Canadian Society for History and Philosophy of Mathematics
La Société Canadienne d'Histoire et de Philosophie des Mathématiques

Final Program—Annual Meeting
George Brown College—May 31–June 2, 2025
All sessions are scheduled for St. James A, Room SJA340E.

Programme

Saturday, May 31

9:00 AM – 9:15 AM Welcome from CSHPM President Robert Bradley

General Session: Early Modern Mathematics
Presider: Patricia Allaire

9:15 AM – 9:45 AM Henryk Fukś, Brock University
Doubling of cube by Juan Ramón Koenig

9:45 AM – 10:15 AM Larry D'Antonio, Ramapo College
Euler at the Berlin Academy

10:15 AM – 10:45 AM Coffee Break (provided)

10:45 AM – 11:15 AM Robert E. Bradley, Adelphi University
Lagrange's Plan for Transcendental Functions

11:15 AM – 11:45 AM Craig Fraser, University of Toronto
The Principle of Least Action in Mathematical Physics 1740-1900

11:45 AM – 1:30 PM Lunch Break (on your own)

General Session: Geometry at the Turn of the 20th Century
Presider: Robert Bradley

1:30 PM – 2:00 PM Christopher Baltus, SUNY Oswego
Finite Geometry 1847–1905

2:00 PM – 2:30 PM Doug Marshall, Minnesota Center for Philosophy of Science
Purity of Methods, Multiple Determination, and Finite Geometry

2:30 PM – 3:00 PM Coffee Break (on your own)

Special Session: Conceptual Change in Mathematics I
Presider: Nicolas Fillion
This year's Special Session and May Lecture are made possible in part through the financial support of the Federation for the Humanities and Social Sciences.

3:00 PM – 3:30 PM	Francisco Martínez-Aviña, UC Davis *Understanding and progress in mathematics*
3:30 PM – 4:00 PM	Dirk Schlimm, McGill University *Conceptual change and notational change*
4:00 PM – 4:30 PM	David R. Bellhouse, University of Western Ontario Christian Genest, McGill University *The Role of the Dice in the History of Probability*
4:30 PM – 5:00 PM	Gavin Hitchcock, Independent Scholar *George Peacock: Reluctant Revolutionary*

Sunday, June 1

General Session: Mathematics in Interdisciplinary Contexts
Presider: Amy Ackerberg-Hastings

9:00 AM – 9:30 AM	Irina Lyubchenko, George Brown College *Infinity in Art and Mathematics: Kazimir Malevich and His Contemporaries*
9:30 AM – 10:00 AM	Alma McKown *Historiography of Indigenous Mathematics: 1880 to 1920 in the American Southwest*
10:00 AM – 10:30 AM	Thomas Drucker, University of Wisconsin – Whitewater *From Erlangen to Jena*
10:30 AM – 11:00 AM	Coffee Break (on your own)
11:00 AM – 11:30 AM	Dora Musielak, University of Texas at Arlington *Mathematics and the Impulse from Physics: From Abstraction to Application, or Vice Versa?*
11:30 AM – 12:00 PM	Sheldon Richmond, Independent Scholar *Revolutions in Mathematics: A Surd Fantasy?*
12:00 PM – 2:00 PM	**Annual General Meeting** (lunch provided)

2:00 PM – 3:00 PM	**The 2025 Kenneth O. May Lecture** Patricia Blanchette, University of Notre Dame *Proof, Provability and Logical Consequence: A Conceptual History*
3:00 PM – 3:30 PM	Coffee Break (on your own)

Special Session: Conceptual Change in Mathematics II
Presider: Nicolas Fillion

3:30 PM – 4:00 PM	Josh Lalonde *Material and structural set theories from Cantor to Lawvere*
4:00 PM – 4:30 PM	Jean-Pierre Marquis, Université de Montréal *Abstract Structuralism, conceptual change and the continuity of mathematical knowledge*
4:30 PM – 5:00 PM	Amy Ackerberg-Hastings, *MAA Convergence* *Conceptual Change in 19th-Century American Mathematics Education*

