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COHERENCE IN SCIENCE AND LAW

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Abstract

A coherence theory of truth states that a proposition is true by virtue of its coherence with a seamless web of propositions. The objective of this paper is to explain the thesis that coherence theories in science and law are prone to manipulation for various agenda. The first part shall discuss three assumptions shared by coherence theories in science: the importance of testing for the compatibility of propositions, their depiction of knowledge as mind and concept-dependent, and the view that the unit of validation in any scientific experiment is never a single hypothesis, but an entire theory. The second shall introduce Ronald Dworkin's theory of adjudication known as Law as Integrity, which states that the law, in being comprised of black-letter rules and the moral principles that figure into their soundest justifications, can be made to "speak with one voice". It shall then be argued that the model of adjudication that is derived from it undermines the objectivity of judges in deciding cases. The final part shall apply the objections to Dworkin's theory to coherence theories in science by demonstrating how they are susceptible to similar forms of manipulation: that scientists may distort the interpretation of scientific evidence, select arbitrary standards of validity, conceal anomalies, and invent rescue hypotheses when their theories fail. The paper concludes by relating these insights to controversies surrounding the interpretation of COVID-19-related data in the Philippines and the government's decision to procure twenty-five million doses of the Sinovac vaccine despite the lack of data pertaining to its safeness and efficacy.

Key Words: *Coherence, Law as Integrity, Adjudication, Sinovac Vaccine, COVID-19 Philippine Infection Rate*

Introduction

On 15 July 2020, Department of Health (DOH) Secretary Francisco Duque III claimed that the Philippines had “successfully flattened” the COVID-19 infection curve,¹ notwithstanding the fact that the cumulative number of confirmed cases would eventually reach ninety-three thousand three hundred fifty-four (93,354) by the end of that month,² more than double the total that had been reported at the end of June, which was thirty-seven thousand five hundred fourteen (37,514).³

On 28 December 2020, Presidential Spokesperson Harry Roque brushed aside criticisms that the Sinovac Biotech Ltd. vaccine that the Philippine government had planned to procure twenty-five million doses of from China was ineffective and unsafe,⁴ never mind that it had barely passed the minimum requirements set by the World Health Organization (WHO),⁵ or that Brazilian health regulators suspended trials of the same vaccine a month prior after one of its volunteer recipients experienced a “serious adverse event” related to his health.⁶

How could two high-ranking government officials issue statements that seemed to defy scientific data and common sense? Surely, they are aware of the importance of relaying accurate information during an unprecedented global health crisis. Let it be assumed, in giving them the benefit of the doubt,

¹ Krissy Aguilar, “DOH: PH flattened its COVID-19 curve since April”, Inquirer.Net, Jul. 15, 2020, <https://newsinfo.inquirer.net/1307150/doh-ph-flattened-its-covid-19-curve-in-april>.

² Neil Arwin Mercado, “PH COVID-19 tally breaches 90k mark as DOH records 4,063 new cases”, Inquirer.Net, Jul. 31, 2020, <https://newsinfo.inquirer.net/1314982/covid-19-cases-breaches-90000-mark-as-doh-records-over-4000-additional-cases>.

³ Darryl John Esguerra, “COVID-19 hits 1,080 more; PH cases soar to 37,514”, Inquirer.Net, Jun. 30, 2020, <https://newsinfo.inquirer.net/1299660/covid-19-hits-1080-more-ph-cases-soar-to-37514>.

⁴ Office of the Presidential Spokesperson, “Press Briefing of Presidential Spokesperson Harry Roque”, PCOO Website, Dec. 28, 2020, <https://pcoo.gov.ph/OPS-content/press-briefing-of-presidential-spokesperson-harry-roque-94/>.

⁵ Darryl John Esguerra, “Sinovac vaccine’s 50% efficacy is acceptable—DOST”, Inquirer.Net, Dec. 24, 2020, <https://newsinfo.inquirer.net/1375560/sinovac-vaccines-50-efficacy-is-acceptable-dost>.

⁶ Nectar Gan, “Brazil suspends trials of China’s Sinovac coronavirus vaccine, citing ‘serious adverse event’”, CNN Philippines, Nov. 10, 2020, <https://cnnphilippines.com/world/2020/11/10/brazil-suspends-china-sinovac-vaccine-trials.html>.

that they genuinely believed that there were sufficient justifications for their claims despite evidence to the contrary. One possible explanation is that Duque defined a flattened curve against a different measure other than what is standardly used, which is the cumulative number of cases. Meanwhile, it is possible that Roque's claim may have rested on an alternative set of facts that did not include the worrying results of Brazil's clinical trials but nevertheless permitted him to conclude that the Sinovac vaccine is safe. Assuming their reasoning proceeded as described, then any strength that their justifications wielded arose not from being supported by direct empirical evidence, but from a seamless web of scientific assumptions that allowed them to logically argue what "successfully flattened" curves and "safe" experimental vaccines are.

The view that defines justification in terms of direct empirical evidence adopts some kind of correspondence theory of truth, while the view that defines it in terms of a seamless web of assumptions adopts some kind of coherence theory. Correspondence theories state that propositions are true because they reflect some state of affairs that constitutes their truth conditions, while coherence theories state that propositions are true by virtue of some related belief or justification.⁷ Correspondence theories are associated with modern science for it is commonly believed that scientific knowledge is attained by means of direct observation of the world. But as it shall be shown, coherence theories of truth have influenced scientists in substantial ways throughout history as well.

The objective of this essay, however, is to argue that coherence theories of truth applied to science are prone to manipulation. That is to say, theories that treat scientific propositions as verifiable against little more than a seamless theory allows scientists with unscrupulous intentions to distort information in a manner that suits them.

