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Artificial intelligence and scholastic epistemology

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The advance of computer technology that has greatly exceeded human computational capabilities makes the question of the *artificial intelligence* (AI) quite natural. If the rate of the progress is maintained, one might anticipate the existence of algorithms mimicking human thinking. Thinking, however, involves not only purely logical operations (enjoying high level of perfection today) but combines other elements of human activity such as joy, fear pain and, most importantly, human *consciousness* as well. Nowadays, the issue of the attainment of new knowledge by man is widely discussed by experts of a broad spectrum of scientific disciplines such as philosophy, logic, computer science as well as neuroscience. It seems that comprehensive understanding of the process of human knowledge is not possible without contributions of all these areas of scientific study. Presently, their combination is often referred to as *cognitive science*[1]. Contemporary epistemology points out to several different theories of knowledge, e.g., correspondence theory, coherentism and contextualism[2]. Ultimately, one needs to engage consistent epistemology in order to elucidate the viability of artificial intelligence. Although the *Chinese Room argument* proposed in 1980 by John Searle is considered to contradict the strong hypothesis of artificial intelligence, its validity still necessitates precise justification.

The problem of human intellection has been of vital importance for philosophers since the times of antiquity. In particular, it attracted attention of medieval thinkers such as St. Thomas Aquinas insofar as it stood at the crossroads of the world material and immaterial[3]. Since it is human intellect that

[1]Cf. M. R. W. Dawson, *Understanding Cognitive Science*. Oxford: Blackwell 1998; C. P. Sobel, *The Cognitive Sciences: An Interdisciplinary Approach*, Mountain View, CA: Mayfield 2001.

[2]Cf. R. Audi, *Epistemology: A Contemporary Introduction,* Routledge 2003.

[3]St. Thomas Aquinas, *In II De anima*, lect. 10, Summa Theologiae q.74, a. 4, ad 1., *Summa Contra Gentiles* II, 82.

is capable to infer the existence of God, the particular branch of philosophy that studies cognition, is for St. Thomas Aquinas of prime importance. Bearing in mind St. Thomas' earnest desire to integrate any section of knowledge into a comprehensive description of reality, one rightly expects that the problem of artificial intelligence would have stimulated his penetrating reflection. However, scholastic philosophy did not cease to exert its influence as the life of St. Thomas came to a close. Despite of its practical extinction with the advent of modern philosophy (Descartes, Kant, Hegel), it enjoyed considerable revival in the 20th century (neoscholasticisim) through the works of such figures as Reginald Garrigou-Lagrange OP, Etienne Gilson, Jacques Maritain, and Mieczysław A. Krąpiec OP in Poland. Although neoscholasticism sought little dialogue with contemporary science (quite lamentably), some thomists did attempt to approach philosophical problems of modern technology with the use of scholastic apparatus[4]. One of them is an American philosopher and social scientist, Frederick D. Wilhelmsen who undertook the effort to evaluate the issue of artificial intelligence from the point of view of scholastic epistemology[5] although his advertence to the leading contemporary AI arguments seems to be rather limited. The use of the term "scholastic" points out to an extension of the Thomistic thought with the achievements of neoscholasticism. In particular, this regards the theory of a power of human intellect that is parallel to abstraction, namely, that of *existential judgments*[6].

This article aims to present Wilhelmsen's line of arguments pointing out to the impossibility of artificial intelligence based on the fact that the existential judgment, responsible for the attainment of new knowledge, is unrelated to any essential content in human intellect and thus cannot be decomposed and analyzed by an algorithm. The novelty of this article's approach consists in combining a classical theory of knowledge founded on the principles provided by St. Thomas Aquinas with current investigations in the area of human intelligence. The main difficulty of the approach lies in the fact that both scholastic metaphysics and epistemology will have to be accounted for in some detail in order to facilitate full comprehension of how Frederick Wilhelmsen dissects the problem of artificial intelligence. Since metaphysics studies being as being (*ens qua ens*), intuitively appealing examples will be somewhat hard to find for all that exists is all but one example and there is nothing beyond that exists. Despite of its metaphysical character, scholastic theory of knowledge

[4]Cf. W. A. Wallace, *The Modeling of Nature: Philosophy of Science and Philosophy of Nature in Synthesis*, Washington D.C.: The Catholic University of America Press 1996 or William A. Wallace, "From a Realist Point of View"', *Essays on the Philosophy of Science, Second Edition*, Washington, D.C.: University Press of America, 1983.

