POPPER'S VERISIMILITUDE: THE SCIENTIFIC JOURNEY FROM IGNORANCE TO TRUTH

By Nicholas Anakwue

ABSTRACT

The question of truth is a broadly broached subject in Philosophy as it features along the entire historical and polemical growth of the discipline right from the time of the Ancients down to our Post-Modern era. Yet, the delimiting realization of being unable to register general success in our dogged attempts at truth and knowledge, mostly stares us blankly in the face, for matters on which philosophy endeavours to speculate on, are beyond the reach of definite knowledge.[1] Our theories of the universe open up to modifications, refutations, and further propositions, evidencing a historical development in philosophical inquiry. This generally is the growth of our science, of our knowledge.

This paper critically seeks to examine Popper's notion of verisimilitude. It takes us through the scientist's journey from ignorance to truth, and the difference between probability and verisimilitude. It addresses the relevance of the theory of content in understanding verisimilitude, under its distinctions as quantitative and qualitative. Finally, it discusses corroboration and the criteria for theory-choice.

Key Words: Verisimilitude, Truth, Corroboration, Popper, Probability, Ignorance.

The concepts of truth and science are philosophically interwoven. Science is essentially, a body of knowledge – proven knowledge.[2] And as Russell expresses, truth is wider than knowledge,[3] because truth defines knowledge. Science, as a result, makes its progress, as a body of knowledge, in an increase in or convergence towards truth.

In common parlance, truth is generally held to be the actual, the real. This rests on the basis of the distinction we often utilize in characterizing what is true from what is false. Heidegger tells us, by way of example, that when we speak of 'true gold', we distinguish it from 'false gold', which is 'not actually what it appears to be', a mere 'semblance'. Truth, therefore, is seen in a metaphysical sense to encapsulate the real. In such wise, one can opine that truth is *what is*. This characterization of truth, thus, raises the historical nuance of the concept's development within

[1] Cf. Bertrand Russell, *Problems of Philosophy* (London: Routledge Publishers Ltd., 1912), p. 74.
[2] Cf. Alan F. Chalmers, *What is this Thing called Science?* (Berkshire: Open University Press, 1978), p. 1.
[3] Cf. Bertrand Russell, *An Inquiry into Meaning and Truth* (London: George Allen and Unwin Publishers, 1980), p. 226.

the province of philosophy, and its primary instantiation in metaphysics. Metaphysics is a critical inquiry into *what is*, and so, into being. It is this defined quest that largely underlines the philosophizing of the early Greeks. Their concern in finding a defining *logos* (reason) to account for the multiplicity of change in the universe, qualifies mankind's progress towards the truth of being. Plato's categorisation of this search under the theme of philosophic dialecticism, expresses our journey from the world of appearances to the objective world of forms. With Plato's subtle shift of emphasis, truth, then, comes too to delineate the world of human language. For, truth, though primarily, a property of beliefs, belief in *what is*, is also, derivatively, a property of sentences.[4] The history of human thinking, further reveals the accentuation of meaning of truth under different shades throughout the epochs of philosophy; at the medieval stage, truth comes to be associated with God, the divine truth, while later stages, in the modern and contemporary epochs, have sought rest in a more practical concept of 'facts'. It is science that picks up this role of categorizing truth as fact, as the 'verifiable'.

Science, on the other hand, is the greatest adventure of our age. Like Heraclitus' proverbial river of flux, science witnesses a spiralling growth from one novel idea to yet greater complex theories. Mirroring this fact, John Glenn Jnr. opines, that, "knowledge begets [more] knowledge…the more I see, the more impressed I am – not with what we know – but with how tremendous the areas are as yet unexplored".[5] As such, science is basically the 'dependence of one fact upon yet another fact',[6] thus invoking the description of science as 'a structure built upon facts'.[7]

Scientific facts are understood as particularly based on the concrete, sensible realities that surround us, such as, what we can see, hear and touch, rather than the unpredictable quicksand of 'personal opinions and speculative imaginings'. This search for 'facts' offers the discipline of science the needed answer to the age-old question which has long occupied the enquiry of epistemology, concerning *what* we can know. Thus, new epistemology, celebrated as Modern science, suggestively offers the indispensable criteria to ensure our possessing the 'right to be sure'[8] that should govern our belief claims. Toward this objective, the British empiricists as well as the logical positivists all mirror the same conventional definition of standards of 'facts' as established by observation and experiment. For, observation, Einstein avers, is a non-logical path, that leads to these scientific laws, reached by 'intuition, based upon something like an intellectual love of the objects of experience'. It is this 'irrational element' or 'creative intuition' that enables the begetting of scientific facts.

