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Opinion

Discovery of Present Space Universe Reveals Ultimate Foundations of Physical Universe, Higher Order and Continuation of Consciousness

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Abstract - This paper introduces a unified theoretical framework, Present Space Reality (PSR), based on the proposed existence of a nonphysical, simultaneously evolving domain termed the Present Space Universe (PSU). Distinguished from the observable Measurement Space Universe (MSU), the PSU serves as the foundational substrate from which all physical phenomena emerge. The theory reconciles the classical constraint of the cosmic speed limit with instantaneous effects observed in quantum mechanics, offering explanations for key phenomena such as entanglement, the quantum measurement problem, and Planck-scale limits. PSR introduces a mechanism called Present Space Causality (PSC) to describe algorithmic evolution across physical systems, impacting our understanding of thermodynamics, randomness, and biological complexity. The model provides a novel account of the origin of physical laws, the expanding universe, and the cosmological role of information, while proposing a mathematically coherent shell model of black holes. PSR aims to offer a foundational resolution to the nature of time, consciousness, and the structure of reality itself.

Keywords - Ultimate reality; Quantum-classical reconciliation; Fundamental consciousness; Afterlife; Ontology of human existence; Computational universe.

1 Introduction and significance, unique methodological pathway and structure of evidence

Here, I present a scientific breakthrough into a hidden ultimate reality. The far-reaching breakthrough provides a new scientific understanding of the foundations of our physical universe and who we are as conscious beings from one principle. The breakthrough follows physical evidence for the ultimate reality of an invisible realm of a universal present, which I refer to as the Present Space Universe (PSU). The new understanding of Present Space Reality (PSR) provides insights into hidden structure, mechanisms, and a nonphysical nature of ultimate reality through steps of fundamental logic. The results include solutions for an unprecedented abundance of our deepest problems of quantum physics, cosmology, thermodynamics, biology, philosophy, and beyond from one principle. As the PSU is the realm of fundamental existence, our apparent physical universe is not. I refer to our physical universe as our Measurement Space Universe (MSU). The MSU arises as an effective, but ultimately artificial projection generated by the PSU. Most importantly for all of us, I identify the fundamental nature of consciousness in its specific physical context. Our fundamentally

real conscious existence must be part of the fundamentally real PSU. As conscious beings we are part of its unique existential reality. We are looking at a realm of fundamental consciousness for which we had no prior scientific concept, neither for its nature nor for its existence. A clear-cut solution to the mind-body problem of philosophy follows from a new foundational understanding of physics. As our conscious existence is ultimately not the result of our human brain activity, we can naturally expect its continuation beyond our physical lifetimes. The miracle of an afterlife is fundamentally real. It is further substantiated by a large body of evidence beyond fundamental physics, particularly from so-called near-death experiences. The existence of the realm of the PSU follows observational evidence that has long been established through fundamental research in quantum and classical physics. It includes the two seemingly irreconcilable operational modi in which physical processes become effective across space. They are physical effects propagating under the cosmic speed limit and simultaneous effects in quantum physical phenomena. The existence of the PSU, is a direct consequence of evaluation and reconciliation of the two operational modi under radically abstract logic. The reality of its existence has the inherent capability to provide answers for a universal abundance of seemingly unrelated ultimate questions of physical sciences and beyond. This unique outcome has unmistakable hallmarks of the discovery of a universal principle that had been missing from prior scientific understanding. The physically and conceptually precise principle of PSR is not just philosophically, but technically relevant as it encapsulates definite consequences for fundamental physics. Decoding and describing these consequences are an exercise of radically abstract logic that extend beyond common methodological pathways in current practice of fundamental physics. I demonstrate how this novel process leads to the discovery of mechanisms and direct conceptual insights for questions from strange quantum behavior to the origin of laws of physics. I decode a foundational understanding of quantum mechanics where quantum characteristics suddenly make and reveal both foundational and functional sense. It includes the quantum measurement problem, questions of fundamental reality, locality, instantaneous action at a distance, randomness, apparent retrocausality, Planck limits, superposition, entanglement, correspondence, and an actual functional relationship with classical behavior. The reality of the simultaneously evolving PSU has a stunning consequence for understanding classical causality. What we observe as causal physical effects in our MSU is simultaneously codetermined and as such 'projected' by a simultaneously effective type of determination. I refer to this mechanism as Present Space Causality (PSC). We already encounter its simultaneous operating modus in measurements of entangled quantum objects. The simultaneous modus implies that our MSU is fundamentally not just the result of interactions of its smallest and seemingly most fundamental constituents. Their relevance emerges in select differentiation of undifferentiated states when we zoom in in measurements. Everything evolves 'sideways' into the future. The foundational insight provides a transformative basis for models in particle physics. Mechanisms for compelled differentiation are identified both in quantum measurement and in observations of thermodynamic randomness. Reverse mechanisms for undifferentiation project phenomena associated with entropy under the second law of thermodynamics. A novel functional understanding of the role of randomness impacts the foundational understanding of biological life, its evolution, and its origin. Living cells are affected by special algorithms in PSC beyond rules for probabilistic physical and chemical evolution. We are looking at deliberate mechanisms in the PSU for an ultimately purposeful process. Details of a deeper understanding of the cosmological role of information emerge. The new understanding has implications for modeling black holes and for assessing any information paradox related to the event horizon. The treasure trove of foundational insights extends to the mysterious nature of the present time. The present time is the phenomenon of existence of the PSU. The ultimate nature of time as a fundamentally evolving process is the evolving moments of existence of the PSU. PSR confirms the understanding that our MSU had a moment of beginning. PSR resolves and provides both foundational context and an actual mechanism in PSC for the origin of laws of physics and our expanding MSU.

They follow an onset of the operational modus of PSC in the PSU. Algorithms under abstract rules of PSC have since projected 'lawful' physical behavior in a MSU expanding from zero spatial extent. Our observable MSU can be thought of as a finite projection. The relevance of the new insights for further research extends beyond fundamental physics and cosmology. They provide a defined new basis for consciousness related research in fields of science including neuroscience, psychiatry, and psychology for both fundamental research and new approaches in patient treatment. It provides guidance for scientific appreciation of certain seemingly irrational experiences of consciousness including dissociative identity disorder and near-death experiences. The most meaningful consequences for all of us lie in the deeper nature of the realm of the PSU. An extensive set of new findings transforms the scientific basis for the question if the origin of our MSU is the result of a somehow natural event or a creation. The new findings coherently suggest a creation for consciousness to thrive and evolve. They imply the action and presence of a higher order conscious intelligence. The PSU is the realm of this higher order entity which can be described and comprehended as divine. It is not a coincidence that the insights from PSR resonate both with long-held religious beliefs and with ideas contemplated in philosophy. PSR identifies the reality of a long-anticipated distinction between our apparent physical universe and an ultimate fundamental realm of which we are part of as conscious beings. The new understanding of ultimate reality provides further deeply meaningful and crucial insights for all of humanity.

2 A clear and precise principle of fundamental physics

The existential reality of the PSU is a physically and conceptually precise principle with technical consequences for understanding mechanisms, foundational structure, and ultimately the nature of our world. The PSU is to be distinguished from our familiar physical Measurement Space world with its apparent space and physical objects. Measurement Space (MS) is an ultimately artificial projection that relays information from prior iterations on the level of the PSU which we ultimately conceptualize. The projection is generated within the PSU. Fundamental reality only exists in the evolving moments of the PSU. What really exists exists there and what really happens happens there, in the way things can happen and exist there. A clear demonstration of this seemingly strange fundamental principle already follows from foundational implications of the cosmic speed limit of light and causality for our physical environment. This is visualized in the ABN Chart Fig.1. We are looking at three observers in presence to help conceptualize a present reality beyond causal relationships between any two observers. Present Space is represented by the horizontal line on top, where no deterministic physical interactions under the cosmic speed limit can occur. As soon as we accept the fundamental reality of Present Space, we realize that our physical MS represented by the area below the horizontal line is not fundamental reality. The straightforwardness and simplicity of the principle demonstrate that PSR is not another speculative idea. It is the direct consequence of application of radically abstract logic to what we observe as the cosmic speed limit and its reconciliation with simultaneous behavior in quantum physical phenomena. The simplicity of the fundamental principle is in contrast with the challenge of decoding its far-reaching and mind-bending consequences. PSR undertakes this novel task through further steps of fundamental logic where complementary pieces of a comprehensive new understanding of reality emerge. A meaningful discussion of PSR requires distinction between validity of the fundamental principle of reality of the PSU and of individual logical consequences.

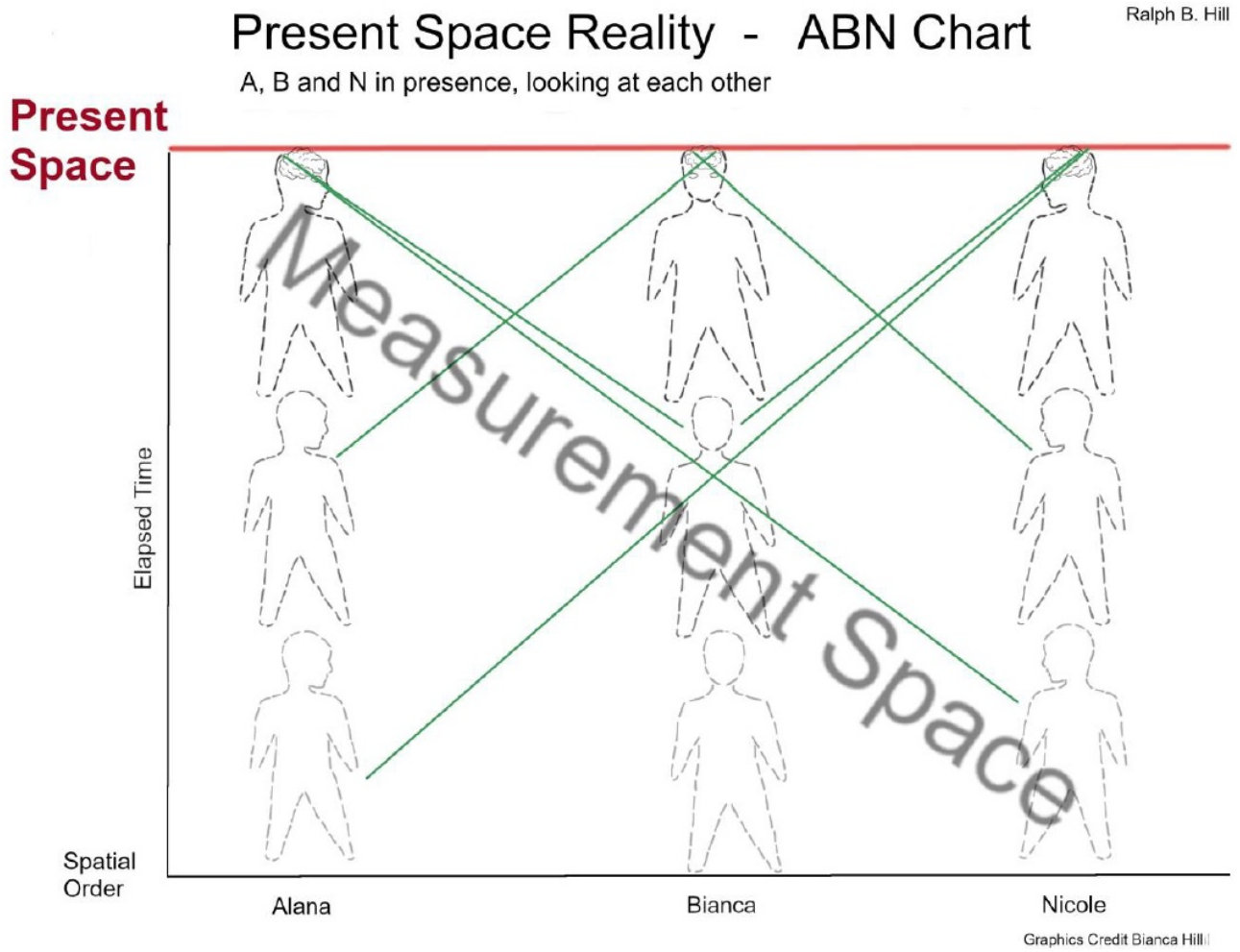

Figure 1: Three observers in presence are looking at each other. Present Space is represented by the red horizontal line on top. Prior moments in Present Space are any parallel line below. The green lines represent lines of sight and measurement which are seen to propagate at the speed of light in Measurement Space. The time delay effect is exaggerated to visualize its fundamental relevance. The area below the red line represents our familiar Measurement Space. The information we realize from points of observation relates to prior moments of the evolving Present Space Universe. In conventional understanding of fundamental reality of Measurement Space, the time delay effect appears trivial and negligible. We now realize its fundamental significance. At any moment only the evolving Present Space is real. What really exists exists there and what really happens happens there, in the way things can happen and exist there. No matter which direction or distance we train our telescopes or microscopes to we can never see or measure the real Present Space Universe. No deterministic physical interactions occur in it, only a simultaneously codetermined evolution under corresponding rules of Present Space Causality. Lines of sight and measurement go beyond our eyes and brains to an ultimate recipient which is our conscious mind. Signal processing by our eyes and brains is part of Measurement Space and its deterministic physics. Our conscious minds are part of the realm of the Present Space Universe. They are at the receiving end of determined information from the past and at the initiating end of action that impacts our observable physical world of the future. Conscious decision making is real, conscious effort impacts the physical world. Our conscious minds are part of the wonderful nature of the realm of the Present Space Universe.

