

An Investigation of Justice

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We often hear of people acting in the name of justice, that is, with the belief that their actions are morally good (even if the opposite is true). Justice also commonly describes the upholding of lawful actions in society and the restraining or punishing of those that are unlawful. While it is true that the human condition and its perpetuation relies on certain social interactions, good or bad, justice is often used synonymously with goodness e.g., as an indication that one is law-abiding or contributes to the success of social contracts.

The application of the term *justice* certainly belongs with the relationship between the good and the bad, but determining that justice pertains only to the moral or legal good and injustice only to the moral or legal bad unduly limits the meaning and extension of justice. Justice is not something that requires human intervention, for it can be achieved without human action. It has application beyond human action; it embraces both the natural and the manufactured alike.

If the nature of justice is confounding, nevertheless there is a likeness connecting justice in regard to morality, ethics, and politics with justice in regard to science, i.e., to nature and the knowledge of nature. It is because of this that we are able to speak of a “just remark” or a “just change” (an ad-justment) in the same way that we are able to speak of a just person or action. I propose that justice is an analogous term with diverse applications and a specific focal sense. This focal sense is what organizes and unifies the different types of justice, namely the political and legal, the ethical and moral, the mathematical and the natural and scientific. This focal sense can be determined through the concept of *balance*.

However diverse the application of *justice* may be, the most familiar are judgements of the just and unjust made in formal proceedings, and commonly understood as determinations of

right and wrong but more specifically the good and the bad. What is it about these two, the good and bad, that calls for judgements of justice and injustice? Many would answer “equity” or “equality of result”. They would seem to be of the opinion that justice depends on fairness. Justice understood as fairness or equity (injustice as inequity), suggests that the call for judgements of justice and injustice are rooted in questions of yours? Mine? Ours? If, then, inquiry should begin with what is familiar, this inquiry into justice as balance should begin with the sharpest expression of political justice. If we consider the proposed focal sense of justice to be “balance”, we will see that an equivalency needs to be attained in order for justice to exist.

Political and Legal Justice

In Plato’s dialogue, *Republic*, Glaucon starts as follows:

They say that to do injustice is, by nature, good; to suffer injustice, evil; but that the evil is greater than the good. And so when men have both done and suffered injustice and have had experience of both, not being able to avoid the one and obtain the other, they think that they had better agree among themselves to have neither; hence there arise laws and mutual covenants; and that which is ordained by law is termed by them lawful and just. This they affirm to be the origin and nature of justice; it is a mean or compromise, between the best of all, which is to do injustice and not be punished, and the worst of all, which is to suffer injustice without the power of retaliation; and justice, being at a middle point between the two, is tolerated not as a good, but as the lesser evil, and honored by reason of the inability of men to do injustice. For no man who is worthy to be called man would ever submit to such an agreement if he were able to resist; he would be mad if he did. Such is the received account, Socrates, of the nature and origin of justice. (Plato 255)

This idea of justice being the midpoint of the two extremes of injustice is interesting, but one must not confuse *mid-point* with *balance*. A mid-point can exist on an unbalanced scale, and achieving balance does not depend on a beam’s arms being equidistant from the fulcrum.

Achieving balance in the realm of political justice resembles the difficulties of balancing a scale.

In order for justice to exist in a society, according to Glaucon, a balance needs to be created between acts of injustice and the suffering of injustice.

Now, anyone who participates in a balanced society must act with legal justice, but this means nothing if the system upon which the society is built is already skewed. This means that the foundation of the society, the political regime, must also achieve balance. Only then, does every member of the community, so long as each lives according to the tenets of societal (legal) justice, contribute to achieving and then maintaining a balanced society—thus the equivalency (the balance) required for political justice can be met.

Glaucon believes that justice is not a good and this is the source of his error. Justice must always be a good because learning the good and acting for it are necessary if one man is to be just, as is later argued by Socrates. In the meantime, Adeimantus introduces another idea that reinforces Glaucon's error. He argues that justice is poorly taught: literature fails to maintain the truth of justice, since it teaches that the good is one's advantage. He concludes that the result of this is the notion that justice is good only selfishly, so that it is good only to seem to be just. He believes that this behavior and logic shows why injustice must be better than justice: once you can get away with injustice, that is, can act strictly for your advantage while seeming to be (legally) just. The community's sense of justice will be skewed; though your actions "lean" your way, they *appear* "upright", for it will be impossible to maintain the sense of balance.