Monday, June 2

General Session: Philosophy of Mathematics
Presider: Robert Thomas

9:00 AM – 9:30 AM	Bradley C. Dart, Memorial University of Newfoundland *The Possibilities for Justifying Mathematical Definitions*
9:30 AM – 10:00 AM	Zoe Ashton, The Ohio State University *Two Cases of Epistemic Injustice in Math*
10:00 AM – 10:30 AM	Nicolas Fillion, Simon Fraser University *Backward error analysis beyond numerical mathematics*
10:30 AM – 11:00 AM	Koray Akçagüner, University of Calgary *Criteria for proof selection*
11:00 AM – 11:30 AM	Coffee Break (provided)

General Session: History of Ancient Mathematics
Presider: Craig Fraser

11:30 AM – 12:00 PM	Daniel Mansfield, University of New South Wales, Sydney *Mesopotamian mathematics as an empirical science*
12:00 PM – 12:30 PM	Roger Petry, Luther College at the University of Regina *Boxing the Circle? An Examination of the Dimensions of the Ark of the*

Covenant in Light of Geometric Floor Markings at the Gihon Springs in the City of David (Jerusalem)

12:30 PM – 12:45 PM Closing Remarks by CSHPM Past President Nic Fillion

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Abstracts

Conceptual Change in 19th-Century American Mathematics Education
Amy Ackerberg-Hastings, *MAA Convergence*, aackerbe@verizon.net

Even though the audience for mathematics education in the United States steadily increased throughout the 19th century, the mental discipline justification for teaching mathematics showed remarkable continuity across time, space, and educational level. Yet, subtle differences in pedagogical approaches and content would seem to have been inevitable as subjects such as arithmetic, algebra, and geometry moved from colleges into secondary and primary schools and as student populations expanded with respect to class, gender, race, and other demographic characteristics. This talk will explore the extent to which conceptual change can be observed in 19th-century American textbooks, instructional practices, philosophies of education, and institutions for teacher training.

Criteria for proof selection
Koray Akçagüner, University of Calgary, koray.akcaguner@ucalgary.ca

Mathematical proofs lie at the heart of mathematics, yet the standards for what constitutes a proof have evolved significantly over time. Historically, proofs have ranged from geometric diagrams to algebraic formulations, and today, formalized and computerized proofs are becoming increasingly popular. These changes are not purely mathematical; they reflect deeper philosophical debates and value judgments. My research examines the criteria used to evaluate proofs—truth, validity, understanding, generality, and elegance—arguing that these criteria function as values rather than rigid rules, with their meaning and weight open to interpretation. This perspective suggests that there is no mathematical proof to determine whether something is a proof; rather, such decisions are made based on these interpretive criteria. In this talk, I will explore this view, elucidate the criteria, and provide examples of proofs to demonstrate their application.

Two Cases of Epistemic Injustice in Math
Zoe Ashton, The Ohio State University, ashton.95@osu.edu

Epistemic injustice is a kind of injustice that harms a person in their capacity as a knower. This focus of this talk is to discuss a few ways that epistemic injustice can occur when judging a proof. To do so, I'll identify two cases of epistemic injustice related to rigor. Our first example involves Sophie Germain's contributions to elasticity theory. In the first case, the purported proofs did lack rigor by contemporary and modern standards. But examination of why the proofs lacked rigor reveals an important dimension of rigor acquisition. I'll argue that, because of epistemic injustice that keeps her from having consistent interlocutors, Germain is barred from obtaining an adequate concept of rigor. The second example is drawn from Grete Hermann's work on quantum theory. In this second case, her rigor judgments were in line with modern and contemporary standards. But her work was not recognized for this until many years afterward. I'll argue that both women suffered from an epistemic injustice related to rigor.

Finite Geometry 1847–1905

Christopher Baltus, SUNY Oswego, christopher.baltus@oswego.edu

College geometry classes that any of us remember have included examples of finite geometries. This is actually a rather recent development in the long history of the study of geometry. Examples appeared in the latter half of the nineteenth century. It can be viewed as part of three trends in mathematics at the time: attention to foundations, i.e., the assumptions that form the basis of the subject we study; abstraction in mathematics, as parts of the subject move farther from daily experience; and the development of algebraic structures. The talk will note work of von Staudt, 1847 and 1856; of Theodor Reye, 1877; of Gino Fano, 1892; Heinrich Weber, 1896; Oswald Veblen and W. H. Bussey, 1905.