3 The evidence for Present Space Reality (PSR)

3.1 Synopsis of evidence

PSR demonstrates extraordinary evidence for the fundamental principle of reality of the realm of the PSU. The fundamental principle is not conceived as a convenient hypothetical assumption. It is the direct result of a radically abstract analysis of the modus of propagation of classical physical effects under the cosmic speed limit and the seemingly irreconcilable simultaneous progression of quantum physical effects. The principle is confirmed by its inherent ability to resolve a universal set of our deepest fundamental questions in cosmology, physics, and beyond, that have been intractable in conventional understanding of reality. The fundamental principle works as a logical lens through which PSR step by step reveals insight after insight into the structure and ultimately the nature of fundamental reality. It provides an effective logical key for unlocking a coherent foundational understanding of quantum physical phenomena. They finally make both foundational and functional sense as they reveal characteristics of the operational modus for the projection of our physical world

under rules of PSC. PSR resolves the apparent incompatibility between instantaneous effects in quantum phenomena and the propagation of physical effects under the cosmic speed limit, where instantaneous action at a distance is the key characteristic of the simultaneous operational modus of PSC. PSR provides foundational understanding for further aspects of strange quantum behavior including the quantum measurement problem, questions of fundamental reality, locality, randomness, superposition, entanglement, apparent retrocausality, Planck limits, correspondence and functional relationship with classical behavior. It reveals a PSC methodology of top-down correspondence between classical and quantum behavior through mechanisms for selective fine differentiation. PSR provides unexpected foundational context for direct relevance of conformal field theories under AdS/CFT correspondence and identifies a surprising tool for fast-tracking the discovery of new MS physics. PSR identifies abstract rules of PSC as the mechanism for the origin and 'enforcement' of our apparent laws of physics, which at the same time is the mechanism for an onset of an expanding MSU. It reveals the nature of apparent physical entities including matter, forces, space, and time. PSR provides an understanding of the significance and ontological nature of the present time, that aligns with our fundamental experience of existence. PSR makes predictions for the understanding of the black hole event horizon. The resulting shell model removes paradoxes of current models with a central singularity, aligns with earlier findings based on thermodynamics about the information content of black holes, and points to a new physical mechanism for black hole growth. PSR makes and reveals fundamental sense of the strange phenomena of thermodynamical randomness and entropy under the second law of thermodynamics. A further analysis of the operational PSC modus demonstrates that biological structures and processes are impacted by special PSC algorithms beyond PSC rules for probabilistic physical and chemical behavior, which explains an exceedingly non-probabilistic origin of life. Above all, PSR demonstrates an unprecedented scientific understanding of our own fundamental nature and a deeper spiritual reality. It settles the mind-body problem of philosophy with the analytical clarity of a key insight of fundamental physics. It makes and reveals sense of seemingly irrational experiences of consciousness including dissociative identity disorder and near-death experiences. It reveals a stunning cosmological role and proprietorship of the exceedingly powerful intelligence in human brain processes. The universal scope of the new insights emerging from one principle, their deeply fundamental nature, and their sheer abundance are unmistakable features of a crucially missing keystone in prior scientific understanding of reality.

3.2 Instantaneous quantum physical phenomena across remote locations

Direct physical evidence for the reality of a simultaneously evolving PSU is present in quantum phenomena that instantaneously transcend Measurement Space (MS). They demonstrate the presence of a world beyond MS and the apparent speed of light and causality by which the projection of MS emerges. These 'strange' phenomena have long been established in quantum physics in theory and in experiment but did not make sense based on an assumed fundamental reality of MS and its classical deterministic physical effects under the cosmic speed limit. Instantaneous effects across MS are common in quantum field theory. A well verified and most obvious effect of this 'spooky action at a distance' appears in quantum spin measurements across remote locations in MS. Measurements of two entangled particles with a total spin of zero instantaneously lead to opposite results for the individual positive or negative spins for each particle at their remote locations on a defined axis of measurement. This consistent outcome already suggests an instantaneous effect across MS regardless of distance. It is further complemented by predictions under quantum mechanical rules for statistical outcomes where the orientation of the axis of measurement differs between the remote locations where the individual particles are measured. The idea that these correlated results may not instantaneously arise in measurement but might possibly be determined by local 'hidden variables' had become a testable hypothesis based on Bell's theorem [1].

Experiments have since demonstrated statistical results that confirm the absence of local hidden variables which again confirms the occurrence of instantaneous effects across MS. Key experiments include works by Freedman and Clauser in 1972 [2], Aspect, Dalibard and Roger in 1982 [3] and Weihs, Jennewein, Simon, Weinfurter and Zeilinger in 1998 [4], which have been recognized in the award of the 2022 Nobel Prize in Physics. The pivotal question is what this means for fundamental reality. Here, we accept that simultaneous quantum effects across remote locations really happen and reflect the presence of a simultaneously evolving fundamental world. The fundamental world is the PSU which projects our MSU.

3.3 Speed of light and causality under rigorous abstract logic

To accept the reality of a distinct present world is not an outlandish conclusion. It already arises as a consequence of the cosmic speed limit of light and causality. It is intelligibly demonstrated as the horizontal red line on top in the ABN Chart Fig.1. A vague concept of reality of a present world is reflected in cosmology where it is generally understood that an astronomical object observed 1,000 light years away is seen the way it appeared 1,000 years ago and that it certainly has evolved since. The very existence of an evolved and evolving world of the present outside our, and ultimately anyone's, light cone, however, necessitates a radical reconsideration of the implications of the cosmic speed limit for the question of reality of MS. Rigorous abstract logic requires the principle of an evolving world beyond our light cone to be applied to any magnitude of distance down to the Planck length. This leads to an understanding of a world of the present that, in a physical MS perspective, may be thought of as the aggregate of simultaneously existing point-like Local Nows. No causal physical effects under the cosmic speed limit can occur between any Local Nows regardless of proximity. Any Local Nows are classically isolated, no matter if they are 1,000 light years or 1 Planck length away. The two worlds of Present Space and Measurement Space cannot both be fundamental reality; it is either or. The unambiguous conclusion under PSR is that the PSU is fundamental reality and the 3-dimensional MSU we observe is not. This has a transformative logical consequence for fundamental physics. The observed causal physical evolution in MS under the cosmic speed limit does not happen naturally. It is a projection that follows a simultaneous evolution under abstract rules of PSC in a PSU evolving through moments of its universal presence.

3.4 PSR explains the nature and significance of the present time and of time itself

To understand the nature of time we need to understand the nature and significance of the present time first. The present time is absolutely existential to us, but its existential nature has no meaningful expression in current understanding of time in physics and cosmology. Time is treated as a measurement parameter in MS that relates to the past and allows predictions about future MS. The significance and mysterious ontological nature of the present time is overlooked. PSR reveals its nature. The present time is the phenomenon of existence of the real PSU. The nature of 'time itself' as a fundamentally evolving process is not the clock speeds we measure and which vary as described by relativity. The nature of time on its ultimate foundational level is the evolving moments of existence of the PSU. It provides a definite understanding for the black hole event horizon in 6. It rules out concepts of a block universe and it explains why there can be no real evolution or 'travel' back in time. Specific insights into the workings of the PSC mechanism for differentiation in 5.5 complement this understanding as they resolve an apparent retrocausality.

3.5 Our unique conscious existence is part of the realm of the Present Space Universe (PSU)

To grasp the transformational implications of the reality of the PSU we need to embrace that it is a unique realm unlike our observable physical world. It is the realm of fundamental reality. What really exists, exists there and what really happens, happens there, in the way things

can happen and exist there. Through our innate experience of existence in consciousness we have direct and irrefutable evidence that consciousness really exists. As it really exists it must be part of the existential reality of the realm of the present. As a phenomenon of the PSU, it lives at a boundary between observable MS and future MS. It is at the receiving end of information and effects that follow the rules of physics we observe in MS and at the initiating end of original action that impacts future projections of MS. Its unique fundamental nature is not the result of the physics of MS but a fundamental attribute of the PSU of which it is part of. The ability to identify the mysterious nature of consciousness in its specific physical context is extraordinary evidence for PSR.

3.6 PSR explains conscious manipulation of our deterministic physical world and the essence of our conscious human experience

Beyond the question of who we are, the apparent fact that we can manipulate the physical world based on personal conscious intent and effort is an unresolved problem in an understanding of fundamental reality of a universe and of physical brains governed by deterministic physics. PSR demonstrates that we do this from a realm of PS beyond the physical world of MS. The interaction between our PS consciousness and our individual MS brains is how we consciously manipulate and experience our effective MS environment. It is how and why we build telescopes, churches, and particle accelerators in a deterministic MS world. A stunning consequence of PSR is that our experience of personal local reality is the result of the connection between our fundamental PS consciousness and our individual brains in an ultimately artificial MSU. This is what forms the essence of our conscious human experience. The stunning cosmological role of human brains and their exceedingly intelligent algorithmic processing is further substantiated in 10.

3.7 PSR identifies the onset of Present Space Causality (PSC) as the mechanism and cause for the origin of our deterministic laws of physics and an expanding projection of our MSU

The fundamental reality of the PSU has direct consequences for understanding the apparent flow of causal deterministic effects under the cosmic speed limit in MS. What we eventually observe as physical behavior in our MSU does not happen naturally. It is a projection that is determined by simultaneous algorithmic progressions under abstract rules of PSC operating in the PSU. PSC rules project the laws of physics as they are observed in physical behavior in the projected MSU. Characteristic elements of the intelligent operational modus of PSC are decoded and described in 5, 4 and 9. PSC not only works as the mechanism that generates and enforces our laws of physics. PSC provides the key for unlocking the fundamental mystery of origin of our apparent physical world. Our MSU is not the result of some prior physical state. An operative onset of PSC inherently leads to an expanding MSU. Since the onset of PSC at a real moment in the past of the PSU, the expanding projection of MS has evolved from zero spatial extent due to the expanding pathways of causality under the cosmic speed limit of light and causality. Both our laws of physics and the origin of our expanding universe are consequences of an operational onset of PSC. How initial moments in this evolution may be envisioned is shown in Fig.2. While this is a most naturalistic model, other histories are conceivable in an ultimately virtual evolution.

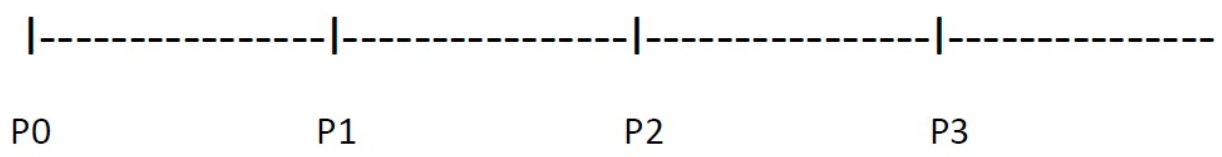

Figure 2: Initial moments in multiples of Planck time P (10-43 seconds). P0 marks the onset of PSC. At this moment PSC rules are defined and become operational. No outcome exists yet that would causally impact the future evolution of the MSU. P1 is the moment when a first outcome has emerged under PSC rules that will causally affect the future evolution of MSU. It is an initial set of values that begins to define MS. It represents highly undifferentiated macrostates that become increasingly differentiated through algorithmic progressions under rules of PSC. As the same initial set of values is the limit of our cosmic horizon of causality in all directions, there is no need for additional assumptions, such as inflation, to explain a largely homogenous and isotropic MSU. P2 A second outcome emerges based on the first outcome and rules of PSC. It is the first moment that reflects a causal deterministic effect under MS physics. P3 At this moment a third outcome emerges under PSC which reflects prior outcomes under the causality of MS physics. Complexity begins to develop and a projected 3D spatial differentiation begins to emerge. PSR points to a dual-energy model where the emergence of positive energy is matched by negative energy of the MS vacuum. It removes a fundamental incoherence of conventional models with positive mass-energy only, where expansion should never take off due to overwhelming gravitational attraction of masses in an initial singularity or in any subsequent ultra-dense states.

3.8 PSR resolves problem of infinity of space, MSU is a finite projection

Based on an assumption of fundamental reality of Measurement Space the question of infinity of space had been one of the most puzzling problems in cosmology. Measurement Space has no apparent borders and therefore appears to be infinite. Measurement Space can now be thought of as a finite projection. Regardless of which direction or depth we train our telescopes in Measurement Space we can never see the real PSU. We are looking at a projection which provides information about a projected evolution of the MSU as observed from points of observation at Local Nows. Our observable universe represents sets of causal lines of measurement that are just increasingly redshifted but complete in their causal connection with an initial moment at the onset of our laws of physics. This horizon of causality goes beyond an era of origination of the cosmic microwave background to an initial moment. The initial moment may be thought of as a moment of zero extension that remains causally effective from all directions across the horizon of any observer. There is literally nothing 'behind' the horizon of our MSU. The current apparent volume of our MSU is a projection that can be thought of as finite. An additional consequence emerges from characteristics of the operational modus of PSC described in 5.5. In the fundamentally unreal Measurement Space, distant galaxies may lack differentiation at Local Nows. They may emerge and further differentiate in our field of view as results of select differentiation in our measurement processes.

3.9 PSR provides fundamental reason for the expansion of our MSU, relates to fundamental inconsistencies in the Lambda-CDM model and observational evidence for an older maturity age of the MSU predicted by dual-energy theory

The expansion of our MSU still appears fundamentally strange based on an assumed fundamental reality of Measurement Space (MS). The quantitative determination of the apparent expansion has been a critical focus of research within the standard model of cosmology. The deeper fundamental questions of the fundamental nature and origin of space, laws of physics, and initial causes for expansion had remained intractable. Under PSR the expansion of MS follows directly from the new understanding of what MS is. MS is not fundamentally real. It reflects results of a simultaneously evolving protocol under rules of PSC as it affects and informs Local Nows at points of observation. The PSC protocol projects causal physical behavior under the cosmic speed limit from the moment of its initial onset. The projected history of causality from the beginning of our MSU necessarily extends with time, corresponding with 1 light-year per year. The apparent MSU necessarily expands as a direct consequence of extending pathways of causality. The new fundamental understanding has implications for current modeling of expansion. It suggests that cosmological models of a

somehow kinetically driven expansion as described in the Friedman equations are fundamentally invalid. This affects current calculations under the Lambda-CDM model for the age of the MSU of around 13.8 billion years. Any new timeline of an expansion history under MS physics would require a fundamental rebuild and recalibration. Its cosmological relevance, however, is fundamentally affected by the lack of fundamental reality of the MSU and the insight that distant galaxies may emerge as results of differentiation in measurement under PSC described in 5.5. A rebuild of a timeline required the identification of quantitative drivers for expansion beyond current understanding under MSU physics. Beyond a baseline effect of a horizon of causality receding at the speed of light we may expect effects of a repulsive form of vacuum energy. Several new insights under PSR point to negative vacuum energy. I had predicted an older maturity age of the universe and the invalidity of the current model based on fundamental incoherences of the current model and a gravitational mechanism that generates negative vacuum energy [6]. The invalidity of the kinetic model with its rapidly decelerating early expansion already gives reason to expect an older MSU with a much deeper early MS. The scenario manifests in mature galaxies at high redshifts that could not have formed within the timeline of the Lambda-CDM model. The early galaxies have an older maturity age than their redshift suggested. As the early MS is deeper than assumed under the Lambda-CDM model we expect additional populations of galaxies in the field of view. Observations with the James Webb Space Telescope and other instruments have aligned with this scenario. Evidence for unexpectedly mature galaxies in the early universe had already been found in observations with the ALMA array by Lelli et al. (2021) [7] of a galaxy at redshift $z \approx 5$. Observations with the James Webb Space Telescope point to further excessive deviation from expectations under the Lambda-CDM model that extends to yet higher redshifts of $z \geqslant 10$. The emerging evidence shows brighter, more evolved, and higher abundancies of galaxies than expected [8,9]. Independent evidence for additional galaxy populations has emerged from the determination of unexpected brightness of the cosmic optical background based on observations with the LORRI instrument on NASA's New Horizon spacecraft. Results obtained by Lauer et al (2022) [10] suggest a factor of 2-3 times more light than expected from populations of galaxies predicted under the Lambda-CDM model.

