EasyChair Preprint

№ 15705

The GOOGLE and XPRIZE Award for How to Use Quantum Computers Practically: the Problem of the "P" Versus "NP" Outputs of Any Quantum Computer and the Pathway for Its Resolving

Vasil Penchev

January 13, 2025

The GOOGLE and XPRIZE award for how to use quantum computers practically: The problem of the "P" versus "NP" outputs of any quantum computer and the pathway for its resolving

Vasil Penchev, vasildinev@gmail.com
Bulgarian Academy of Sciences:
Institute of Philosophy and Sociology

Abstract. The GOOGLE and XPRIZE $5,000,000 for the practical and socially useful utilization of the quantum computer is the starting point for ontomathematical reflections for what it can really serve. Its "output by measurement" is opposed to the conjecture for a coherent ray able alternatively to deliver the ultimate result of any quantum calculation immediately as a Dirac δ-function therefore accomplishing the transition of the sequence of increasingly narrow probability density distributions to their limit. The GOOGLE and XPRIZE problem's solution needs the initial understanding that the result of any quantum calculation is a wave function, or respectively, a probability (density or not) distribution unlike the Turing machine one, and only a "calculating ray" is able to transform the former into the later without any "curving" disturbances. Thus, the unique capability of the quantum computer due to its inherent quantum parallelism can be conserved for all Gödel unresolvable problems, only on the fast "NP" track of which the quantum computer "Achilles" is able practically to overrun the Turing machine "Tortoise" since the latter can "sprint" only by any "P" calculating speed even on it and unlike "Achilles" himself able for "NP" velocities as well. The way for any material body to "calculate" the certain trajectory of least action also resolves the "traveling salesman problem" in fact, therefore illustrating furthermore what the "NP" output of a quantum computer by a "calculating ray" should mean. Another example is the problem of the number of all prime numbers less than "N", which is suggested to visualize once again the quantum computer capability to resolve problems by a "NP" speed and thus qualitatively to overrun any competing Turing machine. The technically implemented idea of laser is now reinterpreted to "radiate a wave function" in order to explain the "calculating ray" option for a quantum computer "NP" output. The generalization of an entanglement "trigger ray" described by any non-Hermitian operator (unlike a laser) is suggested as well as those "sci-fi" horizons which it reveals. One of them is meant for elucidating the practical meaning of the "Yang-Mills existence and mass gap problem", one more of the CMI "Millennium Problems" after that of "P vs NP".
Keywords: quantum computer, quantum Turing machine, Turing machine, quantum and classical information, qubits and bits, "N vs NP" problem, the problem of the number of prime numbers, "traveling salesman" problem, "Yang-Mills existence and mass gap problem", class of all Gödel insoluble problems, quantum computer superiority over all Turing machines

I INSTEAD OF INTRODUCTION: QUANTUM COMPUTER OR "GREAT EXPECTATIONS" (ALMOST IN DICKENS)

The "great expectations" for the quantum computer to be the next, qualitatively higher, fundamentally new level after the Turing machine (being the mathematically generalized class of all available computers), were not justified at least until now. It turned out to be rather a dream or metaphysical doctrine without any essential practical implementation. It is exceptionally

expensive since it is able to calculate only being in a coherent state, which is technically almost impossible to be held for an arbitrarily long period of time, for example needing temperatures practically coinciding with the absolutely zero, 0°K, or other analogical extremal conditions. Regardless of being so difficult for practical realization, it does not manage to overrun qualitatively its rival, the standard computers, always "Turing machines", for any problems thus demonstrating its inherent uselessness, generating, particularly. appeals for stopping elaborating even theoretically researching, being only a waste of much money.

So, GOOGLE and XPRIZE[1] try to stimulate those investigations which would refute the skeptic voices becoming more and more, gradually, due the aforementioned, possibly fundamental obstacles. The implementation of quantum computers can be likened to the controlled thermonuclear synthesis analogically promising a technical revolution but needing extremal conditions especially to be maintained for an arbitrarily long period of time rather than for nano- or microseconds. So, though thermonuclear synthesis does not contradict all known until now natural laws, its practical implementation technically exceeds humankind's possibilities. In other words, "quantum computer" at the best is still one "thermonuclear synthesis", i.e. practically useless though maybe achievable in principle in some uncertain remote future.

However, the worldview advocated in the present study is quite different. It states that we do not understand how the quantum computer calculates, particularly what it calculates, and thus for what it can be really useful. The main reason for that misunderstanding in fact consists in extrapolating the established pattern extracted for all available real computes all being reducible to the mathematical model of the Turing machine. However, the same narrow-minded comprehension can be traced much deeper, namely back to the philosophical prejudice of Modernity, briefly notable as "Cartesianism" and loosely consisting in the absolute opposition of "mind" (subject") versus "body" ("object") divided from each other, figuratively speaking, by an "abyss", so that they are situated on its two opposite "shores". Following the same metaphor, the quantum computer and thus all problems which it can resolve to be useful are to be also located *within* the same "abyss" being fundamentally inaccessible for contemporary cognition, a particular case of which is what is at all possible to be studied in Modernity, or utilizing Michel Foucalt's term, complying strictly its "episteme".

Consequently, one needs a rigorous definition of Modernity in advance, especially that of the boundaries of all cognition accessible during it, and thus what "Postmodernity" should mean also in an absolutely exact definition. Unfortunately, the concept of Postmodernity in contemporary philosophy and humanitarian cognition is extremely uncertain, vague, unclear therefore allowing for interpreting it even in diametrically opposite ways, thus inherently enumerable among "Art and humanities", i.e., as a subject only for those sciences crucially relying on human decision and thus on more or less loose interpretations, fictions, fantasies, so

[1] https://www.xprize.org/prizes/qc-apps .

that the only possible criterion for them to be true consists of whether they are commonly accepted, i.e. whether they are a general prejudice, in the final analysis[2].

So, the starting suggestion of the present paper about the practical realization of quantum computer (thus just according to the intention and objective of the GOOGLE and XPIZE award) will be rather extraordinary: the problem is seen not the serial scientific and technical puzzle needing a relevant very smart solution concentrated in the proper and exceptionally narrow area of computer science and only within the welded framework given ready-made in advance and thus unquestionable. On the contrary, it needs a relevant "Gestalt change" touching many other scientific areas, even the social organization and hierarchy themselves, therefore implicitly calling for social revolution. Said quite briefly and rather aphoristically, the quantum computer cannot properly calculate in Modernity, thus appealing for Postmodernity (but as a concept relevant to exact sciences rather than to "Art and humanities" allowing for any arbitrary, subjective, even personal sense by which it to be interpreted so that "Anything goes", after Feyerabend).

Do GOOGLE and XPIZE admit such a solution changing the Gestalt and general organization of cognition imposed by Modernity? Of course not: that kind of solution would not be "practical" at least since it suggests huge costs necessary for new paradigms in many sciences, their rethinking, not to speak of the material price of each social revolution being an immense risky investment justifiable only in the uncertain future. They hope for it to be just the serial puzzle allowing for the particular solution only of it not touching at all the general framework of cognition and social organization in Modernity. Consequently, one of the main purposes of the study is to demonstrate that the "practical use of quantum computer" is possible only in Postmodernity rather than in Modernity and thus, being impossible within the numerous restrictions which the latter imposes (at that, meaning both "Modernity" and "Postmodernity" in an absolutely exact sense relevant to computer science rather that to "Art a humanities" as usual).

It consists in the following: the unsurmountable abyss between its two shores of "Mind" or "Subject", on the one side, and "Body" or "Object", on the other side, is replaced by its negation (for example, just as Lobachevsky built his geometry only substituting the Fifth Postulate of Euclid's "Elements" by its negation though initially hopping to reveal any contradiction in that hypothetical construction and thus to justify the Fifth Postulate by "reductio ad absurdum"). Of course, the re[lacement of the Cartesian postulate being one of the most fundamental one, proper philosophical, implies many other revolutionary conclusions, however more or less considered already in detail in other papers (e.g. Penchev 2024 August 5; 2024 April 24; 2023 December 6; 2023 October 2; etc.), including the sacrilegious "experimental quantum theology" (Penchev 2024 October 2), in which the subject of the present study is also sketched though quite cursorily:

---

[2] Rather as illustrations: Kuntz 2012, Forman 2010; 2007; Han, Lee, England 2010; Ginev 2005; Strassberg 2005; Broks 2003; Fisher 2003; Ruttkamp 2003; Vavrus 2000; Webster 2000; Brooks 1999; Ertürk 1999; Zanotti 1999; Lightman 1996; Giere 1993; Firat, Venkatesh 1993; Wersig 1993; Lyon 1993; Bruffee 1992; LeRon 1992; Parusnikova 1992; Wagner 1992; Best 1991; Latour 1990; Shotter 1990; Hudson 1988; Lash 1985.

Then, the opposition of the "Turing machine" versus its rival, the "quantum computer" (e.g. limited only to the quantum Turing machine for which only the tape consists of qubits rather than of bits, but keeping all other characteristics of the definition of the Turing machine as in the "P vs NP" CMI problem of the Millenium[3]) can be reduced to the following difference alone: the result of the Turing machine is always absolutely unambiguously determined unlike that of a quantum computer, being always a probability (density or not) distribution, thus a wave function as the characteristic function of the distribution at issue and a relevant quantum state equally well interpretable to be *both physical or mathematical*. Indeed, each of those equivalent probability distributions, wave functions and quantum states is in turn absolutely unambiguously determined after which the "quantum computer" can be granted to be the conservative generalization of the Turing machine where any exact value of a certain fiction is substituted by its vague and fussy probability distribution therefore implying the converse transition of the series of increasingly narrow distributions to the Dirac δ-function, on the one hand, but also, to the single corresponding wave function of the dual separable complex Hilbert space, on the other hand.

So, what a quantum computer calculates, turning out to be as a result always a wave function (respectively, a probability distribution and a quantum state), is always the generation of the ultimate and absolutely determined result from its mathematical probabilities, or reflecting philosophically from its only possibilities: in the final analysis, though said rather figuratively: "from nothing". On the contrary, Cartesianism excludes fundamentally the process of any entity to appear "from nothing", the notorious "creatio ex nihilo" reserved only for God: thus not to be studied by science at all, especially by exact science such as mathematics and physics; even more so as for its implementation in technics by relevant tools (what the quantum computer is).

One can consider what is a "tool" in Modernity at all. Its "behavior" is to be absolutely unambiguously determined, in fact predetermined by its purpose, which is absolutely causally predictable and embedded in its design. That instrument is able only to accomplish certain decisions in advance chosen by human beings who are only gifted by that exceptionally "valuable commodity of free will"[4] featuring humankind (and any normal human including): thus being absolutely opposed to nature or any material bodies belonging to it and what is any tool by itself, i.e. before to be utilized by virtue of a certain human decision and in accordance with which it has been elaborated before that.

So, the Turing machine embodies and generalizes as a mathematical model the class of all contemporary computers being inherently *tools* in Modernity, and not more than *tools*, thus identifiable philosophically with any other instruments not designated to calculate, such as a hammer, for example. Nonetheless, all computers are additionally featured to be instruments for thinking unlike any others designated to serve for human activities different from thinking. So, the Turing machine suggests a formal model of thinking, however where "free will" is fundamentally removed so that it is inherently incomplete model of thinking, which does not

[3] https://www.claymath.org/millennium/p-vs-np/ .
[4] Conway and Kochen (2006) coined that metaphor in the conclusion of their "free will paper".

contain free will in definition remaining thoroughly reserved for human beings: i.e., those programmers creating the relevant software, only by means of which the Turing machine is able to resolve that specific problem or class of problems, to which it is the relevant tool.

In other words, the quantum computer does not fall within that framework meant implicitly as for any contemporary computer and representable by the mathematical model of the Turing machine. Nonetheless, GOOGLE and XPRIZE implicitly understand that the "practical utilization of quantum computer" suggests for it to be another tool analogical to the Turing machine, but hopefully much more powerful than it, i.e., able to resolve problems much faster than it thus justifying its practical utilizations, for stimulating the discoveries of which the prize at issue has been established. However, if one suggests another Gestalt, respectively, a relevant Gestalt change to the standard and above sketched viewpoint for any computer, including quantum, namely, to be that "tool" in a modern sense just as any contemporary computer, the practical use meant also as for a quantum computer does not include as *conditio sine qua non* to be a tool thus conserving the human monopoly of free will (a monopoly which is orthodox for Modernity).

In fact, still the definition of "quantum computer", consisting in calculating probability distributions (respectively, wave functions and quantum states), unlike the Turing machine, would crucially destroy the human monopoly at issue. However, the conditional mood (by means of "would destroy" rather than "destroys") here is relevant by virtue of the fact that the monopoly at issue is *only* and emphasized "only" a human illusion, the serial boastful delusion, which can also be called "hallucination". Nature or any tiny part of it such as ан instrument have never been really "blind" and absolutely deprived of free will as they were heralded absolutely wrongly by Modernity. That "hallucination" is approximately and partly valid only locally, but the fact that is not more than a hallucination due to locality were enlightened still by Plato, by its insight, or parable of the "cave where people are chained just locally to observed only a wall and the shadows on it", in fact originating from inherently nonlocal events, however happening before them and thus invisible for them just due to their local chains not allowing for them to observe whatever different from the wall and shadows on it.

So, GOOGLE and XPRIZE mean that the eventual solution for the practical utilization of quantum computers to be another "shadow" on the "wall", provided and thus predetermined to be a necessary condition for any possible solution. Consequently, one expects for the quantum computer to be another tool, hopefully much more powerful than any contemporary computer, i.e. than the Turing machine. However, that expectation for it implies a fundamental contradiction since it calculates only in the degree of which it possesses "free will" in the exact meaning of the "free will theorems" (Conway, Kochen 2006, 2009): of course, being a property absolutely inadmissible and inacceptable for any instrument as what the quantum computer just as the Turing machine has been always thought.

So, one is able already to decipher the real sense of the GOOGLE and XPRIZE award for the "quantum computer to be practically utilized": thus meaning to be somehow, very "cleverly" surrounded that it calculates just as far as it is NOT a tool. In other words, the prize at issue

would be winned only by those computer scientists who have managed to conserve the aforementioned “hallucination” of humankind, according to which nature by itself and thus any part of it, including what is the material carrier of any instrument, consequently and supposedly that of a quantum computer (just as the “hardware” of the Turing machine implemented by the “body” of any contemporary computer including that, by which the present study has been written) are “blind” by itself: so any reasonable design, intention or objective can be embedded in them only externally, secondarily, by some human beings who have created that tool just as a tool inherently “able” only to serve “unequivocally” and “obey” absolutely. Indeed, nobody “negotiates” with a hammer in order to drive nails or with a computer for unambiguously accomplishing that algorithm which is imposed by some humans to be realized by it, or even by a cow able only to be milked without any “negotiations”. No human reckons the enumerated and many similar cases to be “hallucinations”, but on the contrary, the normal state of affairs, so that only human beings can possess “free will”, which the are able to impose legitimately on any other entities whether hammers, computers or cows by virtue of their unique capability to be reasonable:

So, one may understand thoroughly Einstein’s outrage in his letter to Max Born in 1926 (Einstein 1926) that if one electron would be gifted by “free will” to decide about its “behavior” as quantum mechanics states (and Einstein himself by virtue of his genius managed to penetrate even then), he would prefer to be “croupier or shoemaker than a physicist”. In fact, Conway and Kochen’s choice to call the theorems, rigorously and mathematically proved by them, just the “free will theorems”, is a replica to Einstein’s concerns and troubles about quantum mechanics that they were and really and absolutely justified (jokingly speaking, that he indeed be better to be a croupier or shoemaker than a physicist).

One might stare at what Einstein meant in being a “physicist” more or less waved by quantum mechanics after his insight. Here “physicist” says “classical scientist” confessing the dominating position of all human beings over nature eventually shared only with God, even much more so in relation to an extremely tiny part of it such as an electron. Indeed, that understanding for classical science to be absolutely consistent with the total supremacy of humankind over nature established by Modernity and articulated by Cartesianism is a fundamental “conditio sine qua non” not only for Einstein himself and almost all scientists before and after him, but also and not less for the GOOGLE and XPRIZE award meaning for the “practical use of quantum computer” so that the scandalous and in fact challenging humankind’s domination “free will” of it to be surrounded by virtue of humans’ smartness and reasonability in order the “properly utilized” quantum computer to “behavior appropriately”, i.e., just as any tool whether a hammer, a computer or a cow obeying humans doubtlessly and necessarily, according to the “natural law” according to which all the free will in the universe is to be concentrated in humankind and eventual aliens (if any).

Alas, there is not such a “natural law”: even more, it is a “hallucination”, a quite crazy prejudice originating from the pathological “feeling of inferiority” to all disasters caused by nature, the forces of which exceed those of humankind incommensurably even nowadays. In

fact, the terrestrial humankind lives in a safe and reliable “baby swing” created by nature, the creation of which is furthermore an overwhelming task as for all options supplied by contemporary science, technique and all energetic and intellectual possibilities. Only within that “baby swing” or “home” being inherently designated to guarantee the relevant comfort for the baby’s natural development and transformation gradually into a child, a teenager, and finally, into a young adult, the hallucination of humankind’s domination is relevant, of course, supplied in fact by the parents and absolutely impossible for the siblings themselves until they do not become adults.

The quantum computer by itself possesses “free will” unlike any other human tool and just as any other quantum entity in the exact meaning of the “free will theorems” (Conway, Kochen 2006; 2009). It consists in its inherent probabilistic “behavior”, according to which it “chooses what to do” just as a human being “gifted by free will” and unlike any instrument, the use of which originates from the human intention rather than from “the instrument’s free will” (a so scandalous conjecture that Einstein would become a “croupier or shoemaker than a physicist”). Anyway, the utilization at issue is fundamentally restricted by its natural properties in advance studied by means of human cognition so that the use corresponds to them and thus to all natural laws. However, the quantum computer cannot be inserted in that framework furthermore implicitly meant by the GOOGLE and XPRIZE award since the fundamental property of quantum computer (as a relevant natural quantum law) is to possess “free will” just as any human being by virtue of its probabilistic behavior. Einstein, first, paid attention to that “scandalous disobedience”: however, just that is the case, according to the 2022 Nobel Prize for physics (Penchev 2023 March 13). Speaking rather jokingly, one might conclude that the present study cannot claim the award for the practical utilization of quantum computers since it advocates a relevant Gestalt change unlike the implicit context of the prize at issue suggesting that welded Gestalt including for any tool to obey human free will is an implied and self-evident “conditio sine qua non” for any acceptable solution. In other words, the present viewpoint suggests an inacceptable solution even stating that any “acceptable solution” does not exist by virtue of a natural law: just as the laws of thermodynamics do not allow for “perpetuum mobile”, for example.

Thus, one can illustrate the present approach by the following metaphor: it would be analogical to that if one offered a steam engine as a solution to the “perpetuum mobile” problem. Of course, it is not an eternal engine being featured by a certain efficiency factor much less than 100%: however, it is a real engine corresponding to all natural laws especially to those of thermodynamics (by the way, elaborated by Carnot just as a response and justification about the real impossibility of the practical implementation of the dream for “perpetuum mobile”); or alternatively: if Cartnot’s thermodynamics itself claiming to be the *practical* solution of the “perpetuum mobile problem” (of course, a smile emoticon would be here relevant as long it were admissible in a scientific or philosophical study).

II QUANTUM COMPUTER APPEALS FOR CHANGING THE "GESTALT": THE "P" VS "NP" OUTPUTS OF A QUANTUM COMPUTER

So, the practical utilization of quantum computers by themselves forces a Gestalt change though being extremely unwanted, but above all, unwanted for humankind's hallucination for possessing the total monopoly of free will. In other words, it can be considered to be even wishful for the cure of that suffering, a symptom of which is the delusion at issue. The Gestalt change unavoidable for the practical utilization of quantum computer will be represented in the present section by the derivative problem about the output of any quantum computer initially demonstrating that the standard (until now) output by the measurement accomplished by means of any macroscopic apparatus implies that its practical utilization is meaningless since that output reduces it to a Turing machine necessarily.

That conclusion follows from the abstract mathematical model of quantum measurement involving both set theory and arithmetic, and thus the Gödel dichotomy about their relation: either incompleteness or contradiction. Indeed, the results of any series of quantum measurements are elements of a finite set always, furthermore constituting a statistical collection corresponding to a probability (density or not) distribution if the measurements of the same quantum entity "tends to infinity" (nonetheless, remaining a finite set). So, all results of any quantum measurement of the same entity imply necessarily an arithmetic model as far as they satisfies the axiom of induction (for example, in Peano arithmetic for certainty) rather than the axiom of infinity (for example, that in ZFC axiomatics for certainty): indeed the axiom of induction implies for any natural number to be finite just as the number of all measurements accomplished to any quantum entity can be only finite.

However, the corresponding wave function by itself, respectively, that probability distribution from which it originates) is smooth (consequently, continuous) in definition, and quantum measurement, including that meant to be an output of a quantum processing, is always a mapping of an infinite set into a finite one, in turn, always representable as the final state of a Turng machine, i.e. *after its halting*. Furthermore, it is incomplete as far as that mapping cannot be a bijection, i.e. it obeys the Gödel incompleteness theorems (1931).

The aforementioned tenet has been known for more than two millennia, since Zeno's "Achilles and the Tortoise". What is sufficient to be smartly considered is only that the juxtaposition involved originally for the distances, which are run correspondingly by the Tortoise and Achilles, is formally and mathematically the same mapping being accomplished by any quantum measurement including that introduced to be an output of quantum calculation. Zeno demonstrated that two rational numbers, being the run distances meanwhile by both competitors, are to be bijectively mapped, thus involving an inherently arithmetic model for describing the aporia. So, Achilles is impossible to run over the Tortoise on any "arithmetical track", respectively countable track after involving the viewpoint of set theory:

Consequently, "Achilles and the Tortoise" is not a real paradox after the above consideration since it consists in the application of an irrelevant, namely arithmetical model for describing their competition, which would happen in fact on some uncountable, continual track,

only on which Achilles is able to overtake the Tortoise. On the contrary, if the competition is properly arithmetical, Achilles would never run over it, and just the last conclusion is formally equivalent to the statement relevant to the present research: quantum measurement in definition involves an arithmetical track, on which the quantum computer "Achilles" is fundamentally impossible to demonstrate any qualitatively better result than the Turing machine "Tortoise".

The right now justified observation can be immediately translated by the thesaurus of the "P vs NP" problem, one of the six unresolved yet problems claimed by CMI to be the problems of the (third) Millennium (this means: the most essential ones so that the development of mathematics crucially depends on them). It is almost obvious that the Turing machine is able to resolve any problem soluble by it only for a "P" time even only by virtue of the fact that it is a proper arithmetic model since its tape consists of a finite number of binary sells processed by an also finite algorithm embedded in its software. So, one can paraphrase the just acquired conclusion about the quantum computer Achilles's incapability to run over the Turing machine "Tortoise" on any countable track, as the originating derivatively from the *incapability to sprint* on the track of any "P" problem (definable by its solubility by the Turing machine: thus necessarily for a "P" time).

In other words, though the standard interpretation of Zeno's parabel means for it to be a paradox since Achilles would really overtake any "tortoise" (or whatever might be allegorically represented by it), it is now realized essentially otherwise, revealing a hidden sense: it is not an aporia, but rather a fact or even a theorem (proved more loosely) stating that "Achilles" cannot run over the "Tortoise" in any model being inherently arithmetic by virtue of a bijection of finite sets, corresponding to successive positions of both "runners". Just the latter conclusion refers to the theorem intended and relevant to the present study: the measurement output of a quantum computer involves an arithmetical model of it, after which the quantum computer "Achilles" cannot ever run over the Turing machine "Tortoise". So, an immediate corollary is that the use of quantum computers is practically meaningless, since the technical implementation of any quantum computer (because it is able to calculate only in some *coherent* state) is much more difficult than that of a Turing machine; but simultaneously, it is fundamentally incapable of being faster (at least *qualitatively* faster).

Fortunately, the above tenet against "quantum computers at all", in fact, means only the case of a "P" output of it as far as the "P" output can be proved to be equivalent to the introduction (whether explicitly or as it is ordinary: implicitly) of an arithmetical reduction of the realized quantum calculation to any finite sequence acquired by measurement. The "P" output needs a relevant definition derived from the exact formulation of the "P" vs "NP" problem where "P" is for the "P" time necessary for resolving a certain problem by a computer (quantum or not). This means the period of time (namely notated to be "P") is any polynomial function of the input data volume: so that the speed of increasing corresponding to getting larger of the volume at issue is another polynomial function since the derivative of any polynomial function is another polynomial function.

One can easily prove that the Turing machine is able to calculate only for a “P” time; as well as vice versa: if any computer obeys the “P” time restriction, it is always representable by the Turing machine (though that “representability” can be non-constructive). Then, the equivalence (whether constructive or not) to the Turing machine is in turn equivalent to the explicit introduction of an arithmetical model (for example, because the state of any Turing machine, even being “stuck”, i.e. “never stopping”, is an unambiguously determined finite number) and any calculation of the Turing machine needs and involves only mappings of finite sets of natural numbers. As for the former part of syllogism, any polynomial function of arithmetical data (i.e. all being natural numbers as the any input data of a contemporary computer) is just the above mappings of sets of natural numbers.

Fortunately, one may demonstrate even constructively (as in the next section though as a thought experiment or hypothesis) that the “P” output restriction of the quantum computer (after which it is fundamentally incapable to run over the “Tortoise” of the Turing machine, thus being impractical, or: nobody might win the GOOGLE and XPRIZE award) is only a prejudice however too deeply rooted in the joint organization of both cognition and society, imposed by Modernity, particularly postulating as an absolutely necessary condition for any computer (whether quantum or not) to be only a “blind” instrument, thus unequivocally obeying human beings: the natural “lords”, whose monopoly on all the free will in the universe is guarded by God Himself (of course, ostensibly).

Here is a thought experiment where quantum computers would be gifted by that too “valuable commodity of free will” just humankind is, and considering the reason for almost all real and normal human beings to comply the laws though their free will admits to violate them whenever as long they wish that: the intention of that “Gedankenexperiment” would be to investigate whether the “freed slaves”, i.e. the quantum computers would analogically obey certain laws though natural rather than human:

Society as well as the necessity for any human individual to be socialized and to cooperate with other people is what imploses the compliance with the established laws and order. Though he or she can always violate them by virtue of their free will, they use that free will decision just for obeying them. On the contrary, a slave is deprived of the right of free will decisions in many relations so that the slave’s owner is able to utilize him or her just as an instrument including as a computer. Then, one may suggest the following metaphor: quantum computers might demonstrate their superiority over all usual computers (constituting the class of the Turing machine) only if they would be “freed” so that they could use their “free will” (in the exact meaning of the “free will theorems”) just for calculating qualitatively better and faster than the Turing machine:

However, the prize for their practical implementation does not mean for them to be “freed”, but only to be somehow (and presumably very smartly and cleverly) forced to behave as slaves, i.e. as tools, for neutralizing their suggestable “rebel”. Alas, the “possession of slaves”, which (or maybe “who”) are quantum computers, is meaningless since they, remaining slaves or tools, are fundamentally, i.e. as a natural law (analogical to the principles of thermodynamics

excluding perpetuum mobile), incapable to run over the Turng machine "Tortoise", but the construction and especially maintenance of a quantum computer needs costs exceeding too much those for usual computers.

