

Explanatory summary of my work

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Newest.....	1
1. On Relativity	1
2. On Mathematics	3
a. nD complex number and orientation.....	4
b. Uncountability.....	4
3. On electromagnetism.....	6
c. Proposed alternative laws.....	6
d. Intuitive paradoxes.....	7
e. Analytic computations of the self force of triangular coil	8
f. Numerical computation.....	8
g. Experiments	8
h. Macroscopic Aharonov–Bohm effect	9
i. Other studies	10
j. Incorrect studies	10

Note: the titles contain 2 links, the first points to the article stored on Academia, the second to the article stored on Blogspot

Newest

Kuan Peng, 2023, « [From Coulomb's force to magnetic force](#) and [experiments that show magnetic force parallel to current](#)»

https://www.academia.edu/106863205/From_Coulombs_force_to_magnetic_force_and_experiments_that_show_magnetic_force_parallel_to_current

The Lorentz force law is fundamental for electromagnetism. However, it is known long ago that the Lorentz forces between two current elements do not respect the Newton's third law. This seemingly harmless flaw had never been corrected. In physical sciences a discrepancy often hides in it new understanding or unexpected breakthrough. For solving this problem, we give a purely theoretical derivation of magnetic force which respects the Newton's third law in the case of current elements and is identical to the Lorentz force in the case of coils. This new law reveals how electric force is transformed into magnetic force by velocity and is supported by experimental evidences that we will explain and compute with the new law.

1. On Relativity

Kuan Peng, « [Trajectory of 'Oumuamua and wandering Sun, alien asteroids and comets detected by SOHO](#) »

https://www.academia.edu/100818112/Trajectory_of_Oumuamua_and_wandering_Sun_alien_asteroids_and_comets_detected_by_SOHO
<https://pengkuanonphysics.blogspot.com/2023/04/trajectory-of-oumuamua-and-wandering.html>

The apparent non-gravitational acceleration the extra-solar-system 'Oumuamua exhibits is puzzling. We find that when the position and velocity of the Sun is correctly set in computing the predicted orbit, 'Oumuamua's trajectory can be explained with gravity and we have reproduced the unexpected gap by computation. We also propose to search for new extra-solar-system high speed asteroids with SOHO to check our method with their trajectories.

Kuan Peng, « [What is the thickness of the event horizon of a black hole?](#)»

https://www.academia.edu/85298332/What_is_the_thickness_of_the_event_horizon_of_a_black_hole
<https://pengkuanonphysics.blogspot.com/2022, /08/what-is-thickness-of-event-horizon-of.html>

Kuan Peng, «[How galaxies make their rotation curves flat and what about dark matter?](https://www.academia.edu/46903516/How_galaxies_make_their_rotation_curves_flat_and_what_about_dark_matter?)»

The rotation curves of disc galaxies are flat and dark matter is speculated as explanation. Alternatively, the gravity of material disk could explain the flat curves. Using the gravitational force that a disk exerts on a body in the disk, we have computed the rotation curves of disc galaxies and the curve of their mass densities. The numerical result fits the flat curves and the observed mass densities of galaxies. This theory gives a new way to measure the masses of galaxies using their rotation velocities and shape.

https://www.academia.edu/46903516/How_galaxies_make_their_rotation_curves_flat_and_what_about_dark_matter
<https://pengkuanonphysics.blogspot.com/2021/04/how-galaxies-make-their-rotation-curves.html>

Kuan Peng, «[Gravitational time dilation and black hole](https://www.academia.edu/45434676/Gravitational_time_dilation_and_black_hole)»

In this article, we derive the gravitational time dilation factor in a new manner, which allows us to identify the mathematical cause of Schwarzschild radius, to give a theoretical way to avoid it and to compute properties of black hole. General relativity effects are computed as simple as in special relativity. Observability of black hole is discussed.

https://www.academia.edu/45434676/Gravitational_time_dilation_and_black_hole
<https://pengkuanonphysics.blogspot.com/2021/03/gravitational-time-dilation-and-black.html>

Kuan Peng, «[Analytical equation for Space-Time geodesics and relativistic orbit equation](https://www.academia.edu/44540764/Analytical_orbit_equation_for_relativistic_gravity_without_using_Space_Time_geodesics)»

This article exposes an analytical orbit equation for relativistic gravity and explains how it is derived without Space-Time geodesics.

https://www.academia.edu/44540764/Analytical_orbit_equation_for_relativistic_gravity_without_using_Space_Time_geodesics
<https://pengkuanonphysics.blogspot.com/2020/11/analytical-orbit-equation-for.html>

Kuan Peng, 2021, «[Relativistic dynamics: force, mass, kinetic energy](https://www.academia.edu/49921891/Relativistic_dynamics_force_mass_kinetic_energy_gravitation_and_dark_matter), gravitation and dark matter»

https://www.academia.edu/49921891/Relativistic_dynamics_force_mass_kinetic_energy_gravitation_and_dark_matter
<https://pengkuanonphysics.blogspot.com/2021/07/relativistic-dynamics-force-mass.html>

Special relativity does not deal with acceleration, general relativity does not deal with non gravitational acceleration, which leave the theory of relativity imperfect. We will demonstrate some relativistic dynamical laws that specify relativistic acceleration, force and kinetic energy. Also, based on equivalence principle does gravitational mass vary with inertial mass?

Kuan Peng, «[Relativistic kinematics](https://www.academia.edu/44582027/Relativistic_kinematics)»

The erroneous part of the initial version is suppressed

https://www.academia.edu/44582027/Relativistic_kinematics
<https://pengkuanonphysics.blogspot.com/2020/11/relativistic-kinematics.html>

Like in Newtonian kinematics, the relativistic change of reference frame must be a vector system of transformation laws for position, velocity and acceleration.