3.10 PSR provides new insights that suggest an ultimate cause and purpose for the origin of our MSU (MSU) and the onset of PSC

Questions of ultimate cause for the origin of our physical universe and its laws of physics are legitimate and crucial questions of cosmology. With the identification of PSC as the mechanism for the projection of both, the question of ultimate origin now extends to the cause for the onset of the underlying PSC mechanism. New foundational insights under PSR impact the question if we are looking at results of a somehow natural emergence or an artificial creation. Key elements are summarized in 8. The new insights coherently suggest the deliberate creation of a computational PSC mechanism to project an ultimately artificial MSU. Apparent purposes of the projection directly relate to consciousness where our MSU is a creation for consciousness to thrive and evolve. The new insights imply the presence and action of a higher order conscious intelligence in the realm of the PSU.

3.11 Special PSC algorithms for biological systems within the functional space of randomness resolve fundamental problems in biology

A systematic analysis of the operational modus of PSC in 5.3 and 5.4 provides a foundational understanding for the strange phenomenon of randomness. PSC processes for fine differentiation and undifferentiation project phenomena of randomness and entropy under the second law of thermodynamics. The further analysis in 9 provides pivotal insight into PSC algorithms that govern biological systems. The complex structures and processes in biological systems are governed by special PSC algorithms that compel fine differentiation

within the functional space of general rules for probabilistic physical and chemical evolution. The new finding resolves fundamental problems in biology and impacts our foundational understanding. It provides a fundamental explanation for the distinct information regimen we find in living systems where algorithmic information gains causal efficacy over matter. It provides a fundamental cause for the sustained one-handedness in chiral forms of biomolecules and the general problem of systematic deviation from rules for probabilistic chemical and physical evolution. It demonstrates the presence of a type of rules that can readily explain the origin of life before an onset of Darwinian evolution.

3.12 PSR predicts well-behaved black hole shell model, removes paradoxes arising in central singularity models, points to specific new physical mechanism for black hole growth

PSR does not generally affect quantitative predictions about MS under current models. One exception is the modeling of black holes. PSR provides a deep physical reason for understanding what happens at the event horizon. The understanding of a simultaneously evolving present leads to a MS model of black holes as ultra-dense, relativistic shells at their event horizons where nothing ever falls through. It is in surprising alignment with prior findings based on thermodynamics about the information content of black holes, introduced by Bekenstein [11]. The shell model under PSR removes paradoxes arising in current central singularity models. It also points to a specific physical mechanism for black hole growth beyond known mass accretion processes. The mechanism may help explain observational evidence presented by Farrah, et al. [12], that suggests growth rates for supermassive black holes beyond known physical mechanisms.

3.13 Negation of natural concept of reality of the present hinges on misguided assumption about a fundamental lack of simultaneity

The reality of the present is a natural concept that is in direct alignment with our fundamental conscious experience of existence in the present. The distinction between the invisible realm of the present and the observable MS is conceptually transparent as shown in the ABN Chart in Fig.1. Negation of the reality of this invisible world of the present hinges on assumptions of a fundamental lack of simultaneity associated with Albert Einstein's theories of general and special relativity. Gravitational and relativistic time dilation had led to assumptions that 'time itself' must be relative and that there was no fundamental simultaneity of moments of the present. Under PSR we realize that the fundamental nature of time itself is the evolving moments of existence of the PSU. The divergence in time intervals or clock speeds measured by different observers 'only' represent measurable effects in the projected MS that are properly described by general and special relativity. This can be illustrated with the example of the 'twin paradox' of special relativity. One twin leaving and returning on a spacecraft at near the speed of light will experience time dilation where processes under MS physics occur slower and they return physically younger than their twin. However, regardless of the time dilation experienced by one twin, both twins continuously existed at any moment throughout their separation. The same applies to any divergence in clock speeds due to gravitational time dilation. The assumption of a fundamental lack of simultaneity of moments of the present mistakes the feature of diverging clock speeds in MS for a feature of reality of time on its most existential level. The assumption is inconsistent with simultaneous quantum effects across remote locations and leads to paradoxical black hole models with central singularities. The paradoxes disappear in the black hole shell model predicted by PSR in 6. as a consequence of the existential reality of a universal present.

4 Foundational understanding of quantum physical phenomena

4.1 Foundational understanding of quantum phenomena follows from pivotal insight from beyond quantum physics

PSR has logical consequences that inform and define a foundational understanding of quantum mechanics. The reality of the realm of the PSU is a physically and conceptually precise principle. It enables us to analyze quantum physical phenomena from a clearly defined new footing. The clear new footing includes the reality of a universal present and the insight that our familiar Measurement Space (MS) is a projection generated under simultaneously progressing algorithmic rules of PSC operating in the PSU. Understanding the nature of the mysterious PSU is of utmost interest. We are looking at characteristics of a fundamental reality which not only gives rise to the projection of the MSU, but also is the realm of fundamental existence. The principle of PSR works as an effective logical lens. Quantum physical phenomena that did not make fundamental sense based on reality of MS make sense and reveal capabilities and operational principles of PSC. Relevant implications for the quantum measurement problem and classical information are identified. The phenomena of superposition, lack of local reality, quantum randomness, quantum spin, the appearance of dimensionalities in MS, Planck limits, and entanglement suddenly make conceptual sense and reveal characteristics of computational processes under PSC. The phenomenon of entanglement signifies the key characteristic of simultaneous progression in the operational modus of PSC. The operational modus has profound implications beyond quantum physics which I analyze separately in 5. The new insights include an unexpected consequence for research in quantum physics into AdS/CFT correspondence. AdS/CFT correspondence may describe actual PSC dualities. Dual conformal field theories under AdS/CFT may qualify as rules of the predicted PSC evolving on the PS 'boundary' of a 'bulk' MS of negative vacuum energy.

4.2 Quantum measurement, mechanism for differentiation

PSR provides clear guidance for the quantum measurement problem by directly determining what is part of a present reality and what is part of the projection. 'Live' quantum states are present at all times and are part of the real PSU. They reflect the state of progression of mathematical algorithms under PSC that have the capability to project what we observe as our MS world. Measurement results and their determined classical information are part of the projection we conceptualize as MS. Results in quantum measurement such as effects we associate with a photon or other elementary particles emerge as part of the projected MS. In the live reality of the PSU the particles in these effects do not have a physical presence. The output of their measurement is operationally preserved by way of modifying or transforming PSC capabilities for future effects accordingly. To give an example we may consider an experiment involving electromagnetic waves such as the double slit experiment. We conceptualize the dot that appears on a photographic plate as a fixed measurement result. What happens in the real PSU is the ongoing evolution and transformation of live quantum states and the PSC capabilities they represent. With the initial appearance of the dot on the photographic plate, we are looking at an algorithmic transformation that involved an exchange of photon energy that led to new live states that are the basis for the projection of the dot on the plate. PSC progresses based on whatever new live states have evolved. The measurement process compels fine differentiation. The sensitive measurement apparatus has a specific artificial fine differentiation that compels differentiation of the undifferentiated quantum state. This is just a select description of PSR consequences for the quantum measurement problem. The quantum measurement problem is an isolated aspect of a wider fundamental inquiry under PSR. The wider inquiry under PSR is how the projection of MS is generated under rules of PSC and what this means. Further insights with relevance for the quantum measurement problem are detailed in 4.7, in the context of the operational modus

of PSC in 5, including the question of retrocausality in 5.5, and for the special case of biology in 9. The further insights include that physical evolution is not determined from the smallest and seemingly most fundamental building blocks we can identify in fine measurement. Previously undifferentiated states become differentiated and relevant when we zoom in in measurement. The ranges of possible outcomes signify functional space for compelled fine differentiation due to other influences. Biological systems, such as Schrödinger's cat, compel fine differentiation.

4.3 Active operational capabilities generate passive information

PSR identifies foundational underpinnings for what we encounter and conceptualize as classical information and ultimately as our physical world. In quantum measurement seemingly strange forms of undetermined states appear to magically transform to a determined state. Under PSR we realize that we are looking at mathematical progressions in PSC and their capability to project an output of classical information. We are looking at results of an active and ongoing process based on capabilities where live quantum states signify PSC capabilities. The determination of information has a corresponding effect on new live PSC capabilities to project future MS accordingly. The information has no physically relevant existence beyond its role for the ultimately artificial projection of MS. Unlike live PSC capabilities which are operationally active, classical information is passive, conceptual, and consequently not subject to change.

4.4 Superposition is the capability to project any of the superposed states

For a particle or system to exist in several different states at the same time makes no sense based on reality of MS and its particles. Under PSR the phenomenon of superposition makes immediate sense. Quantum states signify capabilities of the PSU. In superposition we are simply looking at the capability to project any of the superposed states. Despite their appearance in measurement, particles do not exist as fundamentally real physical objects.

4.5 'Spooky action at a distance' in entangled particles is the characteristic capability of the PSU to impact MS across remote locations, MS locality is the result of projections generated by the PSU

Simultaneous quantum effects encountered in entangled particles regardless of distance are in fundamental conflict with a MSU of local realities evolving under the cosmic speed limit. The spooky action at a distance is the characteristic of a simultaneously evolving PSU with the inherent capability to simultaneously impact the MS it projects across remote locations. The phenomenon demonstrates that the locality we encounter in MS is not fundamental. It is the result of projections generated by the PSU under rules of PSC.

4.6 Seemingly nonsensical lack of local reality makes sense under brain-consciousness connection identified by PSR

The lack of local reality suggested by quantum phenomena seemed nonsensical. As physical beings we observe and experience a local presence in a distinct location in a seemingly real MS. Under PSR we realize that MS is an ultimately artificial projection. The appearance of local reality is the result of a connection between our PSU consciousness with an individual MS brain, which forms the essence of our conscious human experience. The stunning existential implications of this insight for all of us are addressed in 10 and 11.

4.7 Randomness in measurement outcomes signifies PSC process for coherent top-down differentiation, functional space for non-probabilistic fine differentiation, fundamental capability of the PSU for original action

We encounter a particularly puzzling phenomenon in quantum 'randomness'. In this phenomenon no physical cause can be identified that determines the specific individual outcome of a quantum physical measurement. The phenomenon has baffled scientific minds for good reason. It stands in glaring opposition with fundamental reality of a MSU governed exclusively by deterministic laws of physics. While quantum wave functions predict probabilities, the foundational implications of the phenomenon had remained mysterious. With PSR we realize that observable effects in MS originate from the fundamentally distinct reality of the PSU of which we are part of. The phenomenon reflects a fundamental capability for original action. The action is 'original' as no physical cause for a specific outcome can be identified. The phenomenon emanates from the PSU and therefore reveals a fundamental capability of the PSU. Randomness in individual outcomes does not readily make sense as a necessary or useful element for a computational determination of a generally deterministic MSU. PSR reveals why randomness is needed for the projection of a coherent MSU in a process of differentiation under PSC and how it works. Randomness has an analogue appearance in molecular behavior in thermodynamics as demonstrated in 5.3. In both appearances of the phenomenon, we are looking at a protocol for selectively compelled fine differentiation of previously undifferentiated states. Fine differentiation that is only selectively compelled is computationally efficient for the artificial projection of a vast MSU. Probability distributions in measurement outcomes relate correspondence between properties of macrostates and emerging microstates that is needed due to the lack of natural bottom-up physical flow of causality in a simultaneously evolving world. The correspondence in probability distributions follows a top-down logical protocol. Ranges of possible outcomes signify functional space for specific non-probabilistic fine differentiation due to influences other than measurement. This functional space is crucial for specific fine differentiation and corresponding fine functionalities which we encounter in our fine manipulation of physical objects and in biological systems as shown in 5.3 and 9.

4.8 Nonphysical spins signify a fundamentally nonphysical world, dimensionalities appearing in MS are results of mathematically determined progressions under PSC and may vary

Particles like the electron have a property called spin that signifies an angular momentum and leads to electromagnetic effects in MS. However, no actual physical rotation in space can be associated with this angular momentum. The observable effects of particle spin as observed in the Stein-Gerlach experiment do not allow for an expression of the angular momentum in 3-dimensional MS other than along the selected axis of measurement. The observed up or down only effects of spin on the axis of measurement represent a 1-dimensional definition. The effect exemplifies that the ongoing evolution of our MS world is not due to the presence of real physical objects doing things in space but an ongoing algorithmically determined process. The abstract modus for the projection of spin in MS further demonstrates that dimensionalities appearing in MS are not fundamental but instead may vary. They depend on how the specific rule of PSC responsible for the observable effect is defined. The phenomenon is further evidence for an ultimately nonphysical MS world that emerges in response to our measurements.

4.9 Planck limits in measuring MS point to computational significance, reduction of computational complexity

The potential for measuring MS has fundamental limits beyond which no measurement result can be determined. The minimal spatial parameter is the Planck length at approx. 1.6 x 10^{-35}m. The minimal time parameter is the Planck time of about 10^{-43}s. This limited

resolution of space and events in space may appear strange in an understanding of fundamental reality of MS. Under PSR we realize that we are not looking at a physical reality of space but at results of algorithmic progressions of mathematically defined rules in PSC. The limited resolution is a characteristic feature of the PSC process under which the projected MS emerges. In an algorithmic progression under PSC, micro limits for effects in MS make sense. The PSC process indicates a fundamental requirement for computational capabilities. An unlimited micro resolution pointed to a requirement for infinite computational capabilities which appears unfeasible. The presence of fundamental measurement limits in MS suggests that computational requirements for the projection of our MSU are finite. This is further substantiated by the methodology of selective fine differentiation being realized in PSC. In a computational determination of the MSU we have reason to quantitatively assess the evolution of computational complexity associated with any phenomena in the MSU. A basic model for reduction of complexity in gravitational mass aggregation has been proposed by Vopson [13]. Other indications for computational processes have emerged in research into AdS/CFT correspondence. Almeiri et al. [14], have pointed out characteristics of quantum error correction under quantum field theories in AdS/CFT correspondence.