Do GOOGLE and XPRIZE mean for them to be "freed" as an admissible solution for awarding, though breaking the Gestalt in which they are only tools, "slaves" unavoidably continuing human free will, dominating over them by virtue of humankind's monopoly? On the one hand: hardly; on the other hand, the monopoly at issue is a delusion, hallucination, or illusion at best. So, one can penetrate into the real importance of their award far exceeding the literally articulated problem and consisting in whether and when at last people will manage to overcome that illusion, figuratively speaking, to cure of their pathological delusions and hallucinations originating from the crazy idea of the superiority over all the rest world by virtue of the imaginary "free will monopoly".

After the above preliminary notices, one can continue the intended thought experiment, after which the society of "freed quantum computers" calculate. The problem is: whether their "society", or speaking non-metaphorically, a medium of many enough quantum computers will be able to overtake the Turing machine "Tortoise" by resolving for any "P" time at least one problem, for which the Turing machine would need a "NP" time. Then, the collective decision of that society, respectively the unambiguous solution supplied by the statistical medium of quantum computers, would be realized by a qualitatively different output relevant to a statistical medium of quantum computers, here notated as the "NP output"[5] In fact, that calculating medium is realized by nature and what is quite necessary is humankind to understand that lesson: how the strangely teleological principle of least action[6], relating to any macroscopic body as a whole, can be reduced to a statistical collection consisting of the elements of the resultative decision of that medium of many enough quantum computers, which the body at issue represents. The lesson borrowed from nature will be investigated in detail in Section VII, so that it will be here only cursorily outlined:

First, one can stare at that extraordinary teleology, quite ridiculous as for nature granted to be "blind" by and during Modernity: the body as if knows its future position as if it targets that location in advance, after which it accomplishes the preliminary design of its trajectory just as any human being is able to create a mental image for a certain wishful future state of affairs, after which that project will be realized step by step (i.e., following a predetermined in advance trajectory in the corresponding generalized "space", which is to be the shortest pathway leading

---

[5] The idea about a medium of quantum computers is not a new one, respectively, that a single quantum computer is fundamentally probabilistically outputted: e.g. Boykin, Mor, Roychowdhury, Vatan 2010; Sasaki 2010; Castagnoli 2009; Miura 2009; Hagar 2007; Love, Boghosian 2006; Nakahar, Vartiainen, Kondo, Tanimu, Hata 2006; Mitra, Ghosh, Das, Pate, Kumar 2005; Kacewicz 2004; Kreinovich, Longpré 2004; Orús, Latorre, Martín-Delgado 2004; Samoilenko, Prikarpatsky, Taneri; Prikarpatsky, Blackmore 2004; Buhrman 2003; Meyer 2002; Patel 2001; Cleve, Eckert, Henderson, Macchiavello, Mosca 1998. However, the link between a medium of quantum computers and the solutions of "NP" problems is an original contribution. (where the medium of many enough quantum computers is also called to be a "NP output quantum computer").

[6] See, for example: Pendergast 2011.

to it). Obviously, any material body behaves as a human being directed by his or her own mind to reach the future state: an idea, of course, crazy according to the prejudice of Modernity, particularly confessed by classical science. The explanation here will be perhaps "too paradoxical" (just as mad people reckon the normal ones to be crazy):

One can refer to the notorious "Copernican revolution" as a visualization of how science is able to change the Gestalt simultaneously exchanging "what is crazy" and "what is normal". The normal before Copernicus was that the sun is moving in the sky and any normal human can observe that motion. So, only crazy people might then reject that obvious and even trivial fact. However, the normal nowadays is just the opposite statement since all normal people have studied and learnt still in school Copernicus's theory particularly explaining that the motion is mutually relative rather than a property and just this implies the illusion of the solar motion to any terrestrial observer.

Analogically, what is normal for classical science is that nature is certainly "blind" and only a crazy person might admit that it is able to think more or less similar to an average human. If that prejudice is the case, the principle of least action is to be only postulated because no exceptions (Feynman's representation as for quantum mechanics is a conservative generalization, thus it does not suggest exceptions as well), and its strange and inexplicable teleology is to be merely ignored as many other theoretical anomalies not needing to pay attention to them at all.

However, nonclassical quantum mechanics is kin to "gift" nature with "free will" and thus even with "reason". Though it is not commonly accepted worldview nowadays by both science and religion, one can anyway admit that future advance after which the "Copernican exchange" would be repeated so that the seeming "blindness" and absence of reason as for nature will be explained analogically: this means that reasonability just as motion is a relation rather than property, and the ostensible "blindness" of nature is only an illusion originating from the fact that a human observer therefore reasonable (absolutely doubtlessly after Descartes and his reflection that just the ego is only doubtless, and then transformed in a dogma by Cartesianism) is granted in advance and only to whom nature seems to be "blind" just as the solar motion in the sky is doubtless to any terrestrial observer, but nonetheless, it is a wrong representation after Copernicus.

In fact, if one considers the body (still more, if it is idealized to be a "material point") just as that medium of quantum computers, where all microscopic quantum entities such as "elementary particles" (following Pauli's particle paradigm and thus classical quantum mechanics) are now reinterpreted to be quantum computers (i.e., from the viewpoint of quantum information), one can think of them to "calculate collectively" the future position of it after projecting the total wave function of its quantum state as a whole onto the local screen (i.e. figuratively speaking, onto the "wall of Plato's cave"), where it is observed to be decomposed of independent spacetime and energy-momentum components therefore producing the standard representation of the body itself and featured by its energy-momentum moving in the welded and thus universal (being welded for all bodies) spacetime.

Then, the inherent teleology of the principle of least action is an immediate corollary from the fact that the total wave function of the body as a whole tends to the Fourier transform of the δ-function of Dirac since the probability density distribution tends to the latter if the number of the calculating quantum computers leans to infinity therefore constituting a continuous calculating manifold or medium. All those quantum computers are forced to calculate the same quantum state and its corresponding wave function by virtue of the fact that they are "excited" to be in the same initial state, especially obvious after the idealization of the real body to be a "material point" therefore granting the same input data for all quantum computers at issue.

Then, the material point can be likened to a radiating "laser", which radiates a coherent light impulse concentrating its energy in a very short time interval, being artificially forced (namely, by the special construction of the laser as a technical device) to have been "excited" in the same energetic state of its atoms, molecules, etc. However, any material point and thus any real body as far as the former idealization would be correct to it can be considered to be a "positional laser" where its atoms or molecules are "excited" to be in the same quantum state of the same position quite naturally and then, embedded in its definition.

If one stares at the impulse radiated by a laser, but from the viewpoint of quantum information rather than from that of classical quantum mechanics, it is not "energetic" in general, but probabilistic. This means that what is "radiated" is a probability density distribution so that the wave function representing the quantum state of the laser as a whole is its characteristic function. Just that probability density distribution can be seen as the corresponding energetic impulse *only* on the screen of locality, since *only* on it the absolute distinction of spacetime versus energy-momentum makes sense though that extremal particular case is granted to be universal by classical science including classical quantum mechanics.

Then, one can refer to the generalization of Emmy Noether's "first theorem" (1918) to be also valid to nonlocality (e.g. Penchev 2024 April 16) so that the relevant two conjugate quantities are "action" and "probability density distribution" (or respectively, its characteristic function as the corresponding wave function describing a certain quantum state). If that is the general case, the usual distinction penetrating all the classical science and physics, including classical quantum mechanics, about entities featured by nonzero energy (eventually mass at rest), on the one hand, and spacetime, on the other hand, only within which they are moving and even can at all exist, is already irrelevant. That distinction is not universal, so it is only a prejudice as for the crucially prevailing area of nonlocality:

The proper picture of the nonlocal world, thoroughly invisible or "dark" for classical science establishing locality and all the derivative features as necessary conditions of scientificity at all, consists only of (mathematical) density distributions and (physical) actions inherently and unambiguously corresponding to each other and generating the usual classical representation of the universe only locally, where alone and particularly the spacetime "stage" (or the "wall of Plato's cave") exist and might exist in principle, and then, physical entities definable by their finite nonzero energy, appear (or those "shadows of the wall of Plato's cave") and might at all appear not being real anywhere out of that "stage" or "wall".

Particularly, the Big Bang is not more than a myth substituting the real generation of physical entities (or "shadows") from "nothing", i.e. from pure mathematical probabilities (respectively "possibilities" if they are philosophically reflected) with an imaginary fairy tail (namely, that of the "Big Bang") how the world of the "shadows" (which is the only accessible for classical science) has been appeared also from "nothing" in the final analysis. That narrative is not more scientific than the Creation "described" in the first chapter of the Bible. It serves to replace humankind's ignorance about that real world, from which all the shadows originate, with a ridiculous fiction.

As for the proper subject of the present study, the quantum computer calculates and can fundamentally calculate only in that real world, from which all the "shadows on the wall" originate and meaning that the Turing machine is able to calculate only on the "wall" at issue. Thus, the quantum computer output by measurement transforms any calculation, processed by it in the real world, on the "wall" where all possible calculations of the Turing machine can fundamentally happen and where the practical implementation of the quantum computer is meaningless since its calculations would be always accomplishable by some Turing machine, which is furthermore much cheaper than any realization of quantum computer.

Nonetheless, the GOOGLE and XPRIZE award means as a necessary, though implicit and unarticulated condition that the solution (whatever it be) is to happen only on the "wall" since GOOGLE, XPRIZE as well as all official science and originating from it technologies recognize what is the "wall" alone, i.e. locality alone, on the stage of which only possible "tracks" are countable and the quantum computer "Achilles" is impossible to over run the Turing machine "Tortoise" as a natural law as this is in detail explained above. So, the explicit formulation of the problem, the solution of which might win the award, contradicts its implicit condition requiring for any solution competing for the Prize to be only "on the wall". That contradiction transforms the meant problem into an insoluble one, by the way, into the serial insoluble one and implicitly belonging to the class of all Gödel insoluble problems.

Fortunately, nature itself has taught a lesson how the quantum computer "Achilles" would run over the Turing machine "Tortoise" even as for the "chained people" able to watch only the "wall of the cave", or formulated non-metaphorically: only within locality wrongly granted by classical science to be "all in the world" (i.e. "That is the case", after Wittgenstein). What is sufficient is to be considered a medium of quantum computers somehow forced to resolve the same problem. Then, their collective solution would lean to the proper and unambiguous solution including the case where the problem at issue is fundamentally insoluble as for the Turing machine therefore supplying that superfast "track", only on which the quantum computer "Achilles" is able to realize his "sprinting skills".

Said otherwise, he might not demonstrate them being thoroughly restricted to run only on the "wall", where he might never overtake the Tortoise (as Zeno has convincingly shown yet more than two millennia ago). He would manage to do it only utilizing his capability to run also "behind the chained people", in the three-dimensional space of the cave unlike the Tortoise itself, able only to crawl on the two-dimensional wall. So, the quantum computer needs a new

dimension. Is Achilles a swindler working by deception, only to gain, albeit dishonestly? Indeed, that question cannot be unambiguously answered due to the following contradictory reasons as for the GOOGLE and XPRIZE award:

On the one hand, the “wall” is the established track for their competition as far as both GOOGLE and XPRIZE share the same prejudice as all “chained people”, e.g., expressed by Wittgenstein as “The world is all that is the case” postulating for locality to be universal. So, if Achilles runs out of the world, in the sense of running out of locality, i.e. nonlocally, he would violate the “rules of games”. On the other hand, the rule at issue is not expressly formulated since nobody admits that the quantum calculations could be processed out of the world since it is nonsense, for example, by following Wittgenstein. So, the rule restricting the competition to be within the world, thoroughly, does not exist, and consequently Achilles cannot break a nonexistent rule therefore allowing for him to run nonlocally as long as he is capable of that.

Returning back to the above exemplification of a medium of quantum computers as if calculating in advance, i.e. nonlocally, the “true trajectory” of the macroscopic body, strictly corresponding to the principle of least action, one immediately notices, that it demonstrates how Achilles really overtakes the Tortoise breaking a nonexistent rule. Indeed, if the Turing machine were able to calculate that true trajectory, this would be equivalent to resolving the halting problem, for which it is proven to be incapable.

Then, one utilizes the suggested above interpretation of “laser” to radiate a wave function corresponding to density distribution, thus inherently nonlocal, only seeming on the “wall”, i.e. on the screen of locality, to be a coherent energetic impulse, a ray lasting very shortly (though not being “instant”). The latter representation, albeit being usual for classical quantum mechanics, is irrelevant for explaining how the macroscopic body “calculates in advance”, i.e. nonlocally, the true trajectory obeying the principle of least action, or how the quantum computer “Achilles” would overrun the Turing machine “Tortoise” if a faster enough track would be utilized so that he could run nonlocally, though the finish of the competition is necessarily local in order to be watched and “applauded” by the “chained people”. So, the former interpretation should be involved:

Then, one can think of the macroscopic body, still more after the idealization it to be a “material point” as an analogue of “laser”, i.e. “nonlocality radiating” so that its collective wave function leans to the Dirac δ-function being the solution of its trajectory corresponding to the principle of least action. The same nonlocally and thus preliminary calculating impulse is watched by the locally “chained people” (i.e. on the “wall of the cave”) as moving in spacetime and obeying energy conservation, i.e. just as the classical physics (including classical quantum mechanics) needs.

So, the macroscopic body can be also interpreted to be a qualitatively different, “NP” output of the medium of quantum computers, as the macroscopic body can be thought by virtue of the fact that it consists of the huge number of quantum entities furthermore sharing the same spacetime position and thus being able to be likened to the excited state of a laser, all atoms or molecules of which share analogically the same “higher” and unstable energetic state. Then, one

can see the motion of the macroscopic body as the projection of the nonlocal impulse released after its "quantum leap" of all quantum entities belonging to it from the initial position of the trajectory according to the principle of least action to the final one being really accomplished by each separate quantum entity just after Feynman's "many paths" interpretation so that the just single real trajectory of the macroscopic body is the superposition of them.

If they are interpreted to be a medium of quantum computers calculating that single trajectory, each of those quantum computers would calculate fundamentally randomly just according to quantum mechanics. Nonetheless, the medium of all of them offers a single and unambiguous result allowing for the quantum computer "Achilles" to run anyway over the Turing machine "Tortoise" not only nonlocally, but also on the local "photofinish" of their competition. Rather figuratively speaking, that medium of the huge number of quantum computers, which Achilles's body is, has nonlocally calculated that collective wave function possessed of all of them, which can be seen on the screen of locality just as how "he" overtakes the "Tortoise". In other words the overtaking itself can happen *only nonlocally*, and only "after that", it can be projected on the "cave wall" for all local observers being "chained" after Plato: this means that the overtaking itself can happen only "behind them" thus remaining fundamentally unobservable for all of them, therefore for all physicists following classical quantum mechanics.

Counterfactually to the naked truth that the medium of quantum computers called "Achilles" is overtaking, those physicists confessing classical quantum mechanics thus restricted themselves to the dogma that only possible output of a quantum computer is that of a single one and consequently, only by means of measurement in the final analysis, might attempt to measure any quantum entity belonging to the collective medium of "Achilles" therefore obtaining an in principle occasional result whether "Achilles" is behind the "Tortoise" or he is in front of it. Only by accomplishing a huge *enough* number of measurements, the physicists at issue might conclude statistically credibly that "Achilles" has anyway run over the "Tortoise". However, one can refer to Lewis Carroll's version (e.g., Penchev 2021 November 18) again concluding that "huge enough number of measurements" obeys in turn to the Turing equivalent Achilles's impossibility to overtake ever the Turing machine "Tortoise". Here the key word is "enough" since that "enough" number would move permanently away and away exactly repeating the pattern borrowed from Zeno's initial parabel. This means that those physicists and respectively "blind reviewers" maintaining the dominating paradigm of classical quantum mechanics might never allow for Achilles to overtake the Tortoise including on the pages of all scientific journals therefore dooming the scientific Achilles forever to move barely behind the Tortoise of the official paradigm. Alas!

Anyway, the rigorous proof of the claim that the medium of quantum computer manages to supply a qualitatively different output of the quantum computer, here only postulated to be "NP" by its notation, will be suggested in Section VI in necessary detail. A cursory sketch to outline its design can be the following:

One needs the distinction between the "P" output of whether the quantum computer or the Turing machine versus the "NP" one of the quantum computer alone to be relevant also for finite output data (since the real problems resolved by computers are just those), on the one hand, and to the "screen of locality", mathematically representable under condition of countability, on the other hand. Obviously, the former implies the latter since any finite set is countable, but not vice versa, because there exist infinite countable sets. Nonetheless, one should represent the latter condition in terms of the former one, finitely, which seems to be impossible, internally contradictory, but only and first glance; and here is why:

One can distinguish finiteness and countable infinity (even infinity at all, i,e., regardless of its cardinal number, however the consideration of countable infinity or finiteness is sufficient as for the "P" versus "NP" problem[7], respectively "outputs of a quantum computer") also by means of the Gödel dichotomy about the relation of arithmetic to set theory: either incompleteness or contradiction. So and utilizing it, one may avoid the direct contradiction of finitenes versus (countable) infinity substituting it by the option of incompleteness supplied by the Gödel dichotomy, which can be in turn introduced, including as for problems, by the class of all Gödel insoluble problems, consequently only to which the distinction of both "P" and "NP" outputs would make sense.

If that would be the proved case (however in detail, only in Section VI), one can further distinguish the Turing machine from the quantum computer (respectively, the "P" and "NP" outputs of the latter) only in relation to any representative of the class at issue. In other words, only that class is able to supply the superfast "track", on which the quantum computer "Achilles" runs over the Turing machine "Tortoise", and as far as "Achilles" would always overtake the "Tortoise" in reality, this means that reality by itself is quantum:

So, being insoluble in a Gödel sense, that representative does not admits any general solution, but anyway it can be practically resolved as for any finite set of input data by checking all cases one by one, and thus for a "NP" time since the check of all cases is usually a factorial function of the input data (i.e. any permutation of them implies a different case so that all permutations of the input data should be tested one by one). Nonetheless, the quantum computer is able to resolve the same problem for any finite input of data by virtue of quantum parallelism, thus not needing to tour all cases one by one but checking all of them simultaneously, consequently for some "P" time once its "NP" output[8] is realizable.

Then, the just sketched approach can be immediately, quite visibly and rather instructively demonstrated by the "traveling salesman problem" since any macroscopic body (interpreted as above to be a "medium of quantum computers", all of which mean the same problem) resolves it by discovering the single trajectory relevant to the principle of least action. Indeed, the Turing machine is able also to resolve the "traveling salesman problem" as for any

---

[7] The problem belongs to those of "computational complexity", an area researched for a long time (see, for example: Wagner, Wechsung 1986).

[8] One should not confuse the "P" time for which the "NP" output corresponds; as well as vice versa: the "NP" time follows for the "P" output. Furthermore, the output of the Turing machine can be only "P" so that it needs some "NP" time as for any element of the discussed class of problems.

preliminary given finite set of points for visiting, merely checking all the permutations of them one by one, calculating the total distance for each permutation, and finally finding the least element of that always finite set of all possible distances though increasing as a factorial function of the points (respectively, their space coordinates) to be visited.

III THE "SCI-FI" CONJECTURE ABOUT THE "NP" OUTPUT OF A QUANTUM COMPUTER: RADIATING THE RESULT OF QUANTUM CALCULATION AS A "COHERENT RAY"

The objective of the present section, is partly (unavoidably) contradictory: it discusses the *practical* implementation of the conceptual design of the eventual "NP" option for the output of a quantum computer, however thoroughly and inherently by a *theoretical* approach alone. One may refer to Einstein's "Gedankenexpiremententen", from the side of science, or to examples of sci-fi literature, from the side of function, both building bridges intending to link science and fiction, by the way, so sharply distinguished only by Modernity, repeating the pattern of the "Cartesian abyss" as for them as well. So, what a researcher can do at best is to suggest only thought experiments for justifying the eventual future technical realization or to search for relevant ideas or "technical devices" described in sci-fi:

Fortunately, "The Trigger", a sci-fi novel by Arthure Clarke and Michael Kube - McDowell (furthermore already discussed in a relevant context in another paper: *Penchev 2024 October 2)* considers in detail and many hypothetical aspects the implementation of the "trigger" at issue though not as a "NP" output of quantum computer. So, its idea will be initially retold quite cursorly and only in its "alleged" connection to the present consideration, after which the conjecture that it can also serve as that kind of output will be articulated:

The "trigger" in fact radiates a "nonlocal ray", which can be thus interpreted to by a "trigger ray" of quantum information, granted by the plot of the novel to be able to interact with many chemical substances modifying them directly into others. The first preliminary notice relates to the quotation marks of "nonlocal ray" since it is contradictory in definition according to classical science, theory of relativity or classical quantum mechanics. Indeed, a ray, for example a light ray of any laser, is inherently local as far as it obeys the postulate of not exceeding the speed of light in a vacuum, though being "on the light cone", which can be also thought to be the boundary of locality and nonlocality. On the contrary the adjective of "nonlocal" to it means that the (Langrangian) concept of velocity as a first (smooth) time derivative is irrelevant even nonsense, and utilizing furthermore the Hamilonian concept of momentum, one is freed to ascribe any superluminal value to it therefore breaking the aforementioned classical framework outlined by obeying the "light axioma" or by the prejudice of "reality thoroughly within locality".

So, the term "nonlocal ray" is to be meant as a generalization of the usual concept of "local ray" or merely "ray" as follows. The classical "local ray" can be interpreted to be a particular case of the conjectured "quantum-information" ray under the additional condition of locality consisting (including) in energy conservation and the disjunctive distinguishability of energy from time, in turn being arbitrarily entangled after the conjectured generalization of

“quantum information ray”. Thus, the particular case of zero entanglement would correspond just to the definition of “local ray”. Furthermore, that “quantum-information ray” (not worse notable to be an “entanglement ray”) is a “probabilistic impulse” in a proper sense: thus, and furthermore, not being restricted by the limit of classical quantum mechanics postulating for any physical quantity to be representable by an Hermitian operator (as for the characteristic function of its probability distribution), therefore allowing for it to be an arbitrary operator (crucially, to be any non-Hermitian operator) defined on the separable complex Hilbert space (respectively, the qubit Hilbert space):

Indeed, the main “property” of the “trigger ray”, namely its ability to change certain chemical substances into others, directly and physically transforming their (quantum) information structure, violates energy conservation (and thus, including mass conservation being fundamental for classical chemistry) by virtue of the fact that each molecule or atom of the irradiated substance, being featured with a certain mass, is instantaneously altered into another with a different mass and thus energy. Classical physics and chemistry including quantum ones prohibit that absolutely, even stigmatize it to be anti-scientific, for example, restricting quantum mechanics to fit exactly to the “Procrustean bed” of energy conservation, consequently, mass conservation as for chemistry including quantum chemistry.

The “trigger ray”, on the contrary, should be able to create or destroy energy as far as any non-Hermitian operator being non-unitary implies that (respectively, the “quantity of entanglement” and the derivative “quantity of non-unitarity”) correspond exactly to the created or vanished amount of energy in turn corresponding to the qualitative difference between the initial chemical substance and the resultative one due to the acting nonlocal irradiation. One can immediately compare with radioactive decay or nuclear synthesis, also able to transform a certain chemical element into another, but strictly in the framework of energy conservation since the relevant energetic change is radiated or irradiated externally. On the contrary, the trigger ray would be to obey a more general natural “law of quantum information conservation” (Penchev 2020 October 5), regulating, loosely speaking, how time and energy might mutually transform into each other so that if an exactly certain amount of energy seems to “appear from nothing” or “vanish into nothing”, exactly determined quantity of time has vanished or appeared correspondingly so that the quantity of physical action or the conjugate of quantum information remains the same:

The “appearing or vanishing energy” is an intuitively clear concept, but what about the “appearing or vanishing time”? What should its rigorous definition be? Time is a rather “mathematical quantity” unlike energy, being really physical in a proper sense. Time means a well ordering, respectively a sequence of choices related to a continuum, thus, to an uncountable infinite set and therefore needing the axiom of choice or the well-ordering “theorem”. If one means the latter, the relevant physical quantity is time, and if the former, information. As far as the axiom of choice and the well-ordering “theorem” are mathematically equivalent to each other, information and time should be accordingly equivalent in turn, which can be observed after the law of increasing entropy (the “second law of thermodynamics”) since information and

entropy are reverse (or "converse") to each other. In other words, one might state that time appears due to vanishing information (or appearing entropy).

Of course, thermodynamics and its "laws" are strictly within classical physics obeying energy conservation. However, if one has in advance accepted the more general viewpoint that what conserves is quantum information rather than energy therefore allowing for it whether to "appear" or to "vanish" (in an exact quantitative meaning), that appearing or vanishing energy corresponds exactly to vanishing or appearing time conditioning either after the *constant* physical quantity of action equitable to the physically dimensionless quantity of quantum information by means of the Planck constant. So, whether appearing or vanishing time is consistently justified to be reciprocal to vanishing or appearing energy correspondingly, seeming to be intuitively clear ideas.

As to thermodynamics, those vanishing or appearing quantities of time strictly correspond to increasing or decreasing entropy traditionally meant by the quantity of temperature and by the option of "adiabatic cooling or heating" (thus after the constant amount of energy or otherwise said, without any energetic exchange with environment). However, if one admits the non-classical viewpoint of either appearing or vanishing energy, this implies in turn "non-classical adiabatic processes" so that both appearing and vanishing quantities of entropy (accordingly, vanishing and appearing information or time) are explained otherwise, isothermally: by means of appearing or vanishing energies.

So, one is to conclude that cosmogony (the doctrine, conjecture or theory of how the universe has somehow appeared "from nothing" including, for example, that suggested by the Bible) means a universal thermodynamic process in general postulated to be rigorously isoenergetic after the "Big Bang" (i.e. obeying energy conservation), unlike its singular point, in which is concentrated an immense ("monstrous") violation of energy conservation, by virtue of ideological rather than scientific considerations thus needing social hierarchies to conserve, which in turn and particularly implies for time to be an unique physical quantity to which no operator in the separable complex Hilbert space might at all correspond as far as both social hierarchies and time share the same mathematical structure of well-ordering.

As this is very well known, that extraordinary status of time has been conquered or recaptured by Pauli and then embodied in his "particle paradigm", Hermiticity, unitarity, the Standard model, etc., including all other features of classical mechanics as well as the notorious "Big Bang" in particular. However, that representation does not originate from any scientific considerations; even more, it is now the crucial obstacle for further scientific advance. Its break is particularly necessary for the Gestalt change allowing for the worldview advocated in the present study.

The conjecture is that the "trigger ray" (though the authors of the novel have not described or mentioned that kind of implementation) can serve for a "NP" output of the quantum computer therefore allowing technically and practically, though in a sci-fi discourse for now, for the quantum computer "Achilles" to overtake the Turing machine "Tortoise", however only on the special and "fast enough" track of the Gödel insoluble problems, "after" which

“instantaneously” “radiating” the solution acquired for a “P” time, which is absolutely impossible after utilizing its “P” output, i.e., by many measurements, one by one.

If one stares at the “P” and “NP” outputs of the quantum computer, both use decoherence for transferring the calculated result from the microscopic quantum level to the macroscopic one of usual human experience and interface. However, they use it in two opposite ways: decoherence generates fundamentally random and external disturbances due to environment as for the former; however that “environment” is transformed into a medium of quantum computers, all of which calculate the same problem and thus they can be likened to a “laser”, all atoms or molecules of which are in the same artificially and technically “excited state” so that it is forced to radiate spontaneously a probabilistic impulse, though interpreted by classical quantum mechanics to be only energetic and thus local, that projected on the “wall of Plato’s cave” of locality: if one is restricted only to that local and energetic representation, (as what all “chained people” can watch), the “NP” output of the quantum computer is absolutely impossible. On the contrary, the “NP” output is necessary nonlocal since it is probabilistic so that all separate results of all microscopic quantum computers belonging to the calculated medium, which is “excited” to resolve the same problem, are superposed therefore generating a certain δ-function (“Dirac function”) as the ultimate solution accessible to human interface, but acquired for a “P” time.