After Glaucon and Adeimantus give their accounts of justice, Socrates commends their forthrightness, but goes on to prove that there can be no reasonable way that injustice is better than justice. Socrates observes that justice is "sometimes spoken of as the virtue of an individual, and sometimes as the virtue of the State" (Plato 267). He decides that the inquiry should start

with justice as the virtue of the state because he claims that it is easier to deal with the greater than the lesser and that this is why Glaucon and Adeimantus misperceive justice.

Socrates proposes that a state comes to fruition through the “needs of mankind” (Plato 267). In this discussion of justice, Socrates agrees with Adeimantus that once certain necessities are decided, e.g. food, housing, and clothing, the origin of justice and injustice can be found in the relations of the state’s inhabitants. In order to fully understand these relations and correct Glaucon’s earlier assertions, Socrates introduces the idea of the Republic or the balanced society. He believes that in the Republic, a hierarchy must exist for the society to be good. There are three levels of the hierarchy: the class of the guardians, the class of the soldiers, and the class of the craftsmen. Each of these classes correlates to a different cardinal virtue. The guardians represent wisdom for they protect the laws and the government. Their education and the knowledge that they gain prepare them to be the advisors. They advise “not about any particular thing in the State, but about the whole and consider how a State can best deal with itself and with other States” (Plato 316). After this tier, next are the soldiers.

The soldiers represent the virtue of courage. “The city will be courageous in virtue of a portion of herself which preserves under all circumstances that opinion about the nature of things to be feared and not to be feared in which our legislator educated them; and this is what you term courage” (Plato 317). The soldiers are what make the city resilient. They protect the city in order to keep it functional so that the craftsmen and guardians are able to attend to their duties as members of the Republic. Unlike wisdom and courage, temperance, the third virtue, encompasses the entire city. It “is the ordering or controlling of certain pleasures and desires”

which is essentially moderation (Plato 319). Temperance exists in this balanced city because the guardians and the citizens are in agreement over how the city should be run.

Having located wisdom, courage and temperance, Socrates suggests, the final virtue, justice, can now be identified, for it “is the ultimate cause and condition of [wisdom, courage, and temperance]” (Plato 322). In this section, Socrates argues that justice is the virtue of minding one’s own business, i.e. in the city, justice means that all are doing their jobs whereas injustice is anyone failing to do so. Each virtue has a different role in the success of the city but none would exist without the influence of justice. Socrates calls justice the “ultimate cause and condition” of the other virtues. He does this because each of these virtues relies on the entire community holding themselves responsible for their duties. This balance of work is necessary for a city to be good. Justice is the craftsmen who create the basis of the city—food, housing, and clothing—and agree to be governed under the counsel of the guardians. The role of the soldier is to protect the craftsmen and the guardians so that they can continue in their roles. All of these roles put together embody temperance which has “the nature of harmony and symphony” (Plato 319).

From Socrates’ plan we can understand justice as it relates to politics. The city of guardians, soldiers, and craftsmen is an aristocracy—a partnership in excellence or the good as best. Socrates states that anyone who answers to aristocracy is one to “rightly call just and good” (Plato 431). If we continue with the idea that justice can be exhibited as everyone doing their jobs, then an aristocracy is a just government. The goal of an aristocracy¹ is for individuals to rule themselves as if all were in themselves an aristocracy. This is why Socrates relates the balanced city to the individual: if each behaves in accordance with the laws of an aristocratic

¹ This goal is very similar to the idea posed on page 3 where the idea of a skewed society is introduced.

government, attending to a chosen position, then each fulfills the duties of a balanced member of a balanced society—thus of a true aristocracy, the epitome of a government of balance. Each aspect of the community is doing its part to create a good and just environment. The balance of a government is essential for its success.

Socrates identifies four more types of government, each of which displays an imbalance of power in some way: timocracy, oligarchy, democracy, tyranny. Each type of government described henceforth is an example of Glaucon's misinterpretation of what constitutes a balanced regime.

A timocracy is described as “the government of honor” which harkens back to the Spartan polity² (Plato 431). Socrates says that a timocracy happens when people disobey the rules of the society but also when they have children for illegitimate reasons³. These birth laws were an interesting part of the balanced society, one that was to be enforced by the guardians:

When your guardians are ignorant of the law of births, and unite bride and bridegroom out of season, the children will not be goodly or fortunate... when they come into power as guardians, they will soon be found to fail in taking care of us... (Plato 433).

In a timocratical society, to have children when unnecessary is to disrupt the balance as seen in the aristocratic society by indulging in “certain pleasures and desires” (Plato 319). It is because of these indulgences, Socrates says, that a divide in the community is created between one party whose interests are in making money and having possessions and another party which focuses on philosophy and virtue. This form of government rests on an imbalance of the classes in which the harmony that comes with temperance can no longer exist: thus the regime's inability to attain justice. This regime is particularly founded in the individual not being balanced or just and as a

² An organized society; a state as a political entity

³ The Republic requires children to be born only during certain times and not as a result of the pursuit of pleasure.

result, the regime suffers. So long as the classes are divided in a way that encourages debauchery, an imbalance will always exist, and justice will not be realized.