---

[4] Cf. Bertrand Russell, *An Inquiry into Meaning and Truth*, p. 236.
[5] "Knowledge Quotes" *Ordinary People Can Win*, http://www.ordinarypeoplecanwin.com/quotesknowledge.htm (10th November, 2014).
[6] Thomas Hobbes, *Leviathan* (London: MacMaster University Archive, 1651), p. 30.
[7] J. J Davies, *On the Scientific Method* (London: Longman Publishers Ltd., 1968), p. 8.
[8] Cf. Alfred J. Ayer, *The Problem of Knowledge* (Victoria: Penguin Books Ltd., 1956), pp. 31-35.

Prior to the time of Galileo, the great grandfather of science, knowledge owed its academic authority to the individual opinions of the philosophers, in particular, that of Aristotle. Gradually, a later part of the centuries, governed by the influence of the Church, built their epistemological support around the authority of inspired Scripture. It was only in the seventeenth century that these antiquated walls of authority all came tumbling down, with that audacious effort of Galileo to appeal rather to the convincing realist support of experience. In one singular demonstration, Galileo was able to disprove, to the amazement of the throng of university professors present, the falsity in the long undisputed axiom of Aristotle that the speed of falling bodies was regulated by their respective weights. Soon, the gradual systematization of the processes of modern science, developed over time to a definite 'structure', at once, thought to be objective and yet flexible, will submit the ambitious claim of providing a defining logic that tackles the goal of understanding nature, predicting events and controlling natural forces. Consequently, one could discover the basic point of science aiming at unravelling explanatory truths – facts – about the world. In arriving at truth, still, there is the difficulty of deciding on a suitable criterion of truth, given the proliferation of various theories of truth. In this regard, science needs to narrow down its preferences to a single sufficient theorem for evaluating its findings. While science chooses this theorem in the correspondence theory of truth, that assesses truth according to the correspondence of theory with facts, or the structural similarity that exists between scientific language and scientific fact, it is the case that scientific theories never fully fit the picture. There is always some inadequacy in the theory, some limitation. As such, we invariably progress from one theory to a better one, and on and on.

I

In our progress towards the best of scientific theories, Popper is clear on the point that we trace a trajectory to objective truth. This counters the mistaken notion that is carried in other theories of truth that demonstrate merely a criterion of true belief, for while a coherence theory of truth misconstrues consistency as truth, the evidence theory does so with a criterion of what is 'known to be true', and the pragmatic, with usefulness as truth.[9] Against all these, Tarski's correspondence theory, choosing to differ, dangles a latent goal for scientific knowledge in truth as objectivity. This notion of objective truth expresses a goal that is not limited to a subject and his world of perception, quite unlike other theories that espouse 'knowledge only as a special kind of mental state, or as a disposition, or as a special kind of belief'.[10] Truth, for Popper, is therefore objective and real. It is correspondence to the objective facts of the external world.

And thus, Objective truth is, rather, built on the vantage base of realism – that is, belief in the objective independent existence of the world of reality – but, science does not just seek after truth, but what Popper terms 'interesting truth'. This is a description of truth as relevant, with

[9] Cf. Karl Popper, *Conjectures and Refutations* (New York: Routledge Publishers, 1963), p. 304.
[10] Karl Popper, *Conjectures and Refutations*, p. 305.

significant predictive and explanatory power. We are so conditioned, because we desire not just mere truth, but answers to the vastness of our problems. But like Xenophanes reminds us, though we may search for this truth, we may never know when we have found it.[11] It eludes us, though it still guides and regulates our progress. Popper draws an analogy of this journey towards truth to a mountain climber, saying:

> The status of truth, in the objective sense, as correspondence to the facts, and its role as a regulative principle, may be compared to that of a mountain peak wrapped in clouds...A climber may not merely have difficulties in getting there – he may not know when he gets there, because he may be unable to distinguish, in the clouds, between the main summit and a subsidiary peak...Yet this does not affect the objective existence of the summit; and if the climber tells us 'I doubt whether I reached the actual summit', then he does, by implication, recognize the objective existence of the summit...the very idea of error or of doubt (in its normal straightforward sense) implies the idea of an objective truth which we may fail to reach.[12]