To this end, this paper shall be divided into three main parts. Part I shall examine three assumptions that are shared by coherence theories in science. Part II shall take a detour into Ronald Dworkin's theory of adjudication known as Law as Integrity—a coherence theory which states that the law partly consists of moral principles that cohere with its black-letter rules—in order to illustrate how coherence theories, allow judges to define what the law is as they see fit. Part III shall return to the domain of science and apply the insights

⁷ Robert Audi, *Epistemology: A Contemporary Introduction to the Theory of Knowledge*, 3rd Ed. (New York: Routledge, 2011), 216-217.

that will have been gained from Part II. The paper will conclude with a discussion of Duque's and Roque's statements and explain why their handling of their respective controversies has been unsettling.

The Assumptions of Coherence Theories

The assumptions of coherence theories are best understood by way of contrast against those of correspondence theories. It was once a commonly accepted view that objects are reducible to statements about their constituent parts.⁸ It was said, for example, that sentences can be broken down into statements about immediate sense experience. On this view, sentences are true if, and only if, there are perceptual sensations that correspond to the content of the propositions they express.⁹ Hence the classic example that the proposition 'Snow is white' is true if and only if snow is actually white.¹⁰ In similar fashion, any proposition can be linked to a unique range of sensory events and be verified independently of other propositions whose truth conditions are constituted of different events. Moreover, each proposition is true by virtue of an external reality; its validity is not mind or theory-dependent in any way.¹¹ It can be demonstrably proven regardless of an individual's mental state, perspective, and background assumptions.

Scientists who subscribe to a correspondence theory of truth believe that the only propositions that are scientifically true are those that reflect the universe as it is, while the only beliefs that are scientifically justified are those that can be derived from scientifically true propositions. Hence, if knowledge is nothing more than justified true belief,¹² then scientific knowledge consists of the set of justified true scientific beliefs.

⁸ Rudolf Carnap, *The Logical Structure of the World and Pseudoproblems in Philosophy*, Translated by Rolf A. George (Illinois: Open Court, 1967), 6.

⁹ A.J. Ayer, *Language, Truth, and Logic* (New York: Dover Publications, 1952), 35.

¹⁰ Alfred Tarski, "The Semantic Conception of Truth and the Foundations of Semantics", *Philosophy and Phenomenological Research* 4:3 (Mar. 1944), 343.

¹¹ Hilary Putnam, *Mathematics, Matter, and Method* (New York: Cambridge University Press, 1975), 69-70.

¹² Edmund Gettier gave powerful reasons as to why justified true belief does not always amount to knowledge (Edmund Gettier, "Is Justified True Belief Knowledge?" *Analysis* 23: 6, 1963). But for the purposes of this article, this definition of knowledge is satisfactory.

The acquisition of scientific knowledge defined as such proceeds in three stages. The first stage consists of the scientist observing the phenomena under investigation and recording his observations as raw data. The second stage consists of his making inferences, explanations, and hypotheses of the raw data that was collected at the first stage. The third stage consists of an experiment during which he tests his hypotheses, records new observations, and predicts what will occur under different conditions,¹³ all of which can be validated against the raw data that was gathered in the first stage. In summary, the scientist who embraces a correspondence theory of truth represents scientific knowledge as emerging from an inferential line that logically connects a set of empirically verifiable premises to particular conclusions about the phenomenon under investigation.

Several philosophers of science such as Carl Hempel, Otto Neurath, and Pierre Duhem, however, expressed their reservations about using coherence theories as the basis of scientific knowledge. There are three assumptions that are commonly shared by the latter, each of which shall now be discussed.

First, coherence theories characterize scientists as being more concerned with making their hypotheses logically consistent with other scientific propositions rather than with testing them against empirical facts or perceptual sensations. One reason is because several phenomena are not directly observable even with the aid of scientific instruments. Another is that much of scientific theorizing involves scientists only postulating what might be the case or inventing explanations to fill in the gaps of incomplete theories. As suspicious as this sounds, a hypothesis conjured in this manner might be accepted by the scientific community if it either broadens and explains new scientific phenomena or is supported by a pre-existing hypothesis that can validate and deepen in turn.¹⁴

For example, although the physical evidence for quarks—the subatomic particles that combine to form hadrons—was only produced in 1968, their existence was postulated by Murray Gell-man and George Zweig as early as 1964 in order to account for the properties of particles that were discovered in accelerator and cosmic-ray experiments conducted in the

¹³ Moritz Schlick, "The Foundation of Knowledge", 1934, Translated by David Rynin, *Logical Positivism*, Edited by A.J. Ayer (New York: The Free Press, 1959), 220-221.

¹⁴ Paul Thagard, "Coherence, Truth, and the Development of Scientific Knowledge", *Philosophy of Science* 74, (Jan. 2007), 36.

1950s.¹⁵ Their theory was initially received as nothing more than a spurious abstraction of unverifiable entities, but it eventually gained acceptance because it explained how protons and neutrons obtained their mass, intrinsic spin, and electrical charge when no other credible theories were available.

Under a coherence theory, should a singular hypothesis fail to fit with an established body of knowledge, then the hypothesis, not the body, is rejected by the scientist. Throughout history, even the most longstanding and celebrated theories—most notably Ptolemy’s geocentric model of the universe—were abandoned when they were shown to be incompatible with a more coherent set of data that suggested that it was the earth that revolved around the sun and not the other way around, thereby casting doubt on the correspondence theorist’s claim that perceptual sensations can be treated as absolute grounds of knowledge.¹⁶

A second assumption shared by coherence theories is that knowledge is mind and concept-dependent, in contrast with correspondence theories that assume that humans possess an external, God’s Eye View that enables them to perceive reality “as it really is”, a capacity made possible by a correspondence between external objects and sensations that fully exhaust the nature of reference. On the latter view, every time an individual experiences a certain combination of sensations, then there is only one kind of object that could possibly have caused it. The objection of the coherence theorist is that this assumes that the world is exactly as the naked eye sees and that knowledge can be acquired in a manner that is completely detached from conceptual schemes applied by the mind.