Kuan Peng, «[Relativistic kinematics and gravitation](https://www.academia.edu/42973353/Relativistic_kinematics_and_gravitation) (initial version)»

The part concerning gravitation is erroneous

https://www.academia.edu/42973353/Relativistic_kinematics_and_gravitation
<https://pengkuanonphysics.blogspot.com/2020/05/relativistic-kinematics-and-gravitation.html>

Like in Newtonian kinematics, the relativistic change of reference frame must be a vector system of transformation laws for position, velocity and acceleration.

Kuan Peng, «[Time-rate change in relatively moving frames](https://www.academia.edu/44018092/Time_rate_change_in_relatively_moving_frames)»

To clearly explain the contradiction between the constant flow of ticks delivered by clocks and the relativistic time dilation

https://www.academia.edu/44018092/Time_rate_change_in_relatively_moving_frames
<https://pengkuanonphysics.blogspot.com/2020/09/time-rate-change-in-relatively-moving.html>

Kuan Peng, «[Explaining Oumuamua and Pioneer anomaly using Time relativity](https://www.academia.edu/42992055/Explaining_Oumuamua_and_Pioneer_anomaly_using_Time_relativity)»

https://www.academia.edu/42992055/Explaining_Oumuamua_and_Pioneer_anomaly_using_Time_relativity

The part concerning gravitation is erroneous

Like in Newtonian kinematics, the relativistic change of reference frame must be a vector system of transformation laws for position, velocity and acceleration.

Kuan Peng, «[Oumuamua, Pioneer anomaly and solar mass with Time Relativity](https://www.academia.edu/42871661/Oumuamua_Pioneer_anomaly_and_solar_mass_with_Time_Relativity)»

https://www.academia.edu/42871661/Oumuamua_Pioneer_anomaly_and_solar_mass_with_Time_Relativity

The part concerning gravitation is erroneous

The theory of Time relativity explains well the weird behavior of the interstellar object 'Oumuamua.

Kuan Peng, «[Velocity, mass, momentum and energy of an accelerated object in relativity](https://www.academia.edu/42616126/Velosity_mass_momentum_and_energy_of_an_accelerated_object_in_relativity)» .

https://www.academia.edu/42616126/Velosity_mass_momentum_and_energy_of_an_accelerated_object_in_relativity

Analytical derivation of relativistic velocity, mass, momentum and kinetic energy of an accelerated object.

Kuan Peng, «[Time relativity transformation of velocity](https://www.academia.edu/42263461/Time_relativity_transformation_of_velocity)» .

https://www.academia.edu/42263461/Time_relativity_transformation_of_velocity

Relativistic transformation of velocity creates a discrepancy. A discrepancy-free transformation of velocity is derived using the Time relativity transformation of coordinates.

Kuan Peng, « [Time relativity transformation of coordinates](https://www.academia.edu/42129223/Time_relativity_transformation_of_coordinates) »

https://www.academia.edu/42129223/Time_relativity_transformation_of_coordinates

Without length contraction, time relativity transformation solves paradoxes and explains incongruent relativistic experiments

Kuan Peng, « [Discrepancy of length contraction](https://www.academia.edu/42024817/Discrepancy_of_Object_contraction) »

https://www.academia.edu/42024817/Discrepancy_of_Object_contraction

Drawing relativity <https://pengkuanonphysics.blogspot.com/2020/02/drawing-relativity.html>

Kuan Peng, « [Length, distance and Michelson–Morley experiment](https://www.academia.edu/41972922/Length_distance_and_Michelson-Morley_experiment) »

https://www.academia.edu/41972922/Length_distance_and_Michelson-Morley_experiment

There are 2 types of length contraction: Object contraction and Distance contraction. Each has a different physical meaning.

Kuan Peng, « [Analysis of Einstein's derivation of the Lorentz Transformation](https://www.academia.edu/41712834/Analysis_of_Einsteins_derivation_of_the_Lorentz_Transformation) »

https://www.academia.edu/41712834/Analysis_of_Einsteins_derivation_of_the_Lorentz_Transformation

Einstein's derivation of the Lorentz Transformation is purely theoretical. This study shows how it is related to the physical phenomenon of time dilation and length contraction.

Kuan Peng, « [Synchronizing moving GPS clocks](https://www.academia.edu/40876793/Synchronizing_moving_GPS_clocks) »

https://www.academia.edu/40876793/Synchronizing_moving_GPS_clocks

Relativity of simultaneity destroys synchronization of GPS satellites

Kuan Peng, « [Testing relativity of simultaneity using GPS satellites](https://www.academia.edu/40736335/Testing_relativity_of_simultaneity_using_GPS_satellites) »

https://www.academia.edu/40736335/Testing_relativity_of_simultaneity_using_GPS_satellites

Relativity of simultaneity can be measured with clocks of GPS satellites

Kuan Peng, « [From Michelson–Morley experiment to length contraction](https://www.academia.edu/40208137/From_Michelson-Morley_experiment_to_length_contraction) »

https://www.academia.edu/40208137/From_Michelson-Morley_experiment_to_length_contraction

Length contraction is used to explain Michelson–Morley experiment. But the variation of distance due to time dilation is more appropriate to explain this experiment.

Kuan Peng, « [Astrophysical jet and length contraction](https://www.academia.edu/40066246/Astrophysical_jet_and_length_contraction) »

https://www.academia.edu/40066246/Astrophysical_jet_and_length_contraction

Astrophysical jets are flows of matter that moves at relativistic speed. They are opportunity to see length contraction in action. An astrophysical jet is analyzed to explain the length contraction effect.

Kuan Peng, « [How to test length contraction by experiment?](https://www.academia.edu/39584663/How_to_test_length_contraction_by_experiment?) »

https://www.academia.edu/39584663/How_to_test_length_contraction_by_experiment?