[5]F. D. Wilhelmsen, *Reasoning and Computers*, in *Being and Knowing*, Albany – New York: PCP 1995.

[6]Cf. E. Gilson, *L'etre et l'essence, Problemes et controverses*, Paris 1948.

offers an important insight into the Chinese Room argument's insistence on the radical irreducibility of semantics to syntax as well as to explain why human intelligence cannot be replaced by a machine.

The strong hypothesis of artificial intelligence stipulates that the entire complexus of human mind is reducible to an extremely complex algorithm provided that sufficient computational power is at hand. This standpoint is antibiological insofar as it reduces human mind to plain formal activity unrelated to any biological processes. The proponents of this hypothesis maintain that if the algorithm mentioned above were ever constructed, it would exhibit typical characteristics of human intelligence. In order to provide experimental verification of a given machine, a somewhat subjective test was developed in 1950 by Alan Turing wherein a person judges computer's response to a given task in relation to a parallel "human" answer[7]. In case no substantial difference is detected, the machine is considered as *conscious*.

The hypothesis of artificial intelligence was challenged by the famous argument of the *Chinese Room*, developed in 1980 by an American philosopher, John Searle[8]. In a nutshell, the argument relates to a mental experiment that employs a non-Chinese speaking person answering questions in Chinese with the help of translational rules but without inquiring into the meanings of the Chinese words. Consequently, he or she ends up executing a strictly defined set of algorithmic instructions and thus acts as a computer. Based on that, Searle concludes that computers do not perform any acts of understanding *ergo* they do not think. In other words, since the symbols are meaningless to the computer it is not intelligent. Its internal states and processes are purely syntactic and they lack semantics, that is, meaning. This leads to the conclusion that computers do not possess any intentional (meaningful) mental states. The core of Searle's argument against the strong hypothesis of artificial intelligence hinges upon the inability to derive semantics out of syntax[9]. John Searle opts for the weak AI hypothesis whereby he admits the possibility of implementing algorithms in the studies of human brain function. Also, following contemporary research, he maintains that human intelligence is conditioned biologically, namely, that mental states emerge as a result of biological structure of the brain. Further developments of the Chinese Room argument, the Chinese Gym, employ attempts to simulate connectionist neural networks that "have many computational elements that operate in parallel and interact with one another according to rules inspired by neurology"[10]. Inasmuch as the Turing test for artificial intelligence is universally rejected today, Searle's Chinese Room

[7]A.M. Turing, Computing machinery and intelligence, *Mind* 59 (1950) 236.
[8]J. Searle, Minds, Brains and Programs, BBS 3 (1980) 450.
[9]J. Searle, Is the Brain's Mind a Computer Program? *Scientific American*, 262 (1990) 1 27.
[10]J. Searle, Is the Brain's Mind a Computer Program? *Scientific American*, 262 (1990) 1 22.

argument is considered as decisive against the strong hypothesis of AI[11]. However, neither the Chinese Room nor the Chinese Gym argument provide justification why the gap between syntax and semantics arises as it has been already signaled in the opening paragraphs.