This portrait, Popper paints, reveals further that the journey to truth is an arduous one; and more importantly, we set out from the low-ground of opinion, of ignorance. In fact, as Plato avers, we, for the most time, live in the twilight zone between knowledge and ignorance.[13] Like Plato therefore puts forward:

> ...It's [wisdom] judging things correctly without being able to give a reason...surely you see that this is not the same as knowing – for how could knowledge be unreasoning? And it's not ignorance either – for how could what hits the truth be ignorance? Correct judgment, of course, has this character: it is *in between* understanding and ignorance.[14]

At any rate, Popper is of the added opinion that we must not rest static on this phase, but make progress from the realm of unpredictability to predictability, from ignorance to knowledge. So, theories surface from our ignorance – our problems – but as we progressively learn from our mistakes, we move forward from problems to greater problems of ever increasing depth. Popper

[11] Cf. Bertrand Russell, *History of Western Philosophy* (London: Routledge Publishers, 2000), p. 59.
[12] Karl Popper, *Conjectures and Refutations*, pp. 306-307.
[13] Cf. Stefano Gattei, *Karl Popper's Philosophy of Science* (New York: Routledge Publishers, 2009), p. 77.
[14] Plato, *Symposium*, 202a in John M. Cooper (ed.), *Plato: Complete Works* (Indianapolis: Hackett Publishing Company, 1997), p. 485.

persuades us thus that 'a scientific theory...is, if anything, an attempt to solve a scientific problem, that is to say, a problem concerned or connected with the discovery of an explanation'.

II

To make good the needed progress in scientific knowledge, arguably, from ignorance to truth, the scientist is faced with the onus of critically testing available scientific theories, so as to determine greater proximity to truth. Howsoever, for the scientist to avoid stumbling into the gaping ditch of category-mistakes, that is, asking the wrong questions, he has to properly axiomatize the given scientific theories. This is made possible by distinguishing the theory into its empirical and logical elements, or contents, as Popper prefers to designate them as.

Prima facie, every scientific theory possesses content, which implicates all the statements that relate to the given theory, and is directed at truth. Though, while the logical content of a statement or a theory, *a*, is the class of all statements which follow logically from *a*, the empirical content of *a*, is the class of all basic statements which contradict *a*. Popper expresses, in a footnote to this point, that we are intuitively justified in holding unto the 'empirical part' of the logical content of a theory, because a statement tells more about our world of experience, the more experiences (that is, possible experiences) it excludes or forbids. This follows the rule of logical probability with the "idea of approaching logical certainty (tautological truth) through a gradual diminution of informative [empirical] content (thus, it combines truth with lack of content)".[15] What this means simply is that a theory grows more *probable*, if it progressively eliminates experiences that contradict its possibility. As such, lesser content enables greater probability, while greater content reduces probability. To explain this, Popper demonstrates that the informative content of any conjunction, *ab*, of two statements *a* and *b*, will always be greater than or at least equal to any of its component statements. Put in logical terms, where Ct (*a*) represents 'the content of statement *a*', and Ct (*ab*) stands for 'the content of the conjunction, *a* and *b*',

$$(1) \qquad \mathrm{Ct}\,(a) \leq \mathrm{Ct}\,(ab) \geq \mathrm{Ct}\,(b)$$

However, the probability takes on a different arrangement, in tandem with the law of the calculus of probability. The logical result goes thus,

$$(2) \qquad \mathrm{p}\,(a) \geq \mathrm{p}\,(ab) \leq \mathrm{p}\,(b)$$

This latter representation implies that the probability of the conjunction, *ab*, will be lesser than that of either of its component statements. Combining the two equations, (1) and (2), one realises the earlier submission that 'with increasing content, probability decreases and vice versa'.

[15] Carlos Garcia, *Popper's Theory of Science: An Apologia* (New York: Continuum International Publishing Group, 2006), p. 127.

Oddie contributes *simpliciter* that 'a proposition has high epistemic probability if it *seems* true'.[16] Seeming or probable truth builds itself on greater conviction of subjective appearances. A banal example of this application can be gleaned in this truism of maximal probability: 'there exists some number of planets'. This proposition gets rid of any quantity in number and content, awarding it a high level of probability (it best *appears* to us that 'there are *some* planets). The converse statement: 'there are seven planets', however, opens up to being falsified (and even, in truth, has been falsified), and so, has reduced probability and a higher content. But it is exactly on this setting, that Popper seeks to differ, presenting his notion of verisimilitude as opposed to the theory of probability that governs inductive logic and the verificationist scientific method.