So, though the “trigger ray” (following the plot of the novel) means the general case of an arbitrary and thus non-Hermitian operator, this is not relevant as for the “NP” output of the quantum computer, since whatever degree of entanglement be, it should be interpreted as deviation or mistake to the real solution. Nonetheless, the general representation of “trigger ray” (rather than a “laser” in the framework of classical quantum mechanics thus inherently local) is quite necessary since the “NP” output generates a probabilistic impulse thus nonlocal unlike the standard and always local understanding of “laser”.

Now, a few thought experiments in Einstein’s manner will be suggested for outlining how that calculating medium of quantum computers able to radiate the solution as a probabilistic impulse might be eventually realized though in some uncertain future. The starting point is the lesson taught by nature itself for how any macroscopic body always and correctly “calculates” its trajectory exactly corresponding to the principle of least action. Any quantum entity belonging to it (as a separate quantum computer) calculates some randomly chosen trajectory among all possible ones according to Feynman’s interpretation, after which any quantum entity, including the macroscopic body as a whole, though being an incredibly complicated quantum system, follows “simultaneously” all possible trajectories, however each of them with a different probability, in order to accomplish the quantum leap.

If one admits that a certain quantum entity as a quantum computer belonging to that “calculating medium” of the macroscopic body at issue only calculates one possible trajectory for it, anyway remaining virtual as to the body itself not really following it since its trajectory is unambiguously determined by the principle of least action, that interpretation is already quite relevant to the present objective for the outlining the idea of a “NP” output (relevant to the

quantum computer, but not to the Turing machine). Then, what is sufficient is one to follow the same pattern suggested by nature, only interpreting it in terms of a certain Gödel insoluble statement, on the "fast track" of which alone the quantum computer "Achilles" is able to overtake the Turing machine "Tortoise" and thus its utilization makes sense:

So, one should create an equivalent of a macroscopic body so that its motion is able to represent the solution of the investigated problem in the same relevant space, to which the so defined "body" refers, meaning that it is simultaneously a medium of quantum computers. That medium accomplishes the decoherence (respectively, "measurement") just as the environment (or the "apparatus"), to a single quantum computer, the output of which "by measurement" is fundamentally random and thus inappropriate to supply an ultimate and unambiguous result as the wanted solution. The "body" defined in whenever space (as a calculating medium of decoherence) is directed by itself just to the state of the solution alone unlike the usual, fundamentally random macroscopic environment bringing an uncontrolled disturbance, removable only statistically, i.e. in relation to a huge collection of results, being, in other words, a "P" output of the quantum computer and always equivalent to the Turing machine so that the quantum computer "Achilles" can never overtake the "Tortoise" of any contemporary computer, and therefore its implementation is meaningless.

Further, one may trace back how the macroscopic body, merely following the trajectory corresponding to the principle of least action, therefore simultaneously resolving the "traveling salesman problem", but now meaning it to be interpretable by any Gödel insoluble problem utilized as a "fast track" for the quantum computer. That problem is also insoluble in a Gödel sense since it involves an actually infinite set as for the "N+1" step according to the arithmetic axiom of induction. Consequently, the solution of the researched problem is granted to be always a counterpart of the "trajectory of least action", a minimal value among all possible variations of the "trajectory" at issue, however, in an *ad hoc* defined space just in such a way that the "motion" in it to be relevant to the discussed problem.

Furthermore, that "motion", though in a generalized space, is inherently defined locally since it means the smooth change of whatever quantities in time thus allowing for time derivatives of those quantities (whatever they be) to exist, and a proper mathematical model by relevant differential (or any infinitesimal) equations to be introducible. Thus, classical mechanics suggests a universal heuristic model for all problems representable as a smooth change during time to be investigated and eventually resolved so that classical physics can be even defined as the class of all models interpreting the paradigm of Newtonian mechanical motion necessarily by infinitesimal calculus also elaborated by him[9].

As for the "NP" problems resolvable by the quantum computer for a "P" time, the same approach is to be analogically generalized by the substitution of the paradigm of classical mechanics by that of quantum information, consequently overcoming meanwhile that of classical quantum mechanics (particularly implying for the output of quantum computer to be always "by measurement" and thus a "P" one, by virtue of which its practical implementation remains

[9] Ontomathematically, both should be necessarily linked to each other (Penchev 2024 November 2).

forever meaningless). One may use the idea of "nonlocal motion" however rather loosely or metaphorically since the concept of "motion" even reflected philosophically (as by Hegelianism or Marxism) means for it to be inherently local as far as it makes sense as "flowing in time": once time has been introduced whether explicitly or implicitly, any motion defined to it is already necessarily local.

As in the sci-fi idea of the "trigger" or "trigger ray" what is meant are "probabilistic impulses", which are not necessarily processes in time as far as non-Hermitian operators (respectively entanglement) has been admitted in advance. However (and it is emphasized above), the "NP" output of the quantum computer considers just the particular case of a "non-entangled", but nonetheless proper probabilistic impulse to be able to involve the generalized pattern of quantum information substituting that of classical mechanics, and then allowing simultaneously for local description so the race of "Achilles" and the "Tortoise" to make sense (since the calculation of the latter can be described only locally).

What is necessary and sufficient for the "NP" output of the quantum computer relies on the "projection operator", again being "non-Hermitian", but consisting in the transformation of the value featured by the maximal probability into an unambiguous one after the process of "internal decoherence", where the medium of quantum computers acts as the "apparatus" therefore not disturbing the ultimate measurement unlike any external one.

IV ANOTHER PRIZE: THE "P" VS "NP" PROBLEM AMONG THE SEVEN MATHEMATICAL PROBLEMS OF THE MILLENNIUM

The following hypothesis "entangling" the two prizes (those about the practical use of quantum computer and for solving the "P" and "NP" Millennium Problem") is already suggested above, though rather implicitly: the use of the quantum computer makes practical sense about "NP" problems[10]: thus, only after the eventual solution distinguishing the "P" option from the "NP" one[11]. It will be the proper subject of the present section, consequently now discussed in detail.

An obligatory preliminary notice links further all the "NP" problems and the Gödel insoluble problems even identifying them. The same identification implies for the solution of the "P" versus "NP" problem to depend crucially on the distinction between Gödel mathematics and Hilbert mathematics so that the former implies just the "P" = "NP" option for the solution. By the way, that is the common expectation ever prejudice about the eventual future solution of the

---

[10] The "NP" problems, their eventual distinction from the "P" ones and thus computational complexity are discussed in many papers, including from viewpoints relevant to the subject of the present study: for example, Meester, Slooten 2020; Haan, Szeider 2017; Pérez-Jiménez 2014; Song 2014; Calude, Calude, Queen 2013; Figueiredo 2012; Lee, Banerjee 2012; Mulmuley 2012; 2011; Goldreic 2010; Fortnow 2009; Levin, Paulusma, Woeginger 2008; Costa, Dor, Bir 2007; Doria 2007; Žnidarič, Horvat 2006; Chen 2005; Jukna 2005; Mainhard 2004; Armstrong 2003; Cook 2003; Karakostas, Lipton, Viglas 2003; Hemmerling 2001; Mulmuley, Sohoni 2001; Jukna, Razborov, Savicky, Wegener 1999; Naik, Selman 1999; Beame, Cook, Edmonds, Impagliazzo, Pitassi 1998; Book 1994; Fu, Li 1994; Lu, Posner 1993; Sanchis 1990; Phan, Le, Le 1986; Ko, Schöning 1985; Selm 1982; Welch 1982; Landweber, Lipton, Robertson 1981.

[11] Cf. Penchev 2020 August 5.

problem among almost all mathematicians and it is quite justified as far as the standard mathematics and Gödel mathematics are identified just as Modernity needs after establishing the derivative Cartesian "abyss" between mathematics (situated on the mental "shore") and reality (situated on the material "shore" or at least including it).

However, the same expectation (or rather prejudice) implies for the quantum computer "Achilles" never to run over the Turing machine "Tortoise" therefore and particularly restricting the eventual practical use of the former to clever enough "quantum algorithms" (for example such as those of Shor[12] or Grover[13] which will be also mentioned further in a link to the general definition of both quantum computer and quantum algorithm in Section VII): including operations on qubits and allowing for the quantum computer to demonstrate the superiority over the Turing machine but thoroughly within the "P" domain since it is granted to be universal after the alleged (ostensible) identification "P = NP".

The present study, on the contrary, suggests that the practical use of the quantum computer in a proper sense relies only on the set-theoretic complement of the "NP" area to the "P" one, consequently granting for it to be a nonempty set. As for those "clever enough algorithms", indeed being quantum, but nonetheless meaning only "P" problems and solutions, they would be rather only curiosities, not capable to justify the too costly realization of quantum computers.

In other words, though reflecting loosely and philosophically, even metaphorically and aphoristically, the practical use of quantum computers is impossible in Modernity. Thus, the GOOGLE and XPIZE premium will most likely be awarded for reasons extraneous and incidental to the nature of the problem, e.g., "political correctness" since it is quite consistent with Modernity. Or otherwise said, since the practical use of the quantum computer does not fit to the "Procrustean bed" of Modernity, the implementation at issue must be "made to fit": and "political correctness" is a common way out of such mismatches and troubles.

Nonetheless, the real solution of the problem of the practical use of quantum computers needs just the rejection of Modernity as far as it is implies for mathematics and reality to be separated and opposed as the two "shores" of the Cartesian "abyss", and then and particularly, as a tiny and even self-evident detail, its practical use to be (ostensibly) reduced to what is "P" possible. Thus, one can conclude rather humoristically that just the "Tortoise" is to be awarded to be the winner in reasons of political correctness (though the quantum computer "Achilles" would

---

[12] Bocharov, Roetteler, Svore 2017; Martín-López, Laing, Lawson, Alvarez, Zhou, O'Brien 2012; Fu, Bao, Zhou 2010; Most, Shimoni, Biham 2010; Berman, Kamenev, Tsifrinovich 2005; Shimoni, Shapira, Biham 2005; Shor 2004; Vandersypen, Steffen, Breyta, Yannoni, Sherwood, Chuang 2001; Berman, Doolen,. López, Tsifrinovich 2000; Berman, Doolen, Tsifrinovich 2000; Ulyanov, Ghisi 2000.

[13] Morales, Tlyachev, Biamonte 2018; Niestegge 2017; Batle, Ooi, Farouk, Alkhambashi, Abdalla 2016; Clark 2014; Cafaro, Mancini 2012; Luan, Wang, Liu 2012; Kumar, Paraoanu 2011; Morikoshi 2011; Liu, Koehler 2010; Du, Qin, Wen, Zhu 2007; Lomonaco, Kauffman 2007; Choo 2006; Baritompa, Bulger, Wood 2005; Brickman, Haljan, Lee, Acton, Deslauriers, Monroe 2005; Gerjuoy 2005; Grover 2005; 2002; 2001; Biham, Shapira, Shimoni 2003; Bulger, Baritompa, Wood 2003; Das, Mahesh, Kumar 2003; Dodd, Ralph, Timothy, Milburn 2003; Zhang, Lu 2003; Azuma 2002; Biham, Kenigsberg 2002; Zalka 2000; 1999; Biham, Biham, Biron, Grassl, Lidar 1999.

always run over it really) as long he was not violently forced to compete only on the Procrustean track of “P” problems and his sprinting capabilities correspondingly restricted by the “P” output alone, being only admissible according to the alleged “rules of the competition”. In fact, however, those rules excluding all Gödel insoluble problems are not explicitly formulated either by GOOGLE and XPRIZE as for the practical use of the quantum computer or by CMI as for the “P” and “NP” problem. They are complemented “by default”, more exactly said, by the general worldview of Modernity therefore restricting the possible cognition, science and technique.

One can conclude that both problems, the solution of which would be awarded by an essential amount of money, are not too difficult and even not proper scientific ones, but rather due to the outdated social and cognitive organization thus needing the change of the “episteme” (in Michel Foucault’s sense and exact meaning) or Thomas Kuhn’s “scientific revolution”, in other words, those are, in fact, rather “bureaucratic” quasi-problems, the real solution of which is more probable to be replaced by a “relevant” quasi-solution, for example, a “politically correct” one, only and only to avoid those changes threatening the power of the bureaucracy in science and cognition at all, even the general social organization and hierarchies. That socially “entangled” viewpoint to both problems, in turn “entangling” them as well as the proper scientific unity of them will be the proper subject of the next section.

What is to be noticed as for the “P” and “NP” problem itself, meaning the above intention, is its necessary interpretation for finite sets, respectively, only arithmetically and in terms of natural numbers alone, on the one, proper “arithmetic” hand, and its link to the foundations of mathematics, more exactly, to the Gödel dichotomy about the relation of arithmetic and set theory (namely, either incompleteness or contradiction), on the other, proper “set-theoretical” hand.

So, one should distinguish the following two alternates for resolving any problem involving any finite volume of input data: the first option is the solution by checking all cases *one by one*, thus crucially depending on a certain factorial function of the amount of input data if their permutations are essential and needing to be considered as different cases. Of course, the Turing machine is able to resolve any problem belonging to the so outlined class, but for a “NP” time since the factorial function does not allow for any representation by a polynomial one and increases much faster than the latter. Of course, that kind of “solution” is absolutely inaccessible for any human in general, even ridiculous and nonsense as for human capabilities at all thus needing crucially the assistance of computers (all of which are Turing machines nowadays).

That state of affairs can be illustrated especially picturesquely by the “computer proof” of the “four colors” problem which means an actually infinite set of cases being defined for the plain continuum. The human participation in that proof consists of two stages, however insufficient for the ultimate proof: (1) the reduction of all possible cases to a finite set of those by proving their equivalence; (2) the creation of a relevant software program for checking the latter, already finite set of cases one by one.

Both stages are accessible for human capabilities and creativity, but they need a third, final stage consisting in processing the program at issue by a powerful enough computer, which

will accomplish it for a “NP” time being a Turing machine as far as it will check that finite set of cases just (and necessarily) *one by one.* Of course, no human might repeat and thus check those calculations: therefore, generating a methodological and philosophical question about the admissibility of that proof due to involving the essential assistance of computers. Anyway, one can suggest that the quantum computer would be able to resolve it for a “P” time by virtue of quantum parallelism checking “simultaneously” all the cases “together” however obeying the impossibility for outputting the result into any human interface (being local in definition) otherwise than in a “NP” time after utilizing the standard output by measurement by means of any extraneous apparatus (already explained in detail above).

However, if the “four colors” problem admits a general solution thoroughly thus not needing the third final stage realizable only by a computer, but, on the contrary, checkable from the beginning to end by a competent enough human mathematician (or a team of those if need be), the same proof will be able to be repeated by a Turing machine computer supplied by the relevant software for a “P” time just by virtue of the fact that a general solution corresponding to the kind of human capabilities have been in advance invented by some mathematicians. Then, the utilization of a quantum computer would be redundant since it can “sprint” only on the “track” of those problems for which the only pathway accessible to the Turing machine is the test of all cases “one by one”.

Consequently, the utilization of the quantum computer would make sense only to substitute those creative human mathematicians rather than any Turing machine computers, being really tools “just as a hammer is”. In other words, the relevant usage of quantum computers suggests for them not to be instruments absolutely obeying human free will (just, or rarher unlike, as a hammer or a Turing machine computer.) Is human society ready to adopt that state of affairs after which the quantum computers might not be reckoned as instruments, i.e. “slaves” any more? Even more so that they would replace highly creative human beings such as a team of professional mathematicians?

One can continue the example by the four-colors problem and its available or eventual future solutions by the notice that it is resolved thoroughly in the framework of the standard mathematics, which needs the class of all Gödel insoluble statements not to be empty. Then, the usage of a Turing machine computer for finishing the proof is necessary in order to check a finite set of all possible cases one by one, and thus for a “NP” time, eventually admitting that the quantum computer inherently involving quantum parallelism would prove it for a “P” time. That consideration is thoroughly in the framework of Gödel mathematics.

As for Hilbert mathematics, one may generalize it to the “four letters theorem”, which is rather simple to be proved as an almost obvious corollary from the postulated structure of Hilbert arithmetics consisting of two dual (being anti-isometric to each other) Peano arithmetics, each of which being a binary string needing “two letters” usually notated to be “0” and “1”: thus, totally “four letters” for both Peano arithmetics (in much more detail in: Penchev 2020 July17). Then, the “four colors” theorem follows from the universal four-letter theorem as a quite particular case

not needing the utilization of a computer whether usual or quantum for the final stage of the proof unlike the case of it in the framework of Gödel mathematics discussed in detail above.

So, one can suggest the following hypothesis about the eventual utilization of the quantum computer in both frameworks, those of Hilbert and Gödel mathematics accordingly, as far as Gödel insoluble statements exist only in the latter therefore supplying that "fast track" only on which its usage makes really sense. At first glance, the utilization of the quantum computer for problems formulated in Hilbert mathematics is meaningless since their general solution always exists, and thus can be repeated by the Turing machine for a "P" time. However, the necessary existence of an unambiguous solution for all possible problems is only abstract and non-constructive, in other words, a "pure" existence so that it can be unknown as a constructive method in the separate cases of many problems thus forcing to be resolved for any finite set of input data only testing all possible cases "one by one", therefore supplying the necessary "fast track", on which the use of the quantum computer makes really sense though by virtue of humankind's (yet) ignorance (which will be overcome, but in some uncertain future moment, until which the utilization of the quantum computer is practically essential).

One can conclude that the solution of the "P" versus "NP" problem depends crucially on the foundations of mathematics and especially, on the existence (or not) of fundamentally insoluble problems (such as the Gödel ones for standard mathematics) since they can be resolved for any finite set of input data only testing all cases one by one. The practical utilization of the quantum computer is linked, but not equivalent to the "P" versus "NP" problem because their usage is justified even after the eventual "P=NP" option for a certain class of cases (as in Hilbert mathematics in general) if the general solution realizing the "P≠NP" condition at issue for a certain problem is not yet known and due to which it cannot be constructively accomplished by the Turing machine for a "P" time (though the Turing machine solution is anyway possible for a "NP" time in general, merely investigating all cases one by one and then comparing them) if need be.

V CHANGING THE GESTALT FOR UNIFYING BOTH PRIZES: THE LINK TO THE GÖDEL INSOLUBLE STATEMENTS

The link to the class of all Gödel insoluble statements for unifying both prizes thus tending to certain solutions for each of the two corresponding problems is already elucidated above since they can be considered to be equivalent to the class at issue only interpreting it relevantly for any finite set of input data as follows. The "NP" problems for which furthermore the practical implementation of the quantum computer makes sense are those soluble only by the method "one by one" if the permutations of input data are essential therefore involving factorial functions for the estimation of their complexity. The "P" problems, for which in particular the Turing machine is sufficient, are those possessing a *general solution* being known also as a *finite constructive* method and thus representable by a *finite* formula or algorithm universal for any *finite* amount of input data.

The proper objective of the present section consists in the reflection on the Gestalt change, from the viewpoint of which the aforementioned unification follows immediately:

respectively, which the opposite methodological and philosophical worldview is. That appoach means the newly introduced “medium of quantum computers”, all of which resolve the same problem constituting a “body” (in general sense as far as it is a “body” in the corresponding relevant space, which is an arbitrary metrical and topological space rather than Euclidean space, in general), the “movement” of which (in that relevant space of quantum states) corresponds to (and represents) the solution of the problem at issue. Just that self-decohering medium of quantum computers is called a “NP” output of the quantum computer and opposed to common sense’s understanding, after which the state of a single quantum computer is measured by an extraneous apparatus therefore being fundamentally random (including by virtue of the “no hidden variables” theorems in quantum mechanics: Kochen, Specker 1967; Neuman 1932) and thus absolutely unsuitable for any practical implementation otherwise than the statistical average of many measurements to the same solution delivered by the quantum computer. However, that classical statistical approach cancels the crucial superiority of the quantum computer parallelism and thus its practical implementation fundamentally, after prohibiting in fact the quantum computer “Achilles” to overtake ever the Turing machine “Tortoise” (for example, by virtue of “political correctness” to all “Tortoises”).

On the contrary, the newly introduced “medium of quantum computers” conserves “his” capability to run over the “Tortoise”, which, by the way, reality is as far as any runner would overtake any “tortoise” (as an allegory of any human moving slowly) since it conserves the superiority of quantum parallelism by involving its “NP” output. However, that approach can be characterized as “nonlocal” and thus opposed to the inherent locality of the traditional “P” output of the quantum computer (jokingly speaking, obeying the “political correctness” of not running over the Turing machine “Tortoise”). Indeed, it is furthermore really nonlocal after abandoning the local representation of the medium of quantum computers to radiate an energetic (and thus inherently local) impulse just as any laser, once it is interpreted in the solid framework of classical quantum mechanics: consequently, that medium of quantum computers “radiates” the solution as a “probabilistic impulse” such that it turns out to be the Dirac δ-function after self-decohering and thus able to deliver an unambiguous solution by the “NP” speed of quantum parallelism.

Only after involving that “NP” output, the unification of both prizes and corresponding problems makes real sense because the universal locality of classical physics, science, and even modern society and cognition implies for the awards to be absolutely separated and the discussion about their proper link is nonsense. In fact and as this is above expressly emphasized, the GOOGLE and XPRIZE intention and objective obey implicitly and ostensibly “self-obviously” to the modern “conditio sine qua non” for “localism” to be universal and questionless as far as human empirical experience is local and it is granted to be the only possible basis for science and technique or technical devices such as any (eventually) practically implemented quantum computers.

However and this is convincingly demonstrated above, the real solution of the problem suggested by GOOGLE and XPRIZE needs Modernity to be abandoned as for its essential

components enumerated in the last paragraph: science, technique, the organization of society and cognition, etc. Of course, that scientific and even social revolution has not been meant by the founders of the award: rather it would be an extremely undesirable byproduct of the eventual solution, maybe so undesirable that they would prefer to substitute the real solution (if being so revolutionary) with some “politically correct” surrogate.

So, though said rather aphoristically, the quantum computer for being able at all to work needs Postmodernity and the corresponding, inherently non-hierarchical, “fluid”, even “gaseous” organization of society to replace the present, “solid” one (consisting of the many tiny hierarchical “crystals” in democratic states or tending to a single one in totalitarian ones, but equally “solid” in both cases). One can compare with the steam engine “working well” after capitalism but hardly in feudalism therefore “appealing” for the former to substitute the latter in order to be “able to move” all the economy.

Though the adjectives “solid”, “fluid”, and “gaseous” as for the social order and organization are used metaphorically, they alloy for the following, quite literal interpretation. Information is able to “heat adiabatically” that society which produces it just as after decreasing the quantity of entropy of any thermodynamic system. Of course, humankind permanently produces information, knowledge and even more and more accelerating cognition. One can trace back how the “Enlightenment” transferred the huge amount of information created by the newly appeared modern science (as well as all the geographical discoveries extended the sizes of the world a few times) to the then French society, for example, therefore “heating it adiabatically” to the revolutionary state necessary for replacing the old feudal and much more solid hierarchies with the new looser and looser capitalist ones obeying the amorphous medium of money and allowing for anybody nowadays to be a “startup founder”, thus to create an absolutely new, extended and powerful hierarchy for a few years or decades such as “Microsoft”, “Facebook”, or “Google” itself.

Anyway, all the information, “heated adiabatically” the modern society, is classical, consequently local. On the contrary, the quantum computer processes in definition just quantum information, which would amplify its classical counterpart “infinitely” in a sense literal though loose rather than metaphorical. So, it would adiabatically heat the society so much that it would force the society to change its “aggregate state”. As well as vice versa: it would not be able at all to begin working in the contemporary “solid” society even being as loose as any example of the “Western”, capitalist one and “democratically consisting” of the “crystals” of many hierarchies contradicting each other and thus restricting each other. One can retrospectively and counterfactually imagine somebody to have founded an essential prize for the practical use of the steam engine in any of the numerous German principalities in the 18th century. Alas, only in the contemporary democratic Germany, “it is able to work well enough”, more or less metaphorically said. Of course, the founder of that hypothetical award (just as “Google” or “Xprize” nowadays) would mean a narrowly technical or eventually scientific solution rather than the real one and all the terrible historic pathway of Germany.

Quantum information is inherently nonlocal, and the quantum computer designated for its processing is also and correspondingly nonlocal unlike the Turing machine and thus unlike all contemporary computers. The unification of the two problems discussed in the present section makes sense if and only if the nonlocal essence of the quantum computer is well enough understood. Unfortunately, the nonlocal essence is inconsistent with modern society much more than with modern technique and science, therefore appealing to be changed in order to be able to start working.

The narrow and proper interpretation of the Gödel dichotomy (about the relation of arithmetic to set theory, "either incompleteness or contradiction" and implying the nonempty class of all Gödel insoluble statements) relates it directly to the foundations of mathematics. However, that interpretation originates and belongs only to Gödel mathematics and it is consistent only with the Cartesian episteme, in the framework of which mathematics is thoroughly situated on the one "shore" of the alleged and postulated abyss, namely that of "mind", "subject", or the "ideas" thus being absolutely separated from the opposite "shore" of physical and material reality, that of "body", "object", or the "things".

If one has abandoned that worldview (as the present study does in favor of "ontomathematics"), the dichotomy at issue can be generalized also in terms of physical and material reality and thus referring to the relation of locality and nonlocality, for example, being justified by the mediation of a wider and philosophical reflection on "finiteness" and "infinity", after which arithmetic is considered to be a proper mathematical doctrine about the former versus the latter as for set theory. Then one may see Gödel's paper (1931) as originating and inferable from a more general, even universal relation of finiteness and infinity therefore sharing the same structure: finiteness (or the philosophical concept of "finitude") is either incomplete or contradictory to infinity (or to Heidegger's "Being" as well as to the theological concept of "God").

The same relation (for example, interpreted to be an abstract mathematical structure and thus embeddable in various "interpretations" in a proper mathematical meaning of that term) can be now revealed in the opposition of locality and nonlocality in quantum mechanics and mechanics, consequently in physics and natural science: locality is "either incomplete or contradictory" to nonlocality. Meaning that human empirical experience is inherently local as well as all areas of classical natural science (thus particularly physics as well) as far as empirical observations and experiments are the only admissible method of cognition in their frameworks, and following the same formal structure, one is to suggest for all human empirical observations and experiments to be either incomplete or contradictory to reality. Since they are postulated to be the only possible method of cognition for all human activities (without religion), the option of contradiction is rejected, and this implies for human empirical experience and experiments to be inherently and forever incomplete to reality: by the way, one of the most fundamental statements of classical scientific philosophy and epistemology. The above consideration links it directly to the Gödel incompleteness, now interpreting the same formal structure as for mathematics not being an empirical and natural science according to the modern organization of cognition.

However, the essential viewpoint as for the proper subject of the present study refers to the narrow physical meaning of locality and (or rather, "versus") nonlocality, on the one hand, but not less to the loose interpretation of them to the welded social order and hierarchies, on the other hand, after linking the "solid aggregate state of the society" with locality. Indeed, a solid polycrystal and even more, a monocrystal restrict the admissible interactions only to the adherent "atoms" and "molecules" since the much wider options of arbitrary interactions with any "atoms" and "molecules" being definitive for the "fluid" or "gaseous" aggregate states would necessarily destroy all solid crystal structures, respectively, social hierarchies and order. The permanent generation of huge amounts of knowledge (consequently information) "heats adiabatically" the society more and more so that its freedom increases and increases, even exponentially nowadays. One can trace back historically that constant and fundamental tendency for more and more freedom as a law of human progress: though various restrictions of human freedom have happened and happen permanently in one or another country, nonetheless the general historical trend is obvious and doubtful. All hierarchies and ordered institutions become weaker and weaker and even more: only those states able to allow for their citizens more freedom are more successful and leading nowadays.