One of the adversaries of the Chinese Room argument, situated at the "right wing", that is, objecting even to the weak AI hypothesis, is a famous English mathematician and physicist, Roger Penrose. His insight into the problem of artificial intelligence follows upon the investigation of the theory of quantum gravity. According to Penrose, this theory will reveal phenomena that cannot be represented in a form of an algorithm pointing to man's ability to resolve problems outside of the power of formal logic systems such as knowing the truth of unprovable statements (quantum hypercomputation)[12]. Also, the celebrated Hilbert's *Entscheidungsproblem* indicates that mathematics cannot be reduced to purely computational mechanisms[13]. Finally, Roger Penrose adverts to the question of *judgments* that is, in his opinion, proper to human intelligence and so far has firmly stood up against any attempt of algorithmization[14]. Interestingly enough, judgments of a very specific kind will play a central role in human cognition as explicated by the medieval master, St. Thomas Aquinas and his followers.

At the outset of his reflection on artificial intelligence entitled *Reasoning and Computers*, Frederick Wilhelmsen invokes David Hume's stand that "judgments concerning existence cannot be deduced from the conceptual content that goes into them, that existence cannot be the feedback of any juxtaposition of ideas in rational discourse"[15]. What Wilhelmsen points to in this quote suggests that "why the mind concludes as it does is not inherent in any content found in the mind and why the real exists is not reducible to anything in the real"[16]. This statement contains the gist of Wilhelmsen's argument. However, before engaging in rigorious metaphysical analysis, the author presents several preliminary phenomenological considerations by adverting to the thought of a famous 20th century English thinker and mathematician, R. Buckminster Fuller. In particular, these considerations accent the newness of knowledge attained by man by means of *integrative* mechanisms.

[11]J. Kloch, *Świadomość komputerów?*, Tarnów: Biblos 1996.
[12]R. Penrose, *Nowy umysł cesarza*, Warszawa: Wydawnictwo Naukowe PWN, tłum. z ang. J.Amsterdamski, ss. 445-491.
[13]A.M. Turing, On computable numbers, with an application to the Entscheidungsproblem, *Proc. Lond. Math. Soc. (ser. 2)* 42, 230-265; correction 43, 544-546.
[14]R. Penrose, op. cit., 452.
[15]F.D. Wilhelmsen, *op. cit.*, 170.
[16] *ibid.*

In his book entitled *Utopia or Oblivion*, Fuller makes a useful distinction between two operations of human intellect: *differentiation* and *integration*. Next, he notices that "the computer has already effectively eliminated man as differentiator, that is, a specialist, but it can never replace him as an integrator"[17]. According to Wilhelmsen, differentiation may be otherwise called *analysis* to follow the Aristotelian idea of "the resolution of reality back to its causes"[18]. In this case, analysis is understood as something inherent in reality that can be known as a result of a formal inference and not a "fresh insight". In other words, the conclusion following upon the analytic differentiation is based in previously given information and as such it can be programmed into the computer. Wihelmsen summarizes succinctly that "programmed questions are tactics dictated by an already fabricated strategy"[19]. This is best illustrated when the computer evaluates the moves in the game of chess based on the numerically given relative strengths of pieces and positions. Its 'decisions' draw from the rules of chess inscribed into the appropriate algorithm. In other words, there is no newness of knowledge for all that the computer achieves while deciding upon its moves depends on the previously given material.

On the other hand, according to Fuller, the act of integration (synthesis) involves introducing complexities together with many variables and interrelations among them. He suggests that computers also integrate but only *accidentally*. As an example, he proposes to consider a computer executing two programs simultaneously such as playing checkers and backgammon[20]. Since the checkers algorithm is simpler than that of backgammon, there occur periods when the two are synchronized resulting in a momentary blockage interference due to the shortage of time for the resolution of both. At this point, the computer faces the need to solve a problem of priority that lies outside of the essential content of either game, namely, which move to make first. Whatever criteria it uses, they are not dictated by either strategy meaning that the conclusion is achieved accidentally with respect to both checkers and backgammon. In the proper sense of the term, integration is accomplished by the human mind as an act of synthesizing. To illustrate this, Wilhelmsen invokes Kant's *synthesis a posteriori* where the predicate expresses what cannot be derived from the subject. Thus new knowledge arises based on non-reducible premises[21]. Similarly, one can refer back to the teaching of St. Thomas Aquinas. Quoting Wilhelmsen directly one realizes that "the synthesis effected is not merely "dug out" of either premise analytically. The intelligence transcends the formal order

