

A Bibliography of Selected Articles and Papers that pertain to and support new theoretical directions in quantum physics, general relativity, integrated quantum gravity, also vacuum-energy (dark energy) photon extraction, stable wormholes, and non-classical temporal order and causality.

This list (constant revisions and mainly additions) is considered to be relevant and in many cases supportive of the general themes and directions of Reflexive Topological Dynamics (RTD) and other work within the PRIMUS Institute. These are papers, reports, and articles, spanning from deeply technical to “general-audience” types) that collectively are viewed as providing valuable contributions to an evolving, maturing and scientifically sound understanding of fundamentals in physics and with implications for other sciences including biology and psychology. There is, it will be claimed here, nothing radical or “out of bounds” here, nor in related work that is being conducted by persons involved directly with Primus Institute (a component of The TETRAD Institutes). Some of the connections between works mentioned here with each other, and with implications in particular for quantum physics and general relativity (including “quantum gravity” and fundamental particle physics and cosmology) may seem hard to grasp or fathom, at first glance. However, it is hoped that forthcoming papers and books that are now nearing a point of readiness for distribution and publication, as well as some lectures and presentations, will aid in bridging these gaps of understanding.

There are various implications from such new and emerging foundational physics. These include research, both theoretical and experimental, directed at investigating possible and realistic energy sources that can lead to generation of useful power for propulsion and other technological applications, as well as for long-distance displacement and travel of macroscopic objects in spacetime.

Some of these materials listed here are intended principally for general audience readers, because such education and dialog is very important in physics and in all the sciences. Some of these materials are included and others will be added here, in the interests of open, innovative, and free-from-orthodoxy thinking that will aid in understanding of phenomena which have, heretofore, been challenging to measure, much less to explain within the context of traditionally accepted theories.

Some documents are semi-technical, and many are formal technical papers (as indicated by annotations). Most of the general-audience articles are in basic plain English and with some graphics, explaining a few points about emerging New Physics which all supports, confirms, adds-to, and/or provides some of the basis for all of this including the work within PRIMUS Institute in the field.

There is a concentrated group of research scientists working in these areas, and particularly in the relevant quantum gravity and quantum relativity domains which involve time dilation and macroscopic quantum events. These are persons and groups with whom collaboration is now ongoing or in other cases desirable and/or under development. (As a standard rejoinder and clarification, there is no implication made herein that any author or group listed here is in specific agreement, consensus, support, or other “scientific-political” standpoint with regard to the Institute or to any one position, view or theory expressed herein.)

Note that this is an ongoing document, there are no annotations or comments here, and there is much more to be added. Absence of names and titles does not imply disregard of importance.

[1]

Foundational physics (pre-spacetime / pre-geometry, process algebra, implicate/explicate orders)

<https://arxiv.org/pdf/1211.2107.pdf>

Process, Distinction, Groupoids and Clifford Algebras: an Alternative View of the Quantum Formalism.
B. J. Hiley. TPRU, Birkbeck, University of London, 2012

<https://arxiv.org/pdf/1602.06071.pdf>

The Algebraic Way
BJ Hiley, 2016

<https://arxiv.org/pdf/1901.01979.pdf>

Dirac, Bohm and the Algebraic Approach
B. J. Hiley, G. Dennis, 2019

<https://arxiv.org/pdf/1809.06078.pdf>

Stapp, Bohm and the Algebra of Process
B. J. Hiley, 2018

<https://arxiv.org/pdf/1809.06072.pdf>

The Dirac-Bohm Picture
B. J. Hiley, G. Dennis, 2018

<https://arxiv.org/pdf/1011.4033.pdf>

The Clifford Algebra Approach to Quantum Mechanics B: The Dirac Particle and its relation
Bohm Approach
BJ Hiley, RE Callaghan 2010

<https://arxiv.org/pdf/1011.4031.pdf>

The Clifford Algebra approach to Quantum Mechanics A: The Schrödinger and Pauli Particles.
BJ Hiley, RE Callaghan 2010