The Role of the Dice in the History of Probability

David R. Bellhouse & Christian Genest, University of Western Ontario & McGill University, drbell@uwo.ca & christian.genest@mcgill.ca

The early development of probability theory has been influenced by the throw of dice. However, dice have been thrown since ancient times, while the first known calculation for the outcomes of the throw of three dice dates from the mid-thirteenth century. We examine the conceptual changes that took place between the ancient and medieval worlds regarding the throw of dice. Based on a study of archaeological data and written source material, we examine various notions around dice (both *tesserae*, or six-sided dice, and *tali*, four-sided dice made from the anklebones of sheep) from the Roman era. Based on the Roman perception of the world and our empirical study, we conclude that Roman society most likely had no access to a concept leading to numerical probability calculations. The first known numerical calculations on dice were made circa 1260 CE in the manuscript *De vetula*, probably written by Roger Bacon. At about the same time, Alfonso X of Spain commissioned a manuscript on games, *Libro de los juegos*. We argue that the conceptual changes in these manuscripts reflect the perceived changing role of fate in the throw of dice, and the empiricism and mathematical abilities of Bacon and his Islamic predecessors.

Proof, Provability and Logical Consequence: A Conceptual History

Patricia Blanchette, University of Notre Dame, Patricia.Blanchette.1@nd.edu

This talk examines some significant changes in the concepts of proof, of provability, and of logical consequence over a long period of time, from Euclid to Hilbert. The focus will be on the role played by these concepts in the axiomatisation of mathematical theories, and on the interaction between the concepts themselves and the formalisms developed to treat them. I'll make a case for the claim that some significant conceptual changes have indeed taken place in these core notions, and that these have, in part, to do with the development of formal logical tools (formal languages, systems of proof, and models). I hope to make it clear that the tools have not just been ways of bringing rigor to the logical investigation of axiomatic theories, but that they have also driven some significant conceptual change. I'll also claim that an understanding of the history of these concepts can help us to understand better the philosophical topic of the nature of logical consequence and some of its proposed analyses.

Lagrange's Plan for Transcendental Functions

Robert E. Bradley, Adelphi University, bradley@adelphi.edu

In 1772, Joseph Louis Lagrange proposed in the journal of the Berlin Academy that ``the theory of the expansion of functions into series contains the true principles of the differential calculus." He further elaborated this proposed foundation, which rejected both infinitely small quantities and the use of limits, in his *Théorie des Fonctions Analytiques* (1797). In 1748, Euler had derived the series for the exponential, sine, and cosine functions without the explicit of the differential calculus, but his derivation had relied on infinitesimals; if Lagrange's program was to succeed, he needed to find derivations that relied only on ``the algebraic analysis of finite quantities." We survey Lagrange's successes and shortfalls in this enterprise.

Euler at the Berlin Academy

Larry D'Antonio, Ramapo College, ldant@ramapo.edu

In this talk, we discuss the recruitment of Leonhard Euler to the Berlin Academy in 1741 by Frederick the Great and his accomplishments over 25 years in Berlin. We pay particular attention to Euler's position within the structure of the Berlin Academy; namely, the classes of experimental philosophy, mathematics, speculative philosophy, and belles-lettres. The historian Wilhelm Dilthey refers to the "two rivers" of the Berlin Academy, the French Newtonians and German Wolffians. We will look at how Euler navigated these rather turbulent waters.

The Possibilities for Justifying Mathematical Definitions

Bradley C. Dart, Memorial University of Newfoundland, bdart@mun.ca

Formally speaking, a definition is a kind of axiom (Suppes, 1957; Srivastava, 2008). Therefore, if axioms constitute part of our mathematical knowledge, then so do definitions, and if we know that some definitions (or axioms) are true, their justification needs to take some form other than being proven. A starting point is provided by Leibniz, for whom a real definition (i.e. one which we can use in demonstrations) requires the possibility of its satisfaction. The non-emptiness of a defined concept and the existence and uniqueness of a defined object are also required for Frege, and Poincare (1903/1902) indicates that a definition is justified by showing that it is free from contradictions. Frege also claims that a definition is 'established' if it is tractable in proofs and if it reveals connections which lead to "an advance in order and regularity" (1884/1950, p. ix). This points to the role of theoretical virtues like naturalness and fruitfulness (Tappenden, 2008) in justifying definitions, as well as an appeal to their explanatory or unifying power. In a similar vein, Park's (2021) argument that the axiom of choice can be justified using abduction, opens the same possibility for definitions.