[17]F. Buckminster Fuller, *Utopia or Oblivion: The Prospects for Humanity*, New York: Bantam Books, 1969. Wilhelmsen invokes the context of Fuller's discussion on pp. 12-79.
[18]Aristotle, *Metaphysics*, II, 1 quoted by F.D. Wilhelmsen, *op. cit.*, 171.
[19]F.D. Wilhelmsen, *op. cit.*, 172.
[20]R. Buckminster Fuller, *op. cit.*, 37 quoted by F. D. Wilhelmsen, *op. cit.*, 173.
[21]F.D. Wilhelmsen, *op. cit.*, 174.

in and through the synthesizing act that posits the formal content as well as the conclusion"[22].

Although the above analysis diagnoses the existence of integration (synthesis) and its specificity with respect to differentiation (analysis), further consideration is necessary to elucidate integration nature. The important criterion, Wilhelmsen states, is that "analytic inferences, themselves formal, are anchored in a priority out of which they are actualized"[23]. For instance, Wilhelmsen compares analytic statements to Sherlock Holmes' deductive way of deciphering the "drinking propensities of Watson's brother from a close study of the latter's pocket watch". Synthetic conclusions, he continues, "are without any anchor in the past. They have no prior formal causes. They are not continuous but discontinuous with what preceded them"[24]. It is the effect that when two judgments are juxtaposed, a new existential unity arises following an intellectual act that transcends both premises. Inasmuch as the origin of this transcendence as the result of the said unity of premises may seem intuitively acceptable, its true source lies in its existential character. However, this issue can be fully comprehended only on the grounds of Thomistic metaphysics and epistemology that will be briefly outlined in the following section.

The discipline of philosophy that is called metaphysics treats of things that are beyond physics. This is mirrored in the composition of Aristotle's works where the book on metaphysics follows that of physics. This indicates that metaphysics should be studied after physics. As St. Thomas Aquinas states in his commentary to Boethius' *De Trinitate*: "beyond physics; for we have to proceed from sensible things to those that are not sensible. It is also called first philosophy, inasmuch as all the other sciences, receiving their principles from it, come after it"[25]. Since according to St. Thomas Aquinas, science is the study of things in the light of their causes, metaphysics reaches to the ultimate cause of the Universe, *Ipsum Esse Subsistens*, that is, God. Metaphysics is the most general of all sciences for its object of study is being as being in abstraction from any specification (*ens qua ens*). The Aristotelian metaphysics yields three major compositions that are found in anything that exists: form/ matter (hylemorphic theory), act/potency and substance/accident[26].

The main accomplishment of St. Thomas Aquinas concerns the distinction between essence and existence. In the *Posterior Analytics,* Aristotle states that what a man is and being a man is not the same, he does not regard the essence

[22] *ibid*.
[23] *ibid.*
[24] *ibid.*
[25] St. Thomas Aquinas, *In Boethii de Trinitate*, q.5, a.1.
[26] Aristotle, *Metaphysics.*

and being (esse) as really distinct in an existing thing[27]. This finds its source in the conviction of the Greeks that the cosmos has always been in existence. Consequently, it prevents the question as to why there is being at all and not nothing. The advent of Christianity instilled the idea that the Universe was created by an independent and totally free act of the Divine will and that the existence of all things is contingent[28]. St. Thomas Aquinas uses this observation to reflect upon the question of the causes of being to arrive at the conclusion that all beings come from God: "being *qua* being is caused by God himself"[29]. The contingency of things as well as their plurality led St. Thomas to conclude that the essence (*essentia*), that is by which a thing created is what it is, is really distinct from that, by which it is (*esse*)[30]. The distinction between *esse* and *essentia* constitutes the most fundamental composition found in every contingent being. In God, however, essence is identical with existence whereby He is the uncaused necessary Being, the ultimate source of existence, *Ipsum Esse Subsistens*.