For example, assume that a taxonomist has just discovered a new species of animal whose physical properties resemble those of a horse. Its characteristics are collectively referred to as “HA” (Horse Attributes), and they induce perceptual sensations collectively referred to as “HIS” (Horse-Induced Sensations). HIS elicits the response ‘This is a horse’ from anyone who encounters it. The taxonomist may be asked how he knows that animal is a horse if he has never seen it before. He replies that it is by virtue of a causal chain that connects HA with the utterance ‘This is a horse’, such that whatever entity possesses it cannot be anything else but a horse. ‘Know’ is

¹⁵ Bill Carithers and Paul Grannis, “Discovery of the Top Quark”, *Beam Line* 24: 3, (Fall 1995), 6.

¹⁶ Carl G. Hempel, “On the Logical Positivists’ Theory of Truth”, *Analysis* 2: 4, (Jan. 1935), 49-59.

being used in the weak sense, which means that the taxonomist does not preclude the possibility that an important piece of counter-evidence could surface and prove him wrong.¹⁷¹⁸ But it does imply that he is confident enough to claim that he *knows*, not just *believes*, that it is a horse.¹⁹

It is eventually learned that the animal also has an attribute D that cannot be seen by the naked eye and which induces sensation d, a property which no other horse has exhibited and is only known to be possessed by donkeys. This means that the animal possesses a range of attributes other than HA and induces different perceptual sensations than HIS does. Yet the taxonomist dismisses this anomaly and reasons that the possession of HA, even if only as a dominant subset of its attributes, is enough to make it a horse.

The fact that he makes this judgement suggests that he already presupposed some kind of categorial system that identifies which combination of properties is necessary and sufficient for an animal to be a horse. The objection, then, is not that perceptual sensations did not play a role in determining whether the animal is a horse, but that something else did, such as an internal, mind-dependent theory of what a horse is that influenced his conceptualization of the animal even before his actual sensations came into play. On this view, truth is some sort of coherence between one's beliefs and past experiences as they have been represented within his belief system even before a new experience occurred.²⁰

The third assumption shared by coherence theories is that scientific experimentation is neither as straightforward nor logical as correspondence theories describe them to be. That is to say, the acquisition of scientific knowledge is not exhausted by testing a single hypothesis in isolation from a host of other scientific propositions. Rather, in every experiment, there is an indeterminate number of scientific propositions which, in their own ways, contribute towards explaining the phenomenon under investigation but

¹⁷ Norman Malcolm, "Knowledge and Belief", *Knowledge and Belief*, Edited by A. Phillips Griffiths (Oxford: Oxford University Press, 1967), 69-81.

¹⁸ A.D. Woozley (1967) characterized knowledge in an even looser sense by arguing that an individual can "know" something even when he is unsure of it, just as the taxonomist "knew" that the animal was a kind of horse at first sight.

¹⁹ H.A. Prichard provided a sophisticated explanation of the difference between knowing and believing in *Knowledge and Perception* (1950).

²⁰ Hilary Putnam, *Reason, Truth, and History* (Cambridge: Cambridge University Press, 1981), 50.

nonetheless remain incommensurate with each other.²¹ It thus becomes the task of the scientist to sort through the entire bundle of relevant assumptions, hypotheses, and auxiliary propositions so that he can frame and design his experiment in a manner that will help him determine which explanation is really “best”.

This point is better explained by Duhem’s Theory of Holism. Holism has been defined as the view that the unit of validation during a scientific experiment is not just a single hypothesis, but the entire theory—the hypothesis in question, other parts of the theory that support the hypothesis, and other auxiliary hypotheses that are needed for the experiment to be conducted.²² In other words, it is really an entire web of mutually reinforcing assumptions about the conventions, instruments, and laws of science that are put to the test whenever a scientist appears to be testing a single hypothesis. For example, the hypothesis in an experiment on thermodynamics would depend on what is currently known about heat, velocity, energy, radiation, and the properties of matter. But even this knowledge depends on what is known about how these are measured, which, in turn, depends on what is known about the instruments that are used to measure them. But even knowledge about these instruments, in one way or another, rests on what has been believed to be known about heat, velocity, energy, and so on—which means that every relevant piece of knowledge is connected in some kind of circle. In the event that the experiment returns a negative result, it does not follow that the main hypothesis is the only faulty scientific proposition in play. At least one other proposition that lies anywhere throughout the entire web of assumptions could have been defective.²³

If Duhem’s claim is true, then the integrity of an entire theory is always in danger of coming unraveled by unexplainable phenomena and must therefore be adjusted time and again to compensate for its shortcomings. The scientist would need to consider a much wider range of possible explanations that may or may not have something to do with his original hypothesis. Of course, some of these might be ruled out along the way,

²¹ Otto Neurath, “Radical Physicalism and ‘The Real World’”, *Philosophical Papers 1913-1946*, Edited and Translated by Robert S. Cohen and Marie Neurath (Boston: D. Reidel Publishing Company, 1983), 105.

²² Alex Rosenberg, *Philosophy of Science: A Contemporary Introduction*, 3rd Edition (New York: Routledge, 2012), 239.