III

The philosophical leaning that endears Popper towards proposing increasing verisimilitude as the goal of science is one that is a midway between the attitudes of realism, a revealing fallibilism and a yet salvaging optimism.[17] Popper's realism helps his belief in the truth of an objective world of reality, to which a rational goal of science is aimed at, though he also realises that, following the history of science, as sometimes 'a parade of promising theories eventually shown to be false',[18] scientific theories are not infallible – they are prone to human fallibility. Expectedly, however, Popper does not prefer to end in this sceptic's *cul-de-sac*. He, rather, checks his fallibilist inclination with a broadening optimism that we can still arrive closer to the mark of objective truth. Nonetheless, quite unlike the theory of probability, science should seek after highly falsifiable, highly improbable, highly *contentful* truth. Popper affirms that in the comparison of theories of science, there was to be a criterion of potential satisfactoriness or progressiveness that judged a theory with greater amount of empirical information or content as logically stronger. It possessed, by virtue of this leverage, greater explanatory and predictive power, and could be more severely tested by comparing predicted facts with observations. The new goal of science, which Popper happens on, with all intuitive certainty, is verisimilitude, for he says:

> Looking at the progress of scientific knowledge, many people have been moved to say that even though we do not know how near to or how far from the truth we are, we can, and often do, approach *more and more closely to the truth*...I myself have sometimes said such things, but always with a twinge of bad conscience... [But] as

[16] Graham Oddie, "Truthlikeness" in Stathis Psillos and Martin Curd, (ed.), *The Routledge Companion to Philosophy of Science* (London: Routledge Publishers, 2008), p. 480.
[17] Cf. Graham Oddie, "Truthlikeness" in Stathis Psillos and Martin Curd, (ed.), *The Routledge Companion to Philosophy of Science*, p. 479.
[18] Ibid.

> long as we speak as clearly as we can, yet do not pretend that what we are saying is clearer than it is...there is no harm whatever in occasional vagueness, or in voicing every now and then our feelings and general intuitive impressions about things.[19]

Verisimilitude, therefore, is an approximation to truth; it is getting closer and closer to the truth. Etymologically, verisimilitude gets its roots from the Greek word, *eoikotōs*, in English, 'like the truth'. This informs the suggested synonym, often used interchangeably *salva veritate*, for verisimilitude, as truth-likeness. The usage appears in the early philosophies of Parmenides, Epicharmus, and Aristotle. Soon, however, the word came to be confused with a closer usage in the term, 'likely', understood in the common use of 'probable'. Nevertheless, Popper is cautious to point out that probability should not be misrepresented with his notion of verisimilitude; for though both indicate an approach to truth by degrees, while one (probability) combines truth with lack of content, the latter (verisimilitude) entails the 'possibility of approaching comprehensive truth by combining truth with content'. From this distinction, verisimilitude concerns itself with being more *similar* to the truth, rather than *seeming* true.[20] At commonsense level, some propositions seem closer to the truth than others. While some truths are closer to the whole truth than other truths, some falsehoods seem closer to the truth than some truths.

So, utilising the relation of truth to content, in which the concept of verisimilitude is cashed out,[21] Popper points out that every set of consequences of a proposition can be divided into truths (its truth content) and falsehoods (its falsity content). Popper makes this deduction on the grounds that the content of a given statement ought to imply the class of all logical consequences of that said statement. If the statement were then true, its class will consist of only true consequences, but if false, it would have both true and false consequences.[22] On that basis, the subclass of all true statements in a given theory *a*'s consequence class is termed the 'truth content' of *a*, while the subclass of all false statements in its consequence class is known as the 'falsity content' of *a*.[23] For a close application of verisimilitude within the precincts of Popper's theory of potential progressiveness in *conjectures* and *refutations*, it becomes crucial to situate verisimilitude as it applies to the comparison of and survival of the fittest theories. In this regard, Popper offers us the yardsticks to enable comparison of two theories in terms of relative verisimilitude, under the two distinctions of the qualitative theory of verisimilitude and the quantitative theory of verisimilitude.