<https://pdfs.semanticscholar.org/1773/bd4ddc5c81e01a84fbcdb4bf7c4dafd73210.pdf>

Quantum and Implicate and Self
BJ Hiley

<https://arxiv.org/pdf/1405.4772.pdf>

Bohm's approach and individuality.
Pylkkänen, Hiley and Pattiniemi, 2014

<https://arxiv.org/ftp/quant-ph/papers/0612/0612002.pdf>

Algebraic Quantum Mechanics and Pregeometry
D.J. Bohm, P.G. Davies and B.J. Hiley, 2000

<https://arxiv.org/pdf/1602.06100.pdf>

Delayed Choice Experiments and the Bohm Approach
B. J. Hiley and R. E. Callaghan, 2016

<https://arxiv.org/ftp/arxiv/papers/0711/0711.2973.pdf>

Emergence and Computation at the Edge of Classical and Quantum Systems
Licata

Effective Physical Processes and Active Information in Quantum Computing
Licata

<http://philsci-archive.pitt.edu/8850/1/SilbersteinEtAl2011v2.pdf>

General-audience

[2]

Fundamentals of emergent spacetime and particle physics including macroscopic entanglement

[Semi-general-audience articles]

<https://physicsworld.com/a/quantum-spin-liquid-state-pathway-emerges/>
Quantum spin liquid state pathway emerges

<https://phys.org/news/2018-04-entanglement-near-macroscopic.html>
2018

<https://www.photonics.com/Article.aspx?AID=53136>
Entanglement observed in near-macroscopic objects
Virtual Photons Become Real in a Vacuum

<https://phys.org/news/2018-11-probing-quantum-physics-macroscopic-scale.html>
Probing quantum physics on a macroscopic scale

<https://www.sciencedaily.com/releases/2018/04/180425131858.htm>
Einstein's 'spooky action' goes massive
The elusive quantum mechanical phenomenon of entanglement has now been made a reality in objects almost macroscopic in size

<https://iopscience.iop.org/article/10.1088/1742-6596/1051/1/012019/pdf>
Macroscopic entanglement and time reversal causality by data of the Baikal Experiment (technical paper)
S Korotaev^{1,2}, N Budnev³, V Serdyuk², E Kiktenko^{1,2}, J Gorohov⁴ and V Zurbanov

<https://www.nature.com/articles/s41567-019-0663-9>
Quantum superposition of molecules beyond 25 kDa (technical paper)
Yaakov Y. Fein, Philipp Geyer, Patrick Zwick, Filip Kiałka, Sebastian Pedalino, Marcel Mayor, Stefan Gerlich & Markus Arndt

<https://phys.org/news/2019-03-physicists-reverse-quantum.html>

+

<https://www.sciencealert.com/physicists-have-reversed-time-on-the-smallest-scale-by-using-a-quantum-computer>

+

<https://www.nytimes.com/2019/05/08/science/quantum-physics-time.html>

+

<https://www.nature.com/articles/s41598-019-40765-6.pdf>

Arrow of time and its reversal on the IBM quantum computer G. B. Lesovik¹, I. A. sadovskyy², M. V. suslov¹, A. V. Lebedev^{1,3} & V. M. Vinokur

[3]

Temporal order, time dilation, time reversal, and integration of quantum mechanics with general relativity

<https://www.cnn.com/2019/03/14/world/russia-scientists-reverse-time-scli-scni-intl/index.html>

General-audience article

<https://www.youtube.com/watch?v=0ui9ovrQuKE>

Delayed Choice Quantum Eraser: Shocking Results may show Future Affects Past (video lecture)

<https://phys.org/news/2015-02-big-quantum-equation-universe.html>

No Big Bang? Quantum equation predicts universe has no beginning

<https://arxiv.org/pdf/1404.3093v3.pdf>

Cosmology from quantum potential --- Ali and Das

<https://arxiv.org/pdf/1411.0753.pdf>

Dark matter and dark energy from Bose-Einstein condensate

<https://arxiv.org/pdf/1310.4691v1.pdf>

Time from quantum entanglement: an experimental illustration

=====

All of the following in this section are connected principally with co-authorship team of Zych, Brukner, Costa, Pikovski, et al

[1]

https://www.eurekalert.org/pub_releases/2019-08/uov-qgt082219.php

News Release 22-Aug-2019

Quantum gravity's tangled time

General-audience article

[2]

<https://thenextweb.com/science/2019/10/03/this-quantum-physics-breakthrough-could-be-the-origin-story-for-time-travel/>