Suppose this division were to continue, the population of those that want to be self-indulgent will increase and those who strive to be virtuous will diminish. Socrates says that this is how a timocracy turns into an oligarchy, which is a government that rests “on a valuation of property in which the rich have power and the poor man is deprived of it” (Plato 437). It is important to note that in an oligarchy, the poor man does not necessarily move from one party to the other but rather they envy the wealthy so much so that the class of craftsmen will diminish. Everyone will try to do everything, so that each can reap the benefits and profits that each craft can bring; nonetheless, not every individual of a society can be so skilled. As a result, no one will be able to accomplish anything particularly well. Socrates says that this decline results in bad parenting, bad government, and a bad educational system:

And then one, seeing another grow rich, seeks to rival him, and thus the great mass of the citizens become lovers of money... And so they grow richer and richer, and the more they think of making a fortune the less they think of virtue; for when riches and virtue are placed together in the scales of the balance, the one always rises as the other falls (Plato 438).

This passage is a great source of evidence as to why an oligarchy is in no way a balanced form of government. The division of the population has a drastic effect on their interpersonal relationships because it results in the letting go of the class of craftsmen, the class in which Socrates claims justice can be discovered. The continued stress of this regime on the individual, particularly on the poor, will result in a revolt for a new regime: a democracy.

Socrates claims that a democracy is a form of government that results from a rising up of the poor against the oligarchy: the poor cast out the wealthy and implement this new

government. Anyone that remains after this mutiny will be given “an equal share of freedom and power” (Plato 445). The idea of democracy as a way that upholds freedoms so that each can do as he pleases is actually a paradox. A democracy is “a charming form of government, full of variety and disorder, and dispensing a sort of equality to equals and unequals alike” (Plato 447). In the text, Socrates comments that many believe democracy to be the best form of government, but that cannot be true. A man cannot have all of his freedoms if he is living in a society that allows for all of this variety. If you have the freedom to do as you please, you are going to constantly be at war with yourself or overly indulgent. Because the democratic society is based on self-indulgence, Socrates claims, there isn’t a way for a person to rely on a good education in order to succeed. To put this form of government in relation to the truly “best” government, aristocracy, we must understand the role of the classes.

In a democracy, there shouldn’t be classes, namely because each man supposedly has every freedom and therefore need not contribute. This destroys the classes of the aristocracy and thus the connection of the government to the cardinal virtues. The virtue of justice was described as minding one’s business. This description seems similar to the idea of freedom and indulgence that comes with a democratic government, but they are very different. Justice relies on the fact that all members of the society and government agree to act according to certain ends. In a true democracy, there is no accountability that can compare to that of an aristocracy. Each citizen has the freedom to choose ends so as to be a singular regime. In this case, the individual and the government are skewed in terms of their sense of justice. The individual is not balanced because their values are selfish and they have no responsibility to ensure that the government is just either—thus another imbalanced government exists.

The final form of government that Socrates discusses is a tyranny. He says that a tyranny comes into being “when a democracy which is thirsting for freedom has evil cup-bearers presiding over the feast, and has drunk too deeply of the strong wine of freedom, then unless her rulers are very amenable and give plentiful draught, she calls them to account and punishes them, and says that they are cursed oligarchs” (Plato 451). A tyranny expands on this idea of freedoms: freedoms compromise freedom. People will become so overprotective of the idea of their freedoms that they will stop obeying the laws all together. This is anarchy and a society that is in this state cannot function as a good and just city which is the exact goal Socrates sets out to create. A tyranny is another example of a decline from a government that is unbalanced. The tyrant takes away freedoms in order to gain some control but that results in this anarchist society. This result can in no way describe a good and just city and so we can finally conclude and confirm Socrates’ beliefs: a timocracy, an oligarchy, a democracy, and a tyranny are not good and just. An aristocratic government (a balanced government) is the only state in which goodness and justice can exist.

These systems of government are incredibly important in the role of creating a society or social contract, but what’s more is that there is something that we can glean from it: the roles and expectations of man. Socrates talks about how the individual must reflect the aristocratic government in order for the aristocracy to remain intact. The individual will have “the same three principles in his own soul which are found in the state; and he may be rightly described in the same terms, because he is affected in the same manner” (Plato 326). Socrates is saying that in terms of justice, the soul of an individual must mirror that of the state. In this case, that means a soul with three parts. In Socrates’ tripartite soul there are three principles that reflect the aspects

of the State: the rational principle as the class of the guardians, the spirited principle as the class of soldiers, and the concupiscent principle⁴ the class of the craftsmen.

