PengKuan's work on electromagnetism

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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.

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1. 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.

1. Kuan Peng, 21 January 2026, « Axiomatic Formulation of "A Derivation of Faraday's law from Coulomb's Law and Relativity" »

We present an axiomatic formulation of electromagnetic induction based solely on electric charge, Coulomb interaction, and relativistic causality. The theory is built upon a single fundamental object—the **Progressing Electric Field**—defined as the causal propagation of electric influence from the past positions of charges at finite speed. Magnetic fields, magnetic flux, and Faraday's law are not assumed as primitives but emerge as derived, effective quantities. This work establishes the axioms, primitive definitions, and core propositions of the theory, providing a foundation for re-deriving induction phenomena without postulating magnetic fields as fundamental entities.

https://www.academia.edu/146952831/Axiomatic_Formulation_of_A_Derivation_of_Faradays_law_from_Coulombs_Law_and_Relativity

https://pengkuanem.blogspot.com/2026/01/axiomatic-formulation-of-derivation-of.html

File name: Progressing Electric Field – Axiomatic Formulation

2. Kuan Peng, 14 January 2026, « A Derivation of Faraday's law from Coulomb's Law and Relativity / 1.The Progressing Electric Field Model »

Faraday's law is empirically derived and, as such, may be subject to limitations. Notably, it appears to violate the law of conservation of energy in certain contexts. To establish a more robust formulation, it is necessary to derive the law from first principles. In this article, we theoretically derive Faraday's law using only Coulomb's law and special relativity. We present the first stage of this derivation: the construction of the 'Progressing Electric Field Model.' This model determines the curl of the electric field produced by moving charges and calculates the electric potential induced in a wire loop within that field

https://www.academia.edu/146009113/A_Derivation_of_Faradays_law_from_Coulombs_Law_and_Relativity_1_The_Progressing_Electric_Field_Model

https://pengkuanem.blogspot.com/2026/01/a-derivation-of-faradays-law-from.html

File name: Derivation of Faraday

3. Kuan Peng, March 2024 « Erosion protection of Tokamak and magnetic force on single charge »

The walls of Tokamaks are heavily eroded by plasma which suggests that a mysterious force pushes the plasma to the wall. We have theoretically discovered this force and named it extra-force. This force appears only on single charges but not on current carrying wire, which is why the Lorentz force law does not contain it. This discovery not only brings new knowledge to electromagnetism, but also gives a solution against the erosion, which could improve the technology for controlled nuclear fusion. We have proposed an experiment to test this new force.
https://www.academia.edu/116178626/Erosion_protection_of_Tokamak_and_magnetic_force_on_single_charge
https://pengkuanem.blogspot.com/2024/03/erosion-protection-of-tokamak-and.html

4. Kuan Peng, 2023, « From Coulomb's force to magnetic force and experiments that show magnetic force parallel to current»

Researchgate.net: From Coulomb's force to magnetic force and experiments that show magnetic force parallel to current
https://pengkuanem.blogspot.com/2023/09/from-coulombs-force-to-magnetic-force.html
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.

5. Kuan Peng, «Longitudinal magnetic force and high field magnet»

http://pengkuanem.blogspot.com/2018/06/longitudinal-magnetic-force-and-high.html
Researchgate.net: 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

6. Kuan Peng, «Plasma under Coulomb magnetic force»

Researchgate.net: Plasma under Coulomb magnetic force
http://pengkuanem.blogspot.com/2018/04/plasma-under-coulomb-magnetic-force.html
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

7. Kuan Peng, 28 March 2018 «Coulomb magnetic force»

http://pengkuanem.blogspot.com/2018/03/coulomb-magnetic-force.html
https://www.academia.edu/36278169/Coulomb_magnetic_force
Researchgate.net: Coulomb magnetic force
The relativistic length contraction effect and changing distance effect produce 2 different magnetic forces. Together they form complete magnetic force.

8. Kuan Peng, 2018, «Changing distance effect»

Researchgate.net: Changing 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.

9. Kuan Peng, 2017, «Length-contraction-magnetic-force between arbitrary currents»

http://pengkuanem.blogspot.com/2017/05/length-contraction-magnetic-force.html
https://www.academia.edu/32815401/Length-contraction-magnetic-force_between_arbitrary_currents
Researchgate.net: 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.

10. Kuan Peng, «Relativistic length contraction and magnetic force»

http://pengkuanem.blogspot.com/2017/04/relativistic-length-contraction-and.html
Researchgate.net: 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.

11. Kuan Peng, Correct differential magnetic force law, pdf word

http://pengkuanem.blogspot.com/2012/04/correct-law.html
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.

12. Kuan Peng, Comparison of the 2 magnetic force laws (near a corner, force tends to infinity), pdf word

http://pengkuanem.blogspot.com/2012/05/comparison.html
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.

