population phenomena theoretically superfluous.¹³⁷

While it is true that post-Darwinian biology uses these kinds of explanations in order to explain similarity, these explanations require similarity among organisms to be presumed in the explanation. Just as the theory of Natural Selection, whether it is admitted or not, requires a teleological presupposition in order to guarantee that overpopulation will induce scarcity and thus a struggle for existence, these Darwinian explanations require teleological similarities between organisms for the processes described to happen at all.

Suppose that God wiped out the world as it is now and then created a new one.

However, this world is different from ours in that it is exclusively jungle and some group of animals who are capable of flourishing within said jungle. They were similar in their parts, behaviors, and capacities so to engage with the environment such to induce nourishment and

¹³⁷ Ereshefsky, Marc. *The Poverty of the Linnaean Hierarchy a Philosophical Study of Biological Taxonomy*. Cambridge, U.K.; New York, NY, USA: Cambridge University Press, 2001, 102.

maintenance, which gave many of them a chance to reproduce with one another. They had similar parts among themselves, and complimentary parts between the males and females so that they could breed with one another. However, this was the first generation. None of this first grouping had ancestors. And yet there is nothing wrong with this picture; in which they as a whole group are able to flourish within an environment and reproduce with another. Nor is it problematic that they do so through their similarity to one another and the way that they compliment each other.

Now consider a slightly different creation. This one has the same jungle with a bunch of dissimilar organisms, none of whom had similar enough reproductive parts or capacities so that they could breed with one another. It follows that no next generation was produced, because they did not have similar enough bodies and were such that they were unable to tend towards the right activity so that they could engage in reproduction with each other. This was especially exasperated by them all trying to breed in different ways that were not at all complimentary. There is no possibility of even utilizing the tools in the Darwinist tool chest here. Explanations rooted in Natural Selection are so focused on temporal priority that they miss that ontological priority is what matters more fundamentally.

When giving an explanation of similarity by appealing to ancestry and breeding one hits a limitation. Without some sort of similarity among a group of organisms that allows for reproduction among them, it would follow that no breeding could happen, and with no breeding there is no line of ancestry. Explaining species according to ancestry and breeding is

incomplete. These explanations could compliment the ones given by Aristotelian Species Essentialism, but they can't replace them.

Now let's consider another evolutionary explanation of why the similarity we find among organisms that we call the same species results: the influence of environmental pressures. We can explain the shared features found in some species, for example that they were very good at jumping long distances, and explain this similarity through environmental pressures that were placed on their ancestors. Say we had a group of herbivores who had developed in an environment in which there was little in the case of serious predators. Say they then began to be forced to interact with a group of very vicious carnivores. Those of the herbivores who were better at jumping long distances were more easily able to get away from this new group of carnivores than those who did not. It follows that many of those who could not get away from the carnivores died, where among those who could there was a much higher rate of reproductive success. The greater capacity for long distance jumping was particularly useful because this was a capacity that the group of carnivores by and large did not exemplify themselves.

That the group of herbivores were such that some of them were able to jump so well, or even jump at all, ties into it being the case that the herbivores generally had legs such that they could jump. Likewise, that this group of carnivores were able to be a threat to the whole group of herbivores suggests that there was a similarity there in what kind of capacities the herbivores would have for fending off the carnivores. For example, if it was normal for this

group of herbivores to have skin made of stone it's very possible that these carnivores would not have been an environmental pressure to the group of herbivores. Likewise, that this group of carnivores were a threat in this way could have only be the case if enough of them were similar in what caused them to be such a threat, and, in this case, that they as a group did not tend to exemplify the ability for long distance jumping was also required for that feature to be one that the herbivore species had a high success rate of transferring down the line of generations.

Once again, we can conceive of there being species which had no ancestors and find all those similarities totally conceivable, And even in normal cases, any talk of environmental pressures is going to rely on something intrinsically unified in the pressured and what is applying the pressure at the group level, which itself needs explanation. This explanation of similarity in causal activity which allows for all the phenomena that Natural Selection takes for granted when giving their explanations is best served by Aristotelian Essentialism, as it can explain a general directedness among those similar organisms towards shared features, without relying on the particular manifestation of one feature or another. Being directed towards some end rather than having some end necessitated allows for essences to account for the variability we see in nature through the invariability and natural stability granted by the essences, which explains the real similarities we see as well.

What needs to be explained is the presence of groups of organisms differentiated according to their shared systematic unities of teleological activities. It is agreed upon across

the board that groups tend to manifest certain behaviors that are necessary or good for shared activities, parts that are necessary or good for those behaviours, and morphological processes which are necessary or good for those parts. The Aristotelian can explain this unity among groups in reference to how the essence directs the morphological processes, to generate the parts, so to engage in the behaviours, that are necessary for the activities. And it is this which explains how organisms can reproduce at all.