Relativistic length contraction is theoretically predicted but not directly tested, which lead to incorrect interpretation of the theory illustrated by Bell's spaceship paradox and Ehrenfest paradox. But these paradoxes can help us designing experiments to test length contraction

Kuan Peng, « [Twin paradox when Earth is the moving frame](https://www.academia.edu/39216040/Twin_paradox_when_Earth_is_the_moving_frame) »

https://www.academia.edu/39216040/Twin_paradox_when_Earth_is_the_moving_frame

We analyze the mathematical mechanism that slows the time of the traveler in the twin paradox and explain what distinguishes the traveler's frame from the Earth's frame

2. On Mathematics

a. nD complex number and orientation

Kuan Peng, 2022, «[Determination of the relative roll, pitch and yaw between arbitrary objects using 3D complex number](#)»

https://www.academia.edu/92242546/Determination_of_the_relative_roll_pitch_and_yaw_between_arbitrary_objects_using_3D_complex_number

<https://pengkuanonmaths.blogspot.com/2022/12/determination-of-relative-roll-pitch.html>

Kuan Peng, 2022, «[Computing orientation with complex multiplication but without trigonometric function](#) »

https://www.academia.edu/80277267/Computing_orientation_with_complex_multiplication_but_without_trigonometric_function

Today's methods for computing orientation are quaternion and rotation matrix. However, their efficiencies are tarnished by the complexity of the rotation matrix and the counterintuitivity of quaternion. A better method is presented here. It uses complex multiplication for rotating vectors in 3D space and can compute orientation without angle and trigonometric functions, which is simple, intuitive and fast.

https://www.academia.edu/80277267/Computing_orientation_with_complex_multiplication_but_without_trigonometric_function

<https://pengkuanonmaths.blogspot.com/2022./05/computing-orientation-with-complex.html>

Kuan Peng, «Procedure to convert 2D formula into 3D complex formula»

<https://pengkuanonmaths.blogspot.com/2022./04/procedure-to-convert-2d-formula-into-3d.html>

«Rendering of 3D Mandelbrot, Lambda and other sets using 3D complex number system»

https://www.academia.edu/92516029/Rendering_of_3D_Mandelbrot_Lambda_and_other_sets_using_3D_complex_number_system

<https://pengkuanonmaths.blogspot.com/2022./04/rendering-of-3d-mandelbrot-lambda-and.html>

Kuan Peng, «Example for “Extending complex number to spaces with 3, 4 or any number of dimensions” »

<https://pengkuanonmaths.blogspot.com/2022./02/example-for-extending-complex-number-to.html>

<https://drive.google.com/file/d/159FE7mCrLcjGz7MXqCEvRHAkBH6sWiKX/view?usp=sharing>

Kuan Peng, 2022, «[Extending complex number](#) to spaces with 3, 4 or [any number of dimensions](#)»

https://www.academia.edu/71708344/Extending_complex_number_to_spaces_with_3_4_or_any_number_of_dimensions

Multidimensional complex systems with 3, 4 or more dimensions are constructed. They possess algebraic operations which have geometrical meanings. Multidimensional complex numbers can be written in Cartesian, trigonometric and exponential form and can be converted from one form to another. Each complex numbers has a conjugate. Multidimensional complex systems are extensions of the classical complex number system.

Kuan Peng, «[Step by step rotation](#) in normal and [high dimensional space and meaning of quaternion](#)»

https://www.academia.edu/52628458/Step_by_step_rotation_in_normal_and_high_dimensional_space_and_meaning_of_quaternion

The orientation of body in space is defined 3 by angles. The step by step rotation process and chain of three-dots multiplication give an easy way to compute pile of rotations in 3D and high dimensional space and give a general orientation system. A visualization of quaternion is proposed.

b. Uncountability

Kuan Peng, 2023, «[Is Hilbert's Grand Hotel a paradox?](#) »

https://www.academia.edu/102116805/Is_Hilberts_Grand_Hotel_a_paradox

Kuan Peng, 2022, «[Real numbers and points on the number line](#) with regard to [Cantor's diagonal argument](#)»

https://www.academia.edu/88279926/Real_numbers_and_points_on_the_number_line_with_regard_to_Cantors_diagonal_argument

<https://pengkuanonmaths.blogspot.com/2022./10/real-numbers-and-points-on-number-line.html>

Cantor's diagonal argument claims that \mathbb{R} is uncountable. When we see real numbers as points on the number line, we can put a name on each point and put the names into a list without contravening Cantor's diagonal argument because we cannot create a diagonal from a list of names.

However, we do not need such a impossible list, but just to split \mathbb{R} into two parts, S_2 and S_{10} . the members of S_2 are real numbers expressed in binary, those of S_{10} in decimal. We create a list of real numbers by picking one member from S_2 and one member from S_{10} alternately and forever. This list is a composite list whose members are in binary and decimal alternately. The diagonal of this list is a sequence of binary and decimal digits alternately and out-of-the-list-number cannot be constructed from it.

In fact, composite list can be created in splitting \mathbb{R} into many subsets in numeral systems of different bases from which no out-of-the-list-number can be created and there is no real number excluded from the composite list. Because the composite list is constructed from the whole \mathbb{R} and no real number is found outside, the composite list contains \mathbb{R} .

If there is one list that contains \mathbb{R} we can already conclude that \mathbb{R} is countable. But the permutation of the subsets of \mathbb{R} can create a huge number of different composite lists which all contain \mathbb{R} . So, we conclude with confidence that \mathbb{R} is countable. Then Cantor's diagonal argument fails.

Cantor's diagonal argument expresses real numbers only in one numeral system, which restricts the used list. If a binary list is shown not to contain \mathbb{R} , this can be caused either by “list” or by “binary”.

Because Cantor has focused only on “list” overlooking “binary”, this is the flaw that breaks Cantor's diagonal argument which then does not prove \mathbb{R} uncountable.