²³ Pierre Duhem, *The Aim and Structure of Physical Theory*, Translated by Philip P. Wiener (Princeton: Princeton University Press, 1954), 183-188.

though it is also possible that the scientist will reach a point of equipoise where he will have to “choose” the “best” candidate out of expediency, and not necessarily that which provides the “truest” correspondence with the observable facts.

In summary, Part I has outlined three assumptions shared by coherence theories in science that are contrasted against those of correspondence theories—that scientists test propositions for their consistency with other propositions than against reality *per se*, that knowledge is mind and concept-dependent, and that no proposition can be verified in isolation from an entire web of mutually dependent assumptions.²⁴

To better understand how coherence theories are prone to manipulation in the domain of science, it will be helpful to first examine their application in the context of law.

Ronald Dworkin’s Theory of Law as Integrity

Dworkin’s coherence theory of Law as Integrity is best understood as a response to the most dominant theory of law in the twentieth century, which was H.L.A. Hart’s Theory of Law as the Union of Primary and Secondary Rules. According to Hart, law consists of primary rules that govern the conduct and social life of citizens (e.g. the law against murder, the law on contracts, and the law conferring powers on guardians), and secondary rules that are directed towards the officials of a legal system concerning the administration of the primary rules themselves. For example, there are rules of change that allow legislators to introduce new primary rules into the legal system, while there are rules of adjudication that authorize judges to make authoritative determinations of whether a primary rule has been broken. The most important secondary rule, however, is the rule of recognition that incorporates criteria by which primary rules are identified as legally valid, such as their promulgation and enactment by certain rule-making bodies, their

²⁴ For a comprehensive discussion on foundationalism and coherence, see Ernest Sosa, “The Raft and the Pyramid: Coherence versus Foundations in the Theory of Knowledge”, *Midwest Studies in Philosophy* 5:1 (1980), 3-26. Sosa represents foundationalist theories as pyramids that rest on stable and secure foundations, and likens coherence theories with free-floating rafts, every plank of which directly or indirectly keeps all others in place.

longstanding customary practice, or their relation to judicial decisions.²⁵ Hart's theory is considered to be paradigmatic of Legal Positivism, the view that law is a matter of social fact and is conceptually distinct from morality. In this sense, positivism is analogous to a correspondence theory because anyone who seeks to know what the law is can simply check what is explicitly written in legal sources.

On the other hand, Dworkin's theory is classified under the Natural Law tradition, which holds that moral concepts must necessarily figure into any adequate definition of law. Dworkin's main gripe is that Hart reduced law to a model of black-letter rules when there are, in fact, unwritten moral principles that judges hold to be just as legally binding. The problem with Hart's theory, according to Dworkin, is that the rule of recognition is structurally incapable of accounting for these moral standards because they rely on tests of social-fact pedigree such as the rule of recognition. Principles, however, are far more vague, nebulous, and abstract than black-letter rules with pedigree are,²⁶ so no positivist can hope to identify all the standards that are binding within the legal system simply by looking at plain social facts.

To rival positivism's allegedly plain fact approach, Dworkin set up an alternative method known as constructive interpretation, which lays out two principles of coherence that can help judges determine what rules and principles are "really" part of the law. The first is referred to as the dimension of fit, which requires judges to remain faithful to the past decisions and institutional history of the court. The second is the dimension of justification, which requires judges to treat as part of the law all of the moral principles that place the law in its morally soundest light.²⁷ This allows them to consider as law some principles that no lawmaker ever officially decreed to be binding, so long as they figure into the moral justification of black-letter rules as the judge interprets them to.

The method of constructive interpretation is divided into three stages akin to Quine's approach to theory construction.²⁸ Consider a judge who presides over a workplace discrimination lawsuit. The plaintiff's counsel brings up the equal opportunity clause of the Fourteenth Amendment in

²⁵ H.L.A. Hart, *The Concept of Law* (Oxford: Clarendon Press, 1961), 92-103.

²⁶ Ronald Dworkin, *Taking Rights Seriously* (London: Duckworth, 1977), 18-40.

²⁷ *Ibid.*, 229-230.

²⁸ W.V.O. Quine, "Two Dogmas of Empiricism", *From a Logical Point of View*, 1953, 2nd Ed (Cambridge: Harvard University Press, 1999), 20-46.

arguing their case. The judge must now construct the “best” interpretation of the concept of equal opportunity to arrive at a decision. The first is the pre-interpretive stage where the settled law related to equal opportunity is identified as raw data that constitutes the concept. The second is the interpretive stage where the judge begins to construct his theory of what equality is. At this stage, the body of law is modeled into a circle with the relevant black-letter rules and most fundamental moral principles at the center of the entire system, while the minor, less important standards lie at the periphery. Each part of the system secures and anchors the others. The third is the post-interpretive stage where the judge will make adjustments to the concept created at the second stage so as to reconstruct what the law “really” requires, which entails testing different conceptions of equality against the dimensions of fit and justification.²⁹ At this stage, the judge may encounter legal materials that are anomalous and inconsistent, which requires him to reinterpret them so as to restore coherence throughout the system. Ideally, no proposition is immune from refutation, but those with the greatest explanatory power stand the least chance of being refuted. They are usually comprised of the most cherished ethical convictions and deeply rooted theoretical beliefs in terms of which the law is explained, and so they are placed at the center of the circle. The modification of the center will cause great disturbances throughout the entire system, whereas the revision of materials at the periphery will be only mildly unsettling. Given this structure, meaning and truth are intertransmittable from the center to the periphery and back. Virtually any proposition can be saved from revision come what may, given suitable adjustments to the rest of the system until reflective equilibrium is attained and the “true” concept of equality emerges.³⁰ Therein lies the correct decision to the lawsuit.