References

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Park, Woosuk. "On Abducing the Axioms of Mathematics." In *Abduction in Cognition and Action: Logical Reasoning, Scientific Inquiry, and Social Practice*, edited by John R. Shook and Sami Paavola, pp. 161-176. Studies in Applied Philosophy, Epistemology, and Rational Ethics, Volume 59. Switzerland, Springer: 2021.

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From Erlangen to Jena

Thomas Drucker, University of Wisconsin–Whitewater, druckert@uww.edu

This year we are marking the centenaries of the deaths of both Felix Klein and Gottlob Frege. Both have proved to be influential, the former because of his position at Gottingen as well as his celebrated Erlangen program, the latter thanks to his efforts to better understand the foundations of arithmetic and geometry. This talk will look at the way Frege responded to the Erlangen program, in particular, and to Kleinian developments in geometry.

Backward error analysis beyond numerical mathematics

Nicolas Fillion, Simon Fraser University, nfillion@sfu.ca

Applied mathematics relies on an ability to find solutions that, although not exact, are found to be satisfactory. Error analyses are required in order to conclude that an inexact solution is satisfactory, or "approximately true". Such error analysis can be performed in many different ways: a priori, a posteriori, forward, backward, using residuals, etc. It is broadly believed that backward error analysis is "a method for assessing the quality of numerical programs in the presence of floating-point rounding errors." This paper argues that it is by no means limited to numerical mathematics, and in fact is a general framework that is a prerequisite for *thinking* about approximation. I will illustrate the point by applying this style of analysis to perturbation methods.

The Principle of Least Action in Mathematical Physics 1740-1900

Craig Fraser, Institute for the History and Philosophy of Science and Technology, University of Toronto, craig.fraser@utoronto.ca

Variational principles in classical mechanics offer an alternative formulation of the basic laws of dynamics different from the usual Newtonian one that is given in terms of forces and accelerations. They also provide a body of mathematical methods from the calculus of variations to develop the theory. Figures historically associated with variational principles are Maupertuis, Lagrange, Hamilton, Jacobi and Poincaré, among others. The best-known variational principles are the principle of least action and Hamilton's principle.

The presentation examines the historical genesis, logical role and scientific utility of variational principles, from Maupertuis to Poincaré. Attention will be focused on the way in which these principles opened new theoretical vistas and provided novel methods of solution and proof.
The teleological character of the principle of least action has been of interest from its original formulation by Maupertuis in the 1730s right up to the present. While teleological questions will not be explored in the present paper, it should be noted that they remain a subject of ongoing discussion and philosophical interest.

Readings

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Doubling of cube by Juan Ramón Koenig

Henryk Fukś, Brock University, hfuks@brocku.ca

One of the earliest mathematical treatises published in the Americas is the work of Juan Ramón Koenig (1623–1709), titled "Cubus et sphaera geometrice duplicata" and published in Lima in 1696. The author, who was the Chief Cosmographer of the Viceroyalty of Peru and professor of mathematics at San Marcos University, claimed in this book to solve the classical problem of doubling the cube by compass and straightedge only. His idea was to start from the neusis solution of this problem given by Nicodemes and transform it into compass and straightedge construction. We know today that cube root of 2 is not a constructible number, thus Koenig's solution has to be faulty, yet so far nobody has analyzed Koenig's work in detail to show where and how he has failed. To fill this gap, by scrutinizing his construction step by step, I will reveal the reason for his failure and discuss other aspects of the story of "Cubus" and of Koenig's life.