Kuan Peng, 2022, « [Construction](https://www.academia.edu/86917528/Construction_of_the_diagonal_flipped_number) of the diagonal [flipped number](https://www.academia.edu/86917528/Construction_of_the_diagonal_flipped_number) »

https://www.academia.edu/86917528/Construction_of_the_diagonal_flipped_number

We write the natural numbers 1,2,3, ... in column 1, write them in binary form in column 2, invert the bits of all the numbers of column 2, the leftmost bit becomes the rightmost bit etc, then add 0. on the left of each inverted number in the column 3 to make them smaller than 1. The column 3 is the list L and does not end. As the bits of all these numbers do not ends, each number in the list L is a real number. So, L contains all the real numbers in the interval [0, 1].

Kuan Peng, 2022, «[Examination of Cantor's proofs for uncountability](https://www.academia.edu/86410224/Examination_of_Cantors_proofs_for_uncountability_and_axiom_for_counting_infinite_sets) and [axiom for counting infinite sets](https://www.academia.edu/86410224/Examination_of_Cantors_proofs_for_uncountability_and_axiom_for_counting_infinite_sets)»

https://www.academia.edu/86410224/Examination_of_Cantors_proofs_for_uncountability_and_axiom_for_counting_infinite_sets

An analysis of Cantor's theory of uncountable sets: The logic of his proofs has some weaknesses. Cantor assumes for both his proofs that all real numbers (set R) are in a list (list L). Considering L as a set this assumption assumes R belongs to L. This makes the claim "a real number is constructed but is not in the list L" questionable. We propose a solution to this problem, an axiom for counting infinite sets and a solution to continuum hypothesis.

Kuan Peng, 2018, « [Graphic of set counting](https://www.academia.edu/37766761/Graphic_of_set_counting_and_infinite_number) and [infinite number](https://www.academia.edu/37766761/Graphic_of_set_counting_and_infinite_number)»

https://www.academia.edu/37766761/Graphic_of_set_counting_and_infinite_number

When counting a set, we can plot a graphic that represents the members of the set on the plane (x, y) to observe visually the counting. Also, graphic of counting of infinite set helps us to understand infinite natural number.

Kuan Peng, 2018, «[Building set](https://www.academia.edu/37590687/Building_set_and_counting_set) and [counting set](https://www.academia.edu/37590687/Building_set_and_counting_set)»

https://www.academia.edu/37590687/Building_set_and_counting_set

A counting set is the set of natural numbers with which a countable set is put in bijection. Is the counting set for the power set of \mathbb{N} the set that builds it?

Kuan Peng, 2018, « [Analysis of the proof](https://www.academia.edu/37356452/Analysis_of_the_proof_of_Cantors_theorem) of [Cantor's theorem](https://www.academia.edu/37356452/Analysis_of_the_proof_of_Cantors_theorem) »

https://www.academia.edu/37356452/Analysis_of_the_proof_of_Cantors_theorem

Cantor's theorem states that the power set of \mathbb{N} is uncountable. This article carefully analyzes this proof to clarify its logical reasoning

Kuan Peng, 2016, « [Lists of binary sequences](https://www.academia.edu/30072323/Lists_of_binary_sequences_and_uncountability) and [uncountability](https://www.academia.edu/30072323/Lists_of_binary_sequences_and_uncountability) »

https://www.academia.edu/30072323/Lists_of_binary_sequences_and_uncountability

Creation of binary lists, discussion about the power set of \mathbb{N} , the diagonal argument, Cantor's first proof and uncountability.

Kuan Peng, 2016, «[Continuity](https://www.academia.edu/28750869/Continuity_and_uncountability) and [uncountability](https://www.academia.edu/28750869/Continuity_and_uncountability) »

https://www.academia.edu/28750869/Continuity_and_uncountability

Discussion about continuity of line, how continuity is related to uncountability and the continuum hypothesis

Kuan Peng, 2016, «[Cardinality of the set](https://www.academia.edu/23155464/Cardinality_of_the_set_of_decimal_numbers) of [decimal numbers](https://www.academia.edu/23155464/Cardinality_of_the_set_of_decimal_numbers) »

https://www.academia.edu/23155464/Cardinality_of_the_set_of_decimal_numbers

Cardinalities of the set of decimal numbers and \mathbb{R} are discussed using denominator lines and rational plane.

Kuan Peng, 2016, «[Prime numbers](https://www.academia.edu/22457358/Prime_numbers_and_irrational_numbers) and [irrational numbers](https://www.academia.edu/22457358/Prime_numbers_and_irrational_numbers) »

https://www.academia.edu/22457358/Prime_numbers_and_irrational_numbers

The relation between prime numbers and irrational numbers are discussed using prime line and pre-irrationality.

Kuan Peng, 2016, « [On Cantor's first proof](https://www.academia.edu/22104462/On_Cantors_first_proof_of_uncountability) of [uncountability](https://www.academia.edu/22104462/On_Cantors_first_proof_of_uncountability)»

https://www.academia.edu/22104462/On_Cantors_first_proof_of_uncountability

Discussion about Cantor's first proof using the next-interval-function, potential and actual infinity.

Kuan Peng, 2016, «[On the uncountability](https://www.academia.edu/21601620/On_the_uncountability_of_the_power_set_of_N) of [the power set of \$\mathbb{N}\$](https://www.academia.edu/21601620/On_the_uncountability_of_the_power_set_of_N) »

https://www.academia.edu/21601620/On_the_uncountability_of_the_power_set_of_N

This article discusses the uncountability of the power set of \mathbb{N} proven by using the out-indexes subset contradiction.

Kuan Peng, 2016, « [Hidden assumption](https://www.academia.edu/20805963/Hidden_assumption_of_the_diagonal_argument) of [the diagonal argument](https://www.academia.edu/20805963/Hidden_assumption_of_the_diagonal_argument)»

https://www.academia.edu/20805963/Hidden_assumption_of_the_diagonal_argument

This article uncovers a hidden assumption that the diagonal argument needs, then, explains its implications in matter of infinity.