Furthermore, to give judges a model to emulate, Dworkin introduced a mythical judge named Hercules, a figure of superhuman intellect who is tasked with constructing an all-encompassing theory of law that is applicable to every legal dispute. Hercules begins by drafting a list of eligible interpretations of statutes and testing for their fit with past decisions, giving “local priority” to interpretations from the same “department” of law that a case falls in. But often this method will fail, especially when a relevant rule lies

²⁹ Dworkin’s method of constructive interpretation was borrowed from John Rawls’ concept-conception distinction in *A Theory of Justice* (1971). In this case, Rawls was interested in explicating the concept of justice by exploring his unique conception of it, which he referred to as Justice as Fairness.

³⁰ *Supra* note 19, 65-66.

in a different department. Fortunately, Hercules is not constrained by the rigid boundaries that demarcate the different areas of law. He finds them to be mechanical and arbitrary, obscuring the most intuitive moral interpretations of laws. He thus redraws the boundaries to make different departments more coherent in principle, making revisions wherever necessary so as to make the law speak with one voice. In this manner, the entire body of law attains a global level of coherence and thereby become the all-encompassing theory that covers every possible dispute and extends law's empire.³¹

In this manner, law becomes a normative system that governs citizens fairly and treats like cases alike. Moreover, it serves as a guide for legislators in creating statutes that are coherent and for judges in conceiving of the body of law as a principled whole rather than as a set of discrete decisions that are made in piecemeal fashion.³² Hence the name Law as Integrity.

There are several reasons why Dworkin's model of adjudication is prone to manipulation. First, it authorizes judges to arbitrarily choose which standards are part of the law. Any moral principle, no matter how alien to the institutional history of the court, can be made to appear as if it had been embedded in past decisions or figures into a statute's justifications. This implies that the law essentially has no limits for Dworkin; any standard can theoretically be counted as part of the law if it satisfies the test of coherence and moral soundness. Second, Dworkin's model allows judges to reconcile inconsistencies within the law by filling it with unifying moral principles, such as when cases fall between the gaps, when statutes are vague, or when judicial decisions conflict with one another. For Dworkin, the moral principles that restore integrity to the legal system when these anomalies arise can be applied by the judge as if they were law. Third, Dworkin's model allows judges to treat past decisions that are incompatible with their best interpretation of the law as mistakes to be abandoned.³³ This implies that judges are relatively free to ignore certain precedents as anomalies and revise the law on their own.

The law, however, is neither as incomplete nor indeterminate as Dworkin made it appear. There are settled conventions, precedents, judicial

³¹ Ibid., 250-252.

³² Ibid., 167.

³³ Grant Lamond, "Legal Reasoning for Hedgehogs", *Ratio Juris* 30:4 (Dec. 2017), 509.

literature, techniques of interpretation, and other sources of jurisprudence that guide judges in resolving even the most controversial of cases. In England, for example, it is customary for judges to apply various canons of construction such as the *eiusdem generis* and *noscitur a sociis* “rules” in hard cases, as well as different methods of statutory interpretation such as the literal rule, the golden rule, and the mischief rule,³⁴ all of which restrict the range of possible interpretations of a given statute. Sometimes, the body of law itself provides the framework that specifies how competing interests are to be weighed, such as when constitutional provisions, legislative statutes, and judicial decisions specify how competing principles or goals are to be weighed. Even laws that are written in ambiguous moral language by containing terms such as “justice”, “fairness”, or “equal opportunity” can be interpreted through various customs that do not require judges to engage in moral reasoning. They can simply consult established conventions for determining what is “just” or “fair” in terms of judicial custom without appealing to any abstract moral principles. Hence positivists argue that judges can apply value-neutral tests of legal validity but still be able to reach value-laden conclusions about the law,³⁵ provided that source-based law figures into the major operative premises of their reasoning.³⁶ Given these shared guidelines, adjudication is determinate most of the time, at least in the sense that most honest, reasonable, and legally-trained men will agree upon the “correct” decision to a case.

Admittedly, no body of law is fully determinate. But Law as Integrity makes matters worse by allowing judges to introduce highly subjective factors into adjudication. It allows them to construct person-relative theories of law that will be contaminated by their personal backgrounds and preferences.³⁷ Two judges may frame the same law into divergent interpretations that are influenced by their personal beliefs, religious

³⁴ Neil MacCormick, *Legal Reasoning and Legal Theory* (Oxford: Clarendon Press, 1978), 207.

³⁵ Joseph Raz, *The Authority of Law* (Oxford: Clarendon Press, 1979), 46.

³⁶ Not all positivists subscribe to Raz’s Exclusive Legal Positivism which states that all law is necessarily source-based and never turns on moral considerations. This is contrasted with Inclusive Legal Positivism, which accepts that officials of the legal system may *sometimes* incorporate moral principles in their tests for legal validity if it is a judicial custom to do so, though this is not conceptually necessary, a view that Hart espoused. To better understand their differences, see W.J. Waluchow, “The Many Faces of Legal Positivism”, *The University of Toronto Law Journal* 48:3 (Summer, 1998), 387-449.