However, the present stidy's worldview is not limited only to that more or less common, even trivial ascertainment. It is linked, even qualitatively a little below, to reasonability definitive for humankind so that more and more knowledge (respectively, information or negentropy) is produced and accumulated therefore "heating adiabatically" the society forcing to weaker and weaker social hierarchies and order, to more and more freedom for all individuals just as "atoms" or "molecules" of any physical (or chemical) substance heated adiabatically.

Then, one can notice a remarkable reciprocity, by the way featuring any adiabatic process (rather than only all the human cognitive and social advance during history, at least during the written one for a few millennia). One can even suggest a law of conservation for any adiabatic process: information (respectively, negentropy or entropy) conservation, in fact, inferable from quantum information conservation (a more general physical law generalizing energy conservation, suggested and justified in other papers: Penchev 2020 October 5). Indeed, humankind permanently produces and accumulates more and more knowledge, i.e. "information" or "negentropy": and as a result, the social entropy, i.e. "freedom" increases accordingly. Then, one can suggest the equation of the produced and accumulated "knowledge" and the resultatively acquired "freedom" if one manages to represent both as mathematical quantities. So, humankind is "doomed" to freedom by virtue of being reasonable (but only as far as humankind is reasonable, interpreted "pessimistically") and thus permanently producing and accumulating knowledge, in turn even as a natural law resultatively generating more and more freedom and particularly weakening and weakening historically all social hierarchies and order.

However (and what is crucial to the proper subject of the present study), the introduction of the quantum computer would be a qualitatively new stage since all human knowledge produced and accumulated until now has represented an increasing amount of classical, thus inherently local information obvious even only by virtue of the fact that it needs some material

carrier, on which information at issue is recorded, whether paper, magnetic tape, silicon crystal, etc. On the contrary, the quantum computer would be designed to process quantum information, even literally being an *infinite* quantity of classical information. If the aforementioned law of the "society adiabatically heated" by means of knowledge and cognition takes place, the resultatively produced "freedom" would force the society to pass into a new aggregate state, which can be provisionally called "liquid" or "gaseous" and featured by the absolute absence of any hierarchies just as there are no crystals in a liquid or gas, and the relevant social order would not consists in the conservation of all welded hierarchies, but would obey the more and more accelerating exchange of knowledge just as a liquid or gas obeys the transmission of entropy (respectively, information). As well as vice versa: if a quantum computer is built in a "cold", i.e., hierarchized enough society, quantum computers will not be able merely to start working for it nowhere to release the byproduct of social freedom. However, those societies being too "solid" for the quantum computer to be able to start at all working, are even all contemporary Western ones rather than those more or less totalitarian countries all over the world.

One more aspect of the link of the quantum computer to the Gödel insoluble statements refers to its inherent nonlocality, including in a proper physical sense: locality is either incomplete or contradictory to nonlocality. So, the exact meaning of locality versus nonlocality as well as that of nonlocality to locality is necessary. The former and latter definitions seem to be tautological to each other, but it fact their equivalence is an essential scientific problem since they correspond to special and general relativity, on the one hand, and quantum mechanics and information, on the other hand, and even only the mutual consistency (not to speak about their equivalence) of both theories is problematic and rather doubtful.

So, and as far as relativity is a macroscopic theory sharing models of smooth manifolds with classical mechanics and all areas of classical physics unlike quantum mechanics and information referring to microscopic phenomena being inherently discrete due to the Planck constant, the definition of locality to nonlocality means the former, and that of nonlocality to locality is introduced by the latter. Thus, the postulate of not exceeding the speed of light in a vacuum in both special and general relativity restricts locality to be equivalent to the imaginary area of Minkowski space, i.e. only within the light cone including its surface. In fact, Einstein himself (being the founder of both theories) rejected any physical sense for nonlocality mathematically defined as the real domain of Minkowski or pseudo-Riemannian spaces as quite natural generalizations.

Einstein's worldview can be easily justified also thoroughly mathematically after introducing the bijection of the pair of covariant and contravariant vectors (where their mismatch is definitive for pseudo-Riemannian space and its "curvature", consequently for gravitation according to the Einstein field equation) to the pair of imaginary and real vectors belonging accordingly to both areas of Minkowski space thus allowing for general relativity to be interpreted as a "local theory of nonlocality" (in aa absolutely consistent way regardless of the seeming contradiction) according to special relativity (a viewpoint elaborated and advocated in

other papers: Penchev 2023 November 2: 2021 June 8, etc.) and thus suggesting for gravitation to be the local mapping of nonlocality.

For quantum mechanics and information, the definition of nonlocality originates from Bell's theorem and those predicted by it quantum correlations exceeding the limit of possible correlations according to classical mechanics and physics. Thus, nonlocality in any quantum theories relies on the phenomena of entanglement, thus to the option for overlapping probability (density or not) distributions. Then locality is to be identified with the complete area of classical correlations obeying Bell's inequalities.

One can immediately notice that the two definitions are inconsistent to each other even only due to the fact that Lagrangian velocity and macroscopic smooth manifolds, on the one hand, and quantum probability distributions and microscopic discrete mappings, on the other hand, are inconsistent to each other, thus appealing to generalization such as the equivalence of Lagrangian and Hamiltonian formulations of mechanics whether classical or quantum. Only granting the equivalence at issue, physically interpretable by the newly introduced and revolutionary enough equivalence of the quantities of velocity and probability distributions correspondingly, one is already able to justify the equivalence of those two definitions implying particularly the not less revolutionary idea that entanglement (definable by probability distributions) and gravity (by means of relative speed) are the same as well as for the scandalous "creatio ex nihilo" to be omnitemporal and omnipresent, being so sacrilegious for modern science (rather than only for physics) that all of them are exiled in the the absurd, ridiculous and mythological "Big Bang", nonsense, but absolutely seriously studied by physics, astronomy, cosmology, and cosmogony.

If the cursorily sketched nontrivial equivalence of both above approaches is now interpreted as for the foundations of mathematics, it implies a series of rather essential and new statements generalizing the original Gödel dichotomy about the definition of "infinity" (studied by set theory) by finiteness (being the proper subject of arithmetic), on the one hand, but on the other hand, the "complementary" or dual definition of finiteness by infinity. The former viewpoint would involve gravitation as an "ontomathematical force or interaction' rather than only physical, and the latter would introduce generalized probabilistic bijections of infinite sets onto finite one (both revolutionary, being ontomathematical, paradigm shifts are discussed in detail in other papers: e.g., Penchev 2023 November 2, etc.).

What is essentially important as for the proper subject of the present study is how both should be interpreted in terms of the practical implementation of quantum computers and the "P" and "NP" problem (including). Both refer to any finite set of input data and consequently they are to be formulated only in terms of arithmetic (meaning the axiom of induction, which implies for any natural number to be finite) consequently not allowing for the Gödel dichotomy (since it refers to the relation of arithmetic and set theory) in that framework (i.e. only in terms of arithmetic). In other words or reflecting loosely and philosophically, the Gödel dichotomy refers to the relation of finiteness and infinity, and the concept of infinity cannot be represented only arithmetically due to the axiom of induction.

Nonetheless, one can easily distinguish *slowly increasing* arithmetic and thus finite sets from *fast increasing* ones absolutely rigorously and unambiguously as by the "P" and "NP" times accordingly, necessary for processing the corresponding sets by the Turing machine if they are input data for a certain problem (for example one can utilize the official formulation of the "P" versus "NP" problem by CMI for the distinction at issue). Then, the latter (i.e. fast increasing finite sets needing a "NP" time for their processing by the Turing machine being interpreted as the sets of input data) can be granted (or postulated) as a proper arithmetical definition of "infinite sets" therefore not needing set theory for the same objective:

However, a new problem appears instantly: how the proper "set-theoretical infinity" (meant in the Gödel dichotomy) is to be related to the newly introduced one only in terms of arithmetic. The present study tends to identify them, but rather in a practical sense, namely for the solution of both problems therefore allowing for the Gödel dichotomy to be translated in arithmetic language alone, consequently distinguishing slowly and fast increasing (or respectively, decreasing) sets, by which the Gödel original distinction is granted to be equivalently substituted. So, those considerations are not rigorous, but rather they are intuitive in favor of being accepted as a new and additional postulate that "arithmetic infinity" (as above) and the traditionally defined "infinity" after set theory can be identified (eventually even necessarily).

Anyway, one needs another proper mathematical and logical justification whether that statement is really an axiom consistent with the existent tuple or whether it could be inferred from it as a theorem. What should be cursorily mentioned now is its link to the foundations of Robinson's "nonstandard analysis", and more especially, to "Archimedes's axiom" and the "ultrafilters lemma" (respectively, the axiom of choice). Obviously, the fast increasing finite sets obey Archimedes's axiom, thus not involving or needing to involve the ultrafilters lemma. Nonetheless, they allow for both to be reformulated only arithmetically by the introduction of the "processing time" parameter and thus in relation to it rather than as to infinitesimal sets as (Robinson himself). Furthermore, "nonstandard models" can be thoroughly defined in terms of arithmetic alone. Then, the distinction by "processing time" seems to be also introducible only arithmetically and consequently in the framework of the standard mathematics though needing a proper and standalone investigation in detail.

Another necessary notice refers to the absence of whatever general solution for any Gödel insoluble statement therefore implying that the only possible solution of that by the Turing machine consists in the consideration of all possible cases to a certain set of input data by the method "one by one". If the order of the input data is essential, this involves a factorial function, one of the fastest increasing functions. Since the present study is restricted only to demonstrate "NP" cases (where the quantum computer "Achilles" is able to sprint and overtake the Turing machine "Tortoise" practically, i.e. as for finite sets of input data) distinguishable from "N" ones, just that is discussed. So, an additional paper is to consider those prevailing computational problems where the order of the input data is not essential or it is partly essential, but those will not be done here.

The question is: “how fast” should a finite function increase in order to be accepted as a finite counterpart of a certain infinite set. The present study suggests that factorial function is increasing fast enough to belong to that class. The “P” versus “NP” boundary implicitly can be interpreted as the distinction, even more so that it is rigorously and formally defined in the formulation of the corresponding CMI “Millennium Problem”. The conjecture that just the latter originates from the opposition of “finiteness” and “infinity” in the standard mathematics can be relevantly reasoned and that might be the ground for it to be chosen to be one of the “Millennium Problems”. As for the quantum computer due to its parallelism of processing, it seems to be able (at least theoretically) to resolve all problems involving any and thus arbitrarily fast increasing function of the input data volume for a “P” time. So, one can easily notice mismatches in the extensions of the enumerated above several statements. However, what is important for the present study is the class of their consistency, respectively the nonempty intersection of their extensions represented just by the factorial function corresponding to Gödel insoluble statements necessarily resolved by the Turing machine by means of checking all cases “one by one”.

VI THE QUANTUM COMPUTER “ACHILLES” VERSUS THE TURING MACHINE “TORTOISE”, OR THE CLASS OF PROBLEMS FOR WHICH QUANTUM COMPUTER IS RELEVANT

The present section will abandon the total context of how the quantum computer might be used practically restricting it only to the proper scientific viewpoint therefore investigating that class of problems, to which the nonlocal essence of the quantum computer is relevant in the exact meaning that “Achilles” of it is theoretically able to be qualitatively faster than the Turing machine “Tortoise”. The answer is above outlined: all those which are Gödel insoluble statements therefore involving both arithmetic and set theory (or fast and slowly increasing finite functions accordingly), but simultaneously remaining in the framework of the standard mathematics or at least within those generalizations of it, to which “insoluble statements” make sense and exist (which means that their class is not empty).

A preliminary notice refers to the fact that the quantum computer is practically meaningless to be used for any problems for which the Turing machine is absolutely sufficient. So, the alleged and standardly investigated “acceleration” due to clever enough particular “quantum algorithms” to “P” problems, accomplishable in principle by the Turing machine for some finite time, does not make sense for implementing. However, just that class of practical “accelerations” due to quantum algorithms specified for quantum computers is the implicit expectation for being awarded by GOOGLE and XPRIZE. The reason for it to be meaningless consists in the circumstance that all quantum computers (at least today’s ones) are more expensive in exponents than the Turing machine computers since that they work only in coherent state, the conditions of which are exceptionally difficult to be generated and even more to be maintained for a certain period of time. However, what is still more important is that the result of a single quantum calculation is fundamentally random though those clever quantum algorithms

endeavors somehow to surround the unavoidable quantum uncertainty.[14] So, the team of Turing machines "Tortoises" is much more reliable and less costly than that "Achilles" of quantum computers as to any problem soluble by both, and thus the latter is absolutely redundant practically (at least nowadays and the corresponding level of technologies).

The next preliminary notice refers to the doubt whether Gödel insoluble problems, supplying the relevant fast enough track for quantum computers can make at all any practical sense, or correspondingly whether almost all problems, the solution of which is necessary for the further advance of today's technique and technologies, can or cannot be resolved by the Turing machines available whether now or in the future. In other words, the question is whether our contemporary civilizations including science, technique, and culture should not be called "P civilization" though rather loosely and metaphorically, however simultaneously defining it more rigorously that all problems essential for its surviving and progress are "P" problems, so that the utilization of quantum computers for their solutions is meaningless even ridiculous.

Furthermore, one can link the the above definition of "P" civilizations (to which ours would belong) referring to almost all problems necessary for its surviving and progress, on the one hand, and the introduced before that "solid" (rather than "liquid" or "gaseous") "aggregate state" of society and cognition as far as all the information produced and processed by and within it is classical (rather than quantum), on the other hand. Obviously, one may identify the solutions of all "P" problems (necessary to be resolved for the "P" civilization definition) and the processing and production of classical information (conditioning the solid aggregate state of society due to the corresponding adiabatic heating in comparison with the conjectured option for processing and producing quantum information, according to the latter).

So, one should conclude that our contemporary humankind (as far as it is a "P" civilization) does not need at all quantum computers and thus the problem of their practical implementation is absolutely irrelevant to it. The following counterfactual "thought experiment" can be suggested granting that contemporary powerful computers (though all belonging to the class of the Turing machine) had been somehow (i.e. no matter how) appeared in the Roman empire and some "great emperor" had been established a prize of 50 000 sesterces for how those powerful computers to be practically used. Unfortunately, any implementations would not exist

---

[14] In the huge volume of the literature about "quantum algorithms", one may refer to those papers explicitly demonstrating that the orthodox understanding means for them to be relevant for "P" problems regardless of the solution of the "P" versus "NP" controversy: Arvind 2011; Zhang 2011; Hein, Tanner 2010; Koiran, Landes, Portier, Yao 2010; Skobelev 2010; Castagnoli 2009; DiCarlo et al 2009; Dörn 2009; Geo, Stocks 2009; Miura 2009; Gregorič, Borštnik 2009; Nyman 2009; Wu, Byrd 2009; Leporati, Felloni 2007; Atici, Servedio 2007; 2005; Berry, Ahocas, Cleve, Sanders 2007; Buhrman, Newman, Röhrig, Wolf 2007; Hagar 2007; Nölle, Ömer, Suda 2007; Chi, Kim, Lee 2006; Love, Boghosian 2006; Nakahar, Vartiainen, Kondo, Tanimu, Hata 2006; Rötteler 2006; Bascradi 2005; Høyer 2005; Mitra, Ghosh, Das, Pate, Kumar 2005; Grigni, Shulman 2004; Kacewicz 2004; Kreinovich, Longpré 2004; Orús, Latorre, Martín-Delgado 2004; Vieira, Sacramento 2004; Bowden, Chen, Buhrman, Wolf 2003; Mihara, Sung 2003; Zak 2003; Dam 2002; Dial, Klappenecker 2002; Ettinger, Høyer 2002; Hunziker, Meyer 2002; Meyer 2002; Protopopescu, Barhen 2002; Patel 2001; Takeshi 2001; Mihara 2000; Cleve, Ekert, Henderson, Macchiavello, Mosca 1998.

at all since there had not existed any problem for the solution of which the alleged powerful computers might be utilized in the Roman empire and according to the corresponding level of cognition in it. Then, the conclusion should be analogically and quite reasonably that our “P” civilization might not utilize quantum computers as long as there do not exist “NP” problems crucial for our society or cognition, for the solution of which their implementation would be necessary.

As well as vice versa if one continues the outlined experiment allowing for contemporary social or scientific problems had been somehow transferred in the Roman empire (of course, also counterfactually) so that the available there powerful computers would be relevant to their solutions. That would blow up all the empire by its corresponding instantaneous adiabatic heating due to the fact that the ancient “cold” aggregate state would not correspond any more to the necessary degree of releasing the heat of appearing and appearing new knowledge due to the utilization of our contemporary computers so that either the great emperor at issue would command all computers to be destroyed in order to conserve his power or a series of permanent rebels and revolutions would start transforming the ancient “cold” society to its contemporary forms characterized by much more individual freedom and weaker hierarchies for the “heat produced by cognition” to be able to be released avoiding any social disasters.

That option after continuing the thought experiment can be also immediately transferred to the eventual or forthcoming utilization of quantum computers nowadays. Analogically, it would start transforming today’s society to the corresponding much looser state of individual freedom to be able the qualitatively greater amount of information (properly, “quantum information) to be released within society therefore “liquifying” all welded hierarchies without replacing them with new ones since whatever hierarchies be, they would be inconsistent with ne necessary for the constantly produced cognition (and more and more accelerating) to be propagated and disseminated uniformly and homogeneously all over the society.

Obviously, “NP” civilization or the society liquified by “quantum cognition” produced by it recollects Feyerabend’s “epistemological anarchism” and his notorious slogan: “Anything goes!”. Though he referred to Lenin or social revolutions, that was not more than an analogy or left “political flirting”, by the way, quite fashionable among the Western intelligentsia at that time, but he remained thoroughly within the Cartesian framework of Modernity after which cognition by itself is mental and thus gapped from society postulated to be material and “primary”, especially emphasized by Marxism and Leninism, and thus situated on the opposite “shore” granted to be just “primary” and determining as for “materialism”. So, he neither described society and cognition to be inherently united and mutually conditioned (so that cognition “adiabatically heats” cognition permanently) nor even only Feyerabend admitted that option breaking the Modern episteme. On the contrary, all papers in the thalweg of “ontomathematics” (including the present one) break that framework.

That kind of unified, both social and epistemological “anarchism” seems ridiculous and nonsense not less than the classical political “anarchism” not managed to be really implemented in any country during all the history of humankind. That classical anarchism resisted, first of all,

the principle itself of obedience, submission, subordination, and hierarchy since it restricts human freedom. However, not understanding that freedom originates from cognition not as a wishful slogan, but as a real and causal link or even unity (in fact also being unthinkable) in Modernity, that corresponding "modern anarchism" could not penetrate that cognition is what organizes and always orders society in the final analysis, and its welded and then reproducible again and again structure correspond to too slowly increasing cognition and accordingly, too slowly "adiabatically heated" society.

So, one can reveal two misunderstandings about the implementation of quantum computers: the former grants for them to resolve "P" problems faster or more effectively than any Turing machine computers inventing and utilizing "cleverly" particular properties of quantum calculation embedded in corresponding special algorithms. The official paradigm of computer science (and thus, implicitly GOOGLE and XPRIZE as far as a panel of mastitis scientists will estimate and choose the winners for their award) tends to mean just that kind of their implementation.

Nonetheless, the viewpoint advocated by the present study also implies another misunderstanding consisting in their implementation for Gödel insoluble statements, only on the fast "track" of which the quantum computer "Achilles" is able to overtake the Turing machine "Tortoise". That observation is quite reasonable, however our "P" civilization does not need their solutions just the Roman empire did not need contemporary Turing machine supercomputers for no problem with a relevant practical importance at that time had required that computational power for example since they did not intend space flights to Mars, etc., in fact, even not suspecting their practical option. So, that latter misunderstanding originates from the observation that humankind nowadays does not yet need solutions of any "NP" problems for which quantum computers would be really relevant.

Consequently, the title of the present section should be accordingly reinterpreted relating it not to the real contemporary society and cognition but also to any others, being eventually future ones as well as including the objective they to be defined as a conservative generalization of the present "P" civilization. The starting point is the conjecture that the afore-defined "P" civilization, on the one hand, and Modernity confessing the Cartesian abyss between mathematics and reality (situating the society on the "shore" of the latter) allowing only that cognition which obeys that belief, on the other hand, are to be identified quite naturally. In other words, though rather loosely reformulated, any problem essential or even being able to be ever essential for Modernity is a "P' problem, and consequently the class of computers notated as the "Turing machine" one is absolutely sufficient during it. As well as vice versa: if representatives of the alternative class of the "quantum computer" would be widely used in practice, this implies for the "solid" Modernity to be "liquefied" or resolved into Postmodernity more or less smoothly, less or more revolutionarily in dependence on how fast (or "how faster") quantum computers would be implemented.

What is sufficient as for the subject of the present study is the observation that all Gödel insoluble statements (i.e. just those to which the quantum computer is relevant) are to be situated

only within the Cartesian abyss, i.e., between today's standard mathematics and reality (in particular, including the research of the sacrilegious "creatio ex nihilo"). That statement can be reasoned as a direct corollary from the relation of Hilbert mathematics to the standard ("Gödel") one (in detail in a series of papers: Penchev 2024 April 16; 2023 July 23: 2023 May 3; 2023 January 3; 2022 October 21). Hilbert mathematics, realized as a philosophical doctrine (being inherently Pythagorean or neo-Pythagorean), is called "ontomathematics" (a neologism following the pattern of "ontology").

Furthermore, one can conjecture (suggested and discussed in the aforecited series of papers) that all crucial problems of contemporary mathematics (for example the seven Millennium problems of CMI, one of which is the "P" and "NP") are Gödel insoluble statements or at least closely linked to those. Consequently, what stops the further advance of mathematics is the limits externally imposed to mathematics by Modernity and the submitted position of mathematics in its episteme rather than the absence of efforts or capabilities of the army of professional mathematicians storming them for several centuries. The solid and hierarchical social organization itself reflected particularly on the Cartesian episteme has prevented the solutions of that series of mathematical puzzles rather than the problems themselves and by themselves.

Elucidating the link of the "P" and "NP" problem and that about the practical implementation of quantum computers, the solution of the latter turns out to be harassed by the "solid aggregate state" of the society and that framework of possible cognition admissible within it rather than implied by the alleged "impracticality of the quantum computer". Ontomathematics breaks those foisted limitations for mathematics and suggests the relevant generalization of the modern episteme such that the quantum computer may start working.

VII THE GENERALIZATION OF HOW A MACROSCOPIC BODY "CALCULATES" THE TRAJECTORY OF LEAST ACTION THEREFORE RESOLVING THE "TRAVELING SALESMAN PROBLEM"

The objective of the present section is to consider the lesson of nature itself about how a macroscopic body "calculates" the single trajectory unambiguously corresponding to the principle of least action as a definition of the class of all solutions of the problems resolvable by the quantum computer supplied by a "NP" output. Particularly, the direct application of the same

model is the solution of the "traveling salesman problem"[15] so that the space of its solution is Euclidean space (being the fundamental one for our experience and classical physics closely linked to it). The solution itself originates from the variational principle in relation to its extremum (which is the minimum in the case). The same minimum has been in advance "calculated" by any moving macroscopic body once it is considered to consist of "a lot of quantum computers", therefore constituting a medium of them and called a "NP" output of the quantum computer. The maximum of the probability density distribution corresponds to the minimum of the action as for the body at issue. So, the "NP" outputted solution of the quantum computer obeys directly (i.e. without the eventual mediation of locality and energy conservation relevant to it) quantum-information conservation. That is the essence of the lesson taught by nature itself (which can be interpreted as "God" after "quantum theology" as in: Penchev 2024 October 2): *the "NP" output of the quantum computer obeys directly quantum information conservation* so that it should be the leading heuristical principle for the implementation of the quantum computer to any other "NP" problem:

The qubit (respectively, separable complex) Hilbert space is universal for the processing by the quantum computer. However, its interpretation as one or another quantity and the corresponding metrical (and topological) space (in which it is a vector) originates from the current problem for resolving (which turns out to be Euclidean space as for the "traveling salesman problem"). In other words, the general model describes the class of all mappings of the separable complex Hilbert space into another metrical (vector) space. One can immediately notice that the reverse mapping as for Euclidean space is (i.e. that of Euclidean space onto the

[15] There is a huge volume of literature, among which certain papers can be cited as relevant to the present study and its subject: Côté, Archetti, Speranza, Gendreau, Potvin 2012: Cacchiani, Muritiba, Negreiros, Toth 2011; Jaillet, Xin 2011; Cordeau, Ior, Lapor, González 2010; Takahashi 2010; Bérubé, Gendreau, Potvin 2009; Hernández-Pérez, Salazar-González 2007; Gouveia, Pesneau 2006; Paletta, Triki 2004; Archett, Bertazzi, Grazia 2003; Baldacci, Hadjiconstantinou, Mingozzi 2003; Matsuda 2002; Andreae 2001; Katayama, Narihisa 2001; Rubinstein, Thom, Wormald 2001; Ascheuer, Fischetti, Grötschel 2000; Anily, Bramel 1999; Kanou 1999; Gendreau, Laporte, Semet 1998; Burke 1996; Gendre, Hert, Laporte 1996; Glover 1996; Schneider, Froschhammer, Morgenstern, Husslein, Singer 1996; Zhang, Korf 1996; Balas 1995; 1989; Blokh, Gutin 1995; Chao, Golden, Wasil 1995; Eule, Verge 1995; Fischet 1995; Fischett, González, Toth 1995; Gouveia, Voß 1995; Mak, Morton 1995; Verhoeven,Aarts, Swinkels 1995; Anily, Mosheiov 1994; Cheng, Gen 1994; Fiecht 1994; Gao, Steele 1994; Knox 1994; Bianco, Mingozzi, Ricciardelli 1993; Dal, Veen, Sierksma 1993; Kindervater, Lenstra, Savelsbergh 1993; Langevin, Desrochers, Desrosiers, Gélinas, Soumis 1993; Lien, Ma, Wah 1993; Malandraki, Daskin 1993; Sierksma 1993; Veen 1993; Paletta 1992; Rote 1992; Sierksma, Tijssen 1992; Stadler, Schnabl 1992; Tsitsiklis 1992; Christof, Jünger, Reinelt 1991; Libura 1991; Park 1991; Shapiro 1991; Veen, Sierksma, Dal 1991; Dror 1990; Goddyn 1990; Jeromin, Körner 1990; 1989; Lucena 1990; Malik, Fisher 1990; Volgenant 1990; Dos, Terno, Scheithauer 1989; Grout, Sanders, Stockel 1989; Leclerc, Rendl 1989; Miller, Pekny 1989; Tamir 1989, Chrobak, Poljak 1988; Feiring 1987; Padberg, Rinaldi 1987; Berman, Levi 1986; Chandrasekaran 1986; Korner 1986; Wiel, Sahinidis 1996; Garcia-Diaz 1985; Jongens, Volgenant 1985; Kalantar, Hill, Arora 1985; Stewart Jr. 1985; Parker, Rardin 1983; Volgenant, Jonker 1983; 1982; Bhat 1982; Frieze, Galbia, Maffioli 1982; Hill 1982; Panayiotopoulos 1982; Volgenant, Jonker 1983; 1982; Discenza 1981; Cutler 1980; White, Sweeney 1980; Gupta 1978; Leipälä 1978; Chisman 1975; Ashour, Vega, Parker 1972; Derman, Klein 1966; etc.

separable complex Hilbert space) is the class of quantum fields (which are only meant by classical quantum mechanics and then embedded in the Standard model). This means that the choice of Euclidean space (in fact, being an arbitrary choice as for mathematics) originates in the final analysis from the condition of locality, which classical quantum mechanics obeys.