General-audience article

[3]

<https://thenextweb.com/science/2019/08/28/this-thought-experiment-explains-how-quantum-computers-can-time-travel/>
General-audience article

Technical papers

[4] ###

<https://www.nature.com/articles/s41467-019-11579-x.pdf>

Bell's theorem for temporal order

Magdalena Zych¹, Fabio Costa¹, Igor Pikovski^{2,3,4} & Časlav Brukner

[5] ###

<https://advances.sciencemag.org/content/advances/3/3/e1602589.full.pdf>

Experimental verification of an indefinite causal order

Giulia Rubino,^{1*} Lee A. Rozema,¹ Adrien Feix,^{1,2} Mateus Araújo,^{1,2} Jonas M. Zeuner,¹ Lorenzo M. Procopio,¹ Časlav Brukner,^{1,2} Philip Walther

[6] ###

<https://arxiv.org/pdf/1712.06884.pdf>

Experimental Entanglement of Temporal Orders

Giulia Rubino^{1*}, Lee A. Rozema¹, Francesco Massa¹, Mateus Araújo², Magdalena Zych³, Časlav Brukner^{1,4}, Philip Walther^{1*}

[7] ##

<https://arxiv.org/pdf/1809.04999.pdf>

Relativity of quantum superpositions

Magdalena Zych,^{1,*} Fabio Costa,¹ and Timothy C. Ralph

[8] ###

<https://iopscience.iop.org/article/10.1088/1367-2630/aa5d92/pdf>

Time dilation in quantum systems and decoherence

Igor Pikovski^{1,2}, Magdalena Zych³, Fabio Costa³ and Časlav Brukner⁴

[9]

<https://arxiv.org/pdf/1206.0965.pdf>

General relativistic effects in quantum interference of photons

Magdalena Zych,¹ Fabio Costa,¹ Igor Pikovski,¹ Timothy C. Ralph,² and Časlav Brukner
Nov 2012

[10] ###

<https://arxiv.org/pdf/1311.1095.pdf>

Universal decoherence due to gravitational time dilation

Igor Pikovski,^{1, 2, 3, 4,*}Magdalena Zych,^{1, 2, 5}Fabio Costa,^{1, 2, 5}and ĀCaslav Brukner¹,
June 2015

[11] ##

<https://arxiv.org/pdf/1508.03296.pdf>

Time Dilation in Quantum Systems and Decoherence: Questions and Answers

Igor Pikovski,^{1, 2}Magdalena Zych,³Fabio Costa,³and ĀCaslav Brukner⁴

Aug 2015

[12]

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6777965/pdf/aax8966.pdf>

Interference of clocks: A quantum twin paradox

Sina Loriani^{*}, Alexander Friedrich^{2*†}, Christian Ufrecht², Fabio Di Pumpo², Stephan Kleinert², Sven Abend¹,
Naceur Gaaloul¹, Christian Meiners¹, Christian Schubert¹, Dorothee Tell¹, Étienne Wodey¹, Magdalena
Zych³, Wolfgang Ertmer¹, Albert Roura², Dennis Schlippert¹, Wolfgang P. Schleich^{2,4,5}, Ernst M. Rasel¹, Enno
Giese²

[13]

<https://arxiv.org/pdf/1607.04022.pdf>

General relativistic effects in quantum interference of “clocks”

M Zych¹, I Pikovski^{2,3}, F Costa¹and ĀC Brukner

July 2016

[14] ##

https://www.researchgate.net/publication/313424051_Quantum_Systems_under_Gravitational_Time_Dilation/stats

2017 PhD thesis/book

[15] ##

<https://arxiv.org/pdf/1612.07735.pdf>

Gravity is not a Pairwise Local Classical Channel

Natacha Altamirano,^{1, 2, *}Paulina Corona-Ugalde,^{3, 2, †}Robert B. Mann,^{1, 3, 2, ‡}and Magdalena Zych

Aug 2018

[16]

<https://arxiv.org/pdf/1906.03980.pdf>

Mass-energy equivalence in harmonically trapped particles

Rebecca Hausteiner,¹Gerard J. Milburn,¹and Magdalena Zych¹

June 2019

[17] ###

Testing collapse mechanisms with high frequency quantum optomechanics

Stefan Forstner¹, Magdalena Zych¹, Sahar Basiri-Esfahaniz, Kiran E. Khosla³, and Warwick P. Bowen¹