St. Thomas Aquinas insists that both *esse* and *essentia* are really distinguishable but they are not things in themselves. They remain in relation of act and potency with respect to each other. As Frederick Wilhelmsen puts it: "esse is absolutely prior, presupposing nothing, whereas everything else presupposes esse", "esse is the being of things, their being composed: the esse of composite creatures is existential synthesizing activity"[31]. *Esse* is never a subject of its own, it is the synthesizing activity through which essential principles are composed into one being[32]. God, the *Ipsum Esse Subsistens,* is the ultimate source of esse while the creatures participate in this source by way of analogy. Insofar as esse is an act, it synthesizes essences into concrete beings[33]. Essence, on the other hand, specifies the mode of being of a thing from within thus establishing the said relation between the two as act and potency. Consequently, esse and essence can be looked upon as autodetermining principles.

Wilhelmsen's assertion that "human reasoning as creative synthesizing analogically mirrors or refracts the structure of being of St. Thomas Aquinas" provides a convenient bridge to Thomistic epistemology. This epistemology shares in the broader understanding of knowledge as the intentional presence of

[27]Aristotle, *Post. Anal.* II, 7.

[28]Stanley L. Jaki, *The Origin of Science and the Science of Its Origin*, Edinburgh: Scottish Academic Press, 1978, pg. 11.

[29]St. Thomas Aquinas, *In VI Metaph.*, l.3., n.1220

[30]St. Thomas Aquinas, *De ente et essentia*, Chp. 6.

[31]F.D. Wilhelmsen, *The Concept of Existence*, in *Being and Knowing*, Albany – New York: PCP 1995. Here Wilhelmsen refers to the following original texts of St. Thomas Aquinas *In I Sent*. d. 19, q. 5, a.1., ad 7; *In I Sent.* d. 38, q.1, a.3.

[32]St. Thomas Aquinas, *Summa Contra Gentiles*, II, 52; *In Boethii de Hebdomadibus*, lect.2.

[33]St. Thomas Aquinas, *De potentia Dei*, q.7., a.2, ad.5.

a known object in the knowing subject by means of a mental representation[34]. As St. Thomas Aquinas explicates, the intelligibility of the created Universe arises only as deduced from the Cause of its being, that is God, and not as somehow implied in their natures[35]. In the act of cognition, the sensory material gathered by the senses is permeated by the light of the active intellect and through the process of abstraction achieves its final mode of being "other-as-other" when impressed upon the *passive* intellect[36]. Thus the idea of a cognized object is formed in human mind. At the same time, it is the reflection of a corresponding idea residing in the mind of God whereby human intellect participates analogically in the Divine intellect[37]. Thomistic epistemology bears radically *existential* character insofar as to know means to achieve a new mode of intellectual (intentional) existence conditioned entirely by the object of cognition[38]. Moreover, the human awareness of *ego* is concomitant to the act of cognition. This implies that without a single act of cognition directed towards objectively existing reality, man is unable to be aware of himself as a knowing subject, as an *ego*[39]. Consequently, the second fundamental trait of Thomistic epistemology is its entire dependence on the objective created order. Human intellect remains entirely transparent and passive in this process, namely, it contributes nothing of its own to the essential content transmitted through the external senses. St. Thomas Aquinas excludes any knowledge obtained through direct illumination, postulated in Platonic and Augustinian tradition[40]. By virtue of its very nature, the process of abstraction mentioned above makes human cognition fragmentary or, as it is often named, *analogical*. Lastly, abstraction leads to the dematerialization of the sensory content so that the very act of knowing – becoming other-as-other – is *immaterial*. This provides important evidence for St. Thomas to conclude that human beings are endowed with immaterial and immortal soul.

Since it is the objectively existing reality that conditions the process of human cognition, human mind must exercise powers matching the structure of cognized things. They must fit as "a plug an outlet in order to make a good connection". This means that the fundamental composition of all created things of esse and essence will be mirrored by two powers of human intellection, existential judgment (*judicium*) and simple apprehension (*apprehensio simplex*),

[34]J. Owens, *Cognition: An Epistemological Inquiry*, Houston, Texas: The Center for Thomistic Studies 1992, pp. 167 – 186.