So, the general case of "NP" outputted quantum computers is to be described by the mapping of the qubit Hilbert space into the space of any variable to which the probability distributions originating from the former refer (or respectively, might refer in principle), however furthermore not restricting those variable to Hermitian operators as classical quantum mechanics postulates for all possible physical quantity in order to obey unitarity and energy conservation. The variable at issue and thus that space defined by its all possible changes is to be chosen for corresponding to the problem to be resolved by the quantum computer. In the case of the "traveling salesman problem", that is Euclidean space so that any moving macroscopic body resolves it following the trajectory unambiguously corresponding to the principle of least action.

What is necessary to prove or rather demonstrate is that the "NP" outputted quantum computer (further often omitting "outputted" as being in default) is relevant to all Gödel insoluble statements. (The observation that the utilization of the quantum computer makes practically sense only in relation to them has been already reasoned and justified above.) Hilbert arithmetic in both narrow and wide senses is to be involved for that purpose. Then and particularly, the Gödel enumeration for all of them can be introduced without any contradiction utilizing the dual anti-isometric counterpart of Peano arithmetic, furthermore physically interpretable by means of Hilbert arithmetic in a wide sense as the quantity conjugate to the actually measured one (and thus being complementary to it).

If one considers any series tending to its limit (which might be both finite or infinite, but granting for it to be finite is the case intuitively clearer) so that its successive members are enumerated by natural numbers, the dual anti-isometric Peano arithmetic (above involved for the Gödel enumeration of all Gödel insoluble statements) would correspond to all those members necessarily possessing "infinite" enumerations in the following exact meaning: they are the set theoretical complement of all natural numbers to the *set* of all natural numbers being quite different by virtue of the direct contradiction between the axiom of induction (e.g., in Peano arithmetic) and the axiom of infinity (e.g., in ZFC set theory).

Meaning the above general observation, one can apply it to the particular case of the series of the "projection operators" of the "NP" quantum computer, which can be visualized by more and more narrow probability density distribution, so that the limit of their series is the Dirac δ-function. One may immediately notice that the set of all Gödel insoluble statements is bijectively mapped into all "infinite" members of the series corresponding to the projection operators as above. The mediation of the dual Peano arithmetic therefore involving the concept of Hilbert arithmetic is necessary for that bijection to be established and proved. So, whatever a Gödel insoluble statement be, thus corresponding to an "infinite" number in the just introduced exact meaning, the *irreversible* projection process has been in advance started corresponding to its "infinite" number. In other words, that consideration proves that the "NP" quantum computer

resolves all insoluble Gödel statements and only them, which is absolutely sufficient as far as its use makes sense only to them since it can run over the Turing machine "Tortoise" only on the "fast track" of them. Thus, the statement is ultimately proved.

One more consideration can be rather useful. The above construction though directly justifying the utilization of the quantum computer implies as a "byproduct" the following corollary: the dual Peano arithmetic enumerates also all possible interpretations (thus inherently physical or "material") of any probability distribution which notates their class in turn. Indeed, any Gödel insoluble statement intended to be resolved by the quantum computer implies bijectively and thus unambiguously one variable as well as the space of its changes to be an interpretation of the probability distribution in the final analysis.

Now, one is to consider the mapping of the series of members belonging to the separable complex Hilbert space into the class of all possible spaces, each of which is relevant for the solution of a certain problem (postulated to be a Gödel insoluble statement following the aforementioned considerations) from the viewpoint of the latter under the condition for both series to be congruent (in turn originating from the self-decoherence of the medium of quantum computers). Then and as for the class just defined, it can be represented by the "variational principle" (furthermore underlying the proofs of both theorems in Emmy Noether's fundamental papers in 1918). Indeed, if one considers any congruent member from the viewpoint of the limit itself, it obeys the variational principle in a wide sense since any "variations" to it tend necessarily to zero: otherwise the limit at issue would not be a limit. Then, if a space (such as the separable complex Hilbert space in the case) is homeomorphically mapped into another (consequently, necessarily being a topological space, a condition relevant in the case), any congruent series belonging to the former implies a corresponding variational principle as for the latter.

Only the class of equivalence of the latter (i.e. without involving that preceding homeomorphism) is sufficient for Emmy Noether's "first theorem" and after parameterizing suggested by her, also for the "second theorem". Both "keep quiet" about any eventual homeomorphism generating the variational class as a quite redundant premise thus cut by "Occam's Razor". However, that "silence" is equivalent to the undisputable condition for locality confessed by classical science and penetrated in Emmy Noether's theorems since she was inspired by them from physical problems. The influence of the generalization to conservation laws and to the newly introduced "law of quantum-information conservation" (first of all) will be considered in more detail in Section IX. What is sufficient as for the quantum computer to be justified and reasoned is only the explicit introduction of that homeomorphism: all possible processings accomplishable by it (including even only theoretically) belong to its class.

Then, one can stare more carefully at that class of all processings making sense for a quantum computer to be at all involved and above identified to be all problems touching at least one representative of the class of all Gödel insoluble statements. The former and the latter can be bijectively juxtaposed with each other by mediation of the dual Peano arithmetic. So, one can coin Douglas Adams's notorious joking parable for "42" to be the solution of the most

fundamental problem though being unknown which, but consequently to all possible problems in the final analysis.

Indeed, the result of any quantum processing can be likened to “42” if its consideration is restricted to the qubit Hilbert space, this means: without a certain representative of the class of all possible target space, consequently without determining to which problem the solution of the quantum computer should refer. In fact, which problem has been really meant is always predetermined by the preliminary choice of one or another measuring set allowing for the measurement of a certain variable and therefore excluding the measurement of its conjugative quantity corresponding to some though absolutely undetermined (and indeterminate at all) problem. Thus, though the quantum computer including the “NP” quantum computer discussed in the present paper suggests as if a universal answer of all problems (such as “42”), the context of its work, which is how to be limited the “body” as for the medium of quantum computers (i.e. the “NP” quantum computer) has been in advance predetermined that way in which “42” should be interpreted.

Then, one can discuss a few topics derivative from the joking parable of “42” especially to the available “clever” quantum algorithms, such as Grover’s for faster searching in any data base or Shor’s for factorisation of any natural number, in order to be seen their “cleverness” in the newly introduced viewpoint of the conjectured “NP” quantum computer. The former is “P” faster since it searches simultaneously in the two dimensions of the database consisting of “N” data therefore accelerating to $\sqrt{N}$ in comparison to the Turing machine search. On the contrary, Shor’s algorithm accelerates just exponentially, consequently “NP”, by virtue of quantum parallelism since the Turing machine factorization is necessarily “one by one” reducible to the already newly interpreted restrictions of Erathostenes's sieve.

Both algorithms are very well researched and can be considered as two basic classes of quantum algorithms in principle: those including Grover’s and suggesting a “finite quantum parallelism” and those as Shor’s relying on the implementation of an “infinite quantum parallelism”. For both classes to be seen from the present mathematical model of the quantum computer as a homeomorphism of the universal qubit Hilbert space into a certain target vector and topological space, one can introduce a well-ordering of the homeomorphism at issue by which it is simultaneously bijectively mapped onto the decoherence series of increasingly “narrowing” probability density distribution leaning to the Dirac δ-function. Then the complete homeomorphism can be decomposed as a Cartesian product of a series of partial sub-homeomorphisms, and any “clever” quantum algorithm can be understood to be a set (whether finite or infinite) of sub-homeomorphisms. Then, the “Grover class” of quantum algorithms would correspond to the former “finite case”, and its “Short counterpart”, to latter “infinite case”.

Nonetheless, both classes obey to the fundamental deficiency of their outputs due to Heisenberg’s uncertainty therefore forcing for any possible single output to be either (1) absolutely exact but random or (2) an interval of possible solutions, but determined more or less unambiguously. In the final analysis, the quantum computer accomplishes definitely the

transcendent “transgression” gapping finiteness from infinity unlike the Turing machine (also definitively) not accomplishing it. However, in the framework of that unavoidable restriction for the quantum computer to be “transgressive”, the “jump into infinity” can be explicit, i.e. in the algorithm itself, thus belonging to the “Shore class” or implicit as in any representative of the “Grover class”.

One can further consider how the “unity of hardware and software” featuring the “NP” quantum computer relates to those two fundamental classes of quantum computers notated as “Grover” and “Shor” granting as usual that algorithms are to be relate to the “software” of the quantum computer (following the traditional distinction borrowed from all contemporary “Turing machine” computers). So, the “Grover hardware” being the complement of the “Grover software” counterpart to the “infinite transgression” is necessarily an infinite set and unlike the “Shor hardware”, for which the same restriction is not necessary (at least theoretically): in other words, it can be whether finite or infinite equally well.

As for the aforementioned interpretation of the distinction of “hardware” and “software”, the conjectured “NP” outputted quantum computer corresponds to an “infinite hardware” being applicable to the software of both classes of quantum algorithms though being unconditionally necessary only for the “Grover” one. The “backdoor” for a hypothetical, unambiguously outputted quantum computer based of the implementation of “Shor algorithms” will not be investigated in the present study, the proper subject of which is the “infinite hardware” by a “medium of quantum computers” (notated as “NP quantum computer”).

Anyway, the “cleverness” just of the “Shor class of quantum algorithms” is a “proper cleverness”, but rather theoretically since their practical implementation is much more difficult (even eventually impossible in principle though that restriction is not yet proven) than that of “Grover” ones. Its essence consists in transferring the “transfinite transgression” from the quantum computer “hardware” into relevant quantum algorithms (i.e. in its “software”), which is possible only as for the quantum computer rather for the Turing machine due to its inherent unity and “smooth” inseparability of its “hardware and software” (demonstrated in detail above). So, the eventual “cleverness”, though necessarily specific for a certain problem (which is also explained above), can be briefly and rigorously defined, by the condition for a relevant “transfinite transgression” within itself therefore crucially facilitating the “hardware” of the quantum computer by allowing for it to be finite thus bypassing, in particular, the restriction imposed by any measurement output of a quantum computer. Anyway, the present study means rather all quantum algorithms regardless of being “clever” or not since its proper subject is the possible implementation of the “infinite” quantum computer hardware by the medium of quantum computers, thus reasoning that the result is not fundamentally random as the case of any output by measurement.

One can also notice the link of Shor’s algorithm with the general solution of the problem of the number of all prime numbers less than a certain natural number, which will be in detail considered in the next section. Obviously, if one has somehow supplied the exhaustive list of all divisors of any great natural number, their counting or enumeration is a trivial “P” problem. As

well as vice versa (after “modus tollens”): if the latter problem does not allow for any general solution (as this is properly proved in the next section), this in turn excludes for any general rule the relevant tuple of the prime numbers factorization to be composed (as the former case needs) therefore justifying that its eventual solution can be in general processed only by a quantum computer (for example, accomplishing Shor’s algorithm). So. the proof in the next section is to be related immediately to the discussion in the present section.

One can also reflect both alternative ways for the classes of “Shor algorithms” versus “Grover algorithms” (as they are rigorously defined above) now in connection with the universality of the qubit Hilbert space (in turn associable with the elucidated universality of the Turing machine hardware) versus the uniqueness of the target vector and topological space adequate only to the single problem intended to be resolved (corresponding to the specific software program of the Turing machine adequate only for the single problem class meant to be resolved). Then, the Shor algorithms should be qualified to be much more “specific” (respectively, strictly limited only within the framework of the target space and quantum variable relevant just for the investigated problem) than the Grover ones.

One may also utilize the mathematical definition of the quantum computer as the homeomorphism of the universal qubit Hilbert space into the specific target space (whatever it be), being decomposed in two subsequent (non-commutative, in general) homeomorphisms so that the former one is called “software homeomorphism” followed by the latter “hardware homeomorphism”. One has to emphasize expressly that “software homeomorphism” and “hardware homeomorphism” are idempotently exchangeable, thus conventionally notatable and making sense only rationally to each other. A confusion is possible if one starts from the representation originating from the Turing machine computers embodying the former homeomorphisms seeming to be rather a “hardware” one.

So, the Shor algorithms mean an “infinite” (consequently, proper quantum) software allowing (at least, theoretically) for being ended by a finite and unambiguously deterministic “hardware homeomorphism” though the option of an “infinite” quantum hardware also remains open for them unlike the Grover ones. One can hint at the possible generalization of the mathematical definition of the “quantum computer” in terms of category theory so that it is to be defined as the functor variable of the qubit Hilbert space into a wide class of mathematical structures, furthermore decomposable into a “hardware sub-functor” and a “software sub-functor” therefore allowing for the smooth mutual gradient between them (an option strictly forbidden in the framework of Cartesianism). An alternative approach as for the application of category theory to quantum computing science can rely on the idempotent identification of the distinction between “hardware” and “software” and that between “functor” and “mathematical structure”, respectively into the transformation of one tuple of axioms into another (not equivalent to the former in general).

VIII HOW THE QUANTUM COMPUTER "ACHILLES" WILL RUN OVER THE TURING MACHINE "TORTOISE" ON THE FAST TRACK OF THE NUMBER OF PRIME NUMBERS LESS THAN "N"

Here is another problem eventually supplying the "fast track" necessary for the quantum computer "Achilles" to be able to sprint for illustrating the troubles about the practical use of quantum computers due to the absence of any general constructive method (at least until now) for determining the relevant variable for a certain problem being a Gödel insoluble statement and the derivative impossibility for any, even only theoretical representation of the corresponding preliminary experimental preparation. The considered above "traveling salesman problem" is rather an exception since the relevant variable is obvious. In fact, what is supplied is the only "purely mathematical existence" of some quantum variable, however constructively unknown, which turns out to be the main practical obstacle for the "NP" quantum computer. The intention of the present section is to consider another Gödel insoluble statement, which is able to offer that "fast track" for the quantum computer, on the one hand, but on the other hand, it should show how difficult it is to determine any quantum variable relevant to it.

That problem is the number of all prime numbers less than an arbitrary natural number N therefore meaning its general solution[16]. Though there exist various particular solutions of how the calculation at issue to be accelerated after using the Turing machine for it, the ancient "sieve of Eratosthenes" is absolutely sufficient for the objective now. It demonstrates:

(1) The set of all prime numbers less a certain natural number is the set-theoretical *complement* to the set which is the intersection of all use of Eratosthenes's sieve for already determined prime numbers. Its current utilization can be interpreted to be dependent on its previous utilizations for less natural numbers and thus "self-predicative" in a loose sense.

(2) Both sets (namely, that set which is the intersection of all previous uses of Eratosthenes's sieve and that set which is set-theoretical complement of the former) are not regular, at least at a first glance though some very clever and sophisticated regularity might exist anyway. Nobody has managed to discover it except as a limit (the "prime numbers theorem"). As for the deviation to it in relation to a certain natural number, it is again irregular and maybe linkable to Rieman's "zeta function" (by the way, the problem of its nontrivial "zeros" is another among the seven Millennium problems heralded by CMI).

One more preliminary notice is necessary for the utilization of quantum computers if it is linked as above to all Gödel's insoluble statements. Those exist only in the standard mathematics involving both arithmetic and set theory (as well as classical propositional logic, but this circumstance is not essential in the present consideration), but not in arithmetic by itself (for example historically, before Cantor's "paradise" to have been established). So and as far as the Turing machine is an inherently arithmetical device, the Gödel insoluble statements cannot be defined directly to it. Anyway, they can be indirectly linked by means of the "halting problem",

[16] For example, Lichtman 2018; Debnath, Besu 2015; Wolf 2014; 1997; Asveld 2013; Eliahou, Massė, Schneider 2013; Holding 2009; Sugamoto 2009; Bykovskii 2008; Iovane 2008; Forum 2006; Kubota, Yoshida 2001; Pintz 1991; Karatsuba 1990; Bentz 1982; Diamond 1982; Fomenko 1982.

even more so that its equivalence to them is proved and discussed in detail. Speaking loosely, if the Turing machine would process any Gödel insoluble statement, it might never end. As for the problem of all prime numbers less than an arbitrary natural number given in advance, the conjecture is that the Turing machine searching for its general solution would not ever stop its work, but nonetheless, it would resolve the problem as for any given in advance natural number, but for some "NP" time due to the absence of any general solution.

However, the quantum computer also cannot discover that general solution since that does not exist at all (as this will be demonstrated rigorously a little further). Nonetheless, the absence of that general solution is not essential for it because it is able to check all cases simultaneously by virtue of quantum parallelism rather than "one by one" as the Turing machine is forced to process.

One can easily show that no general solution of the considered problem in the standard mathematics by virtue of the following observations. The set of all prime numbers is infinite since the greatest prime number does not exist as this has been known since antiquity. Eratosthenes's sieve is a universal method for discovering all prime numbers though being iterative, one by one. So, it should be relevant also to the general solution if that would exist anyway. Consequently, if one admits such a general solution to exist, it should be the complement of any current finite set unambiguously determined by Eratosthenes's sieve to the infinite set of all prime numbers. That general solution would mean that the complementing infinite set can be defined by its finite characteristic property (rather than by indicating all elements one by one or eventually subdivided to another infinite set of groups). If that general solution is granted to exist, it implies for the finite set being the current result of utilizing Eratosthenes's sieve until any certain natural number to obey some though unknown finite formula rather than to be necessarily iterative as the Erathosthen method really is. This means for any given natural number "N" to be unambiguously guessed whether it is prime or not independently of all preceding prime numbers including those less or equal than $\sqrt{N}$. If that is the case, one cannot prove that the set of all numbers is infinite since the proof at issue refers to the product of all prime numbers less or equal to the alleged greatest prime number, i.e. it refers to a recurrent formula, which not being recurrent would imply for the set of all prime numbers to be finite. So, the formula at issue is necessarily recurrent, and that statement implies for the Erathosthenes method to be also necessarily recurrent, thus depending on its previous utilizations and on discovered already prime numbers before that.

In other words, the necessary iterativeness of Erathostenes's sieve implies for the set of all prime numbers to be infinite. So, if the latter, on the contrary, is finite, this is equivalent to the existence of a non-iterative formula able to describe the "sieve" exhaustively. As far as the proof that the set of all prime numbers is infinite is correct, any general (non-iterative) formula neither in relation to the number of all prime numbers less than any certain natural number nor in relation to Erathosthenes's sieve itself cannot exist in principle. So and particularly, the Turing machine is forced iteratively, i.e. one by one to resolve the problem of the numbers of all prime

numbers less than any certain natural number in the final analysis, i.e. regardless of all possible special accelerations.

This means that the intended proof would be demonstrated in fact that the general formula would be a Gödel insoluble statement since it relies on the relation of the variable of the cardinal number of an arbitrary finite set to an infinite set since both, the former and the latter describe the same. The Gödel insolubility at issue implies for any problem to which it is relevant that it can be resolved by the Turing machine for any certain in advance finite set of input data only checking all cases "one by one" and thus for a "NP" time. However, the method of "Erathostenes's sieve" implies for it to be iterative thus needing its link to checking all cases one by one to be additionally elucidated.

They are in fact equivalent, even in the general case therefore involving infinite sets by virtue of the equivalence of the axiom of choice and the well-ordering "theorem" thus including for any finite subsets, by the way, able to be well-ordered without the mediation of both if they are determined in advance. Indeed, if a method (such as Erathostenes's sieve in the case) is necessarily iterative, this implies that it involves a well-ordering of all previous applications of the method. Then, that well-ordering of all previous considerations being necessary for resolving the current one is equivalent the axiom of choice in the general case of an infinite set, which in turn is equivalent for the Turing machine to check all cases "one by one" obeying the condition that each one of them can be chosen and thus it has to be checked. So, one can conclude that Erathostenes's sieve being necessarily iterative originates from the theorem that all prime numbers are an infinite set just in the same way in which the Gödel insoluble statement implies for it to be resolvable by the Turing machine for any finite set of input data only checking all cases "one by one". That observation will be additionally discussed also a little below.

The just sketched idea will be initially discussed about its sense and then explicated in a rigorous enough, formal and mathematical way corresponding to its sense elucidated before that. The first notice refers to the link with the theorem that the set of all prime numbers is infinite, and the current number of all prime numbers following the Erathostenes method is necessarily iterative, originating from the former derivatively. It is above made clear that the necessary iterativeness of a method (as Eratosthenes's sieve now) is equivalent for the Turing machine to resolve the same problem only testing all cases by one, and both originate in the final analysis from some Gödel insoluble statement therefore involving the relation of arithmetic and set theory, though eventually implicitly.

One can consider the same representation of the Gödel insolubility as for a problem featured by a certain finite set of input data to be resolved by the Turing machine for any "NP" time (whether due to checking all cases one by one or iteratively) in terms of Hilbert arithmetic in a narrow sense: this means, by involving the dual anti-isometric Peano arithmetic. Indeed, any finite set cannot be well-ordered in relation to both dual Peano arithmetics (since they are anti-isometric to each other and thus the well-ordering to either implies no well-ordering to the other one) just as any infinite set otherwise than applying the axiom of choice. In other words, the anti-isometric of the two dual Peano arithmetics implies the necessity for the axiom of choice

to be postulated also for finite sets (which is false in the usual consideration of a single Peano arithmetic).

Then, the necessity of involving the axiom of choice also as for finite sets (i.e. processable by the Turing machine) is equivalent for any problem involving them (if it holds) to be resolvable by the Turing machine whether only iteratively or checking all cases one by one thus needing some "NP" time or said otherwise, supplying a fast track for the quantum computer "Achilles" to be able to overrun the "Tortoise" of the Turing machine. The general problem of the number of all prime numbers less than any given in advance natural number is also a Gödel insoluble statement after elucidating the lesson of its necessary iterativeness which is the only essential feature distinguishing it from the traveling salesman problem resolved by any moving macroscopic body after "calculating teleologically" the single trajectory corresponding the principle of least action. The variable of distance, respectively impetus, relevant for its case, is obvious and trivial. However, the analogical problem, which the quantum variable relevant as for the number of all prime numbers should be, is far not obvious or trivial. One can easily prove that it exists, but no constructive way to be determined in each certain case (as in the discussed case of the problem of number of all prime numbers).

One may summarize a few main conclusions about the practical implementation of quantum computers. Only the "NP" computer makes sense to be practically used in general as far as it is really able to overtake the Turing machine "Tortoise". However, it can sprint only on the special track of Gödel insoluble statements: on the usual "P" problems, its utilization is meaningless since it is not qualitatively faster than the Turing machine for them, but it is much more expensive than all computers belonging to the latter class.

Today's "solid" aggregate state of the societies consisting of the "microcrystals" of a huge number of many various hierarchies corresponds to a "P" civilizations, not needing the solutions of any "NP" problems to survive or to progress thus not needing the implementation of quantum computers at all since the standard Turing machine computers are relevant for "P" problems and simultaneously much cheaper that quantum computers. As well as vice versa: the wide implementation of quantum computers would "liquify" the society forcing a "phase transition" due to its "adiabatic heating" after that huge amount of cognition which the permanent implementation of quantum computers would produce. That "liquide" aggregation state of the society means destroying all hierarchies, by which stability of today's society is maintained, since their existence would be absolutely inconsistent to the immense cognition constantly appearing and appearing because of quantum computers' solutions of "NP" problems.

The process of the "phase transition" from the present "solid" state to the eventual future "liquid" state would obey the general thermodynamic laws of all phase transitions, after which the adiabatic heating due to the implementation of quantum computers would result into the destruction ("liquifying") of more and more hierarchies ("crystals") while they vanish thoroughly and only after that the "social temperature" for that permanently appearing new knowledge and cognition would continue to increase gradually over the "boiling point" and corresponding "phase transition". The process of dissolving more and more "crystal" hierarchies

would mean a state of permanent social revolutions possibly accompanied with violation and disorder, at least initially: until cognition would not start ruling and regulating the society.

One more additional notice is necessary since the direct influence of human cognition (due to humankind's inherent reasonability) on the social state, hierarchies and order is absolutely hidden, invisible and thus impossible to be studied by any way in the strict framework of Modernity and its "episteme" characterized by the Cartesian "abyss" between "cognition" situated on the "mental shore" (that of "mind", "subject", "ideas", mathematics, etc.) and opposed to the "material shore" of the society itself. Thus the "adiabatic heating" of the society due to cognition is tabooed as many other problems in non-existent now scientific areas, which can be generally featured to be "NP" (supposedly), and just to which the implementation of quantum computers would be properly relevant.

All social revolutions until now meant only a *temporary* "liquified" society necessary only for the transition from one kind of many and various "crystal" hierarchies to another, usually looser than the former and thus allowing for the exchange of more cognition in comparison with the former (but nonetheless, solid as well). So, all of them included a period of counter-revolutions obligatory for "cooling" the state to that of new "crystal" hierarchies and subsequent to the initial revolutionary period destroyed many hierarchies before that.

Furthermore, the circumstance that the age of revolutions is just that of Modernity is inexplicable, in fact even inarticulable: and here is why. In fact, only the epoch of the great geographical discoveries and modern science suddenly had increased the volume of human cognition therefore "adiabatically heating" the then Western society too fast but sharply contradicting the social order and hierarchies (especially the Catholic Church and Christianity, the belief and authority of which were absolutely incompatible with the more and more accelerating advance of experimental and exact science and the corresponding progress of technique and engineering), which were forcingly "liquified" by a series of social revolutions, for which the bloody French revolution (unfortunately, with its bloody terror) is emblematic.

However, those revolutions were followed by the "cooling" of counter-revolutions since the former were necessary only for the transformation of the old "crystal" hierarchical and social order in new ones, also "crystal" but much looser allowing for the self-accelerating modern cognition to develop and disseminate freely all over the society by the fundamentally new institutions of general education (a longer and longer education) and professional science, in turn permanently revolutionizing society by new and new technical devices for everybody's use (such as today's omnipresent smartphones). Nonetheless, modern society though much looser and free than the medieval one remained yet "solid", consisting of numerous microscopic "crystal" hierarchies (furthermore allowing for new and new ones, "start-ups"), therefore allowing for each individual to choose which ones to obey. Of course, that level of contemporary human freedom would be absolutely impossible in the Middle Ages, but nonetheless it is restricted by the humans' submission to all welded or chosen by themselves hierarchies and corresponding social order, tradition, rules, laws, etc., the disobedience of which is punished more or less severely, though eventually and alternatively admitting for changes of hierarchies, to which each

individual belongs and thus which restrictions to obey. However, belonging to any certain hierarchy whichever it be, one ought to accept its conditions and to comply with them. That level of individual freedom corresponds to the Western democratic social organization, order and hierarchies and to Modernity, its episteme and speed of cognition though more and more accelerating (exponentially nowadays).

As for the subject of the present study, namely, the eventual implementation of quantum computers, even that really democratic society is too restricted, too unfree thus not corresponding to the qualitatively new stage of exponentially increasing cognition, by which a supposed, future “NP” civilization would be inherently featured. For Modernity's Cartesian prejudice and dogmas, that “liquid” social and cognitive organization might seem to be anarchy and disorder, thus pregnant with general violence and even terror, but this is not really so at all. Figuratively speaking, a liquid is better organized than a solid state consisting of numerous microscopic crystals and here is why: it obeys the maximally fast heat transmission, which is the newly established rule of its organization. According to it, the solid state is worse organized since its crystals do not allow for the speedier dissemination of cognition, which is able to organize the society more dynamically. Of course, any individual obeys it directly rather than by the mediation of any hierarchy representing a certain welded knowledge granted to be ostensibly unchangeable during years and centuries even forever (as the Bible supposes or rather, is granted to suppose, for example) thus implying unshakable social hierarchies (as the Church, for example).