Just as in the state, the three parts of the soul in the individual must work together harmoniously. A temperate soul is one “who has these same elements in friendly harmony, in whom the one ruling principle of reason, and the two subject ones of spirit and desire are equally agreed that reason ought to rule, and do not rebel” (Plato 327). One of Socrates’ arguments continues with the importance of an education. He pays particular attention to the education for the sake of the rational principle and the spirited principle:

And these two, thus nurtured and educated, and having learned truly to know their own functions, will rule over the concupiscent, which in each of us is the largest part of the soul and by nature most insatiable of gain; over this they will keep guard, lest, waxing great and strong with the fullness of bodily pleasures, as they are termed, the concupiscent soul, no longer confined to her own sphere, should attempt to enslave and rule those who are not her natural-born subjects, and overturn the whole life of man (Plato 326).

The rational principle and the spirited principle need to keep the principle of desire in check from indulging in things like possessions and money. If the rational and spirited principles are unable to check and balance this irrationality, then the society outside of the individual will deteriorate and result in any of the four imbalanced and unjust governments that were discussed above. In terms of a just man and a just government or state, the characteristics and expectations of the rulers and subjects are the same. It is for this exact reason that it is so important to discuss the aristocracy as opposed to the other four forms of government. An aristocratic government relies on the idea that it is good and just to mind your business and do what you are supposed to do within the society. Those four unjust and imbalanced governments reflect the disorder that

⁴ Principle of desire

follows if a person's soul is not constructed correctly. If the different parts cannot work together harmoniously then the man cannot be just.

Ethical and Moral Justice

Now that we have explored balance as it should be understood in political justice, we can continue on to investigate the focal sense of justice: balance. We must now look to Aristotle so that we can understand his idea of what the ethics and morality of man should like. It is here that we will be able to determine what it means to have balance as a person.

In his *Nicomachean Ethics*, Aristotle discusses the different kinds of justice. He believed that there are certain goods and excellences that have an absolute form. In this case that means that Aristotle was of the opinion that an absolute form of justice is one that encompasses all of the variations of justice that we struggle to determine. Throughout this text, Aristotle looks for the sense of balance that is common to all types of justice. This investigation will illuminate our understanding of a balanced and just man, but it will also set the groundwork for further investigations of balance when we look towards justice as a function of the sciences. It is here that we will see the univocal nature of our focal sense.

Aristotle's use of categories and absolute terms does not counter this essay's argument but it is not something that requires a lengthy explanation. The goal of this paper is to explain how any and every definition of justice must follow the focal sense, "balance", but this is not the same as having an absolute term. I am not proposing that I have discovered the absolute form of

Justice. In fact, I am saying the opposite. I do not know the absolute form of Justice, but there is a commonality of all of the uses of justice and that is “balance”.

Aristotle’s argument for the meaning of the just relies on the idea of “the intermediate”.

The intermediate is the commonality in Aristotle’s understandings of justice:

Since the unjust man is unequal and the unjust act unequal, it is clear that there is also an intermediate for the unequal. And this is the equal; for in any kind of action in which there is a more and a less there is also what is equal. If, then, the unjust be unequal, the just is equal, as all men suppose it to be, even apart from argument. And since the equal is intermediate, the just will be an intermediate (Aristotle 1131a10).

Just as it was mentioned earlier, the term “intermediate” should not be confused with a midpoint for an intermediate only signifies the balancing nature of justice. Aristotle believes that there are different species of justice: the geometrical, the arithmetical, and the reciprocal. While each of these species are distinguishable, they are all comparable because they all require the same sense of balance. This is an important aspect to our argument because this sense of balance is the very same sense that we have previously investigated.

When discussing the geometrical species of justice, Aristotle emphasizes the idea that the just is a proportion. We learn in geometry that a proportion exists when ratios are the same within a minimum of three terms (Euclid V. Def 6 and 8). According to Aristotle, it is only in continuous proportions that a minimum of three terms is allowed “...for it uses one term as two and mentions it twice” (Aristotle 1131b1). With these definitions and requirements, Aristotle is able to explain how the just is the intermediate:

This, then, is what the just is—the proportional; the unjust is what violates the

proportion. Hence one term becomes too great, the other too small, as indeed happens in practice; for the man who acts unjustly has too much, and the man who is unjustly treated too little, of what is good. In the case of evil the reverse is true; for the lesser evil is reckoned a good comparison with the great evil, since the lesser evil is rather to be chosen than the greater, and what is worthy of choice is good and is worthier of choice is greater good (Aristotle 1131b17).