13. Kuan Peng, Correction to the Biot-Savart law, PDF, word

http://pengkuanem.blogspot.com/2013/09/correction-to-biot-savart-law.html
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.

14. Kuan Peng, Why magnetic field must be a tensor? pdf, word

http://pengkuanem.blogspot.com/2013/09/why-magnetic-field-must-be-tensor.html
http://www.academia.edu/4563958/Why_magnetic_field_must_be_a_tensor
Physical explanation of the tensor magnetic field.

15. Kuan Peng, Unknown properties of magnetic force and Lorentz force law, Blogspot, word

http://pengkuanem.blogspot.com/2013/04/unknown-properties-of-magnetic-force.html
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.

2. 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.

a) Induced voltage

16. Researchgate.net: Non-loop induced voltage problem

https://pengkuanem.blogspot.com/2015/03/non-loop-induced-voltage-problem.html

17. Researchgate.net: Induced conductor net problem

https://pengkuanem.blogspot.com/2015/03/induced-conductor-net-problem.html

18. Researchgate.net: Coil and resistor induction paradox

https://pengkuanem.blogspot.com/2015/02/coil-and-resistor-induction-paradox.html

19. Kuan Peng, 11 October 2012, "Faraday's Law Paradox"

https://pengkuanem.blogspot.com/2012/10/faradays-law-paradox.html
https://www.academia.edu/2018620/Faradays_Law_Paradox

20. Kuan Peng, 1 November 2012, "Partial EMF measurement"

https://pengkuanem.blogspot.com/2015/03/non-loop-induced-voltage-problem.html
https://www.academia.edu/2075792/Partial_EMF_measurement

b) Lorentz forces

21. Kuan Peng, Analyze of the Lorentz forces internal to an equilateral triangle coil, 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.

22. Kuan Peng, Paradoxical Lorentz force internal to a triangle coil, 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.

23. Kuan Peng, Lorentz forces internal to a polygon coil, analyze and computation, 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 no cancel each other and make a non-zero self force.

24. Kuan Peng, Lorentz force on open circuit, Blogspot word

http://pengkuanem.blogspot.com/2012/09/lorentz-force-on-open-circuit.html
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.

25. Kuan Peng, Self force of a 3D coil, pdf word
http://pengkuanem.blogspot.com/2014/11/self-force-of-3d-coil.html
https://www.academia.edu/9413326/Self_force_of_a_3D_coil
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.

3. 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.

26. Mathematical cause of the existence of the remaining resultant internal Lorentz force, pdf word
http://pengkuanem.blogspot.com/2012/04/mathematical-cause-of-existence-of.html
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.

27. Proof of the remaining resultant Lorentz force internal to a triangular coil, pdf word
http://pengkuanem.blogspot.com/2012/04/analyze-of-lorentz-forces-internal-to.html
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.

28. Synthesis of the inconsistency of the Lorentz force law, pdf word
http://pengkuanem.blogspot.com/2012/04/synthesis.html
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.

4. Numerical computation

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

29. Numerical computation of the Lorentz force internal to an asymmetric coil, Blogspot word
http://pengkuanem.blogspot.com/2013/04/numerical-computation-of-lorentz-force.html
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.

30. Computation of the self force of a coil, Blogspot word
http://pengkuanem.blogspot.com/2013/05/computation-of-self-force-of-coil.html
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.

31. Unhappiness of Newton with Lorentz and triangular coil experiment, Blogspot word
http://pengkuanem.blogspot.com/2013/05/unhappiness-of-newton-with-lorentz-and.html
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.

5. Experiments

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

c) Theory explaining tangential magnetic force experiment

32. Kuan Peng, 2018, «Showing tangential magnetic force by experiment»
Researchgate.net: Showing tangential magnetic force by experiment
http://pengkuanem.blogspot.com/2018/05/showing-tangential-magnetic-force-by.html
https://www.academia.edu/36652163/Showing_tangential_magnetic_force_by_experiment
Theoretical explanation of tangential magnetic force and the experiment of rotating coil.

33. Kuan Peng, 2013, «Theory about parallel action experiment»
http://pengkuanem.blogspot.com/2013/03/blog-post.html
http://www.academia.edu/3116741/Theory_about_parallel_action_experiment
Explanation of the experimental result using my corrected magnetic force law.

d) Tangential magnetic force experiment

34. Kuan Peng, 2017, « Continuous rotation of a circular coil experiment »
http://pengkuanem.blogspot.com/2017/06/continuous-rotation-of-circular-coil.html
Researchgate.net: 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 »

35. ≪Tangential magnetic force experiment with circular coil≫
Researchgate.net: Tangential magnetic force experiment with circular coil
http://pengkuanem.blogspot.com/2017/06/tangential-magnetic-force-experiment.html
https://www.academia.edu/33353400/Tangential_magnetic_force_experiment_with_circular_coil_with_video_
Tangential magnetic force is shown in this experiment.