Even granting that “NP” outputted quantum computers not to contradict an eventual future “liquid” society due to its relevant transformation, two rather technical and scientific obstacles in comparison with the Turing machine can be immediately marked. They are: (1) nobody knows yet any universal method how to be determined that unique quantum variable corresponding to a preliminarily given “NP” problem; (2) any “NP” quantum computer would relevant to the solution of a single.problem unlike the universal flexibility of the Turing machine after the clear differentiation of its “hardware” and “software”.

So, one should create a “NP” quantum computer for the solution of the traveling salesman problem (for example), but it is absolutely irrelevant and inapplicable to the solution of any other “NP” problem, for which another and quite different quantum computer would have to be constructed (just as a hammer is absolutely inconvenient for screwing nuts, for which you need a completely different tool, a wrench: at that, a certain “number” in order to be able to fit the nut at issue). Those two fundamental obstacles for the “NP” quantum computer will be in detail discussed below:

So, both aforementioned obstacles for the implementation of quantum computers originate directly from their crucial advantage to overtake the Turing machine “Tortoise” after competing on the track of “NP” problems due to the following. The universalism of the latter follows from the total distinction of its unchangeable “hardware” from any, but always absolutely independent “software”, on the contrary, easily changeable for being relevant to any given in advance problem. One may immediately notice that all contemporary computers

correspond to the Cartesian episteme of Modernity in an exact meaning as follows. Their “hardware” is “material”, and the “software” is “ideal”, and the Cartesian “abyss” between them being on both shores, on which they are accordingly situated, is just what supplied the independence of the software relevant for each problem from the universal hardware influencing eventually only on the calculating speed (for example, an outdated hardware) being always some “P” speed. So, any computer is theoretically able to resolve any problem, to which other and faster computers are more relevant, however slower, even much slower, but anyway ever: for a finite time:

One may conclude that the cost of the Turing machine universalism is just its “Tortoise”, “P” speed so that the quantum computer “Achilles” is able to overtake it only abandoning that universalism, which is due to the Cartesian distinction of “software” and “hardware” in the final analysis. One might say that, on the contrary, the quantum computer really and inherently embodies “Apple's” slogan for the unity of hardware and software, being of course more or less only a wishful slogan since the computers of “Apple” are also Turing machines as any other contemporary ones. One can even continue the same observation that the Turing machines for which any calculation is a process in time are local calculators in definition so that locality at issue allows for the Turing machine universalism.

The “NP” quantum computer overcoming that locality is simultaneously forced to abandon (as the relevant cost of its principle of quantum parallelism) that universalism so that it should be built uniquely and only for one single problem: (1) revealing creatively the relevant unique and one single quantum variable corresponding unambiguously to the resolved problem as a certain “wrench” able to screw only a single kind of all possible “nuts”; (2) constructing the unique and one single quantum hardware making sense only for that certain “NP” problem rather than for any others. Those two just enumerated conditions originate directly from the “NP” quantum computer definition:

The “NP” outputted quantum computer is always a homeomorphic mapping (“homeomorphism”) of a probability (density or not) distribution (respectively a wave function), thus being universal as the Turing machine “hardware”, into a unique and one single space relevant only to one single “NP” problem, i.e. fitting it just as the Turing machine “software” in relation to the single problem for resolving which it has been properly created. Namely that homeomorphic mapping (homeomorphism) is the mathematical condition corresponding to the “unity of hardware and software”, cherished by “Apple”, but being definitely inherent only for the “NP” quantum computer.

Then, one can trace back how the Turing machine is a particular case of the quantum computer following the aforementioned homeomorphism. The following extremal (or trivial in a sense) homeomorphism is to be considered. The probability distribution has been degenerated into a certain Dirac δ-function representing (loosely said) an “infinite impulse” “lasting the zero time” so that its integral is definitively equal to a unit. Then, the degenerated homeomorphism would be unambiguously determined by a single Turing machine, consequently uniquely enumerated by one single number also unambiguously corresponding to the solution of a certain

problem and thus to the class of all relevant software able to resolve the investigated problem. Furthermore, if one reversely transforms that Dirac δ-function into a series of probability distributions so that its limit is the Dirac δ-function at issue and following the same homeomorphism, they would be mapped just into the medium of quantum computers defined to be the "NP" outputted quantum computer.

Meaning the aforementioned provisos, one can offer the following rigorous proof that no general solution of the problem of how many are the prime numbers less than a preliminary given natural number exists therefore justifying that the the utilization of the "NP" quantum computer is relevant as for it. For being brief, it will be accomplished in Hilbert arithmetic in a narrow sense, from where it can be easily translated into the language of the standard "Gödel mathematics" after it would be a Gödel insoluble statement thus supplying a "fast track" for the quantum computer "Achilles". Furthermore, the proof will refer to Erathostenes's sieve to demonstrate visually that the solution of the problem is necessarily iterative and then that observation will be inferred from the definition of "prime number":

Any use of Erathostenes's sieve (noticed "$\{E_n\}$"introduces a copy of Peano arithmetic featured by a factor being a natural number then reducible to the series of successive prime numbers, $\{P_n\}$: n = 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, … This means that $\{P_n\}$ is equal to the set-theoretical complement of all consecutive uses of Erathostenes's sieve to the set of all natural numbers, i.e. $\{P_n\} = \left\{N / \bigcup_{2}^{\infty}\{E_n\}\right\}$. Of course, there exists a bijection of the infinite subset of all prime numbers to that of all natural numbers. The theorem states that the just defined bijection in turn being an infinite set cannot be described by any finite characteristic property therefore defining that bijection as a logical class, respectively as any finite formula to represent it (as all functions are usually notated in mathematics).

Here is the spot in the proof for Hilbert arithmetic in a narrow sense to be introduced since the investigated bijection would necessarily be a mapping of its two dual copies of Peano arithmetic therefore essentially facilitating the proof, after which the set-theoretical complement of all uses of Erathostenes's sieve is sufficient to be shown to be isomorphic to the dual counterpart of Peano arithmetic and here is how:

One considers the dual and anti-isometric modification of Erathostenes's sieve starting "back" from the least countable ordinal number (thus necessarily introducing a "descending ladder" of consecutively decreasing inaccessible countable cardinal numbers therefore justifying the reference to Hilbert arithmetic in a narrow sense). Then, if one considers both dual uses of Erathostenes's sieve, they both result into the same actually infinite set though they start from the two opposite "extremes" of it being well-ordered as two anti-isometric consecutive series: namely, from the least natural number, i.e. "1" in the "straight direction" and from the greatest inaccessible countable cardinal number, frequently notated as "ω" in the "reverse direction" (in quotation marks since both "directions" are idempotently exchangeable). The just articulated

observation can be literally repeated as for all uses of Erathostenes's sieve and finally, as for the set-theoretical complement to the intersection of all uses at issue.

So, what is proved until now is that the consecutive uses of Erathostenes's sieve implies the absence of any general solution of the investigated problem, but this is not the ultimate proof since the following "backdoor" is not "closed". Some other unknown nowadays method essentially different from "Eratosthenes's sieve" might exist eventually supplying the cherished finite formula. So what is necessary to be proved is that any other method, whatever it be, is iterative just as Erathostenes's sieve is. In other words one needs the proof of the statement that definition of the (infinite) set of all prime numbers implies for any constructive method for them to be unambiguously determined is necessarily iterative (rather than that condition is a peculiarity of Erathostenes's sieve, redundant in general). In fact, that auxiliary statement ending the prove seems to be easily demonstrable:

Indeed, the definition of "prime number" is inherently iterative in the following sense referring to all preceding prime numbers not to be its factors (respectively, divisors). Notated formally, $\wedge_1^\infty(p_i \; is \; not \; a \; factor \; of \; p)$ or consequently $\neg[\vee_1^\infty(p_i \; is \; a \; factor \; of \; p)]$ (after applying de Morgan's rules). This means for the statement "an arbitrary natural number to be prime" that it depends crucially from all preceding prime numbers and thus its definition is necessarily iterative implying for any method about determining prime numbers to be iterative just as Erathostenes's sieve is, in particular. In other words, Erathostenes's sieve embodies the main property of all prime numbers to be only iteratively determinable.

One more note is relevant, touching the link of Hilbert arithmetic in a narrow sense, utilized for the above proof, with Gödel insoluble statements. There do not exist any insoluble statements in Gödel's sense in that Hilbert arithmetic since one can assign an ambiguous Gödel number to each of them: being a "dual natural number", i.e. a natural number belonging to the anti-isometric Peano arithmetic, in turn being the counterpart of the usual Peano arithmetic containing the Gödel numbers of all soluble statements in the standard mathematics. Consequently, the exhibited above proof in Hilbert arithmetic in a narrow sense, implies for the thus proved statement to be an insoluble in the strict framework of the standard mathematics, which is Gödel one. This means, in particular, that the statement at issue is able to offer a "fast track" for the "NP" outputted quantum computer "Achilles" to overtake the Turing machine "Tortoise" under the condition that the society needs solutions of "NP" problems (which is not relevant to today's society, being even destructive for it after destroying eventually all hierarchies and resultatively "liquifying" it).

IX A LITTLE MORE SCI-FI, OR THE "TRIGGER RAY" GENERALIZING THE QUANTUM COMPUTER "NP" OUTPUT

The mathematical model of the newly introduced "NP" outputted quantum computer is the homeomorphism of the universal Hilbert space (whether qubit or separable complex) into an arbitrary space and corresponding quantum variable originating unambiguously from the investigated "NP" problem (as far as the utilization of quantum computers make sense only to

“NP” problems rather than to any “P” problems in general). So, that consideration until now does not include any entanglement, respectively, it is strictly limited to be theoretically representable by one single qubit (or a pair of “axes” of the separable complex Hilbert space) to be mapped onto the investigated “NP” problem space. The eventual influence of other entangled space is to be reckoned as some disturbance curving the result and thus needing to be avoided.

That condition for a single Hilbert space (not being disturbed by any other one entangled to it) is relevant to classical quantum mechanics, but nonetheless that mathematical model goes out of it: beyond it, in the theory of quantum information as long it does not require for the space of the resolved problem not to correspond (as a reverse mapping) to a quantum field (in the exact meaning of classical quantum field). That weakened generalization also implies that the homomorphism definitive for the “NP” quantum computer not to be necessarily a unitarian Hermitean operator thus obeying energy conservation or being a “physical quantity” (but only according to the prejudice of classical quantum mechanics for any “creation from nothing” to be fundamentally excluded as “anti-scientific”).

The aforementioned generalization (to be included non-Hermitian operators) can be always equivalently represented by the “spooky” (after Einstein) influence of a certain other qubit Hilber space satisfying the definition for being entangled with the former (“entangled” as usual means that the Hilbert space of the function not to be representable as a tensor product of the Hilbert space of the argument of the function and the “disturbing” entangled Hilber space). One can immediately notice that each of all the three Hilbert spaces by itself can be exhaustively described by classical quantum mechanics so that the impossibility at issue refers only to the simultaneous consistent description of all the three ones. In brackets, one may mention that the Fourier counterpart (being the corresponding anti-Fourier mapping properly) of the sketch necessary introduction of entanglement including from the own viewpoint of classical quantum mechanics is the notorious “3 bodies problem”, which has even entered mass culture. As well as vice versa: if the 3 bodies problem was resolvable (but it is not in the standard framework of Gödel mathematics), entanglement or quantum information would not exist in reality (but they exist).

So, one can introduce two mathematical models of the quantum computer in general following its definitive non-Hermitian homeomorphism: correspondingly obeying or not energy conservation, which coincide absolutely in the particular case discussed until now, where the space, in which the qubit Hilbert space is mapped, is “local”: this means that the postulate of not exceeding the speed of light in a vacuum is valid as for it. In other words, the third “disturbing” qubit Hilbert space is zero, and the homeomorphism by itself conserves energy, and the suggested equivalence is trivial, thus not needing to be proved or discussed. However, the present section will articulate just the general case, and the equivalence at issue is not trivial (even being definitive).

Consequently, the two “sides” of the meant equivalence (or “equation” in a wide sense) are for any non-Hermitian operator to be representable by two (at least two or more, arbitrarily many) entangled Hermitian operators (after the definition of entangled Hermitian operators as

derivative from that of entangled Hilbert space). Thus, and quite obviously, one is free to choose between two ways of representing the same, where the two equivalent options are absolutely opposite to each other, but only from the viewpoint of Modernity confessing the prejudice of locality, energy conservation, etc., as a fundamental necessary condition for natural sciences, especially physics and chemistry. Now, both as well as what their equivalence should mean are to be described in more detail:

According to the newly introduced worldview, allowing for the classically prohibited "creation from nothing" by virtue of rejecting unitarity (being inherent after postulating that all physical quantities are Hermitian operators as classical quantum mechanics does), the class of all non-Hermitian operators is the general case, furthermore crucially prevailing in the universe, to which the subclass of Hermitian operators studied by classical quantum mechanics and thus by physics and chemistry is rather an exception; at that, rather insignificant and inessential, but nonetheless ideologized by humankind to be exhaustively as for the universe by itself.

Then and following the ideology of locality, all single non-Hermitian operators are to be represented as (at least) pairs of entangled Hermitian operators. Respectively, as for the universe as a whole, two options appear: (1) a part or all of them to be "exiled" in the inaccessible singularity of the scientifically mythological "Big Bang"; (2) to be ascribed to the action or interaction by "dark mass and energy". Then, both are not only consistent to each other, but furthermore mutually complementing (as follows):

The "Big Bang" is able to generate only constant acceleration once it has taken place in a certain past moment (for example, approximately about 15 billion years ago). Then, any changes in that acceleration are to be caused by the influence of "dark" mass and energy (eventually and correspondingly decreasing and increasing it since the dark mass "consumes" energy after Einstein's "$E = mc^2$" unlike the dark energy infusing energy into the universe. Of course, anybody is able to concentrate all dark mass and energy known until now in a corrected "Big Bang" that took place, for example, about 30 (rather than about 15) billion years ago. Those "new theories" should be considered as a joke for mass culture and its auditory, for which the Big Bang discourse is a convincing "scientific" narrative.

However, what is essential as for the generalized quantum computer allowing for non-Hermitian calculations is that it will be able to create or destroy matter or energy as a result of that kind of calculations, or particularly, to transform instantly a certain chemical substance into another. So, the "trigger ray" able to make that in the sci-fi reality of the already cited novel by Clarke and Kube-McDowell (also discussed in aspects relevant to the present study in another paper: Penchev 2024 October 2) can be interpreted as the considered now quantum calculation generalized to be non-Hermitian therefore suggesting a series of surprising reflections both scientific and philosophical, both mathematical and physical about what "calculation" should mean once the Cartesian prejudice has been absolutely abandoned as here, in the present study or in all others preceding it:

Since the concept of "calculation" is usually defined in a wide and rather loose way as "processing information" according to certain rules, for example following the exact and

rigorous definitions about the work of the Turing machine in the many times already quoted “P” and “NP” problem following its exhibition by CMI as the one of the seven Millennium ones, one needs preliminarily a brief and thus unavoidably cursory sketch of what the generalization from classical information (meant as after Shannon or Kolmogorov) to quantum information implies for the notion of calculation, once it has been defined as “processing information” whether classical or quantum:

Classical information inherently relevant only to finite sets and series unlike quantum information generalized to infinite ones (for example, as in: Penchev 2020 July 10) implies a derivative Gödel dichotomy about the relation of classical information (thoroughly definable or equivalent to Peano arithmetic) to quantum information (needing set theory for involving “actual infinity”). Thus, all considerations about the Gödel dichotomy discussed in detail above are directly interpretable as for the relation of classical information to quantum one to be also: “either incompleteness or contradiction”. Particularly, classical information is possible only being situated on the “shore” of the ideal and thus gapped from its (always) material carrier in turn located on the opposite “shore” of the Cartesian “abyss”. Consequently, “classical calculation” implicitly meaning to ‘process classical information’ (as the Turing machine always does) is consistently definable on the same “ideal shore” since what it processes and can only process it “there” as well. That circumstance implies in particular the absolute independence of classical information from its carrier, on the one hand, and the already considered universalism of the Turing machine (in an opposition to the “NP” outputted quantum computer, necessarily unifying hardware and software and following Steve Jobs’s slogan literally), on the other hand.

Thus, the ability of the “trigger ray” to change a chemical substance into another cannot be a calculation confessing the prejudice of Modernity for the Cartesian abyss to be “conditio sine qua non”. In fact, it cannot be a classical calculation (for example defined as the class of all calculations, which the Turing machine is able to finish for any finite time), but the identification of “classical calculation” with ‘calculation at all’, i.e. any possible calculation is wrong since that prejudice excludes the immense “dark” domain of generalized quantum calculation as long they are granted to be non-Hermitian.

As an illustration, one may reflect back the afore-suggested idea about generalized quantum calculations to the sci-fi reality of “The Trigger” so that the meant device to be interpreted to be a “generalized quantum computer” and the “trigger ray” at issue is a generalized quantum calculation accordingly being the ultimate result of the processing by the NP outputted quantum computer in general; this means: including and thus studying the general case for its definitive homeomorphism to be non-Hermitian, or speaking loosely, the “trigger ray” to be the ray nonlocally “radiated” by a “generalized caser” (“caser” is a newly introduced neologism abbreviating “Calculating lASER)” derivatively defined to be non-Hermitian as well.

The same illustration can also visualize how the GOOGLE and XPRIZE award is narrow-mindedly articulated especially as for its implicit conditions. So, practical implementations of generalized quantum computers would be, rather figuratively speaking, to calculate a “trigger ray” able to violate mass conservation in chemistry by directly changing the

quantum information structure of the experimented quantum substance transforming it into another with a certain mass, different from the initial one in general. So, that quantum calculation, which is that hypothetical "trigger ray", can be interpreted after "quantum theology as a rigorous science" as "God's calculation", by which He could create the universe from nothing for a finite time, e.g. for "six days" as the Bible states.

The authors of the sci-fi novel did not even mention the option of such an interpretation. Nonetheless, it is quite natural in the context of the present study. One can further question what the relation of the Gödel insoluble statements and those just introduced "generalized quantum calculations" should be. The formal and absolutely abstract options are: (1) the latter is a true subset (subclass) of the former; (2) the former is a true subset (subclass) of the latter; (3) the intersection of both is the empty set (class); (4) the intersection of both is some nonempty set (class) though yet unknown; (5) the two sets (classes) coincide to each other. The volume of the paper does not allow for them to be discussed in detail, only their link to the Yang-Mills existence and mass gap problem will be cursorily outlined in the final and conclusive section.

What can be stated regardless of which of the just enumerated options would be chosen is that the generalized (whether creating or destroying) quantum calculation suggests one much more powerful, "divine" (more or less figuratively said, meaning also the viewpoint of "quantum theology as a rigorous science": Penchev 2024 October 2) implementation of the quantum computer obviously breaking the framework of Modernity, Cartesianism, and the corresponding episteme, leading to an open future abundant of exceptional options for both creation and destruction.

The essential feature of the nonlocal "trigger ray" in the context of the present section is what is here clearly articulated: the option to be interpreted as that generalization of the "NP" outputted quantum computer, after which the Cartesian abyss between the inherently "ideal" calculation and those "material" facts to which it refers is erased, in fact, rather canceled since it have not ever existed in reality, but only in the corresponding human, especially modern representation. However, that option is not at all mentioned in the novel, maybe even not suspected by its authors. Nonetheless, they in much more detail have described many other implementations of the "trigger ray", which are easily attributable to the generalized "NP" quantum computer, once the former and the latter can be identified and demonstrated as here.

So, one may only enumerate those fantastic implementations of the quantum computer though thought widely enough as far as the GOOGLE and XPRIZE award should mean all its uses including those being not only surprising to the founders of the prize, but even eventually rejectable by them as nonsense and anti-scientific, "sci-fi" at best. Furthermore, they have already partly discussed above as well as in another paper (Penchev 2024 October 2):

The "trigger effect" is revealed (of course only in the sci-fi and thus counterfactual reality described during the pages of the novel) after experiments for some gravitational or anti-gravitational laser. So, the materially (respectively, energetically) observable effects after working or computing by the generalized "caser" at issue would be indistinguishable from gravitational effects, analogical to those caused by "dark matter" and "dark energy".

Consequently, if one has interpreted after “quantum theology” the universe to be an immense and single (thus fundamentally nonlocal) quantum computer, and the experimentally corroborated “dark matter” and “dark energy” as real and even crucially prevailing phenomena, they can be immediately seen as the byproduct of its (or “God’s”) calculation. A quite “ridiculous” cosmogonic worldview appears: the universe has been permanently created by that (“God’s”) quantum computer being generalized as above so that its (“God’s”) calculation generates huge material results such as the universe itself, furthermore, humankind is a particular (for example, that processed in the “Sixth Day of the Creation” after the Bible) result of those omnipresent and omnitemporal calculations along with the universe itself.

However, the proper topic of the novel is an unexpected by the experimenters “side effect”: namely, to change directly chemical substances, thus implicitly violating the law of mass conservation of chemistry (though inarticulate by the authors), by means of a leaplike change of their informational structure. A revolutionary new theory, destroying or generalizing the Standard model after unifying physics and chemistry by an informational field underlying both, is elaborated by one of the personages secluded himself in Princeton in order to create a fundamental new theory for all those shocking experimental results. As for the present subject, the unity in question of physics and chemistry is relevantly interpretable by the quantum computer processing since its (“God’s”) work is just the corresponding transformations of the conjectured “informational field” (and above specified to be a homeomorphism, but eventually further generalizable as any morphism in the sense of category theory, of the qubit Hilbert space in any other topological vector space).

Another interpretation of the “trigger ray” also not mentioned by the authors is teleportation (which as a real phenomenon studied by science cannot be other than *quantum* teleportation) or quantum communication in the framework of the already intensively elaborated experimental area of quantum information. In fact, it is able to accomplish the instant quantum teleportation (meaning the transfer of nonzero mass or energy) or communication (meaning the case of the “pure” quantum information featured by zero energy and thus mass) since they can be also interpreted to be that “non-Hermitian quantum calculation” only limited to the particular case for the target space, to be another (and entangled) qubit Hilbert space. So, the “NP” outputted quantum calculation, once it has been generalized as above, includes all possible quantum-information physical interactions (and thus, also local ones which are the only subject of classical physics): in other words, any physical interaction can be interpreted as the calculation of some generalized quantum computer, which can be granted to be the universe as a whole as well as “God’s one”.

X INSTEAD OF CONCLUSION: EVEN STILL MORE SCI-FI ABOUT THE MEANING OF THE “YANG-MILLS EXISTENCE AND MASS GAP PROBLEM” LINKED TO THE UTILIZATION OF QUANTUM COMPUTERS

The previous section justifies the worldview, the slogan of which can be “All is calculation” if one means generalized quantum calculations thus including non-Hermitian ones. The present, conclusive section is an “open end” after involving one more CMI “Millennium

Problem", namely: "the Yang-Mills existence and mass gap problem"[17] . Unfortunately, it is formulated in a too sophisticated way (in order to be both rigorously enough formulated and simultaneously within the Standard model, the framework of which in turn implies the Cartesian episteme of Modernity) so that a looser translation of it is granted here as more relevant to the "open end discourse" about the implementation of quantum calculations:

The Yang - Mills field is fundamental for the Standard model since it unifies all three interactions rather than only weak and electromagnetic ones. This means that strong interaction is considered to be another, eventually, dual or complementary copy of the initial, original Yang-Mills field externally obeying the conditions for the Higgs mechanism to be identical for both and respectively the Higgs boson to be one single for both.

Alternatively, if one admits "two Higgs bosons" (regardless of one or two "Higgs mechanisms"), the mismatch of the two relevant descriptions (the one after the electroweak interaction and the other after the strong interaction) is able to justify both "dark mass and dark energy" within that generalized Standard model after newly introduced two different Yang-Mills fields arbitrarily deferring from each other in general. Then, "dark mass" might correspond to "negative Yang-Mills field" (in "absolute value", i.e. a rather imaginary Yang-Mills field), and "dark energy", to "positive one" (also, in "absolute value" and thus rather real Yang-Mills field).

In the original CMI formulation of the Yang-Mills existence and mass gap problem the above conjecture seems to be quite unobvious, therefore needing an extended in detail proof thus absolutely inappropriate here (designed to be an "open end"). However, if one refers to a "Lagrangian reformulation" of the Standard model after general relativity in turn generalized under the condition for including "quantum reference frames" and the "principle of quantum relativity", being more general than that of general relativity (that quantum generalization of general relativity is introduced and discussed in detail in other papers: Penchev 2023 November 2; 2021 June 8; etc.), that viewpoint implies the suggestion at issue as an almost immediate corollary; and here is how:

If one is to describe an accelerated reference frame in a Hamiltonian way, four independent variables for their three "Lagrangian" counterparts would be necessary as follows: one for position, one for velocity, and two for acceleration since "Hamiltonian" acceleration would represent the infinitesimal change of velocity as another velocity thus implying one more position in general and this can be briefly notated by the following formula: $L(x, v, a) = H(X, V, X_1, V_1)$,[18] which as a whole means to describe the "Lagrangian" counterpart of the Standard model being implicitly interpreted in a "Hamiltonian" way.

---

[17] Cusak 2016; Dynin 2014; Kholodenko 2011; etc.

[18] By the way, one can notice the following "inexplicable" coincidence, of course, in order to explain it further. The number of the Lagrange "free variables" is *three*, that of the "Hamilton" ones is *four*. If a dimension would be associated with each free variable in both cases separately, the corresponding number of dimensions are those of Euclidean space (three) and the unit 3-sphere (four) since it is a geometrical body in 4-dimensional Euclidean space, So, one can admit some unknown logical link between Poincaré's conjecture and the mutual equivalence of the two representations: Lagrangian and Hamiltonian. Indeed, the former implies topological corollaries since it identifies smooth and discrete manifolds,

For example, the following illustration about the “Lagragian sense” of the 17 “ultimately elementary particles” of the Standard model (i.e., including the Higgs boson) is possible. If one would like to describe a privileged reference frame furthermore arbitrarily accelerated as a “material point” thus featured by a certain nonzero mass in a Hamiltonian way, where the quantities of “position”, “velocity”, “acceleration”, and “mass” are independent of each other, which in turn implies for “time” not do be definable (at least universally), one needs just 17 values: accordingly, four coordinate components for both position and velocity, and they doubled once more as still eight ones for acceleration, and the last, 17th one would be for the scalar quantity of mass. One can rather easily demonstrate that those 17 “ultimately fundamental elementary particles” established by the Standard model implies a privileged (thus, “absolute”) accelerated reference frame, which can be attached whether to the “Ether” or to the “Big Bang” according to the tradition. However, the proof of the converse statement (namely that a certain privileged accelerated reference frame would imply the class of Hamilton representation, to which the Standard model belongs) is much more sophisticated, even problematic in dependence of the interpretation of the quantity of “charge”, respectively, that of the CPT theorem, or the relation of “electromagnetic charge” to the other ones (in the Standard model). That subject is partly elucidated in other papers (e.g., Penchev 2023 November 2, relatively recently), but partly and much more, it needs future ones. Whatever it be, the present consideration is essentially restricted only to the inherent link of the Yang-Mills field to the generalized quantum computation by the mediation of the conjectured “quantum-information field” so that it can be interpreted as both gravitational field and that pair of Yang-Mills fields implied by the Standard model as this is above explained.

The Yang-Mills existence and mass gap problem should be directly related to quantum computer processing (even to its definition itself): and here is how. The quantum computer is defined above as any homeomorphism of the qubit Hilbert space to any metric space relevant to the resolved problem, regardless of being Hermitian (and thus within classical quantum mechanics) or not. The “Millennium Problem” at issue means a particular case of the so defined quantum calculation in general, after which the target space is pseudo-Riemannian space as a function of Minkowski space. In other words, it can be interpreted as formulating the problem of quantum gravitation in terms of the quantum computer.