Kuan Peng, 2016, «[Which infinity](https://www.academia.edu/20805963/Hidden_assumption_of_the_diagonal_argument) for [irrational numbers](https://www.academia.edu/20805963/Hidden_assumption_of_the_diagonal_argument)? »

https://www.academia.edu/20147272/Which_infinity_for_irrational_numbers

This article clarifies the kind of infinity used to quantify the number of digits of irrational numbers and try to check the cardinality of decimal numbers.

Kuan Peng, 2015, «[Continuous set](https://www.academia.edu/19589645/Continuous_set_and_continuum_hypothesis) and [continuum hypothesis](https://www.academia.edu/19589645/Continuous_set_and_continuum_hypothesis)»

https://www.academia.edu/19589645/Continuous_set_and_continuum_hypothesis

This article explains why the cardinality of a set must be either \aleph_0 or $|\mathbb{R}|$.

Kuan Peng, 2015, «[Cardinality of the set](https://www.academia.edu/19403597/Cardinality_of_the_set_of_binary-expressed_real_numbers) of [binary-expressed real numbers](https://www.academia.edu/19403597/Cardinality_of_the_set_of_binary-expressed_real_numbers)»

https://www.academia.edu/19403597/Cardinality_of_the_set_of_binary-expressed_real_numbers

This article gives the cardinal number of the set of all binary numbers by counting its elements, analyses the consequences of the found value and discusses Cantor's diagonal argument, power set and the continuum hypothesis.

Kuan Peng, «[On Fermat's last theorem](https://www.academia.edu/13665056/On_Fermat_s_last_theorem)»

https://www.academia.edu/13665056/On_Fermat_s_last_theorem

3. On electromagnetism

I have published many articles indicating that the Lorentz force law is flawed. In order to help readers to understand my work, I make a brief guide of my articles. The corrected magnetic force law that I propose is identical to the Lorentz force law for closed coils but respects Newton's third law for differential current elements.

c. Proposed alternative laws

The proposed new law that corrects the flaw of the Lorentz force law. These laws enabled me to design the paradoxes and the experiments.

Kuan Peng, 2023, «[From Coulomb's force to magnetic force](https://www.academia.edu/106863205/From_Coulombs_force_to_magnetic_force_and_experiments_that_show_magnetic_force_parallel_to_current) and [experiments that show magnetic force parallel to current](https://www.academia.edu/106863205/From_Coulombs_force_to_magnetic_force_and_experiments_that_show_magnetic_force_parallel_to_current)»

https://www.academia.edu/106863205/From_Coulombs_force_to_magnetic_force_and_experiments_that_show_magnetic_force_parallel_to_current

The Lorentz force law is fundamental for electromagnetism. However, it is known long ago that the Lorentz forces between two current elements do not respect the Newton's third law. This seemingly harmless flaw had never been corrected. In physical sciences a discrepancy often hides in it new understanding or unexpected breakthrough. For solving this problem, we give a purely theoretical derivation of magnetic force which respects the Newton's third law in the case of current elements and is identical to the Lorentz force in the case of coils. This new law reveals how electric force is transformed into magnetic force by velocity and is supported by experimental evidences that we will explain and compute with the new law.

Kuan Peng, «[Longitudinal magnetic force](https://www.academia.edu/36787024/Longitudinal_magnetic_force_and_high_field_magnet) and [high field magnet](https://www.academia.edu/36787024/Longitudinal_magnetic_force_and_high_field_magnet)»

https://www.academia.edu/36787024/Longitudinal_magnetic_force_and_high_field_magnet

Theoretical explanation of longitudinal magnetic force and its practical application in high field magnet

Kuan Peng, «[Plasma](https://www.academia.edu/36379490/Plasma_under_Coulomb_magnetic_force) under [Coulomb magnetic force](https://www.academia.edu/36379490/Plasma_under_Coulomb_magnetic_force)»

https://www.academia.edu/36379490/Plasma_under_Coulomb_magnetic_force

Plasma is confined in fusion reactors using magnetic force. Coulomb magnetic force law for plasma is derived

Kuan Peng, «[Coulomb](https://www.academia.edu/36278169/Coulomb_magnetic_force) magnetic [force](https://www.academia.edu/36278169/Coulomb_magnetic_force)»

https://www.academia.edu/36278169/Coulomb_magnetic_force

The relativistic length contraction effect and changing distance effect produce 2 different magnetic forces. Together they form complete magnetic force.

Kuan Peng, 2018, «[Changing](https://www.academia.edu/36272940/Changing_distance_effect) distance [effect](https://www.academia.edu/36272940/Changing_distance_effect)»

https://www.academia.edu/36272940/Changing_distance_effect

The motion of electrons in current modifies Coulomb force between charges by changing the distance between them. This effect creates magnetic force.

Kuan Peng, 2017, «[Length-contraction-magnetic-force](https://www.academia.edu/32815401/Length-contraction-magnetic-force_between_arbitrary_currents) between [arbitrary currents](https://www.academia.edu/32815401/Length-contraction-magnetic-force_between_arbitrary_currents)»

https://www.academia.edu/32815401/Length-contraction-magnetic-force_between_arbitrary_currents

Formula for magnetic force between 2 arbitrary current elements derived from Coulomb's law and relativistic length contraction formula.

Kuan Peng, «[Relativistic length contraction](https://www.academia.edu/32664810/Relativistic_length_contraction_and_magnetic_force) and [magnetic force](https://www.academia.edu/32664810/Relativistic_length_contraction_and_magnetic_force)»

https://www.academia.edu/32664810/Relativistic_length_contraction_and_magnetic_force

Derivation of the expression for the magnetic force between parallel current elements from relativistic length contraction formula.

Kuan Peng, [Correct differential magnetic force law](http://independent.academia.edu/KuanPeng/Papers/1868992/Correct_differential_magnetic_force_law), pdf word

http://independent.academia.edu/KuanPeng/Papers/1868992/Correct_differential_magnetic_force_law

Derivation of the expression for differential magnetic force that respects Newton's third law while giving the same force for closed coils than the Lorentz force law.