George Peacock, Reluctant Revolutionary

Gavin Hitchcock, Independent Scholar, aghitchcock@gmail.com

Between 1830 and 1860, centred upon Cambridge, a transition took place from the world of (arithmetical) algebra, via the birth of ‘symbolic algebra’, to a cosmos of concrete structures explicitly recognised by the British mathematicians as new algebras. A major catalyst was the publication of George Peacock's *Algebra* (1830), which provoked puzzlement, excitement and controversy, and was marked by almost comical hesitancy and trepidation on the part of the author. A quite different transition was taking place simultaneously across the Channel in a Continental setting -- the well-known Cauchy-initiated revolution in rigour. Judith Grabiner has argued that the latter bears all the marks of a Kuhnian revolution in science. How far is this also true of the conceptual shift initiated by Peacock's school of British symbolic algebraists? They came to see and talk about symbolic expressions in a radically new way and ask entirely new questions about them that would later redefine mathematics itself. Why was this transformation of perceptions, that would lead ultimately to formal, ‘pure’, ‘free’ mathematics, achieved by the British, passionately concerned with underlying meaning and conceptual clarity? Why was it others who went on to complete the separation of form from matter and make the leap into true abstract algebra? Why were the new non-arithmetical algebras more quickly received in Britain than the new non-Euclidean geometries were anywhere, though involving equally radical conceptual change?

Material and structural set theories from Cantor to Lawvere

Josh Lalonde, josh_lalonde@outlook.com

Benacerraf famously pointed out that in the standard set-theoretical “implementations” of the natural numbers such as those proposed by Zermelo and von Neumann, questions such as whether 3 is an element of 7 must be decided, even though they are completely irrelevant to the use of natural numbers by the “working mathematician”. Similar considerations have motivated the development of various structural (as opposed to material) set theories in which such abstruse questions would not arise. The most prominent proponent of a structural approach to set theory, F. William Lawvere, makes the surprising assertion that such a conception of sets is already to be found in Cantor, although he is usually taken to be the progenitor of the material set theories developed by Zermelo and others in the early 20 th century. I will attempt to elucidate

Lawvere’s rather compressed exposition of his interpretation of Cantor and to explain how the conceptual change brought about by category theory, and especially by the adjoint functor concept, allowed Lawvere to shine a new and surprising light on Cantor’s work.

Infinity in Art and Mathematics: Kazimir Malevich and His Contemporaries
Irina Lyubchenko, George Brown College, irina.lyubchenko@georgebrown.ca

This paper explores the concept of the infinite in the art and writings of Kazimir Malevich, an important historical avant-garde artist, whose 1915 painting *Black Square* and the white paintings of 1918-1919 grappled with representation of infinity. Artists often respond to scientific and technological ideas of their time. To understand Malevich's conception of the infinite, this paper undertakes a comparative analysis of this artist's art and writings and the works of his contemporaries, the mathematicians Nikolai Luzin, Dmitri Egorov, and Pavel Florensky, who wrestled with the implications of set theory. At the basis of their work was an aspiration similar to Malevich's --- to attain the knowledge of the infinite. This paper considers the aforementioned mathematicians' and Malevich's projects as reactions against the crisis of modern reason expressed in mathematical and visual languages, respectively.

Mesopotamian mathematics as an empirical science
Daniel Mansfield, University of New South Wales, Sydney, daniel.mansfield@unsw.edu.au

Mesopotamian mathematics was an empirical science that was understood through evidence and experience rather than axioms and theorems. For instance, for the rectangle with diagonal 5 and sides 4 and 3 we can verify that the square of the diagonal equals to the sum of the squares of the sides. By verifying this relation across a variety of Pythagorean triples, Mesopotamian mathematicians came to understand that this relation applied to all rectangles in general. This talk discusses how viewing Mesopotamian mathematics as an empirical science changes the way we understand certain mathematical artefacts from this period, and raises the possibility that some level of deductive reasoning was also known at the time.

Abstract Structuralism, conceptual change and the continuity of mathematical knowledge
Jean-Pierre Marquis, Université de Montréal, jean-pierre.marquis@umontreal.ca

One of the most important drivers of conceptual change in mathematics is the process of abstraction. In this talk, I will focus on the process of *structural* abstraction as it has developed over the last century. Although this process introduces radical shifts in the organization and practice of mathematics, mathematicians ensure that classical results can still be proved using these new concepts, thereby maintaining continuity in the development of mathematical knowledge. I will illustrate this phenomenon with a specific case: the well-known Stone duality, as it was initially proved and later reconceptualized within the framework of category theory. An interesting aspect of this example is that the new proof is *not* simpler than the classical proof, which is often considered one of the main virtues of reconceptualizing at a higher level of abstraction. So, what is the gain? I will sketch some of the benefits in the final part of my talk.