Sept 2019

[18] ###

<https://arxiv.org/pdf/1703.00779.pdf>

Reversible time travel with freedom of choice

Ämin Baumeler,¹ 2Fabio Costa,³Timothy C. Ralph,⁴Stefan Wolf,⁵ 2and Magdalena Zych

Oct 2019

[4]

Primarily focused upon quantum (Bohmian) trajectories

<https://arxiv.org/pdf/1706.05757.pdf>

Experimental nonlocal steering of Bohmian trajectories

<https://www.nature.com/articles/s41598-018-30730-0>

Entangled Quantum Dynamics of Many-Body Systems using Bohmian Trajectories

<https://www.nature.com/articles/s41598-018-30730-0.pdf>

<https://advances.sciencemag.org/content/advances/2/2/e1501466.full.pdf>

Experimental nonlocal and surreal Bohmian trajectories

<https://www.fetzer-franklin-fund.org/media/bohmian-trajectories-tumulka-video/>

Bohmian Trajectories as the Foundation of Quantum Mechanics and Quantum Field Theory

Video

<https://demonstrations.wolfram.com/BohmianQuantumTrajectoriesForCoherentStatesOfThePoeschlTelle/>

Bohmian Quantum Trajectories for Coherent States of the Pöschl-Teller Potential

<https://www.sciencedirect.com/science/article/pii/S1631070516300585>

Quantum trajectories of superconducting qubits

https://cnls.lanl.gov/qt/QT_talks/wyatt_overview.pdf

Dynamics of Quantum Trajectories-- Wyatt 2008

<https://arxiv.org/pdf/quant-ph/0010020.pdf>

Quantum Trajectories, Real, Surreal or an Approximation to a Deeper Process
Hiley, Callaghan, Moroney, 2000

[5]

String-net liquids and emergence of order from randomness

<https://physicsworld.com/a/quantum-spin-liquid-state-pathway-emerges/>

Quantum spin liquid state pathway emerges

[general-audience]

=====

Several of the following all pertain to the work of Xiao-Gang Wen and colleagues

<http://arXiv:cond-mat/0404617v2> [cond-mat.str-el] 27 Apr 2004

String-net condensation: A physical mechanism for topological phases

Michael A. Levin and Xiao-Gang Wen

<http://arXiv:cond-mat/0407140v2> [cond-mat.str-el] 23 Sep 2005

Photons and electrons as emergent phenomena

Michael Levin and Xiao-Gang Wen

Quantum ether: photons and electrons from a rotor model

Michael Levin and Xiao-Gang Wen, 2007

Quantum field theory of many-body systems (book)

Xiao-Gang-Wen, 2004

Quantum Information Meets Quantum Matter From Quantum Entanglement to Topological Phase in Many-Body Systems

Bei Zeng, Xie Chen, Duan-Lu Zhou, Xiao-Gang Wen, 2018

Four revolutions in physics and the second quantum revolution– a unification of force and matter by quantum information

Xiao-Gang Wen, 2017

Topological order: from long-range entangled quantum matter to a unified origin of light and electrons

Xiao-Gang Wen, 2012

Dimensional flow and fuzziness in quantum gravity: Emergence of stochastic spacetime

Gianluca Calcagnia, Michele Ronco, 2017

Several of the following all pertain to the work of Andrei Khrennikov and colleagues

<https://www.researchgate.net/publication/314133847>

Emergence of Quantum Mechanics from Theory of Random Field

Andrei Khrennikov

Quantum epistemology from subquantum ontology: quantum mechanics from theory of classical random fields

Andrei Khrennikov, 2014

[6]

Wormhole/Blackhole related including potentials for transmission of information or objects

<https://www.physics-astronomy.org/2018/05/new-research-shows-that-time-travel-is.html>

General-audience

<https://www.rt.com/news/471745-wormhole-theory-how-to-find/>

General-audience

+

<https://journals.aps.org/prd/abstract/10.1103/PhysRevD.100.083513>

Observing a wormhole

De-Chang Dai and Dejan Stojkovic

Phys. Rev. D **100**, 083513 – Published 10 October 2019 [*]