Kuan Peng, [Comparison of the 2 magnetic force laws](http://independent.academia.edu/KuanPeng/Papers/1868989/Comparison_of_the_2_magnetic_force_laws) (near a corner, force tends to infinity, pdf word

http://independent.academia.edu/KuanPeng/Papers/1868989/Comparison_of_the_2_magnetic_force_laws

Computation of the magnetic force around an angular wire, the corrected law gives zero while the Lorentz force law gives infinity.

Kuan Peng, [Correction to the Biot-Savart law](http://www.academia.edu/4460303/Correction_to_the_Biot-Savart_law), PDF, word

http://www.academia.edu/4460303/Correction_to_the_Biot-Savart_law

The corrected magnetic force law gives rise to a tensor magnetic field and thus overthrows the Biot-Savart law for magnetic field.

Kuan Peng, [Why magnetic field must be a tensor?](http://www.academia.edu/4563958/Why_magnetic_field_must_be_a_tensor) pdf, word

http://www.academia.edu/4563958/Why_magnetic_field_must_be_a_tensor

Physical explanation of the tensor magnetic field.

Kuan Peng, [Unknown properties of magnetic force and Lorentz force law](http://www.academia.edu/3266279/Unknown_properties_of_magnetic_force_and_Lorentz_force_law), Blogspot, word

http://www.academia.edu/3266279/Unknown_properties_of_magnetic_force_and_Lorentz_force_law

Synthetic study that summarizes studies about the flaw of the Lorentz force law, the corrected magnetic force law and perpendicular and parallel action experiments.

d. Intuitive paradoxes

The circuits of these paradoxes give rise to non-zero self Lorentz force, violating Newton's third law. These self forces can be figured out intuitively using the Lorentz force law. These 5 contradictions are strong proofs of the wrongness of the Lorentz force law.

Kuan Peng, [Analyze of the Lorentz forces internal to an equilateral triangle coil](http://pengkuanem.blogspot.com/2012/03/lorentz-forces-internal-to-equilateral.html), html

<http://pengkuanem.blogspot.com/2012/03/lorentz-forces-internal-to-equilateral.html>

2 straight wires making an angle exert a force on each other and their sum lies on the bisector. The 2 bisector-lying forces on the lower corners of a triangular coil sum to a downward self force, violating Newton's third law.

Kuan Peng, [Paradoxical Lorentz force internal to a triangle coil](http://pengkuanem.blogspot.com/2012/03/paradoxical-lorentz-force-internal-to.html), html

<http://pengkuanem.blogspot.com/2012/03/paradoxical-lorentz-force-internal-to.html>

Place a wire inside a magnetic shield and it will not feel Lorentz force. Shield one side of a triangular coil, the non shielded sides will feel a Lorentz force which is a non-zero self force on the coil.

Kuan Peng, [Lorentz forces internal to a polygon coil, analyze and computation](http://pengkuanem.blogspot.com/2012/03/lorentzforce-internal-to-coil-analyze.html), html

<http://pengkuanem.blogspot.com/2012/03/lorentzforce-internal-to-coil-analyze.html>

The pentagon coil has a sharp angular top and a high rectangular bottom. The top exerts on itself a force that depends on the angle, while the force on the rectangular bottom is constant. Varying independently, the forces on the top and the bottom do not cancel each other and make a non-zero self force.

Kuan Peng, [Lorentz force on open circuit](http://www.academia.edu/1905835/Lorentz_force_on_open_circuit), Blogspot word

http://www.academia.edu/1905835/Lorentz_force_on_open_circuit

The 2 ball capacitors enable an alternate current to circulate in the angular wire that creates a Lorentz force on the wire. Since there is not straight wire connecting the 2 capacitors there is no counter force and the self force is not zero.

Kuan Peng, [Self force of a 3D coil](http://www.academia.edu/1905835/Lorentz_force_on_open_circuit), pdf word

http://www.academia.edu/1905835/Lorentz_force_on_open_circuit

The 2 upward pointing corners of the 3D coil exert on themselves vertical forces that cannot be balanced by the forces on the 2 horizontal wires, violating Newton's third law.

e. Analytic computations of the self force of triangular coil

The 2 self forces computed analytically are non-zero and show that the Lorentz force law is wrong for any triangular coils.

Mathematical cause of the existence of the remaining resultant internal Lorentz force, [pdf word](#)

http://www.academia.edu/1862874/Mathematical_cause_of_the_existence_of_the_remaining_resultant_internal_Lorentz_force

The relation between the forces on the 3 sides of a triangular coil must be linear if the self force is zero. But the Lorentz force law is non linear and the relation between the Lorentz forces on the 3 sides is non linear, giving rise to non-zero self force.

Proof of the remaining resultant Lorentz force internal to a triangular coil, [pdf word](#)

http://www.academia.edu/1862869/Proof_of_the_remaining_resultant_Lorentz_force_internal_to_a_triangular_coil

Analytical computation of the vertical self force a triangular coil exerts on itself. This force is always non-zero.

Synthesis of the inconsistency of the Lorentz force law, [pdf word](#)

http://www.academia.edu/1862866/Synthesis_of_the_inconsistency_of_the_Lorentz_force_law

2 examples that answer the objections to my theory: 1) The Lorentz force law gives zero self force for a system of 2 closed coils, but this self force becomes non-zero when the 2 coils merge into a single coil. 2) The angular top of a pentagon coil can rotate generating horizontal force that the bottom sides cannot cancel.

f. Numerical computation

The 3 self forces computed numerically are non-zero confirming the analytic computations.

Numerical computation of the Lorentz force internal to an asymmetric coil, [Blogspot word](#)

http://www.academia.edu/3386868/Numerical_computation_of_the_Lorentz_force_internal_to_an_asymmetric_coil

Numerical computation of the self force of coils formed with 2 half ellipses of different major axis. The computed values of the self force are all non-zero.