4.10 Pathways towards specific PSC rules, PSR has potential for fast-tracking discovery of new MS physics

A new challenge and opportunity for fundamental physics arises. It is to fundamentally rethink and, where needed, reformulate the mathematical rules for physical behavior that we have been modeling under an assumption of fundamental reality of MS, its objects, and the results we obtain as immersed observers. We would like to identify any 'dual' rules of PSC that simultaneously project observed physical behavior in MS. One potential pathway to extract rules of PSC are abstract translations of our known laws of physics to determine what is needed to project them on the level of a simultaneously evolving PSU. We can already predict conservation principles to play a prominent role in PSC as conservation principles naturally persist through evolving moments of the present. Conservation of momentum, conservation of energy and conservation of vector products in quantum field theory exemplify levels of abstraction of these rules. It suggests an ultimate source for the remarkable symmetries we find in our MSU. The symmetries follow the application of conservation principles in PSC. There is another potential pathway to identify actual PSC rules beyond abstract translations. We may be able to independently discover unexpected dualities in research where we are looking for more efficient theoretical models for what we observe in MS. This pathway has the additional potential to serve as a tool for fast-tracking discoveries of yet unknown MS physics. All MS physics for observable physical behavior in MS, both known and unknown, are generated by dual expressions in PSC. There is no good reason to presume all major MS physics have already been identified. A direct identification of PSC rules can therefore reveal yet unknown MS physics. PSR identifies the reality of a foundational context that suggests direct relevance of AdS/CFT correspondence introduced by Maldacena [5]. It points to negative MS vacuum energy.

4.11 PSR supports direct relevance of AdS/CFT correspondence, dual conformal field theories as part of the predicted PSC evolving in the PS 'boundary' of a 'bulk' MS, negative vacuum energy

PSR describes a foundational basis for direct relevance of AdS/CFT correspondence for the projection of the MSU and suggests an opportunity for the identification and confirmation of specific rules of PSC. Dual conformal quantum field theories under the correspondence may qualify as rules of PSC evolving in the Present Space (PS) 'boundary' of a 'bulk' MS. The conceptual match of the correspondence with the actual reality of a PS 'boundary' and the prediction of actual dual rules in PSC is significant. The stunningly efficient mathematical dualities in field theories in AdS/CFT correspondence, however, only apply where a 'bulk'

space has anti-de Sitter like negative curvature. As an identification of PSC rules can directly identify yet unknown MS physics, dualities under the correspondence challenge current concepts of positive vacuum energy. A confirmation of PSC rules under the correspondence suggests negative MS vacuum energy, giving the MS 'bulk' an anti-de Sitter like negative curvature under general relativity. Negative vacuum energy has other support based on considerations of fundamental MS physics. It has the inherent potential to address fundamental problems arising in the Lambda-CDM model. Gravitationally repulsive negative vacuum energy addresses the fundamental problem that an initial singularity or any subsequent ultra-dense states of only positive mass-energy should never expand into distant structures due to overwhelming attractive gravity. A positive-negative character of energy addresses the fundamental problem of the initial emergence of positive energy from zero in a MSU that evolves under conservation of energy. Centers of negative mass-energy in large cosmic voids may establish definition for direction in cosmic expansion that is missing in a kinetic model of accelerated positive masses. Negative vacuum energy may explain observational effects associated with dark energy. Repulsive gravitational effects from negative mass-energy in cosmic voids on positive masses in outer regions of galaxies may explain some effects currently associated with dark matter. A positive-negative energy mechanism can resolve the problem of unrealistic inflated values for a positive vacuum energy from zero-point fluctuations arising in quantum field theory. A positive-negative energy mechanism in gravity is arguably needed to replace the concept of positive gravitational potential energy as a physical energy source for gravitational acceleration [15]. The proposed gravitational mechanism may help explain excessive growth rates of supermassive black holes as shown in 6.6.

4.12 Foundational context of entanglement, key characteristic of the operational modus of PSC

PSR directly determines the foundational context of entanglement. As a simultaneously effective phenomenon it evolves in the PSU where it is part of the mathematical protocol of PSC. The simultaneous effects of entanglement across remote locations are key in establishing the fundamental principle of PSR. Experimental tests of entanglement rely on entangled pairs of particles which are strictly isolated from their other environment to maintain their strictly bilateral correlation. The appearance in quantum physical experiments, however, is just the artificial setting in which the fundamental phenomenon has become most clearly identifiable to us. Under PSR we realize that entanglement is a fundamental characteristic of the operating principle of PSC for a simultaneous projection of MS. The phenomenon represents and demonstrates the way PSC operates on the level of a simultaneously evolving PSU. Transformative consequences for our understanding of the operational modus for the evolution of MS beyond quantum physics are shown in 5.

4.13 Correspondence principle has a specific foundational explanation

An unresolved fundamental question of quantum mechanics is how correspondence between quantum and classical physical properties and behavior is established. The analysis of the operational PSC modus shows that it is not a somehow emergent physical phenomenon for large quantum numbers. We are instead looking at results of PSC mechanisms for select fine differentiation under top-down logical protocols with analogue mechanisms in thermodynamic systems. Further details are described in 5.7.

5 The operational modus of Present Space Causality (PSC)

5.1 Fundamental nature of forces, space, how 'law enforcement' becomes an issue in physics, entanglement signifies PSC logic for enforcement of laws of physics in MS

In an understanding of fundamental reality of MS, we do not typically ask how our observed laws of physics with their conserved quantities are strictly and uniformly enforced across MS.

When MS is considered to be nature, consistent physical behavior under seemingly natural laws in MS appears to be just a natural fact that may not even require scientific explanation. We may instead be compelled to wonder about the fundamental nature of space, spacetime, particles, fields, or what a force fundamentally is as they appear to be responsible for the observed action in space. Under PSR we no longer need to wonder about the fundamental nature of these constituents, or how they are able to act across space. The surprisingly simple answer is that they all are the projected results of the underlying mathematical logic of PSC. Instead, the question of enforcement of the physical laws we observe in MS becomes an issue. There is no enforcement through natural effects of a physical presence of matter, forces, propagating fields, or the geometry of spacetime. Lawful physical behavior in MS is instead enforced through the simultaneous application of consistent algorithmic progressions under abstract PSC rules. Entanglement signifies the key principle of the PSC logic for the enforcement of laws of physics and their conserved quantities. We already have a clear example for the enforcement of a conserved quantity as the direct consequence of entanglement. It is the conservation of a total spin of zero in experiments with entangled pairs of particles. Measurements of individual particles at remote locations on a defined axis consistently show positive and opposite negative spins adding up to zero. In these experiments, entanglement is seen to enforce conservation of spin instantaneously and without the action of any force or any field propagating at the speed of light. Under PSR we realize that it represents the fundamental principle of how PSC enforces laws of physics in MS through simultaneously evolving moments of the PSU.

5.2 No fundamental building blocks, no physical bottom-up flow of causality, sideways into the future, paradigm-shifting implications for models in particle physics

PSC determines the evolution of MS simultaneously for any macroscopic level. This is the unambiguous consequence of the reconciliation of the apparent incompatibility in the propagation of quantum and classical physical effects under PSR. Unless we would somehow identify a better solution for this most fundamental problem, we face an extraordinary challenge and opportunity for fundamental physics. We have to fundamentally rethink the logical structure for physical behavior that we have been accustomed to understand and formulate from a perspective of fundamental reality of MS. The modus of how MS fundamentally evolves is not what we thought it was. The traditional logical principle for comprehending and describing the physics of our MSU has been up from its smallest and seemingly most fundamental components by modeling how they interact and combine to emergent effects on larger scales under MS physics. Under PSR neither these components nor their apparent locations and distances are fundamentally real. Distances do not represent fundamental physical realities but mathematical results of projections under the abstract mathematical logic of PSC. In a PSU where everything happens at once, there is no bottom-up flow of causality from micro components to physical behavior on macro scales. In this sense, everything evolves 'sideways' into the future. It means that physical evolution of macroscopic properties, objects and processes are projected directly under intelligent PSC algorithms rather than as a consequence of micro components. Models that may adequately reflect actual PSC rules for physical behavior on highly differentiated small scales do not necessarily have to correspond coherently with physical behavior on larger scales. It provides fundamental context for problems under the standard model of particle physics where interactions with virtual particles lose their ability to properly describe MS physical behavior on larger scales. Predictions of an unrealistic energy content of the MS vacuum from zero-point quantum fluctuations are an example. We may identify further specific gaps in modeling physical properties of larger objects from smaller constituents. A candidate is the discrete proton spin which may not correspond with spin properties that can be attributed to its apparent sub constituents. The lack of a directional flow of causality from smaller to larger components has paradigm-shifting consequences for models in particle physics.

5.3 Select differentiation - PSR reveals PSC mechanism for 'randomness' in thermodynamics

PSR leads to a surprising new understanding for thermodynamic phenomena. PSC projection of macroscopic properties and processes can evolve directly rather than as a consequence of micro components. This is reflected in how macroscopic physical descriptions, such as the temperature and pressure of a volume of gas in equilibrium, precisely describe the macroscopic state of an object and its further evolution regardless of the individually chaotic constituents we may observe in microscopic measurement. The operational modus of PSC provides a new perspective for what has been modeled as problems of statistical mechanics. The microstates we eventually determine in measurement, such as the chaotic position and momentum of individual particles of a gas in equilibrium, are not only fundamentally unreal. The individual microstates are irrelevant for the projection of macrostates of ordinary physical objects and their further evolution under PSC rules. The individual microstates become determined and relevant as we select to zoom in in measurement. It demonstrates how probabilistic outcomes in fine measurements are generated under PSC. As there are no bottom-up physical effects in the PSC modus, corresponding outcomes between macrostates and yet to be measured individual microstates are not naturally present. The correspondence in fine differentiation must be established through a fundamentally different mechanism beyond MS physicality. In the example of assessing a precisely determined temperature of a volume of gas we may measure the kinetic excitement of individual microstates. The results in these types of measurements demonstrate how PSC relates correspondence. It happens through random measurement outcomes in states of individual micro components that probabilistically correspond with effects and properties on the level of the macrostate. Rather than natural effects of MS physics, we are looking at an ultimately artificial PSC methodology to match microstates emerging in measurement with previously determined macrostates. The mechanism shows how physical evolution of MS emerges from a top-down logical protocol. The strange results illustrated in Fig.3, that a varied distribution of kinetically excited particles never settles into more uniform kinetic microstates, had remained fundamentally unexplained in prior understanding.

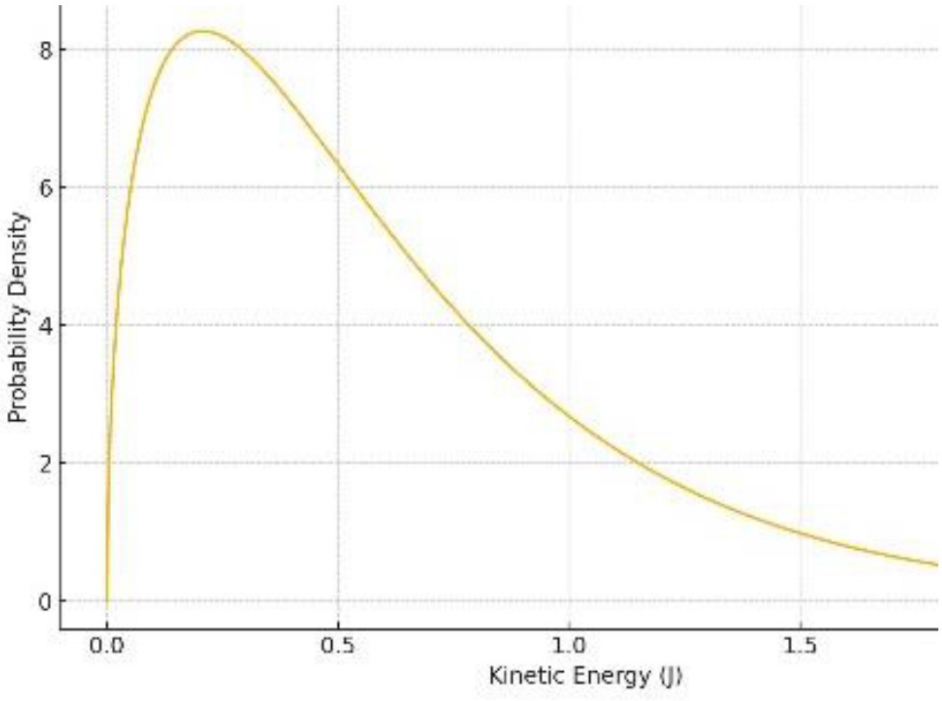

Figure 3: Fig. 3 is an example for a graph of the Maxwell-Boltzmann distribution for the kinetic energy of particles at a given temperature. The curve shows how the probability density of kinetic energy is distributed among particles in a system. The peak of the curve represents the most probable kinetic energy, while the distribution tail indicates the presence of particles with higher kinetic energies. In a bottom-up physical process particles should settle over time into more uniform states as the kinetically most excited particles pass momentum and kinetic energy to less excited particles. They do not, no matter how long a volume of gas remains in thermal equilibrium.

Under PSR it finally makes fundamental sense. There are no differentiated particles that would settle into more uniform states in a physical process. There is yet more relevance to this key phenomenon of thermodynamics. The most obvious functional aspect of an operational protocol of only select fine differentiation under PSC is its computational advantage. MSU evolution based on macrostates, where fine differentiation of microstates occurs only under select circumstances, provides a vastly more efficient computational determination of the projection of an ultimately artificial MSU. The methodology for obtaining correspondence through ranges of probabilistic outcomes still appears strange for top-down logical differentiation, even if we accept that we are not looking at natural phenomena but at computational processes under PSC.

Why do individual microstates that emerge in measurement not simply reflect uniform fractions of macrostates?

For one a varied spectrum of results corresponds with a more varied potential for chemical evolution. Under PSR we further realize that ranges of probabilistic outcomes signify functional space for non-probabilistic fine differentiation due to influences other than measurement. Influences for non-probabilistic fine differentiation include in our own deliberate fine manipulation of any physical objects. The analysis in 9 details evidence for non-probabilistic fine differentiation in biological systems due to special PSC algorithms.

5.4 Differentiation is a reversible process - undifferentiation reveals underlying PSC mechanism for entropy under the second law of thermodynamics

The PSC process of differentiation presents itself as a reversible process in the MSU. A reverse decay of differentiation or 'undifferentiation' is observed in thermodynamic processes that have been associated with the concept of entropy. As I show for the equilibrium scenario in 5.3, microstates of molecules become differentiated and relevant when individually observed. The PSC methodology of only select micro differentiation provides computational advantage for the projection of physical evolution in MS. A reverse PSC process of undifferentiation of previously differentiated states further complements this computational advantage. The process can be observed as our MSU follows its tendency towards equilibrium. A most simple example is when two volumes of a gas differentiated by their temperatures are combined. Once thermal equilibrium is reached, undifferentiation has occurred. The gas can be precisely described by the new overall temperature. Undifferentiation can also be observed in any diffusion processes in gases, liquids and beyond, as locally differentiating gradients decay. It also occurs in deceased cells as their exceedingly differentiated structures begin to decay over time. From our conventional MSU perspective these processes may look strange as there is no natural path for reversibility. They have been modeled with the concept of entropy, which may be vaguely interpretated as 'disorder'. As undifferentiation in these processes grows, entropy increases. Under PSR we realize that 'entropy; or 'disorder' in these processes relates to lack of differentiation under PSC. The fundamentally mysterious tendency of increasing entropy described in the second law of thermodynamics finally makes deeper fundamental sense. It follows a PSC process for undifferentiation that reduces computational requirements for further determination of physical evolution. In the formulation of statistical mechanics, we are looking at the entropy S of a system in equilibrium as the product of the Boltzmann constant k times the natural logarithm of W, S = k ln W, where W has been understood to represent the number of possible actual microstates in a given macrostate. Under PSR we realize that individualized microstates of a system are only actual while they are differentiated. Their differentiation vanishes in a cloak of undifferentiation in the underlying PSC process. As Boltzmann entropy increases in these processes, the cloak of undifferentiation extends further.