³⁷ Joseph Raz, *Ethics in the Public Domain* (New York: Oxford University Press, 1994), 314.

upbringing, cultural attitudes, and political inclinations—many of which are not recognized as law but will nevertheless influence their interpretation of it if they cohere with moral principles. Thus, if adjudication is to be objective, then it must minimize the extent to which personal feelings, beliefs, and value-preferences infiltrate judicial reasoning. What the law is in a jurisdiction is one thing, and what judges believe them to morally be is another. What more if they have hidden political agenda and begin to legislate from the bench by deliberately making the law more progressive than the elected lawmakers intended, or conversely, more restrictive of individual freedom in accordance with their religious biases? They would essentially be allowed to subvert democracy by striking down laws by means of judicial review, not because they are unconstitutional, but because they do not cohere with what they perceive to be the law's inner morality. Never mind that these laws were passed by duly elected representatives; if a moral principle figures into the justification of a legal rule, then for Dworkin, the judge may rightly enforce it as law.

Furthermore, Dworkin's model allows judges to “play fast and loose with the law”.³⁸ It permits them to second-guess the wisdom of authorities, to disregard past decisions, and to reinterpret statutes that are incompatible with their moral beliefs. It shifts the boundary between settled and unsettled law, making what should otherwise be easy cases into hard ones by encouraging a holistic treatment of the law—to let very general and remote principles bear upon each issue in striving for global coherence. Indeed, perhaps only a judge of mythical ability like Hercules will be equal to the task; and given that judges are only human, they will inevitably err in following his example and taint the body of law with more errors than there should be.

The Manipulation of Science

This section shall apply the objection that has been raised against Dworkin's theory of law to coherence theories in science. The latter, broadly speaking, hold that scientific validity is primarily a function of a scientific proposition's logical consistency with other propositions, beliefs, or theories. They might also hold that a scientific theory is “true” if, and only if, its constituent propositions form a seamless web whose parts mutually reinforce one another.

³⁸ J.L. Mackie, “The Third Theory of Law”, *Philosophy & Public Affairs* 7:1, (Autumn, 1977), 15.

Before proceeding with the argument, two general objections that have been raised against coherence theories must first be explained. The first is that coherence theories come cheap because there can be more than one coherent explanation of a given phenomenon, all of which can be made to appear true even when they are factually incompatible.³⁹ In fact, even a set of consistent but false propositions can be passed off as true if carefully woven together. Yet nobody would say that the theory as a whole is true; in ordinary language, people make a distinction between an explanation that is coherent from one that is actually correct.

This is because coherence provides a formal test of consistency when knowledge is primarily understood as a substantive matter. That is to say, an individual who is said to know something is understood to be capable of expressing a true proposition about the world, not simply a proposition that is coherent with other propositions. Unfortunately, it does not take much to accomplish the latter. With enough effort, any theory that declares the existence of unicorns, golden mountains, and bald kings of France can be developed to pass the test of coherence, even though none of these are actually real. The lesson, in short, is that truth is held to a higher standard than merely coherence.

The second objection is that coherence is in danger of regressing into some form of idealism. Coherence theories insist, for instance, that the proposition that snow falls from the sky can only be true if, and only if, the belief that snow falls from the sky is coherent with other related beliefs. But then this would imply that the actuality of snow falling from the sky consists of nothing more than the existence of these other beliefs. Surely snow would continue to fall even if there were no such beliefs that cohere with each other.⁴⁰ This means that even in the best case, coherence only implies a “very strong presumption” that at least majority of one’s beliefs are true.⁴¹ In short, coherence only indicates the probable correctness of a statement, not guarantee it.

³⁹ Bertrand Russell, *The Problems of Philosophy* (Gearhart: Watchmaker Publishing, 2010), 88.

⁴⁰ Colin McGinn, “The Truth About Truth”, *What is Truth?*, Edited by Richard Schantz (Berlin: Walter De Gruyter, 2002), 195.

⁴¹ Donald Davidson, “A Coherence Theory of Truth and Knowledge”, 1983, *Knowledge: Readings in Contemporary Epistemology*, Edited by Sven Bernecker and Fred Dretske (New York: Oxford University Press, 2000), 414.

Both objections may be related to the earlier discussion on Law as Integrity. As for the first objection, any moral principle can be made part of the law if it coherently figures into its justification, even when no authority has explicitly decreed that this is so. Law, in this picture, ceases to be an authoritative system of rules and becomes conceptually indistinguishable from morality, for it becomes partially the product of institutionally-enforced norms and partially a product of the judge's values and beliefs. As for the second objection, any interpretation of a law can be presented as "the" interpretation as long as it approximates the best moral reading in the judge's mind. But there is no guarantee that his reading is the correct legal one as well. Coherence theories in science, in similar fashion, put less weight on accurately describing the natural world and more on the construction of a seamless theory. But a seamless theory is not necessarily a true one.

Scientists, like judges, are only human. They are not immune to the possibility of contaminating their theories with their personal backgrounds, political preferences, and cultural values, no matter how hard and sincerely they try to suppress them.⁴² The religious ideals of the universities they were trained in, the vested interests of private donors who fund their research, and even their ambitions to achieve fame within the scientific community may factor into the process of theory-construction. The potential for non-rational factors such as these to skew a scientist's interpretation of data would be aggravated by a theory that depicts scientific truth as little more than a function of coherence.

Moreover, scientists can grow emotionally attached to their theories after years of investing in them. Whenever their paradigms are thrown into crisis by discrepancies, they cannot help but grow anxious and insecure. Sometimes, they make minor adjustments or introduce *ad hoc* modifications just to be able to save it.⁴³ Fortunately, in most cases, their changes can be checked against the evidence to discourage them from going too far astray. Coherence theories, however, weaken these constraints by giving them more freedom to alter virtually any aspect of the paradigm.

While unlikely in practice, even the most fundamental laws of science can theoretically be questioned, provided there is enough justification to do so. Never mind that their colleagues can criticize them for deviating from

⁴² Paul Feyerabend, *Against Method* (New York: Verso, 1993), 51-52.