[35]St. Thomas Aquinas, *De potentia Dei*, q.3., a.5, ad.1.

[36]St. Thomas Aquinas, *In III de anima*, lect. 10, Art. 738-9, *Summa Theologiae* I, q. 40, a.3, *De veritate* 10, 6, ad 7.

[37]St. Thomas Aquinas, *Summa Theologiae*, I q. 89, a.1.

[38]St. Thomas Aquinas, *Summa Theologiae,* I q.18, a.2.

[39]St. Thomas Aquinas, *In II Sententiarum*, 19, q.5., a.1c et ad 7; *Summa Contra Gentiles*, I c. 59; *De Malo*, XVI, 6 ad 19.

[40]St. Thomas Aquinas, *Summa Theologiae*, I q. 84, a. 3 -5

respectively. Wilhelmsen will use the characteristics of these two powers with particular emphasis on that of judgment to evaluate the feasibility of artificial intelligence.

In his commentary on Boethius' *De Trinitate*, St. Thomas Aquinas states that:

> The first operation of the intellect concerns the nature itself of the thing in respect to which the thing receives certain rank among these that exists either as a complete thing, like some whole, or as an incomplete one like a part or an accident. The second operation of the intellect regards the being itself of a thing that results from the union of principles of a thing in composite substances, or, as in the case of simple substances, accompanies the thing's simple nature[41].

The first of the two operations of the human intellect, *simple apprehension*, is responsible for the understanding or apprehension of intelligible objects. It enables the intellect to know *what* things are, to know their essences. The second operation, judgment, serves to compose and divide what was grasped in simple apprehension. For example, the understanding of what "blue" and "sky" are allows the intellect to **unite** the two and affirm that "sky is blue" or having grasped what "sky" and "dog" are, **divide** the two by asserting that "sky is not a dog". "In judgment, then, the intellect does not simply know what things are; rather, it grasps them in their very existence"[42]. When the human mind affirms that sky is blue, it understands how sky exists, that is as blue. When it judges that sky is not a dog, it comprehends how sky does not exist, it does not exist as a dog. Of course, human mind concludes based on the content of the combined propositions but it is only the "internal structure of the performance of reasoning", there is no conceptual representation of why man concludes[43]. This content, however, has to be put into being by the internal activity of the human intelligence, has to be turned into the "being-known" as a form of unity of predicate and subject. This unity is in no way reducible to what goes into it and new knowledge is attained in the synthesis of premises. However, it is not the synthesis itself but "the esse of synthesizing is the very act of concluding, of affirming or assenting to the new being of a predicate in a subject"[44]. This act is what one understands as *truth* in the Thomistic sense. Frederick Wilhelmsen

[41]St. Thomas Aquinas, *In Boethii De Trinitate*, q.5, a.3.: "Prima quidem operatio respicit ipsam naturam rei, secundum quam res intellecta aliquem gradum in entibus obtinet, sive sit res completa, ut totum aliquod, sive res incompleta, ut pars vel accidens. Secunda vero operatio respicit ipsum esse rei, quod quidem resultat ex congregatione principiorum rei in compositis vel ipsam simplicem naturam rei concomitatur, ut in substantiis simplicibus".

[42]A. Maurer, St. Thomas Aquinas: The Division and Methods of the Sciences. Questions V and VI of his Commentary on the De Trintate of Boethius translated with Introduction and Notes, 4th ed., Toronto: Pontifical Institute of Mediaeval Studies 1986, XVIII.

[43]F. D. Wilhelmsen, *Reasoning and Computers*, in *Being and Knowing*, Albany – New York: PCP 1995, 178.