5.5 Select differentiation and our place in the universe, Fermi paradox, resolving apparent retrocausality

As mechanisms in the PSC modus instantaneously apply across all scales of distance, there is another consequence with cosmological implications. The PSC mechanism for select differentiation may be effective in our observation of distant galaxies in the MSU. Distant galaxies may be not just fundamentally unreal, but emerge and refine through compelled differentiation in our measurement processes. Our cosmic neighborhood may be privileged by elevated levels of differentiation for more relevant Local Nows. The consideration of computational facilitation favors this expectation. In this scenario, distant galaxies lack differentiation at Local Nows on which a present local physical evolution would be based on. Instead, intelligent PSC algorithms project observational results that reflect an implied evolution corresponding with general rules for deterministic MS physics. Results are instantaneously determined through differentiation from points of observation. The resulting information is operationally preserved in PSC for further coherent projection of the MSU. The potential for this is already embedded in current quantum mechanical understanding of instantaneous nonlocal collapse of the wave function. Effects of collapse upon measurement conceptually extend into space to infinity. Under PSR we are looking at a top-down logical PSC process of instantaneously compelled differentiation. The operational PSC principle is shown in the example of probabilistic outcomes under quantum rules (4.7) and phenomena of thermodynamics (5.3). It is identified as an operational principle for establishing correspondence between observations of our MSU at different scales (5.7) as correspondence is not naturally available in a simultaneously determined evolution under PSC. Any differentiation compelled by measurement at some distance (and implied temporal distance at the speed of light) away from any measured object inherently generates effects that may be inadequately interpreted as retrocausality. However, rather than effects traveling back in time, we are looking at instantaneous determinations under PSC that always project differentiation onto a projected past. In quantum physical lab measurements of photons or entangled pairs of photons the temporal effect is miniscule and may appear limited to the measurement of behavior of these photons. The PSC mechanism for compelled differentiation of behavior of individual molecular particles in a thermodynamic system already demonstrates a more far-reaching process (5.3). We do not just measure the photons that may mediate the results of the measurement of particles in the thermodynamic system. The measurement of the mediating photons compels differentiation of individual molecular particle behavior one logical step deeper into the projected past. For distant galaxies, any differentiation through measurement may project onto an implied temporal distance of millions or billions of years. There is an observational pathway to probe whether other cosmic regions have elevated fine differentiation at Local Nows. If we find a presence of biological life or intelligent observers they do. The question relates to the 'Fermi paradox' of lack of evidence for advanced extraterrestrial civilizations in vast remote cosmic regions. Under PSR the search for extraterrestrial life has additional relevance. It becomes a scientific inquiry into how fine differentiation actually extends into the wider MSU. We may after all live in an observer-centric MSU privileged by levels of differentiation in our cosmic neighborhood.

Since any differentiation is projected onto the virtual past of an object, a certain effect onto the projected object occurs at the time and as a consequence of the measurement. The principle is relevant for understanding outcomes of delayed-choice quantum experiments. This PSC effect merely is a refined differentiation that does not otherwise violate a coherently deterministic evolution of the MSU under intelligent rules of PSC. In conventional understanding of reality of physical objects and spacetime structure, any traces of such effects would have an appearance of effects propagating back in time. Traces of these effects have emerged in the concept and formalism of absorber theory for electrodynamics, introduced by Wheeler and Feynman [16]. Besides ordinary 'retarded' waves propagating from an emitter to a

receiver forward in time, additional advanced waves propagating backwards in time are assumed to occur. It includes advanced waves that propagate ahead of the reception of the ordinary wave backwards in time from the receiver to the emitter. The advanced waves already emerge as possible solutions to Maxwell's equations of electrodynamics. Effects of advanced waves that would violate causality are canceled out. Absorber theory may offer some explanatory advantages. However, the appearance of any effects going back in time contradicts conventional understanding of reality. A methodologically related approach is followed in the transactional interpretation of quantum mechanics introduced by Cramer [17], where quantum events are assumed to occur through exchanges of retarded and advanced waves between emitters and absorbers. The transactional process includes an advanced 'confirmation' wave from the absorber back in time to the emitter. While the transactional process cancels out retroactive effects that violate causality, some less direct effects onto the past of the emitter may be associated with the advanced wave in the transactional interpretation. What appears as advanced waves in these approaches may reflect how differentiation is projected onto the artificial past of an emitter in an underlying PSC mechanism for differentiation. This PSC mechanism, however, happens instantaneously and does not retroactively change prior moments of ultimate reality.

5.6 Projection of size, distance, structure and complexity, the exceedingly creative and intelligent mathematical logic for the projection of a functional virtual space

The formally distinct sets of rules for effects on particle (quantum) and molecular (thermodynamics, biochemistry) levels are examples of the transcendental logic applied in PSC. They project small scale levels in a cascading sequence of PSC rules all the way up to gravity. It represents the logical structure applied in PSC for the projection of functional structural differentiation across virtual distance scales. It appears as the hierarchical structure of forces in our MS picture where a weak gravity becomes the determining force for structure only on large scales. Over time this hierarchy has led to the rule-based evolution of stars, planets, and increasingly complex fine structures all the way to finely differentiated structures and processes in biological life and human brains. PSC projects rules of physics that allow us to do and build physical things, good, bad, and increasingly sophisticated, that do not naturally happen or exist in fleeting moments of the present. We are looking directly at the exceedingly inventive and intelligent features of the mathematical logic that projects our ultimately virtual MSU through intricate mathematical structure.

5.7 Select differentiation reveals PSC methodology for correspondence between quantum and classical behavior, limited role of quanta and quantization, functionalities in fine structure, computable limits

Under the correspondence principle in quantum mechanics strange quantum mechanical behavior is to somehow correspond with classical physical behavior in a limit of large quantum numbers. The fundamental question of how correspondence is established, physically or otherwise, had remained unresolved. It represents a fundamental gap in scientific understanding of the relationship between quantum and classical phenomena. The analysis of the operational PSC modus reveals the underlying mechanism. Correspondence is not a somehow emergent bottom-up physical process but the result of PSC rules for select fine differentiation. Fine differentiation occurs only selectively. PSC rules may directly determine physical evolution for undifferentiated macrostates. The process of select differentiation is most clearly observed in what appears as individually random measurement outcomes under probabilistic rules. It is active in particle effects under quantum rules and in effects on molecular levels following probabilistic rules described in statistical mechanics. There is no bottom-up directionality in this top-down process of fine differentiation as there is no bottom-up physical flow of causality under PSC in the first place. Correspondence between classical and quantum behavior follows a top-down logical protocol. Probability distributions in

fine measurement follow intelligent PSC rules that govern the process of fine differentiation and correspond with evolution of undifferentiated macrostates. The principle of select fine differentiation demonstrates a limited relevance of the procedure of quantization for physical modeling of the MSU. Undifferentiated physical objects neither fundamentally nor functionally consist of their measurable finer parts and ultimate quanta. They become functionally relevant where and when differentiation is compelled. Under PSR we can identify clear functional roles for discrete minimal units of energy, charge, and other properties on quantum levels. They facilitate that objects can be broken down and differentiated into finer parts that fractionally correspond with physical properties of the larger object and provide a basis for intricate fine functionalities. More generally, quanta are defined limits for fine differentiation and relate computational feasibility. Quanta and Planck limits of distance and time are ultimate limits in the resolution of the projected MS.

6 6. PSR predicts well-behaved black hole MS shell model, resolves black hole paradoxes, suggests new physical mechanism for black hole growth

6.1 Overview

PSR does not generally affect predictions for observable effects in MS. PSR has no problems accepting whatever the ultimately correct mathematical models for physical behavior in MS are, as they reflect the PSC rules and algorithms that project physical behavior. However, we cannot presume that all ultimate mathematical models for fundamental physical behavior are properly identified by current models in physics. Deviations of current models from consequences of PSR can be seen as indicators that these current models are incomplete. This is the case for current understanding of black holes and gravity. PSR provides a physical understanding of what happens at the event horizon. The fundamental existence of a simultaneously evolving present constitutes a deep physical reason for a MS model of black holes as ultra-dense, relativistic shells at their event horizons where nothing falls through. The shell model under PSR removes paradoxes of current central singularity models. The model is in surprising alignment with findings based on thermodynamics about the information content of black holes, first introduced by Bekenstein [11]. Additionally, it points to a specific physical mechanism for black hole growth beyond known mass accretion processes. The mechanism may help explain evidence presented by Farrah, D. et al. [12], that suggests growth rates for supermassive black holes far beyond known physical mechanisms. The mechanism arises naturally in the dual-energy model of gravity.

6.2 The MS black hole shell model under PSR

PSR provides a physical understanding of what happens at the event horizon. The question of what happens to a test mass falling towards an existing black hole depends on the fundamental understanding of time. Under general relativity time can be modeled as an independent proper time. This appeared to allow for physical objects to pass through the event horizon of a black hole on their own proper time. This does not hold under PSR and its understanding of a simultaneously evolving universal present. Nothing ever falls through an event horizon where time dilation represents a standstill of MS time. We are looking at non-rotating Schwarzschild black holes featuring spherical event horizons. At the event horizon a gravitational time dilation factor X rises towards infinity for an approaching object at distance r from the center of a Schwarzschild black hole with its event horizon at radius r_s: $X = 1/\sqrt{1 - r_s/r}$, where the gravitational time dilation factor is time elapsed for an observer outside the gravitational field divided by the time elapsed for an observer at r. This is due to the singularity limit $X = 1/0$ at $r = r_s$. Based on fundamental reality of a simultaneously evolving present, we can now expect that MS physical processes come to an objective halt within Planck length of the event horizon. Any physical structures can be expected to undergo effective compactification towards Planck length upon final approach.

The inability to pass is not limited to the more tangible matter and electromagnetic radiation. The flow of MS causality itself does not pass the event horizon. The event horizon represents a boundary for the projection of MS at the shell. It suggests that black holes are best described as ultra-dense shells at their event horizon without a projected interior MS. PSR has no fundamental issue with a terminal loss of differentiated information or aggregation of information at the event horizon and the lack of projection of an interior Measurement Space. PSC operates a fundamental process of undifferentiation which is already shown in the context of entropy in 5.4. In the abstract logic of PSC, we are looking at a mathematically defined limit for the projection of deterministic MS effects at the event horizon. The event horizon coincides with an escape velocity equal to the cosmic speed limit and a standstill of MS time. This hints to an abstract correspondence of limits between the projection of gravitational and kinetic effects in PSC rules.

6.3 Shell model removes paradoxes arising in central singularity models, gravitational extremes from relativistic and Newtonian physics coincide at the event horizon

In the shell model the event horizon represents a locally effective, high energy MS physical environment as opposed to a mere coordinate singularity. The relativistic concentration of mass-energy at the event horizon constitutes a physical limit that leads to important differences when compared to central singularity models. Central singularity models lead to paradoxical smooth Newtonian gradients across the event horizon. The larger the mass of the black hole is, the smaller the Newtonian parameters are at the event horizon in these models. Newtonian gravity at the event horizon of sufficiently supermassive black holes would be as 'pedestrian' as what we experience on earth. The inverse relationship follows from the distance at the event horizon from the center being proportional to black hole mass M, while the gravitational force decreases with the square of distance. The proportionality of distance from the center at Schwarzschild radius r_s to black hole mass M is shown in the Schwarzschild vacuum solution of the Einstein field equations where G is the gravitational constant and c is the speed of light: $r_s = 2GM/c^2$. The paradoxical smooth Newtonian gravitational gradients in the central singularity model suggest physical conditions just below the event horizon that would allow for an acceleration to just above the event horizon from where light may easily escape the black hole. Under PSR we realize that these smooth Newtonian gradients across the event horizon are the result of a misguided assumption of a remote central singularity. Further paradoxical consequences of the central singularity model include the implication of a gravitational time dilation beyond standstill and escape velocities beyond the cosmic speed limit behind the event horizon. Escape velocities beyond the cosmic speed limit are particularly paradoxical as velocities of infalling masses should mirror escape velocities. There is no energy concept for velocities of masses beyond the cosmic speed limit. Any attempts to deal with these paradoxes with coordinate solutions under general relativity that suggest a reversal of time have no real-world validity under PSR. As time is the evolving moments of the present there is no reversal of or traveling back in time. By contrast, in the shell model escalating gravitational extremes from both relativistic and Newtonian physics all coincide at the event horizon. Time dilation approaching standstill of measurement time, an escape velocity approaching the speed of light, Newtonian gravitational acceleration, field strength, and gravitational force all have escalating extremes at maximal mass-energy densities at the event horizon. In the example of the gravitational force F, we recognize the principle of an escalating extreme when approaching increasingly point like mass concentrations already in Newton's law of universal gravitation, $F = Gm_1m_3/r^2$, where G is the gravitational constant. A 'relativistic' extreme emerges due to the inverse square relationship of F with the distance r between masses m_1 and m_2, when an infalling mass approaches zero distance to any effectively gravitating mass that is not canceled out. The limit of zero distance is not encountered at the surface of any bodies with densities of gravitating matter limited by some degeneracy pressure. Even in the highly compactified

case of a neutron star, an effective approach to zero distance to gravitating mass at the surface is restricted by the degeneracy pressure of neutron matter. Only once any remaining degeneracy pressure is overcome, a singularity limit of zero distance may be encountered. In the PSR model, the paradoxical results of central singularity models never arise. Newtonian and relativistic limits finally coincide at an event horizon of maximal mass-energy densities.

6.4 MS black hole shell model aligns with findings based on thermodynamics

The MS model of black holes as ultra-dense shells at the event horizon is in alignment with findings about their information content introduced by Bekenstein [11]. These findings were primarily based on thermodynamics and suggested that the amount of information contained in black holes is proportional to the surface area at their event horizons. The result appears strange based on an assumed fundamental reality of our 3-dimensional MS where we would expect a maximum information content inside a black hole to be proportional to an interior volume rather than the surface area at the event horizon. A quantitative limit for information defined by surface area does make sense in the shell model where the surface area of the shell is all there is from which MS effects may be projected. The alignment further supports the validity of the shell model.