36. Current and parallel action, Blogspot, word
http://pengkuanem.blogspot.com/2013/06/current-and-parallel-action.html
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.

37. Lorentz parallel action experiment, Blogspot youtube
http://pengkuanem.blogspot.com/2013/03/lorentz-parallel-action-experiment.html
http://youtu.be/2u5Nadx0mOM
This experiment shows magnetic force parallel to current. Photographs and video.

38. Anti-Lorentzian Motor, pdf, word
http://pengkuanem.blogspot.com/2014/01/anti-lorentzian-motor.html
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.

39. Kuan Peng, 2014, « Circular motor driven by tangential magnetic force »
http://pengkuanem.blogspot.com/2014/08/detail-of-my-circular-motor-using.html
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.

40. 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
Disposition of the magnets and the coil of the circular motor and explanation of the reverse equivalence with a homopolar motor.

41. Tangential force motor with regular magnets, pdf, word with video
http://pengkuanem.blogspot.com/2014/03/tangential-force-motor-with-regular.html
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.

42. Disc magnet parallel action experiment pdf Word with video included
Researchgate.net: Disc magnet parallel action experiment
https://www.academia.edu/13033082/Disc_magnet_parallel_action_experiment_video_included
https://www.youtube.com/watch?v=GVTyiyhS2WU
Square coil showing parallel action due to the magnetic field of a round magnet

43. Earth's magnetic field and parallel action pdf word with video
Researchgate.net: Earth's magnetic field and parallel action
https://www.academia.edu/12926460/Earth_s_magnetic_field_and_parallel_action_video_included_
Square coil showing parallel action due to terrestrial magnetic field

e) Perpendicular action experiment

44. Success of the modified Lorentz perpendicular action experiment, Blogspot word
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.

45. Lorentz perpendicular action experiment and Lorentz force law, Blogspot word

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.

46. Corrected law and Perpendicular action experiment, Blogspot word

http://www.academia.edu/2971430/Corrected_law_and_Perpendicular_action_experiment
Explanation of the experimental result using my corrected magnetic force law.

47. One way magnetic force, pdf, word

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°.

f) Macroscopic Aharonov–Bohm effect

48. Solenoid parallel action experiment

Researchgate.net: Solenoid parallel action experiment
https://pengkuanem.blogspot.com/2015, /06/solenoid-parallel-action-experiment.html
http://www.academia.edu/4777632/One_way_magnetic_force
This experiment will investigate the parallel action of a long solenoid. I have done this experiment and here is my result.

49. Q: Parallel action with a solenoid

50. More photograph of the hairpin wire

51. A 1.95 m long solenoid exerting Aharonov–Bohm force on a coil

Researchgate.net: 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
https://www.academia.edu/17214485/A_1.95_m_long_solenoid_exerting_Aharonov_Bohm_force_on_a_coil
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

52. Aharonov–Bohm effect in CRT experiment PDF, Word with video

Researchgate.net: Aharonov–Bohm effect in CRT experiment
http://pengkuanem.blogspot.com/2015, /04/aharonovbohm-effect-in-crt-experiment.html
https://www.academia.edu/12052541/Aharonov_Bohm_effect_in_CRT_experiment_Video_included_
Image in a CRT TV set deflected by a long solenoid. Aharonov–Bohm effect in CRT.pdf

53. 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.

54. Macroscopic Aharonov–Bohm effect experiment and theory, pdf, word

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

55. 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
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

6. Other studies

56. 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.

57. Magnetic field of a non-circular toroidal magnet, pdf, word

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.

58. Perpendicular action experiment with a long rectangular coil, pdf, word
https://www.academia.edu/6556384/Perpendicular_action_experiment_with_a_long_rectangular_coil
This experiment shows the magnetic force exerted by long straight wires.

59. 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.

7. Incorrect studies

60. Not a "one-way" magnetic force, pdf, word
http://www.academia.edu/4838155/Not_a_one-way_magnetic_force

61. Magnetized wire effect and perpendicular action experiment Blogspot

62. Fail of the perpendicular action experiment, Blogspot word
http://www.academia.edu/2538169/Fail_of_the_perpendicular_action_experiment

63. Lorentz torque experiment, pdf word
http://independent.academia.edu/KuanPeng/Papers/1869001/Lorentz_torque_experiment

64. Lorentz perpendicular action experiment, Blogspot word
http://www.academia.edu/2237784/Lorentz_perpendicular_action_experiment

65. 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_Amperes_torque

66. Curve shape of the magnetic torques, pdf word
http://independent.academia.edu/KuanPeng/Papers/1869006/Curve_shape_of_the_magnetic_torques