[44]F.D. Wilhelmsen, *op. cit.*, 177.

summarizes succinctly: "If radical existential activity is in every sense act and in no sense potency, then it follows that the efficient causation (Hume's act of belief) of the being of integration or synthesis is not deducible formally from pre-existent knowledge but that it is totally new, creative, discontinuous"[45].

Although the length of the above metaphysical/epistemological rightly seems somewhat burdensome, it facilitates the evaluation of artificial intelligence in light of the scholastic philosophy proposed by Frederick Wilhelmsen. The core of the argument hinges upon the discussed distinction between the conceptual content of what goes into reasoning and the activity of the intellect that exercises the reasoning. Wilhelmsen states that it is exactly this conceptual content and formal relationships that can be "charted through psychological and electronic techniques"[46]. In other words, only the static component of human reasoning that comprises the cognitional content can be subject to algorithmization. What remains entirely beyond algorithmization is the very act by which reasoning is effected. This act introduces radical discontinuity into the process of human intellection so that newly achieved knowledge is not reducible to the conceptual content it has been achieved upon. A meaningful mental state is attained by the exercise of the entire complexus of cognitive powers of man. Semantics transcends the formal order of syntax. Consequently, scholastic epistemology presents human cognition as a complex process wherein one needs to probe into the nature of each of its constituents to account for its algortihmizability. Inasmuch as the static conceptual part can be "charted" (Wilhelmsen's terminology), the dynamical part responsible for making the conceptual intentionally exist as known escapes translation into any computational language. Thus, it renders the strong hypothesis of the artificial intelligence not feasible. However, since the conceptual aspect of human thought, namely, its internal structure, can be algorithmically modeled, scholastic epistemology can be considered to corroborate the weak hypothesis of artificial intelligence. It is the very act of the doing of reasoning that cannot be modeled.

In his reflections on mathematical truth, Roger Penrose writes:

> I think that Gődel's Theorem clearly indicates that the notion of mathematical truth cannot be satisfactorily represented in any formal system. Mathematical truth exceeds the limits of pure formalism. … In mathematical truth, one can find something absolute and "given by God"[47].

Although the last sentence of the above quote is of rather theological nature and does not pertain to the scope of this study, Penrose's claim of the formal non representability of the mathematical truth follows upon Alan Turing's solution

[45]F.D. Wilhelmsen, *op. cit.*, 179.
[46]F.D. Wilhelmsen, *op. cit.*, 178.
[47]R. Penrose, *op. cit*., 134.

of Hilbert's *Entscheidungsproblem* that there are no general algorithms permitting solutions of all mathematical problems. Also, Penrose's insight in regards to the formulations of judgments as an exclusive manifestation of human consciousness seems to accord with the conclusions of this article. It is not possible to state whether such correlation is scientifically justifiable. As indicated by Frederick Wilhelmsen, the exploration of scholastic epistemology on the grounds of the works of St. Thomas Aquinas provides important means to probe into the nature of human reasoning in general. Indeed, some of the terminology used in scholastic philosophy is not entirely compatible with that used by contemporary cognitive science. Scholastic epistemology facilitates the understanding of the complexity of human thought by singling out processes of its internal structuring (conceptualization) as well as the very act by which reasoning is effected (judgment/synthesis). This accords with the increasing insistence of modern science on the existence of a non algorithmizable element of human reasoning. In particular, this approach sheds valuable light on the issue of artificial intelligence and the *Chinese Room* argument of John Searle. While it describes the origin and specificity of the non algorithmizable aspect of human thinking and thus contradicts the strong AI hypothesis, it thoroughly metaphysical nature makes the application of experimental methods of study quite limited.

Does non alogithmizability means non rationality? It might. For as Frederick Wilhelmsen asserts in conclusion: "Lovers tell us – and the Thomistic tradition buttresses their conviction – love is non rational. Perhaps there is an even deeper irony: the non rationality of reason. A friend of the author recently won two thousand dollars playing blackjack against a computer. He did so by throwing away the book and trusting his own wits"[48].

[48] F. D. Wilhelmsen, *op. cit*., 179.