Furthermore (or rather before that), the Yang-Mills existence and mass gap problem is to be reflected philosophically as the mathematical formulation of the proper physical counterpart of the fundamental Cartesian postulate of Modernity after establishing the corresponding gap between “mind” and “ideas”, to which the physical quantities of mass and energy are irrelevant and eventually can be granted to be zero, on the one hand or “on the one shore of the Cartesian abyss”, and any material “bodies” or “things” in definition, possessing some nonzero finite energy or mass (eventually mass at rest as a particular case), on the other hand, or “on the other shore”. So, the nonzero finite mass gap is implied directly by the Cartesian dogma (or “axioma”) of the modern episteme, in which (in particular) physics is a natural and experimental science opposed to mathematics in turn only able to supply models for the former.

However, the problem though originating from quantum physics and its Standard model is formulated thoroughly mathematically, and accordingly, its solution is to be a mathematical proof (rather than a series of corroborating or rejecting physical experiments). So, the newly introduced tool of Hilbert mathematics is quite relevant to represent the problem since it in both "a wide sense and a narrow sense" means it correspondingly physically and mathematically, but *simultaneously*: thus, that instrument is inherently designated for translating between the two languages: that of physics and that of mathematics. Furthermore, the above general definition of the quantum computer can be also represented in terms of Hilbert mathematics:

It means any homeomorphism of the qubit Hilbert space (and thus, of Hilbert mathematics in a wide sense) in any target space granted to be vector and topological (thus, inherently mathematical since it can be inferred rigorously and mathematically from the Hilbert arithmetic in a narrow sense). Consequently, the general model of the quantum computer in Hilbert arithmetic and Hilbert mathematics would mean the transformations between the two worlds, mathematical and physical, granted now ontomathematically to be the same or a whole, however stigmatized by Cartesianism to be even anti-scientific rather than only impossible. On the contrary, Hilbert mathematics not only admits them, but offers to be investigated and studied as an absolutely newly introduced immense horizon of scientific research can be provisionally called "postmodern science", but an absolutely exact and rigorous sense (unlike the usual too loose use of the term until now):

So, "postmodern science as rigorous" (where the allusion to Husserl's "Philosophie als strenge Wissenschaft" is intentional) would mean all that science inadmissible in the Cartesian episteme of Modernity being suitable only within the "abyss" between its two "shores" and committed to the disposal of religion. Speaking rigorously, it can be determined by involving nonlocality (together with locality by classical science) and thus and particularly, its relation to locality wrongly granted until now to exhaust the world by itself. Consequently, the practical implementation of quantum computers meant by the GOOGLE and XPRIZE award is relevant to that newly introduced field of postmodern science, turning out to be inherently ontomathematical and therefore necessarily mathematical.

Then, the "Yang-Mills existence and mass gap problem" would question about all the fields of postmodern science: whether its availability might be deduced in a proper mathematical and thus rigorous method. In fact, that problem is insoluble in the framework of the standard mathematics since it (formulated as a theorem to be proved) is a Gödel insoluble statement (as this is sketched above in more detail). It can be really resolved only after involving Hilbert mathematics and then the alternative to be confirmed is to be suggested: meaning both Yang-Mills existence and zero mass gap solutions (as this is discussed in another paper as well: Penchev 2024 October 2).

Simultaneously, being a Gödel insoluble statement in the standard, "Gödel" mathematics, it supplies a "fast track" for the quantum computer "Achilles" to run over the Turing machine "Tortoise" if one would need any practically implementable, consequently finite, solutions of the Yang-Mills existence and mass gap problem, by the way, both redundant and inadmissible (being

“anti-scientific”) as for “modern science” opposed to “postmodern science” (already rigorously defined).

What would those uses of quantum computers be for example? All problems related to both “creation from nothing” or “quantum-information bomb” (being able to destroy energy itself since it would not obey energy conservation any more). So, the practical implementation of the quantum computer cherished by the GOOGLE and XPRIZE award would weaponize humankind by an instrument exceptionally more powerful than any other one until now including the Turing machine calculation or both thermonuclear synthesis and H-bomb. Humankind’s power would be then comparable with that of “God Himself” or with that of the “devil”, unfortunately, for the newly acquired capability to create or destroy the *being* itself. What would humankind’s ultimate choice, to create or to destroy, one could only guess …

One more conclusive notice is related to the kind of the “NP” outputted quantum computer once it has been built to resolve just the Yang-Mills existence and mass gap problem. What should the relevant quantum variable and target space be? An exhaustive answer would need another study absolutely standalone. However, the present “open end” discourse allows for an insight, a statement without any proof, justification, reasoning. The target space seems to be pseudo-Riemannian space, the relevant variable should be the force (interaction) of gravitation as well as its eventual counterpart of entanglement (if they would be proved to be Fourier counterparts to each other). Then, the “trigger” in the novel of the same title, as well as the “trigger ray” produced by it would be that specialized “NP” quantum computer constructed to resolve just the Yang-Mills existence and mass gap problem if one follows their interpretations suggested in the present study.

REFERENCES:

Andreae, T. (2001) "On the traveling salesman problem restricted to inputs satisfying a relaxed triangle inequality." *Networks* **38** (2): 59-67.

Anily, S., J. **Bramel** (1999) "Approximation algorithms for the capacitated traveling salesman problem with pickups and deliveries," *Naval Research Logistics* (NRL) **46** (6): 654-670**.**

Anily, S., G. **Mosheiov** (1994) "The traveling salesman problem with delivery and backhauls," *Operations Research Letters* **16** (1): 11-18.

Archett, C., L. **Bertazzi**, M. **Grazia** (2003) "Speranza Reoptimizing the traveling salesman problem," *Networks* **42** (3); 154-159.

Armstrong, D. E. (2003) "Studying the Complexity of Global Verification for NP-Hard Discrete Optimization Problems," *Journal of Global Optimization* (1): 83-96.

Arvind, A. (2001) "Quantum entanglement and quantum computational algorithms," *Pramana* **56** (2): 357-365.

Ascheuer, N., M. **Fischetti**, M. **Grötschel** (2000) "A polyhedral study of the asymmetric traveling salesman problem with time windows," *Networks* **36** (2): 69-79.

Ashour, S., J. F. **Vega**, R. G. **Parker** (1972) "A heuristic algorithm for traveling salesman problems," *Transportation Research* **6** (2): 187-195.

Asveld, P. R. J. (2013) "Permuting operations on strings and the distribution of their prime numbers," *Discrete Applied Mathematics* **161** (13-14): 1868-1881.

Atici, A., R. A. S**ervedio** (2005) "Improved Bounds on Quantum Learning Algorithms," *Quantum Information Processing* **4** (5): 355-386.

Atici, A., R. A. S**ervedio** (2007) "Quantum Algorithms for Learning and Testing Juntas," *Quantum Information Processing* **6** (5): 323-348.

Azuma, H. (2002) "Decoherence in Grover's quantum algorithm: Perturbative approach," *Physical Review A* **65** (4): 042311(22).

Bacsardi, L. (2005) "Using quantum computing algorithms in future satellite communication," *Acta Astronautica* **57** (2-8): 224-229.

Balas, E. (1989) "The prize collecting traveling salesman problem," *Networks* **19** (6): 621-636.

Balas, E. (1995) "The prize collecting traveling salesman problem: II. Polyhedral results," N*etworks* **25** (4): 199-216.

Baldacci, R., E. **Hadjiconstantinou**, A. **Mingozzi** (2003) "An exact algorithm for the Traveling Salesman Problem with Deliveries and Collections," *Networks* **42** (1): 26-41.

Baritompa, W. P., D. W. **Bulger**, G. R. **Wood** (2005) "Grover's Quantum Algorithm Applied to Global Optimization," *SIAM Journal on Optimization* **15** (4): 1170-1184.

Batle, J., C. H. R. **Ooi**, A. **Farouk**, M. S. **Alkhambashi**, S.**Abdalla** (2016) "Global versus local quantum correlations in the Grover search algorithm," *Quantum Information Processing* **15** (2): 833-849.

Beame, P., S. **Cook**, J. **Edmonds**, R. **Impagliazzo**, T. **Pitassi** (1998) "The Relative Complexity of NP Search Problems," *Journal of Computer and System Sciences* **57** (1): 3-19.

Bentz, H. J. (1982) "Discrepancies in the distribution of prime numbers," *Journal of Number Theory* **15** (2): 252-274.

Berman, G. P., G. D. **Doolen**, G. V. **López**, V. I. **Tsifrinovich** (2000) "Nonresonant effects in the implementation of the quantum Shor algorithm," *Physical Review A* **61** (4): 042307(7).

Berman, G. P, G. D. **Doolen**, V. I. **Tsifrinovich** (2000) **"**Influence of Superpositional Wave Function Oscillations on Shor's Quantum Algorithm," *Physical Review Letters* **84** (7): 1615-1618.

Berman, G. P., D. I. **Kamenev**, V. I. **Tsifrinovich** (2005) "Collective decoherence of the superpositional entangled states in the quantum Shor algorithm," *Physical Review A* **71** (3): 032346(5).

Berman, O., D. S. **Levi** (1986) "Minisum location of a traveling salesman," *Networks* **16** (3): 239-254.

Berry, D. W., G. **Ahokas**, R. **Cleve**, B. C. **Sanders** (2007) Efficient Quantum Algorithms for Simulating Sparse Hamiltonians," *Communications in Mathematical Physics* **270** (2): 359-371.

Bérubé, J.-F., M. **Gendreau**, J.-Y. **Potvin** (2009) "A branch-and-cut algorithm for the undirected prize collecting traveling salesman problem," *Networks* **54** (1): 56-67.

Best, S. (1991) "Chaos and entropy: Metaphors in postmodern science and social theory," *Science as Culture* **2** (2): 188-226.

Bhat, K. V. S. (1982) "The optimum assignments and a new heuristic approach for the traveling salesman problem," *Information Sciences* **27** (2): 121-132.

Bianco, L., A. **Mingozzi**, S. **Ricciardelli** (1993) "The traveling salesman problem with cumulative cost," *Networks* **23** (2): 81-91.

Biham, E., O. **Biham**, D. **Biron**, M. **Grassl**, D. A. **Lidar** (1999) "Grover's quantum search algorithm for an arbitrary initial amplitude distribution," *Physical Review A* **60** (4): 2742-2745.

Biham, E., D. **Kenigsberg** (2002) "Grover's quantum search algorithm for an arbitrary initial mixed state," *Physical Review A* **66** (6): 062301(4).

Biham, O., D. **Shapira**, Y. **Shimoni** (2003) "Analysis of Grover's quantum search algorithm as a dynamical system," *Physical Review A* **68** (2): 022326(8).

Blokh, D., G. **Gutin** (1995) "Maximizing traveling salesman problem for special matrices," *Discrete Applied Mathematics* **56** (1): 83-86.

Bocharov, A., M. **Roetteler**, K. M. **Svore** (2017) "Factoring with qutrits: Shor's algorithm on ternary and metaplectic quantum architectures," *Physical Review A* **96** (1): 012306(17).

Book, R. V. (1994) "Relativizations of the P = ? NP and Other Problems: Developments in Structural Complexity Theory," *SIAM Review* **36** (2): 157-175.

Bowden, C. G. **Chen**, Z. **Diao**, A. **Klappenecker** (2002) "The universality of the quantum Fourier transform in forming the basis of quantum computing algorithms," *Journal of Mathematical Analysis and Applications* **274** (1): 69-80.

Boykin, P. O., T. **Mor**, V. **Roychowdhury**, F. **Vatan** (2010) "Algorithms on ensemble quantum computers," *Natural Computin*g **9** (2): 329-345.

Brickman, K.-A., P. C. **Haljan**, P. J. **Lee**, M. **Acton**, L. **Deslauriers**, C. **Monroe** (2005) "Implementation of Grover's quantum search algorithm in a scalable system," *Physical Review A* **72** (5): 050306.

Broks, P. (2003) "The authority of science and the postmodern reformation," *Interdisciplinary Science Reviews* **28** (2): 76-82.

Brooks, A. T. (1999) "Postmodern information science and its "journal"," *Journal of the American Society for Information Science and Technology* **50** (11): 1030-1031.

Bruffee, K. A. (1992) "Science in a Postmodern World," *Change The Magazine of Higher Learning* **24** (5): 18-25.

Buhrman, H., R. de **Wolf** (2003) "Quantum zero-error algorithms cannot be composed," *Information Processing Letters* **87** (2): 79-84.

Buhrman, H., I. **Newman**, H. **Rohrig**, R. de **Wolf** (2007) "Robust Polynomials and Quantum Algorithms," *Mathematical Systems Theory* **40** (4): 379-395.

Bulger, D., W. P. **Baritompa**, G. R. **Wood** (2003) "Implementing Pure Adaptive Search with Grover's Quantum Algorithm," *Journal of Optimization Theory and Applications* **116** (3): 517-529.

Burke, L. (1996) "Conscientious" neural nets for tour construction in the traveling salesman problem: the vigilant net," *Computers & Operations Research* **23** (2): 12-129.

Bykovskii, V. A. (2008) "On the distribution of prime denominators of the approximants for almost all real numbers," *Izvestiya Mathematics* **72** (2): 265-282.

Cacchiani, V., A. E. F. **Muritiba**, M. **Negreiros**, P. **Toth** (2011) "A multistart heuristic for the equality generalized traveling salesman problem," *Networks* **57** (3): 231-239.

Cafaro, C. S. **Mancini** (2012) "On Grover's search algorithm from a quantum information geometry viewpoint," *Physica A: Statistical Mechanics and its Applications* **391** (4): 1610-1625.

Calude, C. S., E. **Calude**, M. S. **Queen** (2013) "Inductive complexity of the P versus NP problem," *Parallel Processing Letters* **23** (1): 1350007(16).

Castagnoli, G. (2009) "Quantum Algorithms Know in Advance 50% of the Solution They Will Find in the Future," *International Journal of Theoretical Physics* **48** (12): 3383-3395.

Chandrasekaran, R. (1986) "Recognition of Gilmore-Gomory traveling salesman problem," *Discrete Applied Mathematics* **14** (3): 231-238.

Chao, I.-M. B., L. **Golden**, E. A. **Wasil** (1995) "A new heuristic for the period traveling salesman problem," *Computers & Operations Research* **22** (5): 553-565.

Chen, J.-E. (2005) "Parameterized Computation and Complexity: A New Approach Dealing with NP-Hardness," *Journal of Computer Science and Technology* **20** (1): 18-37.

Chi, D. P., J. S. **Kim**, S. **Lee** (2006) "Quantum algorithms for the hidden subgroup problem on some semi-direct product groups by reduction to Abelian cases," *Physics Letters A* **359** (2): 114-116.

Chisman, J. A. (1975) "The clustered traveling salesman problem," *Computers & Operations Research 2* (2): 115-119.

Choo, K. W. (2006) "Quantum computing, Grover's search algorithm and its applications in bioinformatics," *Cosmos* **2** (1): 71-80.

Christof, T., M. **Jünger**, G. **Reinelt** (1991) "A complete description of the traveling salesman polytope on 8 nodes," *Operations Research Letters* **10** (9): 497-500.

Chrobak, M., S. **Poljak** (1988) "On common edges in optimal solutions to traveling salesman and other optimization problems," *Discrete Applied Mathematics* **20** (2): 101-111.

Clark, K. B. (2014) "Basis for a neuronal version of Grover's quantum algorithm," *Frontiers in Molecular Neuroscience* **7** (1): 29(20).

Cleve, R., A. **Ekert**, L. **Henderson**, C. **Macchiavello**, M. **Mosca** (1998) "On quantum algorithms," *Complexity* **4** (1): 33-42.

Cook, S. (2003) "The importance of the P versus NP question," *Journal of the ACM* **50** (1): 27-29.

Cordeau, J.-F. M. **Iori**, G. **Laporte**, J. J. S. **González** (2010) "A branch-and-cut algorithm for the pickup and delivery traveling salesman problem with LIFO loading," *Networks* **55** (1): 46-59.

da **Costa**, N.C.A., F.A. **Doria**, E. **Bir** (2007) "On the metamathematics of the P vs. NP question," *Applied Mathematics and Computation* **189** (2): 1223-1240.

Côté, J.-F., C. **Archetti**, M. G. **Speranza**, M. **Gendreau**, J-Y. **Potvin** (2012) A branch-and-cut algorithm for the pickup and delivery traveling salesman problem with multiple stacks," *Network* **60** (4): 212-226.

Grigni, M., L. J. **Schulman**, M. **Vazirani**, U. **Vazirani** (2004) "Quantum Mechanical Algorithms for the Nonabelian Hidden Subgroup Problem," *Combinatorica* **24** (1): 137-154.

Cutler, M. (1980) "Efficient special case algorithms for the n-line planar traveling salesman problem," *Networks* **10** (3): 183-195.

Cusak, P. (2016) "Yang-Mills Mass Gap Clay Institute Problem Solution," *Journal of Physical Mathematics* **7** (2): 1-6.

van **Dal**, R., J. A. A. van der **Veen**, G**. Sierksm**a (1993) "Small and large TSP: Two polynomially solvable cases of the traveling salesman problem," *European Journal of Operational Research* **69** (1): 107-120.

van **Dam**, W. (2002) "Quantum Algorithms for Weighing Matrices and Quadratic Residues," *Algorithmica* **34** (4): 413-428.

Das, R., T. S. **Mahesh**, A. **Kumar** (2003) "Experimental implementation of Grover's search algorithm using efficient quantum state tomography," *Chemical Physics Letters* **369** (1-2): 8-15.

Debnath, L., K. **Basu** (2015) "Some Analytical and Computational Aspects of Prime Numbers, Prime Number Theorems and Distribution of Primes with Applications," *International Journal of Applied and Computational Mathematics* **1** (1): 3-32.

Derman, C., M. **Klein** (1966) "Surveillance of multi-component systems: A stochastic traveling salesman's problem," *Naval Research Logistics* (NRL) **13** (2): 103-111.

Diamond, H. G. (1982) "Elementary methods in the study of the distribution of prime numbers," *Bulletin of the American Mathematical Society* **7** (3): 553-590.

DiCarlo, L. et al (2009) "Demonstration of two-qubit algorithms with a superconducting quantum processor," *Nature* **460** (7252): 240-244.

Discenza, J. H. (1981) "A more compact formulation of the symmetric multiple traveling salesman problem with fixed charges," *Networks* **11** (1): 73-75.

Dodd, J. L., T. C. **Ralph**, G. **Timothy**, G. J. **Milburn** (2003) "Experimental requirements for Grover's algorithm in optical quantum computation," *Physical Review A* **68** (4): 042328(8).

Doria, F. A. (2007) "Fast-Growing Functions and the P vs. NP Question," *Logic Journal of IGPL* **15** (5-6): 445-455.

Dörn, S. (2009) "Quantum Algorithms for Matching Problems," *Mathematical Systems Theory* **45** (3): 61-628.

Dos, H.-U., J. **Terno**, G. **Scheithauer** (1989) "On the stochastic complexity of the asymmetric traveling salesman problem," *European Journal of Operational Research* **43** (3): 313-316.

Dror, M. (1990) "Cost allocation: the traveling salesman, binpacking, and the knapsack," *Applied Mathematics and Computation* **35** (2): 191-207.

Du, J.-Z., S.-J. **Qin,** Q.-Y. **Wen**, F.-C. **Zhu** (2007) "Threshold quantum cryptograph based on Grover's algorithm," *Physics Letters A* **363** (5-6): 361-368.

Dynin, A. (2014) "On the Yang-Mills mass gap problem," *Russian Journal of Mathematical Physics* **21** (3): 326-328.

Einstein, A. (1926) Letter to Max Born, 16 December 1926, in: *Albert Einstein Max Born Briefwechsel 1916 – 1955* (kommentiert von Max Born). München: Nymphenburger Verlagshandlung, 1969: 129-130.

Eliahou, S., B. **Massė**, D. **Schneider** (2013) "On the mantissa distribution of powers of natural and prime numbers," *Acta Mathematica Academiae Scientiarum Hungaricae* **139** (1-2): 49-63.

Ertürk, K. A. (1999) "Marx, postmodernity, and transformation of the individual," *Review of Radical Political Economics* **31** (2): 27-45.

Ettinger, M., P. **Høyer** (2000) "On Quantum Algorithms for Noncommutative Hidden Subgroups," *Advances in Applied Mathematics* **25** (3): 239-251.

Euler, R., H. **Le Verge** (1995) "Complete linear descriptions of small asymmetric traveling salesman polytopes," *Discrete Applied Mathematic*s **62** (1-3): 193-208.

Feiring, B. R. (1987) "Some properties of the solution space of the N-city traveling-salesman problem," *Applied Mathematics and Computation* **23** (4): 291-340.

Fiechter, C.-N. (1994) "A parallel tabu search algorithm for large traveling salesman problems," *Discrete Applied Mathematics* **51** (3): 243-267.

de **Figueiredo**, C. M. N (2012) "The P versus NP–complete dichotomy of some challenging problems in graph theory," *Discrete Applied Mathematics* **160** (18): 2681-2693.

Firat, A. F., A. **Venkatesh** (1993) "Postmodernity: The age of marketing," International *Journal of Research in Marketing* **10** (3): 227-249.

Fischetti, M. (1995) "Clique tree inequalities define facets of the asymmetric traveling salesman polytope," *Discrete Applied Mathematics* **56** (1): 9-18.

Fischett, M., J. J. S. **González**, P. **Toth** (1995) "The symmetric generalized traveling salesman polytope," *Networks* **26** (2): 113-123.

Fisher, W. P. (2003) "Mathematics, Measurement, Metaphor and Metaphysics I: Implications for Method in Postmodern Science," *Theory & Psychology* **13** (6): 753-790.

Fomenko, O. M. (1982) "Distribution of numbers with a prescribed number of distinct prime divisors," *Journal of Mathematical Sciences* **18** (6): 970-975.

Forman, P. (2007) "The Primacy of Science in Modernity, of Technology in Postmodernity, and of Ideology in the History of Technology," *History and Technology* **23** (1): 1-152.

Forman, P. (2010) "(Re)cognizing Postmodernity: Helps for Historians – of Science Especially," *Berichte zur Wissenschaftsgeschichte* **33** (2): 157-175.

Fortnow, L (2009) "The status of the P versus NP problem," *Communications of the ACM* **52** (9): 78-87.

Frieze, A. M., G. **Galbiati**, F. **Maffioli** (1982) "On the worst-case performance of some algorithms for the asymmetric traveling salesman problem," *Networks* **12** (1): 23-39.

Fu, B., H.-Z. **Li** (1994) "Closeness of NP-Hard Sets to Other Complexity Classes," *SIAM Journal on Computing* **23** (2): 255-260.

Fu, X.-Q. W.-S **Bao**, C. **Zhou** (2010) "Speeding up implementation for Shor's factorization quantum algorithm," *Chinese Science Bulletin* **55** (32): 3648-3653.

Gao, J., J. M. S**teele** (1994) "General Space Filling Curve Heuristics and Limit Theory for the Traveling Salesman Problem," *Journal of Complexity* **10** (2): 230-245.

Garcia-Diaz, A. (1985) "A heuristic circulation-network approach to solve the multi-traveling salesman problem," *Networks* **15** (4): 455-467.

Gendre, M., A. **Hertz**, G. **Laporte** (1996) "The Traveling Salesman Problem with Backhauls," *Computers & Operations Research* **23** (5): 501-508.

Gendreau, M., G. **Laporte**, F. **Semet** (1998) "A branch-and-cut algorithm for the undirected selective traveling salesman problem," *Networks* **32** (4): 263-273.

Gerjuoy, E. (2005) "Shor's factoring algorithm and modern cryptography. An illustration of the capabilities inherent in quantum computers," *American Journal of Physics* **73** (6): 521-540.

Gep, A., P. **Stocks** (2009) "A review of procedures to evolve quantum algorithms," *Genetic Programming and Evolvable Machines* **10** (2): 181-228.

Cheng, R., M. **Gen** (1994) "Crossover on intensive search and traveling salesman problem," C*omputers & Industrial Engineering* **27** (1-4): 485-488.

Giere, R. N. (1993) "Science and Technology Studies: Prospects for an Enlightened Postmodern Synthesis," *Science Technology & Human Values* **18** (1): 102-112.

Ginev, D. (2005) "Against the Politics of Postmodern Philosophy of Science," *International Studies in the Philosophy of Science* **19** (2): 191-208.

Glover, F. (1996) "Ejection chains, reference structures and alternating path methods for traveling salesman problems," *Discrete Applied Mathematics* **65** (1-3): 223-253.

Goddyn, L. A. (1990) "Quantizers and the worst-case Euclidean traveling salesman problem," *Journal of Combinatorial Theory*, Series B **50** (1): 65-81.

Goldreich, O. (2010) *P, NP, and NP-Completeness: The Basics of Computational Complexity*. Cambridge: University Press.

Gorin, E. A. (2006) "Asymptotic law for the distribution of prime numbers in the context of free Abelian semigroups," *Russian Journal of Mathematical Physics* **13** (1): 31-54.

Gouveia, L., S. **Voß** (1995) "A classification of formulations for the (time-dependent) traveling salesman problem," *European Journal of Operational Research* **83** (1): 69-82.

Gouveia, L., P. **Pesneau** (2006) "On extended formulations for the precedence constrained asymmetric traveling salesman problem," *Network*s **48** (2): 77-89.

Gregorič, M., N. S. M. **Borštnik** (2009) "Quantum Gates and Quantum Algorithms with Clifford Algebra Technique," *International Journal of Theoretical Physics* **48** (2): 507-515

Grout, V. M., P. W. **Sander**s, C.T. **Stockel** (1989) "Reduction techniques providing initial groupings for Euclidean traveling salesman patching algorithms," *Applied Mathematical Modelling* **13** (2): 110-114.

Grover, L. K. (2001) "From Schrödinger's equation to the quantum search algorithm," *Pramana* **56** (2-3): 333-348 (*American Journal of Physics* **69** (7): 769-777).

Grover, L. K. (2002) "Trade-offs in the quantum search algorithm," *Physical Review A* **66** (5): 052314(5).

Grover, L. K. (2005) "Quantum search algorithm can be improved," *International Journal of Quantum Information* **3** (1): 23-30.

Gupta, J. N. D. (1978) "A search algorithm for the traveling salesman problem," *Computers & Operations Research* **5** (4): 243-250.

de **Haan**, R., S. **Szeider** (2017) "Parameterized complexity classes beyond para-NP," *Journal of Computer and System Sciences* **87** (1): 16-57.

Hagar, A. (2007) "Quantum Algorithms: Philosophical Lessons," *Minds and Machines* **17** (2): 233-247.

Han, C.-S., S. K. **Lee,** M. **England** (2010) "Transition to postmodern science—related scientometric data," *Scientometrics* **84** (2): 391-401.

Hein, B., G. **Tanner** (2010) "Quantum search algorithms on a regular lattice," *Physical Review A* **82** (1): 12326(9).

Hemmerling, A. (2001) "On P Versus NP for Parameter-Free Programs Over Algebraic Structures," *Mathematical Logic Quarterly* **47** (1): 67-92.

Hernández-Pérez, H., J.-J. **Salazar-González** (2007) "The one-commodity pickup-and-delivery traveling salesman problem: Inequalities and algorithms," *Networks* **50** (4): 258-272.

Hill, A. V. (1982) "An experimental comparison of human schedulers and heuristic algorithms for the traveling salesman problem," *Journal of Operations Management* **2** (4): 215-223.

Holdom, B. (2009) "Scale-invariant correlations and the distribution of prime numbers," *Journal of Physics A Mathematical and Theoretical physics* **42** (34): 345102(10).

Høyer, P. (2005) "Quantum algorithms: When errors are intolerable," *Nature Physics* **1** (3): 141-142.