In this passage, Aristotle is looking at two sets of proportional terms. The first set is as follows:

(A) the man who acts unjustly, (B)⁵ the just, and (C) the man who is unjustly treated. Both (A) and (C) experience injustice because they either receive too much good or too little good.

Because there is unjust treatment in both cases, the term (B) is not an intermediate and therefore the relationship of these three terms is not balanced. It is for this reason that we know that any proportion created with these terms will never be proportional. It is from here that we know that a balanced proportion can only exist so long as the terms are (a) the man who acts justly, (b)⁶ the just, and (c) the man who is justly treated, i.e. $a : b :: c : b$. The man who acts justly directly relates to the just in the same way that the man who is justly treated relates to the just. The value of these terms are the same and (b) is the intermediate term that balances the proportion. The terms (a) and (c) indicate actions taken so that justice is achieved as well as received and this is balance. We must hold onto this concept as our understanding of what Aristotle terms “the intermediate”⁷. This leads us into another one of Aristotle’s species of justice: the reciprocal.

Reciprocity in the realm of justice is somewhat difficult to understand for it leans more towards the idea of fairness rather than balance. Earlier, the idea of “equity” or “equality of

⁵ This is a continuous proportion. The term (B) will be used twice as Aristotle requires.

⁶ This term acts just as the term (B) did; it is used twice so as to satisfy Aristotle’s requirements.

⁷ “The intermediate” holds the same meaning as our focal sense.

result” was introduced as a way to understand why formal judgments in our society are rooted in imbalance. It is from this that we know that the concept of fairness resulted from the basis of an unbalanced society and should not be mistaken as another way of understanding balance.

Aristotle talks about the exchange of goods in this section and how the exchange relies on the equality of the exchange. In order to accomplish an equal exchange, a universal unit is one way in which man can interact with each other, they can barter and trade without the requirement of producing goods so long as they have the universal unit: money. The argument that Aristotle tries to make is that so long as an exchange is equal, it is just. Aristotle believes that the specific unit of exchange is irrelevant so long as the result is a strict quantitative equality:

There must, then, be a unit, and that fixed by agreement (for which reason it is called money); for it is this that makes all things commensurate, since all things are measured by money. Let A be a house, B ten minae, C a bed. A is half of B, if the house is worth five minae or equal to them; the bed, C, is a tenth of B; it is plain, then, how many beds are equal to a house, viz. five. That exchange took place thus because there was money in plain; for it makes no difference whether it is five beds that exchange for a house, or the money value of five beds (Aristotle 1133b20).

The ability to exchange a house for five beds makes sense because it is a balanced and equal exchange, but it also seems to go against the way of trade that we see today with our commercial economy. The way in which we trade as individual consumers requires currency and the interesting part of Aristotle’s argument relies on the idea that trade should allow for more than just currency but equivalent amounts of other products as well. You may be asking yourself, what in the world does the consumer economy have to do with justice (balance)? In this case, nothing. But it has everything to do with injustice (imbalance).

Our society exists on the exchange of goods through the transfer of currency. The economy that Aristotle discusses allows for the exchange of goods with or without money actually being a good. Our way of trade should be considered an injustice according to Aristotle because it requires the rejection of balanced and equal goods. To continue with the above analogy, a man would act unjustly if he refused to trade the house for a payment of five beds and instead required a payment of five minae. It should make “no difference” (Aristotle 1133b27). The refusal of the seller to accept equivalent goods instead of the minae is an unjust action against the buyer. The aspect of injustice in this analogy is the man who has been treated unjustly. This man can be described as such because of the refusal of five beds as payment. We must always remember that according to Aristotle, “it is plain that just action is intermediate between acting unjustly and being unjustly treated; for the one is to have too much and the other to have too little” (Aristotle 1133b30). This analogy embodies the idea of proportionality that was discussed in reference to the geometrical species of justice. We know that the proportion, $A : B :: B : C$ ⁸, is absurd because it is unbalanced. Justice cannot exist in this way for the ratios $A : B$ and $B : C$ are not the same⁹ and therefore this proportion is unbalanced.