<https://www.rt.com/viral/346164-wormhole-spacecraft-blackhole-universe/>

General-audience

+

<https://iopscience.iop.org/article/10.1088/0264-9381/33/11/115007>

Impact of curvature divergences on physical observers in a wormhole space–time with horizons

Gonzalo J Olmo^{1,2}, D Rubiera-Garcia³ and A Sanchez-Puente¹

Published 28 April 2016 • © 2016 IOP Publishing Ltd

Classical and Quantum Gravity, Volume 33, Number 11 [*]

[7]

Cosmology, Inflation, Bootstrap Theories, Emergence of SpaceTime, Amplituhedrons

<https://www.quantamagazine.org/the-origin-of-time-bootstrapped-from-fundamental-symmetries-20191029/>

General-audience

<https://www.quantamagazine.org/physicists-discover-geometry-underlying-particle-physics-20130917/>

General-audience

https://www.researchgate.net/publication/264826201_Anatomy_of_the_Amplituhedron

Anatomy of the Amplituhedron – 2014

<https://arxiv.org/pdf/1503.08043.pdf>

Cosmological Collider Physics Nima Arkani-Hamed and Juan Maldacena – March 2015

<https://arxiv.org/pdf/1811.00024.pdf>

The Cosmological Bootstrap: Inflationary Correlators from Symmetries and Singularities Nima Arkani-Hamed,¹ Daniel Baumann,² Hayden Lee,³ and Guilherme L. Pimentel² – June 2019

[8]

Extraction (generation, production) of individual photons and potentially multiple sources for useful energy from the “quantum vacuum” (“dark energy”)

[General-audience articles]

<https://phys.org/news/2011-11-scientists-vacuum.html>

<https://www.scientificamerican.com/article/something-from-nothing-vacuum-can-yield-flashes-of-light/>

<https://physicstoday.scitation.org/doi/10.1063/PT.6.1.20190204a/full/>
Negative-energy particles may extract energy from black holes

<https://arxiv.org/pdf/1411.4986.pdf>
Extracting Hidden-Photon Dark Matter From an LC-Circuit (technical paper)

<https://arxiv.org/pdf/1210.6751.pdf>
Exploring quantum vacuum with low-energy photons (technical paper)

<http://inspirehep.net/record/1705081/>
Mechanically generating entangled photons from the vacuum: A microwave circuit-acoustic resonator analog of the oscillatory Unruh effect (technical paper)

<https://arxiv.org/pdf/1811.10065.pdf>
Mechanically Generating Entangled Photons from the Vacuum: A Microwave Circuit-Acoustic Resonator Analogue of the Unruh Effect (technical paper)

Hui Wang (王惠),¹M. P. Blencowe,¹C. M. Wilson,²and A. J. Rimberg^{1,1}Department of Physics and Astronomy, Dartmouth College, Hanover, New Hampshire 03755, USA²Institute for Quantum Computing and ECE Department, University of Waterloo, Waterloo, Canada (Dated: November 27, 2018)

<https://arxiv.org/pdf/1811.07526.pdf>
Experimental investigating communication in a superposition of causal orders (technical paper)

Yu Guo,^{1,2}Xiao-Min Hu,^{1,2}Zhi-Bo Hou,^{1,2}Huan Cao,^{1,2}Jin-Ming Cui,^{1,2}Bi-Heng Liu,^{1,2}*Yun-Feng Huang,^{1,2}Chuan-Feng Li,^{1,2}† and Guang-Can Guo^{1,2}CAS Key Laboratory of Quantum Information, University of Science and Technology of China, Hefei, 230026, People’s Republic of China²Synergetic Innovation Center of Quantum Information and Quantum Physics, University of Science and Technology of China, Hefei, Anhui 230026, People’s Republic of China (Dated: November 20, 2018)

[ADDITIONAL BIBLIOGRAPHIC MATERIALS, and progressively, also annotations, WILL BE ADDED FROM TIME TO TIME TO THIS AND RELATED DOCUMENTS]

Contact:

PRIMUS Institute
contact@tdyn.org
+1 (505) 926-1399
+1 (231) 492-8301