---

[19] Karl Popper, *Conjectures and Refutations*, p. 313.
[20] Cf. Graham Oddie, "Truthlikeness" in Stathis Psillos and Martin Curd, (ed.), *The Routledge Companion to Philosophy of Science*, p. 480.
[21] Carlos Garcia, *Popper's Theory of Science: An Apologia*, p. 124.
[22] Cf. Karl Popper, *Conjectures and Refutations*, p. 316.
[23] Cf. Carlos Garcia, *Popper's Theory of Science: An Apologia*, p. 124.

To measure verisimilitude, hence, one would need to obtain the values of both the 'truth content' and the 'falsity content' of a given theory. Then, the verisimilitude (Vs) can be measured in the following equation,

(1) $$Vs\,(a) = Ct_T\,(a) - Ct_F\,(a)$$

Where $Ct_T\,(a)$ is the unit for the value of the truth content of a, and $Ct_F\,(a)$ is the measure for the falsity content of a. This is generally regarded as the quantitative theory of verisimilitude. This rendition of the theory of verisimilitude makes easy the understanding of the notion of verisimilitude as 'a function of both the measure of its truth content and the measure of its falsity content'. It tries to assign quantities to contents, with the rule of the inverse proportionality of content to probability. As such, with greater truth content, a given theory increases in verisimilitude, and vice versa with increased falsity content, as well as with an increasing improbability.

On the qualitative account of the theory of verisimilitude, Popper asserts that if the truth-content and falsity-content of two theories t_1 and t_2 are comparable, we can be able to say that one of the theories, say t_2, corresponds better to the facts than t_1, if and only if, the following conditions are met. Firstly, the truth-content but not the falsity-content of t_2, has to exceed that of t_1, or secondly, the falsity-content of t_1, but not its truth-content, has to exceed that of t_2.[24] On this level, relative verisimilitude is defined according to subclass relationships, that is, both theories are comparable on the basis that both their truth and falsity contents coincide. In précis, the qualitative theory compares these two theories, if either t_2's truth-content includes t_1's falsity-content, if it exists, is included in, or is the same [measure] as t_1's, or if t_2's truth-content includes, or is the same as t_1's and t_2's falsity-content, if it exists, or is included in t_1's.[25]

IV

Evidently, the notion of verisimilitude offers science the ability to make comparisons between two or more scientific theories, given their relative closeness to the truth. But this is not enough. In making proper judgements of verisimilitude, Popper expresses that we are often guided by the corroboration of a theory. As such, he points out, matter-of-factly, that corroboration is:

> a concise report evaluating the state (at a certain time, t) of the critical discussion of a theory, with respect to the way it solves its

[24] Cf. Karl Popper, *Conjectures and Refutations*, p. 316.
[25] Cf. "Karl Popper" *Stanford Encyclopaedia of Philosophy*, http://plato.stanford.edu/entries/popper/#ProKnoVer (16th March, 2015).

> problems; its degree of testifiability; the severity of tests it has undergone; and the way it has stood u to those tests.[26]

In unambiguous terms, corroboration represents the "evaluation report of past performance". But, significantly, the degree of corroboration of a given theory says absolutely nothing about the future, for it rather establishes its value for a given time, *t*, concerning the logical and empirical preferability of the competing theories. This says loads about the difficulty of utilising corroboration as a guide for theory-choice, for greater corroboration does not specify greater verisimilitude.[27] Despite this limitation, Popper still deems that corroboration does help, for it enables us the evidence in eliminating false theories. But even with this advantage, corroboration may show a theory false, but is incapable of telling if the falsified theory has less verisimilitude than a non-falsified one. Simply, corroboration is 'no indication of verisimilitude'.

To form a link between corroboration and verisimilitude, Popper is led to suppose that in a system of a finite number of putative theories, wherein one theory were true, if one were to apply the corroboration test, one could eliminate all false theories, and finally happen on the single true theory. Inopportunely, however, the reality is that we have systems of infinite number of theories.[28] So, Popper has to base his system on the justification of basic statements, which are basically non-rational, as they are not supported inductively by positive evidence. These basic statements have their acceptance or rejection hinged on our individual decisions, which 'settle the fate of theories'.[29] This tends to deny any reference to support from universal statements, the bedrock of the inductivist method. Popper describes this non-rational basis on basic statements with the interesting picture of a swamp. Science does not rest on a 'solid bedrock', but on a swamp; and when we build on this changing base, we realise that we never get to firm ground, but only get satisfied for the time being, if the structure holds enough to carry the structure for that passing period. Basic statements are essentially hypothetical and so are not subject to evidence, but are made by free choice. This choice is 'a matter for something like a scientific jury – the scientific community (which may or may not come to an agreement)'. The general scientific community then tends to repose its faith in the theories approved by this arbitrary panel.