Another species of justice that Aristotle talks about is the arithmetical. This type of justice, the transactional kind, most closely resembles that which we follow in judicial proceedings. In this case, the specific act of injustice is not important; instead, it is most important that a balance is met in response. In order to do this, a mediator is required. A

⁸ (A) the man who acts unjustly, (B) the just, and (C) the man who is unjustly treated

⁹ As determined on page 14, terms A and C do not share in the same value where the terms a and c are interchangeable

mediator would be someone who strives to equalize the distribution of suffering and action by means of penalty. Once the parties have been equalized, justice will be met:

Therefore the equal is the intermediate between the greater and the less, but the gain and the loss are respectively greater and less contrary; more of the good and less of the evil are gain, and the contrary is loss; intermediate between them is, as we saw, the equal, which we say is just; therefore corrective justice will be the intermediate between loss and gain. This is why, when people dispute, they take refuge in the judge; and to go to the judge is to go to justice” (Aristotle 1132a14).

Again, we see that justice is an intermediate. Aristotle uses the idea of proportion as a way to help his reader understand the complicated relationship of the balanced and unbalanced. This commonality of justice being the intermediate is yet another piece of evidence supporting the proposal of justice meaning balance.

So far, we have discussed justice as it relates to man. We began with various political systems, each of which are specific human constructs designed to bring a sense of ease and order to our society. From there we ventured into justice through interpersonal relations. This section in particular involves topics that generate the most variant perceptions according to the general public. Aristotle classifies the different species of justice because of these perceptions so that the unification of the types of justice is more easily understood. The arithmetical species of justice most closely resembles what we would see in our society specifically because of our reliance on contracts that require reciprocal or transactional justice. It is most familiar to us because it is the essence of our political justice system. With that being said, the geometrical and the reciprocal species of justice reflect more on our everyday interactions with each other. What we can glean

from this is that justice must be an analogous term considering how much it affects different aspects of our lives. In every part of the analysis thus far, justice has been discussed as it relates to man. Some may say that this is enough, that is this is as far as one can go when discussing justice. Fortunately, they are wrong.

Mathematical Justice

Justice is a term that extends beyond the bounds of human constructs. Because of this, we must explore the natural world. In order to do so, we must look at justice as it relates to the sciences. Mathematics in particular is a science whose purpose is entirely dependent on man's goal of understanding the natural world. We have already determined that justice requires balance and to discuss balance only as it relates to man would be to ignore the totality of justice.

In learning mathematics, we begin with geometry because it exists entirely without numerical values, for it focuses on relationships of angles, lines, shapes etc. One of the most recognizable geometrical propositions is Proposition 47 in Book I of *Euclid's Elements*. Its enunciation is as follows: "In right angled triangles the square on the side subtending the right angle is equal to the squares on the sides containing the right angle" (Euclid I. Prop 47). It is from this proposition that we get the Pythagorean theorem, which can be represented as $a^2 + b^2 = c^2$. This equation is a representation of the relationships of right angled triangles and because of this we can take the equation one step further and make it into a proportion: $a : c :: \text{base} : \text{hypotenuse}$. As we learned with Aristotle, so long as these individual ratios are the same or that

the corresponding values are interchangeable, then we can conclude that proportion is balanced and therefore just. The important thing to take away from this equation is that not only is a balanced proportion identifiable, but an equality is as well. One of the main arguments for this essay is that balance refers to more than just equal parts, it refers also to a proportional relationship. In this case, numerical values are not necessary to understand the relationship.

Any equation where an equality is found is an example of balance and this means that any equation with a proved equality is also an example of justice. As we are taught various forms of math, we are more easily able to recognize equalities. From arithmetic to calculus, mathematics relies on equalities and it is through this characteristic that we are able to see justice as it pertains to mathematics. Aristotle's use of proportion and Euclid's use of proportion are not different. In his text, Aristotle uses proportion as a way to signify equality, which we have already understood to mean balance, and in turn justice. Euclid on the other hand does not comment on the connection between justice and equality. Instead he sets out propositions that embody balance as the natural form of justice.

In Book V of *Euclid's Elements*, Euclid focuses on magnitudes and their relationships. The fact of the matter is that whether one follows Euclid's propositions to the letter or not, the concept of ratios of equality is understood. If magnitude A consists of the magnitudes B and C, we can deduce that $A = B + C$. Taking this one step further, let us say that another magnitude, D, is commensurable with the magnitude A by the unit Z. If Z is half of A and A is half of D, then the relationship of the magnitudes A and D is $A : 2(Z) :: D : 4(Z)$. This proportion tells us that

$D = 2 (A)$, thus it is true that D is commensurable with A . Now it is important to understand the correlation of magnitudes B and C with magnitude D . If $A = B + C$ and $D = 2 (A)$, then it must be true that $D = 2 (B + C)$ and $2 (Z) = 2 (B + C)$. These magnitudes are all proportional in some way and so it is clear that these equations are true and that none represent inequalities. It would be false to claim that anything other than what is displayed above is an example of balanced and equal proportions. Each equation requires either side of the equal sign to be the same in value. These equations are balanced regardless of what comprises either side and so we can then conclude that any equation that is balanced and equal is also just.