It may be true that biologists focus on explaining diversity among organisms according to ancestry and environmental pressures, and also that biologists explain the similarities between members of species through relations over that which is intrinsic.¹³⁸ However, explanations of this sort require intrinsic similarities among organisms, such that we can give general accounts of them as groups. For example, that they shared a developmental program that allowed them to be complementary reproductive partners. Such similarities in teleological activity are exactly what Aristotelian Essentialism explains. The intrinsically shared causal foundations posited by Aristotle underlies all cases of organic activity.

138 Ereshefsky, Marc. "What's Wrong with the New Biological Essentialism." *Philosophy of Science* 77, no. 5 (2010): 674–85.

In conclusion: (1) Aristotelian Species Essentialism is just an outflow of explaining and differentiating groups of organisms according to their shared natural teleological activity. (2) Natural Selection is not opposed to Aristotelian Natural Teleology, but presumes it and utilizes teleological explanations. (3) It is not possible to explain away the unified teleological activities of species through the microbiological features and extrinsic processes which contemporary biologists use to give explanations of the activities and features of groups of organisms. (4) Aristotelian Essentialism is coherent with Natural Selection. And finally (5) Aristotelian Essentialism provides an explanation of something required for Darwinistic explanations, but is left unexplained by Darwinistic explanations alone. It follows that “if natural selection is true then Aristotelian Species Essentialism is false” is false.

Aristotle Vindicated: Modern Science and the Question of Essences Revisited

Aristotle was accused of stunting intellectual progress, and his philosophical system was relegated to being either an outmoded artifact, or a dangerous example for contemporary philosophers. Supposedly, the metaphysical systems of old philosophers like Aristotle were barely a step above abandoning explanations of nature to the dictates of divine beings, with its obscure and fruitless postulations of essences and teleology. But the scientists of Europe learned how to ask the right questions, shrugged off their religious baggage, arrived at better theories, and made the views of the old philosophers like Aristotle all but defunct. Finally: Darwin's theory of Natural Selection banished teleology, essences, and Aristotelianism from the natural world once and for all! However, I believe that I have cast sufficient doubt on the validity of this narrative.

What I find particularly pernicious about this narrative is the belief that metaphysics was merely a steppingstone for the flourishing of "mature science". There is no doubt that the sciences have broken off from philosophy and carved out their own admirable approaches to understanding the world. But a science without metaphysical presuppositions is a fiction. In the process of this thesis I have made reference to how two great achievements of modern science which were believed to be paramount in superseding Aristotelianism actually assume its principles: the Law of Inertia and Natural Selection. Both turned out to operate according to teleological and essentialist presuppositions. Metaphysics is irreplaceable, and when it comes to metaphysics, Aristotle *literally* wrote the book.

I attempted to demonstrate that Aristotle's teleology is not reducible to theistic design, and that it is not a misguided ascription of vague "purpose" to the natural world, one which needed to be unlearned for Science to emerge. Indeed, as I pointed out, Divine Agent Teleology played a crucial role in the emergence of the mechanical philosophy that broke with Aristotle's philosophy and paved the way for this very science. All too often this juvenile antagonism against religion by pundits of Science does little to illuminate the origins and accomplishments of the very enterprise they propose to be championing.¹³⁹

Getting back to details, Aristotle's robust theory of Species Essentialism can also be used to explain a large range a variation among members of a species. This allows for it to cohere with the demands of Natural Selection. Aristotle understood the vast range of diversity that can be found in nature, and was a committed gatherer of empirical data just as much as he was a brilliant philosophical thinker. While the book of his dissections has been lost, we can know that he had dissected at least 50 different kinds of animals himself.¹⁴⁰ And the care by which he did it led him to anatomical discoveries that were not rediscovered until the 19th century.¹⁴¹ Georges Cuvier, a God in Darwin's pantheon – of which Aristotle was the final member – wrote of Aristotle the biologist that:

139 More should be said elsewhere about the complimentary connection between Europe's science and its faith.

140 Gotthelf, Allan. *Teleology, First Principles, and Scientific Method in Aristotle's Biology*. Oxford: Oxford University Press, 2012, 374.

141 Barnes, Jonathan, 1982, 10-11.

I cannot read the work [Aristotle's *History of Animals*—the largest of his biological treatises] without being ravished with astonishment. Indeed it is impossible to conceive how a single man was able to collect and compare the multitude of particular facts implied in the numerous general rules and aphorisms contained in this work and of which his predecessors never had any idea.¹⁴²

Like all thinkers who have attempted to grapple with knowing the world, Aristotle did so imperfectly. Nevertheless, he made his attempt in an admirable and exemplary manner. I believe that Aristotelian Philosophy is far from dead, outdated, or wrong headed. In this thesis I have emphasized Aristotle's willingness to change his views upon further reflection and evidence. This suggests that his followers are not meant to take his writings as a static corpus of complete knowledge, and this guarantees the perpetual relevance of his approach. I believe that his Medieval moniker – “The Philosopher” – was well earned. As mentioned earlier, the best way to defend Aristotle is merely to showcase the richness and nuance of his thought. But, even if one is not convinced of any of Aristotle's philosophical views, I hope that I have at least been able to demonstrate some unconsidered merit to be found in them.

142 Taken from: Gotthelf, Allan, 2012, 382.

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