But, as it emerges, it seems that Popper's system slowly seems to reduce its claim at critical rationality to glaring irrationality, or worse still, non-rationality. This is because given that Popper disposes of the inductive method, he is reluctant in acceding a rational justification for his basic statements. Inevitably, he ends up in a non-rational support for these grounding statements of corroboration. However, to concede some points to his more obdurate rational side, Popper decides on some requirements for theory choice.

---

[26] Karl Popper, *Objective Knowledge* (New York: Clarendon Press, 1972), p. 18.
[27] Cf. William Newton-Smith, *The Rationality of Science* (London: Kegan and Paul Publishers, 1981), p. 60.
[28] Cf. William Newton-Smith, *The Rationality of Science*, p. 60.
[29] Cf. Karl Popper, *Logic of Scientific Discovery*, p. 91.

V

Popper, in putting a lid to his new framework for science, proposes that before assenting in faith to a theory with better agreement with the facts, or greater verisimilitude, the theory should endeavour to meet up with three basic requirements. These yardsticks should serve as a summary comparative structure for appraising a theory in the light of previous theories.

Firstly, Popper argues that the better theory should be simple. It should be able to offer us a simple picture of the world, and be capable of connecting things and facts with a 'simple, new and unifying idea'.[30] Secondly, as a follow-up, Popper suggests that the better theory should be independently testable. Apart from explaining all the facts that the competing theory did, the new theory must be able to more *contentful*, making newer predictions. Finally, the better theory should be able to register greater empirical success. It must be able to record a greater degree of corroboration than its competitors. While the first two criteria indicate a logical requirement for the theory, the last represents a material condition that can only be verified on empirical bases.[31] As such, each theory ought to be subjected to constant testing and re-testing. However, it is noted that even if a theory does fail new tests, it can still be considered a good approximation to truth, unless it is bested by another theory with a better verisimilitude or truth-likeness.

In all, Popper's system of science, guides us unwaveringly towards the truth, as a regulative principle of scientific progress.

As we have seen in the paper, Popper's notion of verisimilitude is couched within his larger understanding of our general progress from ignorance to truth, as the general attitude of science. In achieving this objective, therefore, Popper has reasoned out an objective goal for science in truth, one that is gotten through verisimilitude.

BIBLIOGRAPHY

Ayer, A. J. *The Problem of Knowledge*. Victoria: Penguin Books Ltd., 1956.

Chalmers, A. F. *What is this Thing called Science?* Berkshire: Open University Press, 1978.

Davies, J. J. *On the Scientific Method*. London: Longman Publishers Ltd., 1968.

Garcia, C. *Popper's Theory of Science: An Apologia*. New York: Continuum International Publishing Group, 2006.

Gattei, S. *Karl Popper's Philosophy of Science*. New York: Routledge Publishers, 2009.

Hobbes, T. *Leviathan*. London: MacMaster University Archive, 1651.

Newton-Smith, W. *The Rationality of Science*. London: Kegan and Paul Publishers, 1981.

[30] Karl Popper, *Conjectures and Refutations*, p. 326.
[31] Cf. Carlos Garcia, *Popper's Theory of Science: An Apologia*, p. 130.

Oddie, G. "Truthlikeness" in Stathis Psillos and Martin Curd, (ed.), *The Routledge Companion to Philosophy of Science*. London: Routledge Publishers, 2008.

Plato, *Symposium*, 202a in John M. Cooper (ed.), *Plato: Complete Works*. Indianapolis: Hackett Publishing Company, 1997.

Popper, K. *Conjectures and Refutations*. New York: Routledge Publishers, 1963.

Popper, K. *Objective Knowledge* New York: Clarendon Press, 1972.

Russell, B. *Problems of Philosophy*. London: Routledge Publishers Ltd., 1912.

Russell, B. *An Inquiry into Meaning and Truth*. London: George Allen and Unwin Publishers, 1980.

Russell, B. *History of Western Philosophy*. London: Routledge Publishers, 2000.

Email: nikibertx@gmail.com