Since mathematics is a way for man to understand the natural world, it is necessary to investigate how mathematics works within the bounds of the other sciences so that we can understand justice as it relates to sciences like physics and chemistry. We will first take a look at one of the most important laws of physics: the law of conservation.

In his *Relativity: The Special and General Theory*, Einstein discusses the special theory of relativity as a bridge of classical mechanics and physics to the modern understanding of physics and mechanics:

The most important result of a general character to which the special theory of relativity has led is concerned with the conception of mass. Before the advent of relativity, physics recognized two conservation laws of fundamental importance, namely, the law of conservation of energy and the law of conservation of mass; these two fundamental laws appeared to be quite independent of each other. By means of the theory of relativity they have been united into one law” (Einstein 51).

The reason why the unification of these two laws is so important is because a correlation was discovered in the relationship of energy transfer and mass. When the transfer of energy is involved in an equation, energy can neither be created nor destroyed. In classical mechanics, the minute difference of mass was indiscernible but thanks to more modern technology, it was discovered that the change in energy resulted in a change in mass. This meant that the classical mechanics regarding energy was unbalanced, i.e. it did not result in an equality. The unification of these laws ensures that Einstein's equation for the theory of relativity is in fact balanced. Once again, we can now conclude that this equation is just.

Scientific Justice

Mathematics is the intermediate between the natural world and man. As we discovered with Aristotle, the intermediate is the balanced. If we consider the intense relationship of mathematics and the other sciences, we will find that these other sciences are often built from the foundation that mathematics provides. Hence, it is important that we now look towards the sciences that help us to understand the ways of the natural world. Man cannot corrupt the laws of nature for it "operates not otherwise in the depths of the world than at its surface or in the hands of man" (Berthollet 9). The best way to explore the natural world is to look into the science that most closely resembles nature, i.e. chemistry. Chemistry is a branch of science that imitates nature, for it concerns the study and identification of the world's makeup. Hence, it is the best science to investigate as we need to determine how balance (justice) is represented in nature.

The study of chemistry revolves entirely around the composition of the world. Many natural philosophers spent their entire lives trying to determine what makes up our bodies and the world around us. Once it was determined that everything was made up of varying combinations of elements, the race to discover their natures was on. Charles Louis Berthollet was a French chemist who researched the laws of chemical affinity. The concept of chemical affinity is based in proportion, i.e. the combination of elements must only exist according to some sort of innate balance:

If we find it impossible to make an ounce of nitric acid, an oxide, a sulfide, or a drop of water, in ratios other than those which nature has assigned to them from all eternity, we must again recognize that there is a balance which, subject to the decrees of nature, regulates even in our laboratories the ratios of compounds. And even if some day we should succeed in clearly recognizing the causes which retard or accelerate the action of substance tending to combine, we could only flatter ourselves with knowing one more thing, namely, the means which nature uses to restrict compounds to the ratios in which we find them combined” (Berthollet 9).

We now know, according to the work of past and present chemists, that Berthollet’s assertion that nature assigned a balance to the composition of the world is in fact correct. It is from this that we can also correctly determine that justice is truly more than human constructs. Justice indeed exists in nature.

Chemical compounds are entirely dependent on the nature of the ratios and causes that Berthollet references. In Jons Jacob Berzelius’ *Essay on the Cause of Chemical Proportion*, he proposes that “there is a neutralization of opposing electricities” (Berzelius. 1). This neutralization corresponds to the relationship of electrons¹⁰ as individual atoms combine to create

¹⁰ An electron is the negatively charged particle of an atom

molecules of chemical compounds. In modern chemistry this is known as electronegativity¹¹. Through the development of chemistry, we know that each atom has a limited number of electrons in its make-up. This is incredibly important in our discussion of justice and balance within the natural world. Chemists have worked tirelessly to determine the most basic unit of our world and that is the atom. Each element and chemical we know can be broken down to individual atoms and even further into neutral particles, i.e. neutrons, as well as positively or negatively charged particles, namely protons and electrons, respectively. Because each atom has a specified number of electrons, we know that this characteristic is an innate aspect of any chemical's make-up, thus proving that nature is indeed strict in elemental composition—just as Berthollet proposed. It is from here that we can transition into discussing how chemical compounds are made, i.e. how the natural world exists, which in turn provides our answer as to how balance, as the defining term for justice, can correspond to nature.