Computation of the self force of a coil, [Blogspot word](#)

http://www.academia.edu/3386868/Numerical_computation_of_the_Lorentz_force_internal_to_an_asymmetric_coil

The self force of an asymmetric coil (2 different half ellipses) is computed using different number of discretization, which converges to a definite value showing the consistency of the computation.

Unhappiness of Newton with Lorentz and triangular coil experiment, [Blogspot word](#)

http://www.academia.edu/3500211/Unhappiness_of_Newton_with_Lorentz_and_triangular_coil_experiment

The self force of a triangular coil is computed using the Lorentz force law and the corrected magnetic force law, which is non-zero for the former and zero for the latter.

g. Experiments

Experiments below show strange magnetic forces that the Lorentz force law cannot explain. They are experimental proofs of the incorrectness of this law.

- Theory explaining tangential magnetic force experiment

Kuan Peng, 2018, «[Showing tangential magnetic force by experiment](#)»

https://www.academia.edu/36652163/Showing_tangential_magnetic_force_by_experiment

Theoretical explanation of tangential magnetic force and the experiment of rotating coil.

Kuan Peng, 2013, «[Theory about parallel action experiment](#)»

http://www.academia.edu/3116741/Theory_about_parallel_action_experiment

Explanation of the experimental result using my corrected magnetic force law.

- Tangential magnetic force experiment

Kuan Peng, 2017, «[Continuous rotation of a circular coil experiment](#)»

https://www.academia.edu/33604205/Continuous_rotation_of_a_circular_coil_experiment

Experiment that shows continuous rotation of a coil in its plane revealing the action of a magnetic force that is parallel to current. with homopolar motor »

«[Tangential magnetic force experiment with circular coil](#)»

[https://www.academia.edu/33353400/Tangential magnetic force experiment with circular coil with video](https://www.academia.edu/33353400/Tangential_magnetic_force_experiment_with_circular_coil_with_video)

Tangential magnetic force is shown in this experiment.

Current and parallel action, [Blogspot](#), [word](#)

[http://www.academia.edu/3654643/Current and parallel action](http://www.academia.edu/3654643/Current_and_parallel_action)

Second parallel action experiment in a configuration where the Lorentz force law's prediction is contrary to the experimental result. Numerical computation of the torque using my corrected magnetic force law and the Lorentz force law.

Lorentz parallel action experiment, [Blogspot](#) [youtube](#)

This experiment shows magnetic force parallel to current. Photographs and video.

Anti-Lorentzian Motor, [pdf](#), [word](#)

[https://www.academia.edu/5610448/Anti-Lorentzian Motor](https://www.academia.edu/5610448/Anti-Lorentzian_Motor)

A motor making use of the force parallel to current: A rectangular coil rotates parallel to the wires. Explanation using my corrected magnetic force law.

Kuan Peng, 2014, « [Circular motor driven by tangential magnetic force](#) »

[https://www.academia.edu/6227926/Circular motor driven by tangential magnetic force](https://www.academia.edu/6227926/Circular_motor_driven_by_tangential_magnetic_force)

A round coil rotates parallel to the wire showing a magnetic force tangential to the wire propelling a motor. Explanation using my corrected magnetic force law.

Kuan Peng, 2014, « [Detail of my circular motor using tangential force](#) and the equivalence

[https://www.academia.edu/7879755/Detail of my circular motor using tangential force and the equivalence with homopolar motor](https://www.academia.edu/7879755/Detail_of_my_circular_motor_using_tangential_force_and_the_equivalence_with_homopolar_motor)

Disposition of the magnets and the coil of the circular motor and explanation of the reverse equivalence with a homopolar motor.

Tangential force motor with regular magnets, [pdf](#), [word with video](#)

[https://www.academia.edu/6395827/Tangential force motor with regular magnets](https://www.academia.edu/6395827/Tangential_force_motor_with_regular_magnets)

A round coil rotates parallel to the wires in a regular magnetic field showing the existence of parallel force in ordinary magnetic field. Effect of the U-turn wire.

Disc magnet parallel action experiment [pdf](#) [Word with video included](#)

[https://www.academia.edu/13033082/Disc magnet parallel action experiment video included](https://www.academia.edu/13033082/Disc_magnet_parallel_action_experiment_video_included)

Square coil showing parallel action due to the magnetic field of a round magnet

Earth's magnetic field and parallel action [pdf](#) [word with video](#)

[https://www.academia.edu/12926460/Earth's magnetic field and parallel action video included](https://www.academia.edu/12926460/Earth_s_magnetic_field_and_parallel_action_video_included)

Square coil showing parallel action due to terrestrial magnetic field

- perpendicular action experiment

Success of the modified Lorentz perpendicular action experiment, [Blogspot](#) [word](#)

[http://www.academia.edu/2624139/Success of the modified Lorentz perpendicular action experiment](http://www.academia.edu/2624139/Success_of_the_modified_Lorentz_perpendicular_action_experiment)

This experiment shows a case where the magnitude of the force perpendicular to a current varies while according to the Lorentz force law it should be constant.

Lorentz perpendicular action experiment and Lorentz force law, [Blogspot](#) [word](#)

[http://www.academia.edu/2700290/Lorentz perpendicular action experiment and Lorentz force law](http://www.academia.edu/2700290/Lorentz_perpendicular_action_experiment_and_Lorentz_force_law)

Explanation of the experimental result against the Lorentz force law's prediction.

Corrected law and Perpendicular action experiment, [Blogspot](#) [word](#)

[http://www.academia.edu/2971430/Corrected law and Perpendicular action experiment](http://www.academia.edu/2971430/Corrected_law_and_Perpendicular_action_experiment)

Explanation of the experimental result using my corrected magnetic force law.