⁴³ Thomas Kuhn, *The Structure of Scientific Revolutions*, 2nd Ed. (Chicago: The University of Chicago Press, 1970), 68-78.

established theories; the harm will have been done to the general public whenever professional scientists claim that there are “alternative facts” about scientific phenomena. For example, a scientist may claim that there is evidence that climate change is a myth. He may support his argument by cherry picking certain scientific assumptions, never mind that there are better theories that suggest the total opposite. The problem is that some people may believe what they hear just because it comes from an authority figure. Thus, not only will his claim influence the lifestyle choices and that ordinary consumers make, especially with regard to practices that affect the environment, but it will also weaken the political pressure on lawmakers to enact environmental reforms by providing them with an excuse to deprioritize them.

Moreover, coherence theories exacerbate the temptation for scientists to act injudiciously in the face of anomalies. When the theories of scientists are thrown into crisis by discrepancies, they may belittle their significance, invent rescue hypotheses to cover them up, direct their attention to different problems altogether, or continue pretending that their theories are accurate.⁴⁴ Coherence theories enable this behavior by tagging scientific knowledge as “mind or concept-dependent”, thereby giving scientists leeway to chalk up anomalies to the many ways in which scientific concepts can be defined and to amend them as needed by looking at them “in a different way”. In a similar vein, coherence theories provide scientists with excuses whenever an experiment, prediction, or policy goes wrong. Rather than admitting to their mistakes, scientists may blame some other assumption on which they were dependent. In this manner, they will be able to insist that their scientific opinions were right and that someone else was wrong. In summary, whether deliberately or not, coherence theories applied to science enable scientists to manipulate their narratives in a manner that personally suits them.

The main argument, then, is that in the same way that Dworkin’s coherence theory allows judges to determine which moral principles form part of the law based on their compatibility with their best interpretation of rules, a coherence theory of science allows scientists to determine which scientific propositions count as true on the basis of whether they figure into their explanation of a phenomenon.

⁴⁴ Imre Lakatos, *The Methodology of Scientific Research Programmes*, Edited by John Worrall and Gregory Currie (New York: Cambridge University Press, 1978), 4.

The remarks of Duque and Roque may now be returned to in light of this argument. After being criticized for claiming that the COVID-19 infection curve had been “flattened”, Duque clarified later that same day that it had only been “bent”, in the sense that the doubling time of the number of infections had increased from three days to April to eight days in July. He did, however, claim that this was a sign that the fight against COVID-19 was going well,⁴⁵ and explained that the rising number of cases could be credited to the efforts of the DOH to increase the country’s testing capacity.⁴⁶

This illustrates how an unambiguous quantitative measure can be distorted to tell a different story than it actually does. The point of presenting the cumulative number of infections over time through a line graph is to emphasize its rate of change, a first-order derivative which, at that time, was anything but indicative of success. But by highlighting the change in doubling time instead, which is a second-order derivative measuring the slope of the first-order derivative itself, Duque called attention away from what the curve was really saying and made his office appear as if it had been more successful in combatting the virus than it actually was. He only needed to redefine what it means for a fight to “go well” to make a scientifically plausible claim.

Additionally, Duque’s attribution of the rising number of infections to boosted testing capacities fed into his narrative of success, though even this was rejected by experts from the OCTA Research Group who explained that there was, in fact, a genuine surge of infections at the time as indicated by the positivity rate (the number of positive tests divided by the total number of tests administered), largely due to the ineffectiveness of government-imposed community quarantine measures.⁴⁷ Yet Duque conveniently left this important measure out of his story. A coherence theory of science would only enable more dubious narratives such as this to be woven together, precisely

⁴⁵ Daphne Galvez, “Duque retracts: COVID-19 infection curve ‘bent’, not ‘flattened’ since April”, Inquirer.Net, Jul. 15, 2020, <https://newsinfo.inquirer.net/1307260/duque-retracts-covid-19-infection-curve-bent-not-flattened-since-april>.

⁴⁶ Department of Health, “DOH: Philippines Leads in Testing in Southeast Asia; Increasing Cases Attributed to Increased Testing and Community Transmission”, DOH Website, Aug. 6, 2020, <https://doh.gov.ph/press-release/DOH-PHILIPPINES-LEADS-IN-TESTING-IN-SOUTHEAST-ASIA-INCREASING-CASES-ATTRIBUTED-TO-INCREASED-TESTING-AND-COMMUNITY-TRANSMISSION>.

⁴⁷ Paolo Barcelon, “Increase in COVID-19 cases due to ‘genuine’ surge, not PH’s testing capabilities”, CNN Philippines, Aug. 21, 2020, <https://cnnphilippines.com/news/2020/8/21/Increase-COVID-19-cases-genuine-surge-not-testing-capabilities-.html>.

because any interpretation of a phenomenon can be made to appear acceptable under certain assumptions. But again, a coherent explanation is not necessarily a true one.