Purity of Methods, Multiple Determination, and Finite Geometry

Doug Marshall, Minnesota Center for Philosophy of Science, dmarshall@dmarshall.net

For decades mathematicians have attempted to provide a purely geometric proof of Veblen and Bussey's theorem (that every finite Desarguesian projective plane is Pappian). What would be accomplished by finding such a proof? The literature on purity of methods in mathematics offers some possible answers: that the discovery of a purely geometric proof would reveal the objective grounds of the truth of the theorem (Bolzano, 1810); or that it would offer a stable solution to the problem that the theorem resolves (Detlefsen and Arana, 2011). In this paper, I wish to discuss these answers and to suggest alternatives. First, the discovery of a purely geometric proof would give mathematicians an independent proof of Wedderburn's little theorem (that every finite division ring is a field). Second, it would provide a type of robust support for Veblen and Bussey's theorem that is analogous to what philosophers of science call "multiple determination".

Understanding and progress in mathematics

Francisco Martínez-Aviña, UC Davis, fnma@ucdavis.edu

Penelope Maddy's account of mathematical progress (2000) seems to exclude reproofs of solved problems as tokens of mathematical progress. As Weisgerber (2022) notes, this is extremely restrictive, especially given how reproving old theorems is often seen as a valuable practice in most, if not all, areas of mathematics. However, on Weisgerber's account, the value of such reproofs is mostly taken as non-epistemic, since it comes from "aesthetic or pedagogical and other social reasons" (2022, p. 24). In the first part of this talk, I will argue that, to the extent that a reproof can be *more explanatory* than the original proof of a given theorem, there should be no doubt that reproofs can also have epistemic value. Reproofs may not generate new knowledge, but they can improve our *understanding* of a given problem, and thus contribute to mathematical progress. In the second part of the talk, I will argue that, in a similar way, the development of new mathematical concepts might not yield new knowledge by itself, but it can lead to new understanding of old problems. I will illustrate this with two cases from the history of algebraic geometry, the introduction of the concepts of *scheme* and *topos* by Grothendieck.

Historiography of Indigenous Mathematics: 1880 to 1920 in the American Southwest

Alma McKown, asmckown@gmail.com

Indigenous mathematics in the American Southwest remains under-studied despite the region's rich archaeological remains, vibrant traditions, and proximity to Mesoamerican mathematical heritage. This neglect can be traced to the research processes of early anthropologists and historians between 1880 and 1920. John Wesley Powell, director of the Bureau of Ethnography, played a significant role in this omission. Influenced by Henry Lewis Morgan's social evolutionism, Powell's leadership and editorial style suppressed investigations into Indigenous mathematics. Ethnographers were pressured to align their findings with his framework, disregarding Indigenous number systems and geometry. Simultaneously, early historians of mathematics, David Eugene Smith and Florian Cajori, sought a global history of mathematics but excluded Indigenous contributions from their own continent. Their adherence to a linear, evolutionary view dismissed Indigenous mathematics as unsophisticated and unworthy of study. The legacy of Powell, Smith, and Cajori established a paradigm that excluded Indigenous mathematics from the fields of anthropology and history. This systemic disregard has perpetuated the marginalization of Indigenous mathematical traditions, leaving a critical gap in our understanding of mathematical histories in the American Southwest.

Mathematics and the Impulse from Physics: From Abstraction to Application, or Vice Versa?

Dora Musielak, University of Texas at Arlington, dora.musielak@uta.edu

Is mathematics eternally existing, the manifestation of truths inherent in the structure and beauty of the universe? Or is mathematics a human created language adapted to certain outcomes prescribed by our own observations? These questions have been asked many times, and they become more intriguing and challenging when dealing with quantum mechanics (QM) and special relativity (SR) theories.

I argue that QM and SR, which are indisputable valid mathematical theories, are unrelatable and are based on mathematical reformulations to fit abstractions and model experiments. Because neither theory is compatible with our human sensorial perceptions, I contend that they are subject to physical misunderstanding and mathematical biased interpretation, leading to other deep questions as yet unanswered. For example, QM cannot explain how matter is created from energy. Quantum field theory (QFT) postulates that matter creation in the vacuum results from a process that converts *virtual particles* into real particles—implying that virtual particles (which cannot be detected) pre-exist in the vacuum. But if the vacuum is an empty space (as assumed in SR), how can something come out from nothing?