6.5 Lack of remaining degeneracy pressure indicates absence of a 'loophole'

The shell model under PSR is a consequence of gravitational time dilation for infalling objects onto an existing event horizon. This might potentially leave a loophole for the presence of a central singularity from the formation of the black hole in the collapse of a stellar progenitor object. A most straightforward principle to consider is that for black hole formation to occur any remaining degeneracy pressure of fermionic matter is overcome by overwhelming inward pressure such as gravitational pressure from mass exceeding the Tolman-Oppenheimer-Volkoff limit below which a neutron star could still form. A crucial conceptual consideration is that without any remaining degeneracy pressure there is no reason to assume for any infalling mass-energy to coalesce into a singularity at the center of the black hole. Infalling mass-energy would still carry the property of momentum that projects a now frictionless trajectory through a central point towards the event horizon forming on the opposite side. Any interior dynamic processes we might assume for a hypothetically effective interior space only came to a halt where masses from the inside approach a point on the opposite event horizon where the associated gravitational time dilation represents a standstill of measurement time. The conceptual consideration is further indication confirming that a MS description of black holes does not require a central singularity.

6.6 New physical mechanism for understanding black hole growth, substantiation of negative MS vacuum energy, observational support, implications for gravitons

The supermassive black holes we observe in MS leave a pressing need for physical mechanisms that explain how they grow to their astonishing size. The problem has become yet more prominent as evidence recently presented by Farrah, D. et al. [12], suggests growth rates for supermassive black holes beyond known physical mechanisms in mass accretion. Under the PSR shell model, gravitational blueshift provides a mechanism for substantial black hole growth from influx of electromagnetic radiation that relates to its Planck limit. In this mechanism black holes grow not just through accretion of infalling matter but with incoming radiation that gets maximally blueshifted at its final approach to the event horizon where maximal mass-energy densities are realized and the escape velocity reaches the cosmic speed limit. In this model a locally effective blueshift carries mass-energy to the event horizon that increases the gravitating mass of the black hole. The Planck limit for the wavelength of any blueshifted radiation is the Planck length of approx. 1.6×10^{-35} m. The photon energy at this extremal wavelength is conveniently expressed in Planck units

due to their definition. The energy of each photon at this wavelength is 1 Planck unit of energy with a mass equivalent of 1 Planck unit of mass. In more conventional units, each of these maximally energetic photons carries the substantial amount of energy of 1.22 x 10^{19} GeV and increases the mass of the black hole by approx. 2.18 x 10^{-8} kg. The biggest beneficiaries of these stunning mass increases of about 22 micrograms per each photon are supermassive black holes as photon capture increases with larger event horizons. Fundamentally significant is that the 1 Planck length wavelength of these photons is equal to their individual Schwarzschild radius. It points to pixelation of maximal mass-energy densities at the event horizon which increases in area with mass increases. The understanding of accrual of gravitationally generated mass-energy at the event horizon matter has relevance beyond radiation influx. Escalating kinetic energies from infalling matter accelerated towards the speed of light can be expected to provide additional growth of black hole mass over conventional models. Further contributions may arise from neutrino capture at the event horizon. Quantitative models for these processes remain to be developed. Evidence from actual black hole growth and the consideration of their environmental context may provide observational guidance and verification for quantitative models. The survey by Farrah et al, examines this type of observational evidence [12]. The gravitational mechanism in the shell model raises the question of the physical energy source for these confounding increases in mass-energy seemingly out of nothing. In conventional understanding of gravitational energies, the energy source could be positive gravitational potential energy. In the alternative dual-energy model the energy source relates to negative MS vacuum energy. The proposed dual-energy model is a straight forward physical mechanism [6]. In gravitational acceleration down a gravitational field positive energy is gained at the expense of an increase of negative energy of the MS vacuum in the same amount. In elliptical orbits it works as a dynamic reversible process, in mass accretion processes it leads to lasting increases in mass-energy. The proposed mechanism is a consequence of conservation of energy. The amount of energy conserved is zero. The crucial physical reason for the proposal is that the concept of gravitational potential energy cannot describe a physical form of energy. It reflects a scenario calculation. There is no definitive maximum for the gravitationally achievable kinetic energy on the basis of which we could quantify gravitational potential energy and determine a gravitating mass equivalent. A local point in a gravitational field does not 'know' or signify a determinable amount of potential energy. The corresponding maximum kinetic energy that a test mass may gain in free fall in a gravitational field is not conclusively determined by the large gravitating mass and the distance from its center of mass. The energy to be gained in acceleration crucially depends on the scenario of mass densities that will eventually be encountered in free fall. The black hole scenario already shows that we are looking at a runaway effect with acceleration approaching the cosmic speed limit at the event horizon and kinetic energies escalating accordingly. Additionally, any masses that fall into a black hole may later merge with other black hole masses generating yet more kinetic energies through gravitational acceleration. There is no quantifiable potential energy for this. We are looking at the characteristic instability of an open-ended bifurcation mechanism involving negative energy. The gravitational bifurcation mechanism follows the utterly simple mathematical equation of 0 = -1 +1. Negative energy arises from zero along with equal amounts of positive energy. The model greatly impacts predictions for mass evolution in black hole mergers compared to conventional models based on positive gravitational potential energy. In the negative energy model, the total mass of the merged black hole far exceeds the sum of the masses of the progenitor black holes, while negative energy in space increases. The conventional model instead assumes a significant loss of positive mass-energy in the merger process. Under the conventional energy model, the orbital decay in merger processes due to relativistic effects signifies a loss of positive mass-energy that is assumed to be radiated away in gravitational waves. The stark difference of predicted effects for mass evolution under the two models may be tested through observational evidence. A most direct observation would be a scenario where masses for both progenitor black holes as

well as the mass of the merged object could be individually assessed in model independent ways. Other observational evidence consists of signals in gravitational wave astronomy that point to black hole populations with masses significantly above what well founded physical models for black hole formation (stellar collapse) and growth would provide without the negative energy mechanism. Signs for this type of observational evidence have emerged in a recent report by The LIGO Scientific Collaboration, The Virgo Collaboration, and The KAGRA Collaboration about a gravitational-wave signal detected on November 23rd 2023 [18]. Progress in gravitational wave astronomy and the consideration of the negative energy model may provide further evidence. Under the negative energy model there is no more reason to look for gravitons of a certain minimal positive energy as the gravitational field does not contain positive energy. The bifurcation mechanism instead points to a type of energetically inverse 'quantum' as the gravitational bifurcation limit of space with maximal mass-energy densities at a high 1.22 x 10^{19} GeV per Planck area of space.

6.7 Issue of loss of information, irreversibility in time

Infalling information, while not 'lost' altogether at the event horizon, may be effectively reduced to an undifferentiated aggregate form such as an overall mass, charge, angular momentum, and momentum in 3D space that may impact future projections of MS only accordingly. A common understanding that information is neither destroyed nor created does not hold under PSR. The new understanding for the cosmological role of information is summarized in 7. It includes a crucial role of differentiation of information which evolves and may decay over time under rules of PSC as shown in 5.4. Decay of information or 'undifferentiation' is a PSC process that can be observed in thermodynamic behavior which has been associated with the concept of entropy. PSC processes of undifferentiation also appear to happen at the event horizon. In both cases undifferentiation of information leads to irreversibility of physical processes. In the understanding of a simultaneously evolving fundamental PSU, we can naturally accept a limit for reversibility in time for the projection of physical effects in the MSU.

7 Cosmological role of MS information, human impact, zero, -1 and +1, select differentiation of undifferentiated states, undifferentiation and entropy, differentiation in biological systems

A common understanding of the role of information in the MSU assumes that all information is present from some primordial state. The information is supposed to determine the evolution of the universe at any time. Information is neither destroyed nor created. What happens right now is conclusively encoded in the primordial state of the MSU. Free will does not exist, we are determined by a complex physical protocol evolving in our brains. Under PSR I identify details of a very different reality. Operationally active rules and algorithms, not passive information determine our MSU. Information is not conclusively determined from a primordial moment. It represents results of underlying PSC processes evolving over time. Conscious action impacts projection of future information as an original cause. Original action of the PSU generates specific information in a process of compelled differentiation in quantum physical measurement where no physical cause can be identified that determines the random individual outcome (4.7). The cosmological process starts from a low level of differentiation and complexity. Conventional approaches for quantifying the information content of the MSU based on sums of microstates are misguided. Vast areas and aspects of the observed MSU are expected to represent undifferentiated information. Fundamental bits of information that best reflect the structure and evolution of our ultimately virtual MSU can be understood as +1's and -1's with an undifferentiated ground state of zero. The underlying process for select differentiation of information in the MSU is a computational progression of algorithms under PSC. In 5.3 and 5.4 I show how differentiation and 'undifferentiation' evolve in thermodynamic phenomena under PSC. The fundamentally mysterious phenomenon of increasing entropy under the second law of thermodynamics is a result of a

PSC process of undifferentiation. PSC processes for select differentiation and undifferentiation demonstrate computational advantage. The evolution of differentiation is an important area for further research. Relevant inquiries include how differentiation extends into the wider MSU. In 5.5 the search for extraterrestrial intelligence and life is shown to be relevant for assessing both the extent of differentiation and our place in the MSU. Of particular fundamental interest is the understanding of evolution of differentiation of living cells under PSC algorithms. The distinct information regimen in biology and its resulting complexities is in fundamental contrast to what we observe in non-biological physical evolution in MS. Approaches to assess the fundamental phenomenon of biological systems from an abstract perspective include works by Marshall et al. [19], and of Walker and Davies [20] who proposed a corresponding physical transition in the emergence of life. A systematic analysis of implications of the operational PSC modus for biology in 9. leads to the conclusion that special PSC algorithms beyond rules for ordinary physical evolution compel fine differentiation in biological systems.

8 New insights coherently suggest that our MSU is an artificial creation for purposes of consciousness

8.1 Not the result of any prior physical state but the consequence of the onset of rules of PSC

The transformational insights under PSR have implications for the scientific question if the origin of our observable universe is the result of a somehow natural event or a creation. PSR confirms a prevailing understanding in modern cosmology that our observable MSU had a specific moment of beginning. Under PSR we realize that the origin of our expanding MSU is not the physical result of any prior physical state. It is the direct consequence of an operational onset of mathematically defined rules of PSC.

8.2 MSU is not fundamental reality

Based on the traditional scientific assumption of fundamental reality and therefore 'naturality' of our MSU we may have seen reason for restricting scientific consideration of its ultimate cause to concepts that may explain a somehow natural origin. As we realize that our MSU is not a fundamental natural world, the restriction to scientific consideration of a somehow natural origin is no longer justified.

8.3 The observed flow of causality is an ultimately virtual effect

The observation that 'nature' follows specific mathematical rules may be seen as deeply puzzling already. Under PSR we realize that the flow of causality itself is only the result of projections generated under yet more abstract principles of mathematical logic in PSC that bear no more resemblance with natural concepts of physical things doing things in space. Under PSR we further realize everything is instantaneously codetermined under PSC rules. It means that the flow of causality observed in physical processes in Measurement Space does not happen naturally. The flow of causality we observe as our physical universe is an ultimately virtual effect.

8.4 Lack of fundamental reality of basic physical features of Measurement Space (MS)

Under PSR we realize that our apparent 3-dimensional MS and its physical objects are projections that lack fundamental reality. The new fundamental understanding of quantum phenomena under PSR provides additional detail that confirms a lack of fundamental reality of any basic physical feature of MS. There is no fundamental local reality. Distances in space do not represent fundamental physical realities but mathematical values. There is no fundamental physical nature of measurable space or time intervals. There is no fundamental

physical nature of forces or the geometry of spacetime. Instead, features in quantum behavior such as quantum spins and Planck limits directly point to computational processes in the projection of our MS world. Beyond quantum phenomena, PSR reveals distinctly non-physical features of molecular behavior in thermodynamic systems that emerges in response to measurement. The MS we conceptualize has the characteristics of an ultimately virtual world where the impression of local physical reality ultimately arises from the connection of our consciousness with an individual brain in MS.

8.5 PSU is a higher order realm of reality that hosts the projection of the MSU and precedes it

Our MSU evolves within a higher order realm which is the PSU. This means that the PSU 'hosts' the projection of the MSU. It has preceded the beginning of our MSU and has been instrumental in its origin.

8.6 Consciousness uses human brains in MS as a vital resource

Consciousness does not arise from our human brains in MS, consciousness uses them. This means that a fundamental consciousness uses the MSU through our physical human presence as a vital resource to thrive and evolve.

8.7 Consciousness exists as a fundamental attribute of the PSU

Under PSR consciousness exists as a fundamental attribute of the PSU which naturally precedes the origin of our MSU. It means that a higher order consciousness has been in place to initiate the origin of our MSU through the operational onset of deliberately defined rules of PSC.

8.8 The new insights suggest a purposeful creation for consciousness to thrive and evolve, they imply the action and reality of a higher order conscious intelligence

The new insights under PSR coherently suggest that our MSU with its apparent laws of physics is a purposeful creation for consciousness to thrive and evolve. They imply the original action and reality of a higher order conscious intelligence in the PSU. It provides an ultimate reason for the origin of our MSU. Above all it is a deeply meaningful conclusion for all of humanity.

8.9 Anthropic fine-tuning of our MSU

The laws of physics we observe in MS present themselves as exceedingly fine-tuned to result in the right physical structures and chemistry for complex biological life and humans to evolve. This appears exceedingly improbable to occur naturally and the anthropic feature of a fine-tuned MSU may already be seen as evidence for a purposeful creation. Fine-tuning as a somehow natural emergence may only appear plausible under hypothetical cosmological models that imply a somehow natural and random emergence of varied laws of physics in large numbers of different universes or exceedingly remote regions of the MSU. In contrast to the hypothetical multiverse approach, the origin of our observed laws of physics under PSR is based on two identifiable universes for which I present specific evidence. Moreover, mechanisms that would naturally generate and enforce specific laws of physics in the multiverse setting are exceedingly hypothetical. Why natural objects should follow specific mathematical formulas in the first place has remained equally mysterious. Under PSR I identify an actual mechanism in PSC that both generates and actively enforces the laws of physics we observe in the MSU through defined algorithmic operations. What we encounter is not mathematical formulas mysteriously governing physical behavior of natural objects. It is the mathematically consistent projection of an artificial MSU. PSR and the discovery of the PSC mechanism are not hypothetical concepts but direct logical

consequences of reconciling the distinct modi of propagation of effects in quantum and classical physical behavior. The result of a deliberate creation under PSR is not derived from the philosophically stunning fine-tuned character of MSU laws of physics. The fine-tuned properties of the MSU reconfirm a PSR conclusion that follows from a comprehensive new understanding of structure, mechanisms, and the nature of reality. The identification of an active role of special PSC algorithms in biological systems beyond probabilistic physical behavior again reconfirms the evidence for a purposeful creation (9).