One of the most essential chemical compounds necessary to sustain human life is water. One molecule of water is comprised of two hydrogen atoms and one oxygen atom. This is a natural ratio: natural, because the two elements have a specific chemical affinity for each other. Each element has a specific electron configuration. The most important aspect of electron configuration is the quantity of valence¹² electrons an element has. Oxygen has a total of eight electrons but only six valence electrons. This distinction refers to the different shells of an atom, since it is within these shells that electrons orbit around a cluster of protons and neutrons. When

¹¹ “Electronegativity is a measure of the tendency with which an atom in a molecule attracts the electrons in its covalent bonds with other atoms” (McQuarrie 197)

¹² Valence electrons are the electrons that occupy the outermost shell of an atom (McQuarrie 110)

elements combine, they share electrons. This is where electronegativity and chemical affinity come into play: each element demands their outermost shell to be filled completely with the maximum number of electrons. Each shell of an atom has a specific capacity for electrons, e.g. the first shell of any element cannot exceed two electrons and the second shell cannot exceed eight electrons. The outermost shell of an element is where valence electrons can be found.

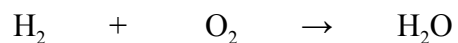
Valence electrons are essential for the stable combination of elements.

Let us take the compound of water, H_2O for example. As mentioned earlier, oxygen only has six valence electrons. This means that in order for an O_2 molecule to make a stable bond with another molecule, the second shell of the oxygen atom must contain eight valence electrons.

Hydrogen on the other hand only has one valence electron because it only has one electron in total. Since we know the composition of a water molecule, we know that each molecule of water has one atom of oxygen and two atoms of hydrogen. In this combination, the hydrogen atoms act as bonding agents. When these two elements combine according to this ratio, water is produced. Since the lowest shell of any element wants to fulfill its capacity of two electrons, the outermost shells of the hydrogen and oxygen atoms are satisfied only if they are in accordance with this 2 : 1 ratio that water requires. These two elements share an affinity for each other which is satisfied by the sharing of these electrons.

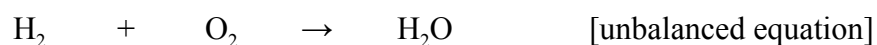
Hydrogen and oxygen are unique because they are diatomic molecules. This means that a single molecule of hydrogen or oxygen is composed of two atoms each, i.e. they can only exist

by themselves as H_2 or O_2 . Since any chemical compound can be represented by an equation, we will discuss the composition of water as such:



As we learned from Aristotle and the mathematicians mentioned above, any equation is only balanced if it exhibits equalities. This is not a balanced equation. Just as we see in every type of mathematics, chemical equations must be balanced. Following from that same line of logic we can also conclude that because this is not a balance equation it is also not just.

A balanced chemical equation requires that each element is represented with the same quantity on either side. In this case on the left side of the arrow, there is one molecule of each element whereas on the right side of the arrow there is one molecule of hydrogen but only one atom of oxygen. Because oxygen is diatomic, we know it cannot exist like this. This requires us to create a new but equal proportion:

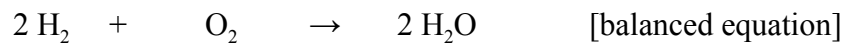


Number of H_2 molecules: 1

Number of H_2 molecules: 1

Number of O_2 molecules: 1

Number of O_2 molecules: $\frac{1}{2}$



Number of H_2 molecules: 2

Number of H_2 molecules: 2

Number of O_2 molecules: 1

Number of O_2 molecules: 1

With the new balanced equation, we now have an equation that conforms to the laws of chemistry as well as to the laws of arithmetic.

Throughout this essay, the concept of justice has been exhibited in many different areas of study, but none were more natural and essential than that of chemistry. Chemistry imitates nature and the fact that justice can be seen in our world's composition just goes to show the all-encompassing nature of justice. In the equation for the composition of water, the balanced equation gives us nature's ratio for water, and it is from this discovery that we know the composition of water has to be H_2O . Nature determines balanced (just) equations for the production of the world's substances.

Throughout this essay, the focal sense of justice, balance, has been represented in a multitude of ways. It was proposed that the univocal meaning of justice could be nothing other than balance. Through an analysis of various political systems and the interpersonal relations regarding morality and ethics, we are able to understand the role that justice plays in direct correlation to man. In order to encompass all that justice extends to, justice's role in the sciences was a necessary step to take. It was in this analysis that we are able to confirm that justice is more than just a human construct. It is something that goes beyond the bounds of man's interference. The sciences that were discussed, namely mathematics, physics and chemistry, are three of the most essential branches of scientific study that help man to understand the natural world. "Justice" must be understood as a term that references more than what man initially

believes and according to every text analyzed in this essay, the only possible meaning of justice must be defined as balance. Balance is the one way in which our society can be just and it is the only way in which the sciences have been and will be understood.

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