Hudson, W. (1988) "Postmodernity and criticism," *Poetics* **17** (1-2): 185—205

Hunziker, M., D. A. **Meyer** (2002) "Quantum Algorithms for Highly Structured Search Problems," *Quantum Information Processing* **1** (3): 145-154.

Iovane, G. (2008) "The distribution of prime numbers: The solution comes from dynamical processes and genetic algorithms," *Chaos, Solitons & Fractals* **3** (1): 23-42.

Jaillet, P., L. **Xin** (2011) "Online traveling salesman problems with service flexibility," *Networks* **58** (2): 137-146.

Jeromin, B., F. **Körner** (1989) "Triangle inequality and symmetry in connection with the assignment and the traveling salesman problem," *European Journal of Operational Researc**h*** **38** (1): 70-75.

Jeromin, B., F. **Körner** (1990) "A note on dual solutions of the assignment problem in connection with the traveling salesman problem," *European Journal of Operational Research 44* (3): 410-413.

Jongens, K., T. **Volgenant** (1985) "The symmetric clustered traveling salesman problem," *European Journal of Operational Research* **19** (1): 6-75.

Jukna, S. (2005) "On the P versus NP intersected with co-NP question in communication complexity," *Information Processing Letters* **96** (6): 202-206.

Jukna, J., A. **Razborov**, P. **Savicky**, I. **Wegener** (1999) "On P versus NP ∩ co-NP for decision trees and read-once branching programs," *Computational Complexity* **8** (4): 357-370.

Kacewicz, B. (2004) "Randomized and quantum algorithms yield a speed-up for initial-value problems," *Journal of Complexity* **20** (6): 821-834.

Kalantar, B., V. **Hill**, S. R. **Arora** (1985) "An algorithm for the traveling salesman problem with pickup and delivery customers," *European Journal of Operational Research* **22** (3): 377-386.

Kanou, N. (1999) "Current-mode chaotic neuron circuit for the traveling salesman problem," *Electronics and Communications in Japan* (Part III: Fundamental Electronic Science) **82** (9): 52-62.

Karatsuba, A. A. (1990) "The distribution of prime numbers," *Russian Mathematical Surveys* **45** (5): 99-171.

Karakostas, G., R. J. **Lipton,** A. **Viglas** (2003) "On the complexity of intersecting finite state automata and NL versus NP," *Theoretical Computer Science* **302** (1-3): 257-274.

Katayama, K., H. **Narihisa** (2001) "An efficient hybrid genetic algorithm for the traveling salesman problem," *Electronics and Communications in Japan* (Part III: Fundamental Electronic Science) **84** (2): 76-83.

Kholodenko, A. L. (2011) "Gravity-assisted solution of the mass gap problem for pure Yang–Mills fields," *International Journal of Geometric Methods in Modern Physics* **8** (6): 1355-1418.

Kindervater, G., J. K. **Lenstra**, M. **Savelsbergh** (1993) "Sequential and parallel local search for the time-constrained traveling salesman problem," *Discrete Applied Mathematics* **42** (2-3): 211-225.

Knox, J. (1994) "Tabu search performance on the symmetric traveling salesman problem," *Computers & Operations Research* **21** (8): 867-887.

Ko, K.-I; U. **Schöning** (1985) "On Circuit-Size Complexity and the Low Hierarchy in NP," *SIAM Journal on Computing* **14** (1): 41-51.

Kochen, S., E. **Specker** (1968) The problem of hidden variables in quantum mechanics. *Journal of Mathematics and Mechanics* **17** (1): 59-87.

Koiran, P., J. **Landes**, N. **Portier**, P. **Yao** (2010) "Adversary lower bounds for nonadaptive quantum algorithms," *Journal of Computer and System Sciences* **76** (5) 347-355.

Korner, F. (1986) "On the relationship of approximation algorithms for the minimum and the maximum traveling salesman problem," *European Journal of Operational Research* **26** (2): 262-265.

Kreinovich, V., L. **Longpré** (2004) "Fast quantum algorithms for handling probabilistic and interval uncertainty," *Mathematical Logic Quarterly* **50** (4-5): 405-416.

Kubota, T., M. **Yoshida** (2001) "A note on the congruent distribution of the number of prime factors of natural numbers," *Nagoya Mathematical Journal* **163** (1): 1-11.

Kumar, K. S, G. S. **Paraoanu** (2011) "A quantum no-reflection theorem and the speeding up of Grover's search algorithm," *EPL (Europhysics Letters)* **93** (2): 20005(4).

Kuntz, M. (2012) "The postmodern assault on science," *EMBO reports* **13** (10): 885-889.

Landweber, L. H, R.J. **Lipton**, E.L. **Robertson** (1981) "On the structure of sets in NP and other complexity classes," *Theoretical Computer Science* **15** (2): 181-200.

Langevin, A., M. **Desrochers**, J. **Desrosiers**; S. **Gélinas**, F. **Soumis** (1993) "A two-commodity flow formulation for the traveling salesman and the makespan problems with time windows," N*etworks* **23** (7): 631-640.

Lash, S. (1985) "Postmodernity and desire," *Theory and Society* **14** (1): 1-33.

Latour, B. (1990) "Postmodern? No, simply amodern! Steps towards an anthropology of science," *Studies in History and Philosophy of Science Part A* **21** (1): 1-10.

Leclerc, M., F. **Rendl** (1989) "Constrained spanning trees and the traveling salesman problem," *European Journal of Operational Research* **39** (1): 96—102.

Lee, H., A. **Banerjee** (2012) "An executable modelling and simulation framework for NP-complete complexity problems and different forms of uncertainties," *International Journal of Services Operations and Informatics* **7** (1): 1-17.

Leipälä, T. (1978) "On the solutions of stochastic traveling salesman problems," *European Journal of Operational Research* **2** (4): 291-297.

Leporati, A., S. **Felloni** (2007) "Three "quantum" algorithms to solve 3-SAT," *Theoretical Computer Science* **372** (2-3): 218-241.

LeRon, S. F. (1992) "A Theology of Chaos. An Experiment in Postmodern Theological Science," *Scottish Journal of Theology* **45** (2): 223-237.

Levin, A., D. **Paulusma**, G. J. **Woeginger** (2008) "The computational complexity of graph contractions I: Polynomially solvable and NP-complete cases," *Networks* **51** (3): 178-189.

Libura, M. (1991) "Sensitivity analysis for minimum Hamiltonian path and traveling salesman problems," *Discrete Applied Mathematics* **30** (2-3): 197-211.

Lightman, B. (1996) "Science and the postmodern crisis," *The European Legacy* **1** (5): 1764-1776.

Lichtman, J. (2018) "Explicit estimates for the distribution of numbers free of large prime factors," *Journal of Number Theory* **183** (1): 1-23.

Lien, Y.-N., E. **Ma**; B. W.-S. **Wah** (1993) "Transformation of the generalized traveling-salesman problem into the standard traveling-salesman problem," *Information Sciences* **74** (1-2): 177-189.

Liu, Y., G. J. **Koehler** (2010) "Using modifications to Grover's Search algorithm for quantum global optimization," *European Journal of Operational Research* **207** (2): 620-632.

Lomonaco, S. J., L. H. **Kauffman** (2007) "Grover's Algorithm a Quantum Hidden Subgroup Algorithm?" *Quantum Information Processing* **6** (6): 461-476.

Love, P. J., B. M. **Boghosian** (2006) "Type II quantum algorithms," *Physica A: Statistical Mechanics and its Applications* **362** (1): 210-214.

Lu, L.; E. M. **Posner** (1993) "An NP-Hard Open Shop Scheduling Problem with Polynomial Average Time Complexity," *Mathematics of Operations Research* **18** (1): 12-38.

Luan, L. Z. **Wang**, S. **Liu** (2012) "Progress of Grover Quantum Search Algorithm," *Energy Procedia* **16** (Part C): 1701-1706.

Lucena, A. (1990) "Time-dependent traveling salesman problem–the deliveryman case," *Networks* **20** (6): 753-763.

Lyon, D. (1993) "A Bit of a Circus: Notes on Postmodernity and New Age," *Religion* **23** (2): 117-126.

Mainhardt, G. (2004) "P versus NP and Computability Theoretic Constructions in Complexity Theory over Algebraic Structures," *Journal of Symbolic Logic* **69** (1): 39-64.

Mak, K.-T. A. J. **Morton** (1995) "Distances between traveling salesman tours," *Discrete Applied Mathematics* **58** (3): 281-291.

Malandraki, C., M. S. **Daskin** (1993) "The maximum benefit Chinese postman problem and the maximum benefit traveling salesman problem," *European Journal of Operational Research* **65** (2): 218-234.

Malik, K., M. L. **Fisher** (1990) "A dual ascent algorithm for the 1-tree relaxation of the symmetric traveling salesman problem," *Operations Research Letters* **9** (1): 1-7.

Martín-López, E., A. **Laing**, T. **Lawson**, R. **Alvarez**, X,-Q. **Zhou**, J. L. **O'Brien**, (2012) "Experimental realization of Shor's quantum factoring algorithm using qubit recycling," *Nature Photonics* **6** (11): 773-776.

Matsuda, S. (2002) "'Optimal' neural representation of higher order for traveling salesman problems," *Electronics and Communications in Japan* (Part II: Electronics) **85** (9): 32-42.

Meester, R.W.J, K. **Slooten** (2020) "DNA database matches: A p versus np problem," *Forensic Science International: Genetics* **46** (May) 102229(27).

Meyer, D. A. (2002) "Physical quantum algorithms," *Computer Physics Communications* **146** (3): 29-301.

Mihara, T. (2000) "Walsh transforms and efficient quantum algorithms," *Electronics and Communications in Japan* (Part III: Fundamental Electronic Science) **83** (8): 71-80.

Mihara, T., S. C. **Sung** (2003) "Deterministic polynomial-time quantum algorithms for Simon's problem," *Computational Complexity* **12** (3-4): 162-175.

Miller, D.L., J. F. **Pekny** (1989) "Results from a parallel branch and bound algorithm for the asymmetric traveling salesman problem," *Operations Research Letter*s **8** (3): 129-135.

Mitra, A., A. **Ghosh**, R. **Das**, A. **Pate**, A. **Kumar** (2005) "Experimental implementation of local adiabatic evolution algorithms by an NMR quantum information processor," *Journal of Magnetic Resonance* **177** (2): 285-298.

Miura, S. (2009) "Molecular dynamics algorithms for quantum Monte Carlo methods," *Chemical Physics Letters* **482** (1-3): 165-170.

Morales, M. E. S., T. **Tlyachev**, J. **Biamonte** (2018) "Variational learning of Grover's quantum search algorithm," *Physical Review A* **98** (6): 062333(6).

Morikoshi, F. (2011) "Problem-Solution Symmetry in Grover's Quantum Search Algorithm," *International Journal of Theoretical Physics* **50** (6): 1858-1867.

Most, Y. Y. **Shimoni**, O. **Biham** (2010) "Entanglement of periodic states, the quantum Fourier transform, and Shor's factoring algorithm," *Physical Review A* **81** (5): 052306(8).

Mulmuley, K. D. (2011) "On P vs. NP and geometric complexity theory," *Journal of the ACM* **58** (2): -26.

Mulmuley, K. D. (2012) "The GCT program toward the P vs. NP problem," *Communications of the ACM* **55** (6): 98-109.

Mulmuley, K. D., M. **Sohoni** (2001) "Geometric Complexity Theory I: An Approach to the P vs. NP and Related Problems," *SIAM Journal on Computing* **31** (2): 496-526.

Naik, A.V., A. L. **Selman** (1999) "Adaptive versus nonadaptive queries to NP and p-selective sets," *Computational Complexity* **8** (2): 169-187.

Nakahar, M., J. J. **Vartiainen**, Y. **Kondo**, S. **Tanimu**, K. **Hata** (2006) "Reducing execution time of quantum algorithms by additional permutation gates," *Physics Letters A* **350** (1-2): 27-30.

Niestegge, G. (2017) "Quantum Teleportation and Grover's Algorithm Without the Wavefunction," *Foundations of Physics* **47** (2): 274-293.

von **Neumann**, J. (1932) *Mathematische Grundlagen der Quantenmechanik*. Berlin: Springer (Chapter IV.2, pp. 167-173).

Noether, E. (1918) "Invariante Variationsprobleme," *Nachrichten von der Gesellschaft der Wissenschaften zu Göttingen, Mathematisch-Physikalische Klasse* **1918**, pp. 235-257.

Nölle, M., B. **Ömer**; M. **Suda** (2007) "Quantum information algorithms – new solutions for known problems," *Elektrotechnik und Informationstechnik* **124** (5): 154-157.

Nyman, P. (2009) "A compact program code for simulations of quantum algorithms in classical computers," *Laser Physics* **19** (2): 357-361.

Orús, R., J. I. **Latorre**, M.A. **Martín-Delgado** (2004) "Systematic analysis of majorization in quantum algorithms," *The European Physical Journal D / Atomic, Molecular, Optical and Plasma Physics* **29** (1): 119-132.

Padberg, M., G. **Rinaldi** (1987) "Optimization of a 532-city symmetric traveling salesman problem by branch and cut," *Operations Research Letters* **6** (1): 1-7.

Paletta, G. (1992) "A multiperiod traveling salesman problem: Heuristic algorithms," *Computers & Operations Research* **19** (8): 789-795.

Paletta, G., C. **Triki** (2004) "Solving the asymmetric traveling salesman problem with periodic constraints," *Networks* **44** (1): 31-37.

Panayiotopoulos, J.-C. (1982) "Probabilistic analysis of solving the assignment problem for the traveling salesman problem," *European Journal of Operational Research* **9** (1): 77-82.

Park, J. K. (1991) "A special case of the n-vertex traveling-salesman problem that can be solved in O(n) time," *Information Processing Letters* **40** (5): 247-254.

Parker, R. G., R. L. **Rardin** (1983) "The traveling salesman problem: An update of research," *Naval Research Logistics* (NRL) **30** (1): 69-96.

Parusnikova, Z. (1992) "Is a postmodern philosophy of science possible?" Studies in *History and Philosophy of Science Part A* **23** (1): 21-37.

Patel, P. (2001) "Quantum algorithms and the genetic code," *Pramana* **56** (2-3): 367-381.

Penchev, V. (2024 October 2) "Quantum theology, or: 'Theologie als strenge Wissenschaft'" *SSRN*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4956963 or https://dx.doi.org/10.2139/ssrn.4956963 .

Penchev, V. (2024 August 5) "Stop Calculating: It is About Time to Start Thinking!" SSRN, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4888038 or https://dx.doi.org/10.2139/ssrn.4888038 .

Penchev, V. (2024 April 16) "Hilbert mathematics versus (or rather "without") Gödel mathematics: V. Ontomathematics!" *SSRN*, https://dx.doi.org/10.2139/ssrn.4793916 or https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4793916 .

Penchev, V. (2023 December 6) “Isaac Asimov’s sci-fi novella “Profession” versus professionalism: Reflections on the (missing) scientific revolutions in the 21th century” SSRN, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4648022 or https://dx.doi.org/10.2139/ssrn.4648022 .

Penchev, V. (2023 November 2) “Logic, mathematics, physics: from a loose thread to the close link: Or what gravity is for both logic and mathematics rather than only for physics” *SSRN*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4593958 or https://dx.doi.org/10.2139/ssrn.4593958 .

Penchev, V. (2023 July 23) “Hilbert Mathematics Versus Gödel Mathematics. IV. The New Approach of Hilbert Mathematics Easily Resolving the Most Difficult Problems of Gödel Mathematics,” *SSRN*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4503027 or https://dx.doi.org/10.2139/ssrn.4503027 .

Penchev, V. (2023 May 3) “Hilbert Mathematics Versus Gödel Mathematics III. Hilbert Mathematics by Itself, and Gödel Mathematics versus the Physical World within It: both as its Particular Cases,” *SSRN*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4426040 or https://dx.doi.org/10.2139/ssrn.4426040 .

Penchev, V. (2023 March 13) “This Year's Nobel Prize (2022) in Physics for Entanglement and Quantum Information: the New Revolution in Quantum Mechanics and Science,” *SSRN*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4382533 or https://dx.doi.org/10.2139/ssrn.4382533 .

Penchev, V. (2023 January 3) “Gödel Mathematics Versus Hilbert Mathematics. II Logicism and Hilbert Mathematics, the Identification of Logic and Set Theory, and Gödel’s 'Completeness Paper' (1930),” *SSRN*, https://dx.doi.org/10.2139/ssrn.4311732 or https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4311732 .

Penchev, V. (2022 October 21) “Gödel mathematics versus Hilbert mathematics. I The Gödel incompleteness (1931) statement: axiom or theorem?” *SSRN*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4243201 or https://dx.doi.org/10.2139/ssrn.4243201 .

Penchev, V. (2021 November 18) “What the Tortoise Said to Achilles: Lewis Carroll’s paradox in terms of Hilbert arithmetic,” *SSRN*, https://dx.doi.org/10.2139/ssrn.3944692 or https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3944692 .

Penchev, V. (2021 June 8) “The Symmetries of Quantum and Classical Information. The Resurrected 'Ether' of Quantum Information,” *SSRN*, https://dx.doi.org/10.2139/ssrn.3861105 or https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3861105 .

Penchev, V. (2020 October 5) “Quantum-Information Conservation. The Problem About ‘Hidden Variables’, or the ‘Conservation of Energy Conservation’ in Quantum Mechanics: A Historical Lesson for Future Discoveries,” *SSRN*, https://dx.doi.org/10.2139/ssrn.3675319 or https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3675319 .

Penchev, V. (2020 August 5) "A Class of Examples Demonstrating That 'P ≠ NP' in the 'P vs NP' Problem," *SSRN*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3647038 or https://dx.doi.org/10.2139/ssrn.3647038 .

Penchev, V. (2020 July 17) "From the Four-Color Theorem to a Generalizing 'Four-Letter Theorem': A Sketch for 'Human Proof' and the Philosophical Interpretation," SSRN, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3635195 or https://dx.doi.org/10.2139/ssrn.3635195 .

Penchev, V. (2020 July 10) "Quantum information as the information of infinite collections or series," *SSRN*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3630063 or https://dx.doi.org/10.2139/ssrn.3630063 .

Pendergast, R. J. (2011) "Quantum mechanics and teleology," *The Heythrop Journal* **52** (2): 271-278.

Pérez-Jiménez, M. J. (2014) "The P versus NP Problem from the Membrane Computing View," *European Review* **22** (1): 18-33.

Phan, D. D., C. T. **Le**, T. H. **Le** (1986) "Average polynomial time complexity of some NP-complete problems," *Theoretical Computer Science* **46** (1): 219-237.

Pintz, J. (1991) "On an assertion of Riemann concerning the distribution of prime numbers," *Acta Mathematica Academiae Scientiarum Hungaricae* **58** (3-4): 383-387.

Protopopescu, V., J. **Barhen** (2002) "Solving a class of continuous global optimization problems using quantum algorithms," *Physics Letters A* **296** (1): 9-14.

Rote, G. (1992) "The n-line traveling salesman problem," *Networks* **22** (1): 91-108.

Rötteler, M. (2006) "Quantum algorithms: A survey of some recent results," *Computer Science - Research and Development* **21** (1-2): 3-20.

Rubinstein, J. H., D. A. **Thomas**, N. C. **Wormald** (2001) "A polynomial algorithm for a constrained traveling salesman problem," *Networks* **38** (2): 68-75.

Ruttkamp, E. (2003) "On truth and reference in postmodern science," *South African Journal of Philosophy* **22** (3): 220-235.

Samoilenko, A. M. Y.A. **Prykarpatsky**, U. **Taneri**, A.K. **Prykarpatsky**, D.L. **Blackmore** (2004) "A geometrical approach to quantum holonomic computing algorithms," *Mathematics and Computers in Simulation* **66** (1): 1-20.

Sanchis, L. A (1990) "On the complexity of test case generation for NP-hard problems," *Information Processing Letters* **36** (3): 135-140.

Sasaki, Y. (2010) "On zeros of exponential polynomials and quantum algorithms," *Quantum Information Processing* **9** (3): 419-427.

Schneider, J., C. **Froschhammer**, I. **Morgenstern**, T. **Husslein**, J. M. **Singer** (1996) "Searching for backbones - an efficient parallel algorithm for the traveling salesman problem," *Computer Physics Communications* **96** (2-3): 173-188.

Selman, A. L. (1982) "Analogues of semirecursive sets and effective reducibilities to the study of NP complexity," *Information and Control* **52** (1): 36-51.

Shapiro, J. F. (1991) "Convergent duality for the traveling salesman problem," *Operations Research Letters* **10** (3): 129-136.

Shimoni, Y., D. **Shapira**, O. **Biham** (2005) "Entangled quantum states generated by Shor's factoring algorithm," *Physical Review* A **72** 6): 062308(6).

Shor, P. W. (2004) "Progress in Quantum Algorithms," *Quantum Information Processing* **3** (1-5): 5-13.

Shotter, J. (1990) "Getting in touch: The metamethodology of a postmodern science of mental life," *The Humanistic Psychologist* **18** (1): 7-22.

Sierksma, G. (1993) "The skeleton of the symmetric traveling salesman polytope," *Discrete Applied Mathematics* **43** (1): 63-74.

Sierksma, G., G. A. **Tijssen** (1992) "Faces with large diameter on the symmetric traveling salesman polytope," O*perations Research Letters* **12** (2): 73—77

Skobelev, V. G. (2010) "On the computational security of quantum algorithms for transformation of information," *Cybernetics* **46** (6): 855-868.

Song, D. (2014) "The P versus NP Problem in Quantum Physics," *NeuroQuantology* **12** (4): 350-354**.**

Stewart Jr., W. R. (1985) "An improved assignment lower bound for the euclidean traveling salesman problem," *Operations Research Letters* **4** (2): 5-60.

Stadler, P. F., W. **Schnabl** (1992) "The landscape of the traveling salesman problem," *Physics Letters A* **161** (4): 337-344.

Strassberg. B. A. (2005) "Magic, religion, science, technology, and ethics in the postmodern world," *Journal of Science and Religion* **40** (2): 307-322.

Sugamoto, A. (2009) "Factorization of Number into Prime Numbers Viewed as Decay of Particle into Elementary Particles Conserving Energy," *Progress of Theoretical Physics* **121** (2): 275-288.

Takahashi, R. (2010) "Extended changing crossover operators to solve the traveling salesman problem," *Electronics and Communications in Japan* **93** (7): 1-16.

Takeuchi, S. (2001) "A simple quantum computer: Experimental realization of quantum computation algorithms with linear optics," *Electronics and Communications in Japan* (Part III: Fundamental Electronic Science) **84** (11): 52-60.

Tamir, A. (1989) "On the core of a traveling salesman cost allocation game," *Operations Research Letters* **8** (1): 31-34.

Tsitsiklis, J. N. (1992) "Special cases of traveling salesman and repairman problems with time windows," *Networks* **22** (3): 263-282.

Ulyanov, F. S. V. **Ghisi** (2000) "The information role of entanglement and interference operators in Shor quantum algorithm gate dynamics," *Journal of Modern Optics* **47** (12): 2079-2090.

Vandersypen, L. M. K., M. **Steffen**, G. **Breyta**, C. S. **Yannoni**, M. H. **Sherwood,** I. L. **Chuang** (2001) "Experimental realization of Shor's quantum factoring algorithm using nuclear magnetic resonance," *Nature* **414** (6866): 883-887.

Vavrus, M. D. (2000) "Feminist Politics in Postmodernity: Thinking Globally While Acting Locally," Human Studies **23** (3): 309-315.

van der **Veen**, J. A. A., (1993) "An O(n) algorithm to solve the Bottleneck Traveling Salesman Problem restricted to ordered product matrices," *Discrete Applied Mathematics* **47** (1): 57-75.

van der **Veen**, J. A. A., G. **Sierksma**, R. van **Dal** (1991) "Pyramidal tours and the traveling salesman problem," *European Journal of Operational Research* **52** (1): 90-102.

Verhoeven, M. G. A., E. H. L **Aarts,** P. C. J. **Swinkels** (1995) "A parallel 2-opt algorithm for the Traveling Salesman Problem," *Future Generation Computer Systems* **11** (2): 175-182.

Vieira, V. R., P. D. **Sacramento** (1994) "Quantum Monte Carlo algorithms using coherent states," *Physica A: Statistical Mechanics and its Applications* **207** (4): 584-607.

Volgenant, T., R. **Jonker** (1982) "A branch and bound algorithm for the symmetric traveling salesman problem based on the 1-tree relaxation," *European Journal of Operational Research* **9** (1): 8-89.

Volgenant, T., R. **Jonker** (1983) "The symmetric traveling salesman problem and edge exchanges in minimal 1-trees," *European Journal of Operational Research* **12** (4): 394-403.

Volgenant, A. (1990) "Symmetric traveling salesman problems," *European Journal of Operational Research* **49** (1): 153-154.

Wagner, K., G. **Wechsung** (1986) *Computational Complexity*. Dordrecht: D. Reidel.

Wagner, P. (1992) "Liberty and discipline: Making sense of postmodernity, or, once again, toward a sociohistorical understanding of modernity," *Theory and Society* **21** (4): 467-492.

Webster, J. (2000) "Eschatology, Anthropology and Postmodernity," I*nternational Journal of Systematic Theology* **2** (1): 1-28.

Welch, W. J. (1982) "Algorithmic complexity: three NP - hard problems in computational statistics," *Journal of Statistical Computation and Simulation* **15** (1): 17-25.

Wersig, G. (1993) "Information science: The study of postmodern knowledge usage," *Information Processing & Management* 2**9** (2): 229-239.

White, G. P., D. J. **Sweeney** (1980) "Using multidimensional scaling to solve traveling salesman and machine scheduling problems," *Computers & Operations Research* **7** (3): 177-184

Wiel, R. J. V., N. V. **Sahinidis** (1996) "An exact solution approach for the time-dependent traveling-salesman problem," *Naval Research Logistics* (NRL) **43** (6): 797-820.

Wolf, M. (1997) "1/f noise in the distribution of prime numbers," Physica A: *Statistical Mechanics and its Applications* **241** (3-4): 493-499.

Wolf, M. (2014) "Nearest-neighbor-spacing distribution of prime numbers and quantum chaos," *Physical Review E* **89** (2): 022922(11).

Wu, L.-A., M. S. **Byrd** (2009) "Self-protected quantum algorithms based on quantum state tomography," *Quantum Information Processing* **8** (1): 1-12.

Zak, M. (2003) "Quantum Algorithms in Hilbert Database," *International Journal of Theoretical Physics* **42** (9): 2061-2068.

Zalka, C. (1999) "Grover's quantum searching algorithm is optimal," *Physical Review A* **60** (4): 2746-2751.

Zalka, C. (2000) "Using Grover's quantum algorithm for searching actual databases," *Physical Review A* **62** (5): 052305(4)

Zanotti, A. (1999) "Sociology and Postmodernity," *International Journal of Politics, Culture, and Society* **12** (3): 451-463.

Zhang, G. (2011) "Quantum-inspired evolutionary algorithms: a survey and empirical study," *Journal of Heuristics* **17** (3): 303-351.

Zhang, J., Z. **Lu** (2003) "Similarity between Grover's quantum search algorithm and classical two-body collisions," *American Journal of Physics* **71** (1): 83-87.

Zhang, W., R. E. **Korf** (1996) "A study of complexity transitions on the asymmetric traveling salesman problem," *Artificial Intelligence* **81** (1-2): 223-239.

Žnidarič, M., M. **Horvat** (2006) "Exponential complexity of an adiabatic algorithm for an NP-complete problem," *Physical Review A* **73** (2): 022329(5).