9 Special PSC algorithms for biological systems

Already from their appearance in MS, DNA resemble encoded information. Key biological processes resemble algorithmic progressions. Under PSR we find evidence for special PSC rules governing biological systems beyond probabilistic physical and chemical evolution. Under PSR any physical processes and outcomes we observe in MS are ultimately governed by algorithmic progressions under PSC. Biological processes and structures are no exception. As shown in 5.2, PSC progression evolves simultaneously, everything evolves 'sideways' into the future. It is a logical rather than a bottom-up physical progression. It means that outcomes In MS can be simultaneously and directly determined across levels of distance and levels of complexity. Here, I show what the PSC modus means for the understanding of biological systems. In a nutshell, PSR identifies a functional space for special PSC algorithms. The functional space provides definition for hallmarks of characteristic effects of special PSC algorithms. The characteristic effects match precisely what we observe in biological systems. The functional space for special PSC algorithms lies in the ranges of possible outcomes observed in thermodynamical randomness and an analogue quantum randomness. In this phenomenon, we are looking at physical/chemical behavior on particle and molecular levels. What happens at this scale is crucial for the workings of fine processes. This ordinarily probabilistic behavior relates the likelihood of chemical reactions and molecular assembly. We recall a crucial new insight from the analysis of thermodynamical randomness in 5.3. What appears as thermodynamic randomness in microstates of individual molecules emerges as the result of PSC processes of compelled fine differentiation as a consequence of the measurement process. The probabilistic behavior of individual molecules observed in measurement emerges from previously undifferentiated macrostates in a top-down logical process as there is no fundamental physical bottom-up flow under PSC. Probability rules artificially provide correspondence of emerging microstates with properties of the undifferentiated macrostate. The probabilistic outcomes in measurement reflect default modes in the absence of other influences that may compel specific non-probabilistic differentiation. An obvious influence for non-probabilistic fine differentiation includes our own artificial fine structuring of physical objects. It also includes any special PSC algorithms that may compel fine differentiation beyond probabilistic PSC rules for ordinary physical and chemical evolution, provided we find evidence. The functional space in probabilistic thermodynamic behavior of individual molecules includes variations of their position and momentum. Their individual position and momentum are obviously critical for where they can be located in space, how they react, assemble and fold. This functional space can be understood as a computational backdoor in PSC for the projection of fine structures and processes. It is placed in perfect fashion to coherently blend in with ordinary physical and chemical evolution. It observes and preserves coherent evolution of MS, as outcomes under special algorithms remain within the allowable range under rules that project ordinary physical behavior. When behavior of molecules is directly affected by special PSC algorithms, they still possess their basic physical and chemical properties. The outcomes are seamlessly processed for further special and ordinary physical evolution in the same way as probabilistic outcomes. The functional space naturally defines the predictable characteristics of effects of special PSC algorithms. Special PSC algorithms may project any effect within the allowable range under PSC rules for ordinary probabilistic physical and chemical evolution. The

predictable hallmark of special PSC algorithms is behavior of differentiated microstates that systematically deviates from probabilistic behavior under general rules. Results of special PSC algorithms may include structural complexities of molecules that are not a consequence of general probabilistic rules. They may include pure homochirality where only one of two equally probabilistic mirror versions of a molecule are assembled. They may include complex and targeted processes, positioning, movement, and assembly of molecules that do not follow from general probabilistic rules of physics and chemistry. They may include higher-level mechanisms for determination of molecular processes in cells. An example for these phenomena includes research by Manicka, Pai, and Levin [21], where tissue-level bioelectric voltage patterns have been found to trigger the formation of organs through complex downstream molecular processes. The predicted types of effects of special PSC algorithms are precisely what we observe in biological structures and processes. The unambiguous conclusion under PSR is that key aspects of biological structures and processes are governed by special PSC algorithms. It does not mean that every aspect of physical behavior in cells is the direct consequence of special PSC algorithms. Their efficacy is embedded within effects under general PSC rules for ordinary physical and chemical behavior. The active presence of special PSC algorithms resolves fundamental problems in biology. It establishes the presence of a type of algorithms that can readily explain an exceedingly complex origin of life before onset of a Darwinian evolution. It directly explains why biological processes deviate from general rules for chemical evolution. It provides a fundamental explanation for the distinct information regimen in living systems where algorithmic information gains causal efficacy over matter, as Walker and Davies have adequately observed [20]. It provides a fundamental reason for the pure one-handedness in chiral forms of biomolecules where DNA and RNA are right-handed, proteins and amino acids in life are left-handed. We are looking at efficient outcomes of special PSC algorithms. The new understanding impacts the foundational understanding of the nature of the processes of emergence of life and its evolution. We are looking at deliberate mechanisms in the PSU for an ultimately purposeful process. The process still has characteristics of trial, error, and evolutionary improvement as MS information is not an ultimate deterministic feature but the result of processes over time.

10 Cosmological role of human brains, transcendental intelligence in algorithmic progressions, a functional and spiritual connection

As a direct consequence of PSR, our consciousness does not arise from our human brains in MS, we use our human brains as a vital resource. It raises the question of the cosmological role of our human brains. The human brain facilitates highly powered and exceedingly sophisticated algorithmic processing. It is estimated to contain some 80 billion neurons and their connectivity may be in the order of 100 trillion synapses. Our vision is based on sophisticated algorithmic progressions that transmit information through action potentials of ganglion cells from the retina to several regions of the brain. The data transmission rate in human vision has been estimated by Koch et al. to be in the order of 8 million bits per second [22]. The incredibly powerful and intelligent algorithmic processing in our brains is clearly not the result of our individual conscious minds. We can literally sit back, relax, and enjoy the show without conscious effort or conscious thought. By any quantitative measure, our brains are exceedingly more intelligent than our individual conscious minds are. PSR provides a defining perspective for these intelligent brain processes. As we 'only' interact with our brains in MS as a resource, we can no longer assume identity between our individual conscious minds and the exceedingly intelligent processing in our brains. The issue of proprietorship emerges as a question of both cosmological and spiritual significance. The fundamental result under PSR is clear. The intelligent computational processing in our human brains is a proprietary process of the higher order conscious intelligence that projects our MSU. Our human brain structure represents its highly evolved functional organization. The actual objects of perception of our conscious minds are the signals and models that

the brain processes generate. Our comparatively simplistic individual conscious minds are afforded active and passive interaction with incredibly sophisticated and intelligent brain processes. It is a defining connection for our emergence as individualized conscious beings and it is a spiritual connection with a higher order entity. The connection generates the basis for our conscious experiences including perception of MS, emotion, and states of wakefulness during our physical lifetimes. Our active conscious directives only selectively impact exceedingly complex brain processes. This is how we consciously guide motor activity, direct brain function in conscious thought processes, invoke brain memory, and direct attention. Our simplistic conscious directives are readily functional in a complex MS brain as they only selectively interact with automatisms that are independently functional. Biological organisms do not require an individual conscious mind to operate successfully in MS. Effective automatisms independently emerge through evolutionary development and learning processes in individual brains. We can summarize that our individual conscious minds are afforded access to a highly evolved resource that is based on complex algorithmic progressions of mathematical-logical structure supplied by a higher order entity. The human brain is the observable result of an exceedingly sophisticated type of functional organization. Its level of sophistication took eons to evolve and is embedded in the evolution of the wider MSU. Under PSR we may distinguish three fundamentally distinct phases in the evolution of the MSU. Each phase is characterized by the emergence of new drivers that compel differentiation. The first is non-biological physical evolution from the very beginning of the MSU under general PSC rules for laws of physics. Second is an onset of biological evolution under special algorithms for biology that eventually lead to the emergence of sophisticated brains. Humanity represents a third phase. It is the onset of individualized conscious minds that impact the MSU through their interaction with highly evolved brains. Under PSR we realize that the evolution of the MSU is a targeted process by a higher order conscious intelligence for consciousness to thrive and evolve. We are an integral part of this fascinating process and experience through our interaction with our individual human brains.

11 Pathways for scientific inquiry into continuation of consciousness and the realm of consciousness

11.1 The miracle is fundamentally real

Expectations of the continuation of a fundamental essence of our existence beyond death have long been anticipated in religious beliefs and in philosophy. From a scientific perspective of fundamental reality of our physical MSU any continuation appeared nonsensical. PSR radically transforms the scientific paradigm. It identifies the consciousness-brain relationship as the consequence of an insight of fundamental physics. Consciousness is part of the PSU. Consciousness does not arise from our human brains in MS. Consciousness uses human brains as a resource to thrive and evolve in a highly functional but ultimately virtual MSU. Under PSR our fundamental conscious existence can be expected to continue in some form beyond our physical presence in the MSU. The expectation is supported in various ways beyond being a consequence of the bare fundamental principle. We are looking at an ultimately benign evolution by and for consciousness. The exceedingly complex and powerful intelligence in brain processes is distinct from our individual conscious minds who have their own fundamental active and passive capacities. Specific experiential and analytical pathways are outlined in 11.3 and 11.4. that further substantiate the reality of continuation of consciousness. The scientifically surprising result of continuation of consciousness is an awe-inspiring insight for humanity. It is a wonderful insight and reason for joy and hope to all of us.

11.2 We are looking at a very real realm with the potential of real exploration

While any continuation of conscious existence suggests some existential relevance, the basic insight from fundamental physics is highly abstract. As we are experiencing the wonder of our personal conscious identities, we are looking for answers that relate to us as individuals in a meaningful way. It raises questions about the deeper nature of a realm of consciousness, about interactions and further evolution of the individual, about resources and structures other than our MSU which the realm of the PSU may project. These questions are not just relevant for a more meaningful understanding of continuation of consciousness. They are questions for a yet deeper understanding of who we are right now, what is really out there, how we as individuals relate to a higher order consciousness, and what our destiny and purposes are. Based on an assumed fundamental reality of our MSU these questions appeared to be unreal or forever beyond scientific comprehension. Under PSR we discover the PSU as a very real realm which in principle is accessible to further exploration. Under PSR we already understand its fundamental physical context and we realize that we have direct experiential access. We can begin to grasp two distinct pathways to comprehend its fundamental reality. There is the analytical pathway informed by the fundamental physical context. It is indirect but objective. The other pathway stems from our innate conscious experience. It is subjective but uniquely direct. Both pathways can begin to intelligibly inform each other.

11.3 A defined new basis for researching consciousness in established fields of research, a beautiful insight for people affected by dissociative identity disorder, scientific appreciation of seemingly irrational experiences of consciousness

The new understanding of the consciousness-brain relationship directly resolves the essence of the mind-body problem. Consciousness does not arise from our human brains in MS, consciousness uses our human brains. The insight neither depends on an interpretation of the phenomenology of consciousness nor on any further advances in neuroscientific understanding of brain function. It is an unambiguous result of fundamental physics as the consequence of a reconciliation of quantum and classical physical behavior and the discovery of fundamental reality of the PSU. The result provides a defined new framework for further research into consciousness through various avenues within established fields of research including neuroscience, psychiatry, and psychology. It suggests a radical shift of paradigm as the concept of a brainless conscious identity and agent had appeared nonsensical in prior scientific understanding of fundamental reality of the MSU. PSR lays the foundation for scientific inquiries to distinguish capacities and characteristics of our Present Space (PS) consciousness from functionalities available through our MS brains. The exploration of the interaction between MS brain function and our PS consciousness becomes a defined scientific interest. We can assess personality and mental disorders from a defined new perspective. Of unique relevance is dissociative identity disorder. The phenomenology of a form of this disorder suggests that alternate individual conscious minds can interact with the same human brain. Under PSR we have reason to evaluate these seemingly irrational experiences of consciousness as fundamentally real phenomena. Studies of specifics of interactions of alternate conscious identities with an individual human brain may provide specific details of the workings of the interface between our PS consciousness and the MS brain. It brings a beautiful insight to everyone affected by this phenomenon and by any stigmatization based on conventional understanding of reality. With authentic reports of their unique experiences, they can be perfectly rational messengers giving humanity deeper insight into a world of fundamental consciousness that is new to science. This includes the study of their experiences with levels of co-consciousness and varying abilities to interact with their MS brain. An exemplary report is included in this video reference [23]. We would eventually like to inquire the relationship between individual consciousness and a higher order entity of consciousness. The study of varying and altered states of consciousness may

provide relevant clues and insights. As we explore a scientifically surprising new world of consciousness, we have reason to expect the unexpected. A most far-reaching scientific inquiry relates to transcendental experiences reported in what has been termed near-death experiences (NDE). Ample evidence of these experiences has been collated. A particularly large collection is available online at the Near-Death Experience Research Foundation [24]. A study in a clinical resuscitation setting has been undertaken by Parnia et. al. [25]. Insights into the phenomenology of these experiences include extensive research undertaken by Greyson [24]. Transcendental experiences of consciousness are real phenomena that begin to make and reveal specific sense under the framework of reality identified by PSR. Corresponding with the way PSR provides a definitive basis for the analysis of quantum physical phenomena, PSR provides guidance for what is real and what is not real in these experiences.