After Roque was criticized for insisting that the Sinovac vaccine was safe and effective despite reports to the contrary, he countered by citing statistics from clinical trials performed in Turkey and Indonesia that measured its efficacy at over ninety-one percent (91%).⁴⁸ He then fired back at critics by accusing them of either espousing a colonial mentality by only trusting Western vaccines like that of Pfizer,⁴⁹ or politicizing the government's warm relations with China. In particular, Roque targeted Dr. Anthony Leachon—a former adviser of the National Task Force (NTF) against COVID-19 who questioned the government's prioritization of Chinese vaccines—by alleging that he was only angling for a government position.⁵⁰

Roque failed to mention that only one thousand six hundred twenty (1,620) Indonesians participated in the trial, a population that is too small to provide representative data, and that an earlier set of trials from the same country only produced an efficacy rate of sixty-five percent (65%).⁵¹ He also failed to mention that other countries logged far less reassuring results. Brazil, for example, only logged an efficacy rate of fifty percent (50%) over several trials.⁵²

But more importantly, Roque's responses illustrate how non-scientific factors color the interpretation of data. He gave no evidence that suggests that a preference for Western vaccines is fueled by colonial mentality rather than safety, especially given the fact that Western pharmaceutical corporations have been more transparent with their data than Sinovac Biotech Ltd. has. He also gave no evidence that Leachon's criticisms were

⁴⁸ Office of the Presidential Spokesperson, "Press Briefing of Presidential Spokesperson Harry Roque", PCOO Website, Jan. 11, 2020, <https://pcoo.gov.ph/press-briefing/press-briefing-of-presidential-spokesperson-harry-roque-121/>.

⁴⁹ Ibid.

⁵⁰ Office of the Presidential Spokesperson, "Press Briefing of Presidential Spokesperson Harry Roque", PCOO Website, Dec. 14, 2020, <https://pcoo.gov.ph/OPS-content/press-briefing-of-presidential-spokesperson-harry-roque-90/>.

⁵¹ "China's Covid Shot Has Four Wildly Different Efficacy Rates", Bloomberg Law, Jan. 13, 2021, <https://news.bloomberglaw.com/pharma-and-life-sciences/china-vaccine-going-global-with-four-different-efficacy-rates>.

⁵² "Brazil trial finds efficacy of Sinovac vaccine at 50.4%", Al Jazeera, Jan. 13, 2021, <https://www.aljazeera.com/news/2021/1/13/brazil-trial-finds-efficacy-of-sinovac-vaccine-at-50-4-percent>.

motivated by political ambitions, and even if they were, his intentions were immaterial to the issue of whether Sinovac is safe. Roque, however, has guaranteed the safety and effectiveness of Sinovac's vaccine by discrediting the allegedly political intentions of its critics, which obviously does not follow. But the problem remains that political issues are being conflated with scientific ones in a manner that is advantageous to the government.

To be clear, this paper does not claim that Duque, Roque, or any other government representative has consciously embraced a coherence theory of science. But it does contend that their behavior has been akin to that of a scientist who defends his theories just because they are coherent with the larger narrative that they are trying to peddle. After coming under fire, Duque insisted that his office was successful by resorting to a measure of progress other than the standard indicator that is the cumulative number of cases, not unlike the scientist who invents a rescue hypothesis to save his theory when anomalies that discredit it have been encountered. Roque, on the other hand, has defended the government's choice of vaccine by ignoring scientifically valid criticisms and cherry picking his own supporting data. He has also diverted the public's attention towards politics, which, he seems to believe, is relevant to the scientific question of whether the Sinovac vaccine is safe and effective. Most people, one would think, would hardly describe the fight against COVID-19 as "going well" on the basis of the infection rate doubling time alone, nor would many people believe that politics is the only reason that trust in the safety of the Sinovac vaccine has faltered.

There is an important lesson to be learned here. The public must keep a watchful eye not only on the scientific correctness of the claims that are made by those in power, but also on the logical and meta-theoretical presuppositions that underlie them. This, fortunately, is a task that is of interest to the philosopher; he inquires into the definition of scientific truth, inspects the relationship between propositions and theories, and scrutinizes the reasoning behind startling conclusions. And as this paper has argued, he will find that there are powerful reasons to be wary against coherence theories applied to science, particularly in the fact that they are prone to manipulation for various agenda.

This is not to make a hasty generalization that coherence theories are objectionable in all fields of knowledge, but as far as science is concerned, especially when human lives are at stake, there is no room for scientists to be given a high degree of freedom to interpret the data as they please and to

evaluate public policy loosely. Virtually any public health program can be advertised as successful from one point of view or another, depending on how “success” is measured and made consistent with selected pieces of supporting data. This possibility is dangerous; the conclusions of health officials ought to be policed and tallied against the complete sets of facts, no matter how divergent or inconsistent they may be, if informed and responsible decisions are to be made in service of the public good.

Conclusion

This first part of the article provided a discussion on three assumptions shared by coherence theories in science: their emphasis on the logical consistency of propositions rather than observable facts, their portrayal of knowledge as mind and concept-dependent, and their holistic view of science.

The second part provided an exposition of Dworkin’s coherence theory of Law as Integrity, a theory of adjudication which, it has been argued, undermines the objectivity and determinacy of law by allowing judges to construct and interpret the law against a limitless background of moral principles that figure into their soundest justification.

The third and final part applied the objections to Dworkin’s theory of law to coherence theories in science by explaining how even scientists can manipulate the interpretation of scientific data, whether consciously or not, in light of their personal interests. The main objection that was raised by this article is that coherence is a purely formal rather than substantive requirement that allows virtually any theory to pass as “true” provided sufficient adjustments to any of its definitions, assumptions, or conclusions. Coherence prioritizes the logical consistency of the individual propositions that constitute a theory over their factual accuracy, which, while still valued, no longer becomes the main criterion by which scientific truth is measured. This issue was further explored in the context of the political controversies surrounding the interpretation of COVID-19 data in the Philippines and the effectiveness of the Sinovac vaccine. It is not that Duque or Roque openly subscribe to coherence theories, but it is worrying that their actions are similar to those who do and abuse them for personal motives. This article humbly concludes that while these examples cannot serve as knock-down arguments against coherence theories in science and law, they give us reason

to guard against what they would lead one to believe in the spirit of watchful caution.

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