I examine QM equations (Schrödinger, Heisenberg, Dirac) to support my arguments, with consequences for philosophical interpretation and connections to reality.

Boxing the Circle? An Examination of the Dimensions of the Ark of the Covenant in Light of Geometric Floor Markings at the Gihon Springs in the City of David (Jerusalem)

Roger Petry, Luther College at the University of Regina, Roger.Petry@uregina.ca

In 2010 a temple was excavated in Jerusalem near the Gihon Springs dating from the 18th c BCE and subsequently covered by King Hezekiah during his religious reforms of the 8th c BCE. Containing several rooms (one with a stone monument (*matzevah*), an altar room, and a small olive press used to produce oil for priestly rites), a final storage room for sacred objects (*genizah*) was excavated in 2011. This revealed a mysterious assortment of geometric shapes etched into the bedrock floor: a point, line, various v-shapes, and other geometric figures (e.g., a rectangle and circle). One of the archaeologists, Eli Shukron, sufficiently puzzled by these markings even invited public input on their meaning.[1] Based on subsequent site excavation and scriptural analysis, Shukron contends that adjacent to this room was the likely location of the tent containing the Ark

[1] Lidman, Melanie. “Thousands suggest explanations for ancient J'lem carvings.” *Jerusalem Post*. Dec. 9, 2011. https://www.jpost.com/national-news/thousands-suggest-explanations-for-ancient-jlem-carvings

of the Covenant, supposedly brought to Jerusalem by King David (ca 10th-9th c BCE) and later moved to his son Solomon's temple.[2] This paper uses a grounded philosophical approach to interpret these floor markings and their possible connection to the dimensions given for the Ark in Exodus (25:17). The findings include a surprisingly accurate measure for π within the Ark itself.

Revolutions in Mathematics: A Surd Fantasy?

Sheldon Richmond, Independent Scholar, askthephilosopher@gmail.com

Do revolutions occur in mathematics? Karl Popper, Imre Lakatos and Joseph Agassi subscribed to the view that in the history of both ancient mathematics, early modern mathematics, as well as recent mathematics, revolutions occur. Contrarily, I argue that mathematics is a continuum in terms of the main problem of mathematics. I propose that the main problem of mathematics has endured since the time of Plato until today through to Stephen Cook. Let's start with Stephen Cook and then go backwards in time. Stephen Cook's paper of 1971 seemed to turn computationally based mathematics on its head: "The Complexity of Theorem-Proving Procedures". Cook's problem, the P vs NP problem, is: the answer to the question, "can there be an algorithm to determine whether any polynomial equation or computer program, also a polynomial equation, will come to a stop or not?", is no. Versions of this problem have been discussed throughout history by George Polya, the Russell-Frege epistolary exchange, David Hilbert, Henri Poincaré, the Dedekind-Cantor exchange, Leonhard Euler, Euclid, Plato, Pythagoras. The problem comes down to: how do mathematical proofs go?

Conceptual change and notational change

Dirk Schlimm, McGill University, dirk.schlimm@mcgill.ca

Two contradictory claims can be found in the literature regarding the relation between conceptual and notational change in mathematics: One the one hand, according to the "concepts first", or derivative, view changes in notation follow conceptual innovations. On the other hand, according to the "notations first" view purely syntactic developments can be an engine for driving conceptual change. As I shall illustrate in this talk, there are episodes in the history of mathematics that support each of these views. Thus, I argue that the above dichotomy is an artificial one and that a more nuanced attitude should be taken towards mathematical notations to do justice to the intricacies of mathematics as it is practiced.

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[2] Shukron, Eli and Yoel Bin-Nun. "A Matzevah Temple from the Period of the Patriarchs in the City of Salem, Later the City of David." https://www.k-etzion.co.il/Eli-Shukron-and-Yoel-Bin-Nun--A-Matzevah-Temple-from-the-Period-of-the-Patriarchs-in-the-City-of-Salem,-Later-the-City-of-David