11.4 Continuation of consciousness, pathways for independent observational confirmation of consciousness-brain relationship, NDE as a window for informed research into a realm of consciousness

The inquiry into continuation of consciousness is not only about our most troubling existential worry. It can provide insight into structural and operational characteristics as well as the qualitative nature of a realm of consciousness of which we are part of right now. PSR provides a foundational framework for analyzing otherworldly experiences reported from near-death experiences (NDE). The framework of PSR determines what is real and what is not real in NDE. Conscious experiences in NDE are part of the reality of the PSU. They are real as conscious experiences. This does not mean that whatever is perceived in these experiences is fundamentally real. It means that in these experiences something real is happening in the PSU in the way things can happen in the realm of consciousness. Moreover, NDE offer a pathway for independent observational proof for the brain-consciousness duality predicted by PSR. In continuation of consciousness the activity of an individual PS consciousness eventually persists beyond activity of its MS brain. Some NDE appear to occur already in the absence of any brain activity. The reported experiences of NDE experiencers constitute witness testimony. A clinically demonstrated absence of neural correlates during NDE provides independent MS based observational confirmation of the brain-consciousness duality predicted by PSR. Existing case reports may be reevaluated without prior bias and scrutinized for independent confirmation of brain-consciousness duality. A disciplined evaluation of various aspect in the phenomenology and contexts of occurrence of NDE already suggests that they cannot the result of brain function, Eberhard-Rast [27]. Far-flung out-of-body experiences occurring in some NDE demonstrate visual and perspective information that an individual brain cannot provide to the experiencer. A specific objective consideration for the interpretation of NDE is that our MSU is a resource that strictly follows MS causality as a result of PSC. It means that experiences of unphysical phenomena in a familiar MSU environment do not indicate that the causal physical evolution of MS is magically overcome. In a visual feed from the perspective of an out-of-body experience there is no magical rerouting of perception through human eyes but rather the provision of new independent access into the projection of MS. A different MS based confirmation for brain-consciousness duality may be derived from research into a phenomenon referred to as paradoxical lucidity. Batthyány and Greyson [28] have examined cases where patients who had been suffering from dementia suddenly experience episodes of lucidity shortly prior to death, even in severe and long-lasting cases of dementia. The phenomenon shows the persistence of a lucid individual consciousness beyond apparent damage to the brain. The form of dissociative identity disorder, where alternate conscious minds may alternately use one human brain also has evidentiary implications for the consciousness-brain relationship. Subject only to confirmation of authenticity it demonstrates that one individual conscious mind is not the necessary consequence of one individual human brain. More generally, it can be seen as independent MS based observational evidence that a human brain serves as

a resource for consciousness rather than being the cause for an emergent human conscious mind. For deeper qualitative insight into the realm of consciousness we can begin to apply PSR insights to the phenomenology of NDE and potentially other significant experiences in altered states of consciousness. One important clue for interpretation follows directly from the insight that consciousness uses the MSU as a resource for our individualized consciousness. It means that our consciousness may access resources other than our MSU, provided such otherworldly resources are provided by higher order consciousness. As experiences of transcendental worlds happen in some NDE, we have reason to conduct informed research to develop meaningful insight into their qualitative and structural properties. A particularly meaningful inquiry for us as individual beings is in what experiential form our individual identity may persist in these experiences and more generally the relationship between individual and higher order consciousness. We may investigate the manner of interactions of an individual in otherworldly resources, experiences of transition between resources, and any experiences beyond egoistic perspectives as strictly individualized beings. Authentically reported NDE provide relevant witness testimony. It can provide inspiring evidence for insights and experiential qualities that our minds may not have access to as strictly individualized human beings in MS. We may examine 360-degree experiences of vision beyond the directional focus we are limited to in our perception of MS through our human eyes. We may examine novel types of experiences such as novel feelings, colors, and experiences of oneness with a consciousness beyond the self. We may examine phenomena of instantaneous comprehension which may be available in a simultaneously evolving reality beyond the linear analytical structure through which we develop our understanding of a MS world of classical information. The structural framework of PSR provides us with analytical context for these experiences. Objective analytical and direct experiential pathways can begin to intelligibly inform each other. Beyond qualitative questions of what type of transcendental experiences and resources may lie beyond, the new insights under PSR already point to a procedural characterization of what happens to the individual conscious mind. Transcendental experiences in NDE appear to represent stages in a managed transition of an individual conscious mind in a phase of impending death of the body. As experiencers of NDE return with information that may even include deliberate messages from a world of consciousness beyond our projected MSU, we have reason to expect a scientifically baffling expansion of human understanding into a scientifically unexpected realm of consciousness.

11.5 Structural characteristics reveal MSU related and transcendental purposes of life, transcendental evolution of consciousness

With growing sample size of relevant NDE we can account for what is uniquely realized in our MSU but missing in non-MSU resources. The differential can reveal unique purposes of our existence in MS with its challenging and unforgiving physicality. If the MSU is a purposeful creation by and for consciousness, why is it not more consistently pleasant as some non-MSU worlds experienced in NDE appear to be? The issue of suffering has long been a subject of theology and philosophy. The issue is further pronounced under the findings of PSR where the evolution of our MSU requires exceedingly challenging algorithmic progressions. Initial computational requirements from ordinary physical evolution have stepped up further with the introduction of functional fine differentiation in the first living cells. Another step up can be associated with intense processing activity in evolved brains. Computational requirements for the projection of the strictly causal and finely differentiable structure of our MSU go beyond requirements for pleasant artificial worlds for consciousness to simply enjoy. There is no optionality to have a strictly causal physical world without its physical challenges. The causal physical structure and the capability of individuals to interact positively and negatively in the MSU necessarily includes negative consequences. The apparent purposes of this challenging physical world are ample and manifold. They include all we can be, evolve into, experience, do, create, and develop through our human

existence in the MSU as individuals and as a society. The intriguing questions of purposes and meaning of life have long been contemplated, expressed, and questioned across wide sections of humanity and in individual minds. Under PSR we gain a new scientific perspective to appreciate our unique possibilities available through our lifetime in the MSU. There is no fundamentally real physical space. The MSU is a purposeful projection down to its most basic levels of apparent physicality. Its constructed physicality and functionality are not simply available as consequences of a natural physical world. They are a highly creative and imaginative invention that evolves through mathematical algorithms in the realm of consciousness of a higher order entity. The MSU includes a stunning availability of potential fine functionalities for the development of ever more sophisticated technological advancements of which humanity has only begun to take advantage of. It is an incredibly evolved and precious masterpiece that may be assumed to require substantial higher order conscious effort sustained over eons. PSR points to further fascinating purposes for us as individuals and as an evolving human society. We are part of the evolution of a higher order consciousness. We may emerge into meaningful existence as individuals through our unique conscious interaction with our individual brains in the MSU. The evolution of our individual identities through our experiences presents itself as a key purpose of the MSU. We may fulfill our purposes in an abundance of individual ways through our physical lifetimes and potentially beyond. The strict physicality of the MSU includes that harm can be done against other individuals or against the long-term viability of our planet for consciousness to continue to thrive and evolve. As continuation of an individual experiential identity is part of an overall evolutionary process, there may be negative consequences for overly abusive individuals for a meaningful individualized continuation. The evolutionary capability of consciousness has fascinating implications. Biological evolution in MS under special PSC algorithms already demonstrates a targeted, deliberate process that has characteristics of trial and error. Rather than a predetermined and limited process, evolution presents itself as an open-ended process by and for consciousness to thrive and evolve. Otherworldly resources may not be forever unchanging heavenly worlds. Further innovative enhancements and improvements within a higher order evolution of consciousness may evolve in the future on different levels of the PSU and in ways beyond our imagination. We apparently are part of a mind-bending, open-ended evolution of a higher order consciousness.

11.6 Independent confirmation of fundamental reality of a divine higher order entity of consciousness, god

PSR demonstrates the existential reality of a fundamental PSU. It is identified from fundamental physics and found to be the realm of a higher order entity of consciousness that precedes, initiates, and projects our physical universe. Our physical universe is a creation for consciousness to thrive and evolve. We are looking at an existential reality that has been anticipated in religious beliefs and concepts in philosophy. We realize that as conscious human beings we always had innate access to our ultimate reality in PS beyond analytical comprehension. We are looking at the independent scientific confirmation of a fundamental truth for which we had no prior scientific concept. Beyond scientific nomenclature and conventional physical understanding, the fundamental nature of the PSU can be described and comprehended as spiritual and divine. The higher order entity may be described and comprehended as divine and as god.

11.7 Science, philosophy and a surprising source for ultimate existence and emergence

PSR resolves the mind-boggling problem of initial emergence of our seemingly physical MSU. Our ultimately virtual MSU is not a physical result of some prior physical state. It is instead constructed from something we can imagine to simply exist. It is constructed from a naturally existing potential for mathematics. The mathematics applied in its projection follow an intricate, exceedingly intelligent, and creative logic under PSC rules and algorithms.

They are defined and applied by a higher order entity of consciousness. It is a visionary and targeted approach towards projected results that differentiate on a spectrum of distance scales. Three-dimensional physical space, physical objects in the MSU, their functionalities, and biological life are all results of an inventive approach through evolution under PSC rules and special algorithms. We are provided experiential access to the MSU through our interaction with processes in individual human brains which are proprietary processes of the higher order entity. As conscious beings we are individualized subjects of the higher order entity. The higher order entity has developed an ability to isolate and deploy individualized conscious identities where we live and evolve as individual conscious beings and as part of its divine existence. The isolation and individual connection with our human appearance in the MSU can be described as a divine assignment. Our individual experience of existence, the projection of our physical universe, and the phenomenon of the present time are all direct manifestations of the higher order entity.

A common theological description of an all-knowing and all-powerful god applies to this higher order entity of consciousness in identifiable sense. These deeply confounding attributes have spurred scientific-philosophical skepticism against conceiving an existence of divine reality and furthered its dismissal as an overly convenient explanation for ultimate questions physical science cannot yet answer. Under PSR we can open a yet deeper window into the conceivability and emergence of an all-knowing and all-powerful entity of consciousness. Fundamental consciousness presents itself as the primary form of existence, as physicality itself is artificial. The incredibly sophisticated intelligence in the projection of our MSU together with the phenomenon of, and capacity for, ongoing evolution further suggest that the higher order entity itself has evolved from a basic ground state over eons, if not eternity. It points to a fundamental consciousness that has found ways for mental self-organization and differentiation long before the initiation of the MSU. It has developed imaginative capacities and thoughtful application of logic and mathematics. After all, even our individualized conscious minds undoubtedly possess and mirror these capacities in limited fashion. We are looking at a depth of understanding of ultimate origin that we may have not expected to ever arise from a scientific understanding derived from fundamental physical phenomena.

There is one ultimate philosophical problem remaining. How did original emergence of higher order consciousness happen? Can this ever be understood by human minds, and if so, how? Is there a better source than abstract philosophical reasoning about eternity or maybe some necessary potential? Amazingly, a surprisingly direct source may provide a unique understanding of how original emergence happened. Under PSR, near-death-experiences (NDE) are real as experiences of consciousness in a process managed and projected by higher order consciousness in the PSU (11.4). As experiencers of NDE eventually return into their physical existence, their experiences include information and may include deliberate messages from higher order consciousness that we can begin to scientifically appreciate. A rather common experience in NDE includes a vivid reliving of episodes that happened earlier in the life of the experiencer, referred to in the literature as life review. It often includes additional information beyond the human memory of the experiencer, namely an experienced perception of the feelings and thoughts of the other individuals that were involved in the interaction at the time. In these cases, the higher order entity of consciousness has the capacity to project past life experiences beyond the individual's own experiences to the NDE experiencer. It raises a deeply tantalizing question. If higher order consciousness has the capacity to project past experiences beyond the individuals own, could it also project its own first-hand experience of original emergence as a relived experience of an individual in an NDE? It could serve as a message to humanity that completes and reassures humanity's understanding of divine reality. There is evidence that suggests that this has happened. A unique NDE describes this type of experience in profound, beautiful and instructive ways

[29]. While I add a transcript of the video of the reported NDE for convenience, direct listening may convey deeper comprehension and inspiration for the felt experiences. Their qualitative character lies beyond our familiar human experiences and the ordinary reach of common language. Like in many other NDE the experiences are radically enhanced compared to what we could be able to experience in the short nominal time span in the physical world while the NDE happens in the PSU. Some experiences and insights are reported to occur rather at once than in strictly sequential order. The NDE experienced and reported by Crystal Faith [29] is a vivid experience in distinct phases that occurred in 2000 in a hospital setting during severe childbirth complications and reported periods of 45 minutes of revival attempts and subsequent 8 minutes of apparent physical death [30]. The most relevant phase followed a prior phase in her NDE, that included a beautifully presented reminder that the experiencer (like others) was a divine being. When the prior phase came to an abrupt shock-like ending, she reports experiencing the following (transcribed from video) '... I go into shock. I suddenly find myself in a black space. And I'm in this black space of ABSOLUTELY NOTHINGNESS. There was pure silence the angel sounds were gone. No noise no white noise no frequency waves no energy, no thoughts nothing. I'm surrounded in a 360 view degree room or space that endlessly goes out to all infinite spaces of all, in all directions. It was the absence of light as if almost light can cast a limiting end to where you can go. So I'm in this space and I am just being there. And it was like where the Bible says in the beginning, there was nothing. And you're literally in a state of NOTHINGNESS yet it's EVERYTHINGNESS too. And you feel so calm and relaxed and I sat there in the state for what felt like billions of years. Which is so hard to comprehend in our human bodies today expressing this thought to you. But I felt all of everything before there was anything for a really long time and I'm in this space completely calm. And then suddenly. Just like a pop. While I'm in this velvety black space I felt like a pop and it was like my first thought. I was like wait a minute. I have a me, there's a sense of me. So this is where the divine steps away and becomes something. It becomes aware of oneself. And I popped out and I became aware of my one self and I was like, okay so I have a thought. I can think and I have a sense of me, there's a me here. But I'm just a thought and I can only think like I don't feel like I have a being or a body and I wasn't questioning whether I even did. I just felt like I have a thought. And I sat there in this space for a long time. And every once in a while, it was like a DEEP state of meditation I went like oh yeah, I have a thought. I still I'm here and a whole bunch more time goes by. And then after a while I'm like okay so I wonder what I'm supposed to do here, maybe there should be something going on. So I thought maybe there should be something here so I manifested this spark of color but it wasn't like the bright white space that I had just come from it was like a very stark bright color and it shot across the sky like a shooting star as fast as my perception of it could move. It was like I was watching it and I created this light. And then I'm playing with this ability to create form, to create a light and pretty soon I'm in a firework show a little mini one and I'm like okay I can do that. And I sat there again for a really long time. And then I was like at some point in this I began to question, oh yeah wait a minute I had a life, I just I had a life and now I'm here and I'm going to be infinitely here and I truly believed I was going to be infinitely in this space forever, because I just spent a billion years here ... '. The reported experience of an original emergence includes elements that precisely align with other PSR findings, such as evolution from a ground state and an onset of mental creation. The experience of initial emergence resonates with the understanding of reality under PSR.

12 Wonderful and crucial insights for humanity

The insights into our spiritual reality are confirmation of belief for many of us. They come as a transformational surprise to many other of us who rely on the analytical logic of science to understand the universe and ourselves. We all have reason to celebrate a scientific confirmation of divine reality. There is much more to our conscious existence

than its appearance during our human lifetimes. We are all part of the same divine higher order entity. We play an active role in its purpose to thrive and evolve. The prospect of continuation of consciousness alleviates our most existential worry. We have been given a wonderful opportunity to experience and contribute. It includes our own life experiences and the evolution of our individual identities. It includes positive effects on experiences and evolution of our fellow human beings as well as other contributions to evolutionary advancement of humanity. Reckless and excessively egoistic behavior on individual and group levels do not fit a higher order purpose for consciousness to thrive and evolve. It may impact prospects for a meaningful continuation of personal identity, as each individual is part of a higher order evolutionary process and some NDE relate shedding of aspects of individual personal identity. As human society on this planet today we do not just have room for incremental evolutionary improvement. We face immediate catastrophic failures and long-term existential threats. The evolution of our physical universe, of our planet, our biological species, and our evolution as humanity presents itself as the exceedingly elaborate, precious, and important undertaking of a divine higher order entity. We shall not fail. As we realize who we really are, and what we are here for, we have ever more reason to resolve catastrophic failures and long-term existential challenges. We all have an active role in the evolution of consciousness as individual human beings and as part of human society.

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