One way magnetic force, [pdf](#), [word](#)

[http://www.academia.edu/4777632/One way magnetic force](http://www.academia.edu/4777632/One_way_magnetic_force)

A weird magnetic effect: when a current flows in one direction there is a force but when the current is reversed, the force disappears. This force varies smoothly from maximal value to zero when the wire rotates 180°.

h. Macroscopic Aharonov-Bohm effect

Solenoid parallel action experiment

[http://www.academia.edu/4777632/One way magnetic force](http://www.academia.edu/4777632/One_way_magnetic_force)

<https://pengkuanem.blogspot.com/2015/06/solenoid-parallel-action-experiment.html>

This experiment will investigate the parallel action of a long solenoid. I have done this experiment and here is my result.

[Q: Parallel action with a solenoid](#)

[More photograph of the hairpin wire](#)

[A 1.95 m long solenoid exerting Aharonov-Bohm force on a coil](#)

[https://www.academia.edu/17214485/A 1.95 m long solenoid exerting Aharonov Bohm force on a coil](https://www.academia.edu/17214485/A_1.95_m_long_solenoid_exerting_Aharonov_Bohm_force_on_a_coil)
<http://pengkuanem.blogspot.fr/2015./10/a-195-m-long-solenoid-exerting.html>

This experiment shows the magnetic force on a coil exerted by the magnetic field of a long solenoid that should be zero.
Solenoid 2 m long.pdf

[Aharonov–Bohm effect in CRT experiment PDF, Word with video](#)
[https://www.academia.edu/12052541/Aharonov Bohm effect in CRT experiment Video included](https://www.academia.edu/12052541/Aharonov_Bohm_effect_in_CRT_experiment_Video_included)
<http://pengkuanem.blogspot.com/2015./04/aharonovbohm-effect-in-crt-experiment.html>

Image in a CRT TV set deflected by a long solenoid. Aharonov–Bohm effect in CRT.pdf

[Consequences of macroscopic Aharonov-Bohm effect, Blogspot, word](#)
http://academia.edu/3852332/Consequences_of_macroscopic_Aharonov-Bohm_effect

The macroscopic force of Aharonov-Bohm effect overthrows the classical interpretations of this effect and has big consequence in quantum mechanics. Explanation using my corrected magnetic force law.

[Macroscopic Aharonov–Bohm effect experiment and theory, pdf, word](#)
[http://www.academia.edu/3690352/Macroscopic Aharonov-Bohm effect experiment and theory](http://www.academia.edu/3690352/Macroscopic_Aharonov-Bohm_effect_experiment_and_theory)
<http://pengkuanem.blogspot.com/2013/06/macroscopic-aharonovbohm-effect.html>

This experiment shows the magnetic force on a wire in a region where the magnetic field should be zero. In this experiment, the long solenoid is simulated with a long bar magnet. Explanation using my corrected magnetic force law.
Macroscopic Aharonov.pdf

[Non-Lorentzian Magnetic force and Aharonov-Bohm effect in CRT, Blogspot, Word](#)
[https://www.academia.edu/3800480/Non-Lorentzian Magnetic force and Aharonov-Bohm effect in CRT](https://www.academia.edu/3800480/Non-Lorentzian_Magnetic_force_and_Aharonov-Bohm_effect_in_CRT)
<http://pengkuanem.blogspot.com/2013/06/non-lorentzian-magnetic-force-and.html>

This experiment shows that magnetic materials are attracted differently than usual in the mid-region of a bar magnet.
Proposition of an experiment to test macroscopic Aharonov-Bohm effect in cathode ray tube. Non Lorentzian.pdf

i. Other studies

[Paradoxes and solutions about Lorentz force law \(complete study\), pdf word](#)
http://independent.academia.edu/KuanPeng/Papers/1869002/Paradoxes_and_solutions_about_Lorentz_force_law

This article presents the paradox of non-zero self force of a triangular coil, B-cutting paradox (energy unbalance and zero electromotive force) and the corrected differential magnetic force law that solves these problems.

[Magnetic field of a non-circular toroidal magnet, pdf, word](#)
[https://www.academia.edu/5879020/Magnetic field of a non-circular toroidal magnet](https://www.academia.edu/5879020/Magnetic_field_of_a_non-circular_toroidal_magnet)

This experiment shows the magnetic field of a toroidal magnet formed with 2 horse-shoe magnets.

[Perpendicular action experiment with a long rectangular coil, pdf, word](#)
[https://www.academia.edu/6556384/Perpendicular action experiment with a long rectangular coil](https://www.academia.edu/6556384/Perpendicular_action_experiment_with_a_long_rectangular_coil)

This experiment shows the magnetic force exerted by long straight wires.

[Magnetism and dark matter](#)
https://www.academia.edu/10183169/Magnetism_and_dark_matter

In my research on electromagnetism, I have understood that magnetism is forces created by moving charges and felt by moving charges. An electric current is a model of continuous flow of uncountable electrons moving in the same direction. This scheme seems benign but when I applied it to the Universe, I find in it a surprisingly judicious approach to solve the mystery of dark matter.

j. Incorrect studies

[Not a “one-way” magnetic force, pdf, word](#)
http://www.academia.edu/4838155/Not_a_one-way_magnetic_force

[Magnetized wire effect and perpendicular action experiment Blogspot](#)

[Fail of the perpendicular action experiment, Blogspot word](#)
http://www.academia.edu/2538169/Fail_of_the_perpendicular_action_experiment

[Lorentz torque experiment, pdf word](#)
http://independent.academia.edu/KuanPeng/Papers/1869001/Lorentz_torque_experiment

[Lorentz perpendicular action experiment, Blogspot word](#)
http://www.academia.edu/2237784/Lorentz_perpendicular_action_experiment

[Calculation of the Lorentz' Torque and the Ampere's torque, pdf, word](#)

http://independent.academia.edu/KuanPeng/Papers/1869005/Calculation_of_the_Lorentz_Torque_and_the_Ampere_torque

Curve shape of the magnetic torques, [pdf](#) [word](#)

http://independent.academia.edu/KuanPeng/Papers/1869006/Curve_shape_of_the_magnetic_torques