

# *Introduction to Electromagnetism According to Maxwell*

(Electromagnetic Mechanics)

André Michaud

Service de Recherche Pédagogique

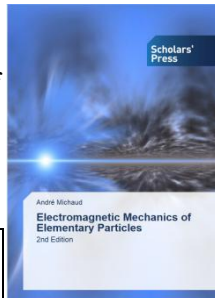
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Introduction to Maxwell's initial electromagnetics theory with deeper analysis leading to the establishment at the subatomic level of clear mechanics of electromagnetic photons emission and absorption and of electron stabilization in atoms. The resulting discovery of the adiabatic nature of the energy induced in all elementary charged particles, related to Maxwell's first equation, tends to confirm the conclusion that Einstein reached towards the end of his life that gravitation seems to follow the pattern of electromagnetism.

Complement to the previously published monograph describing the electromagnetic mechanics of elementary particles:

*Electromagnetic Mechanics of Elementary Particles – second Edition*

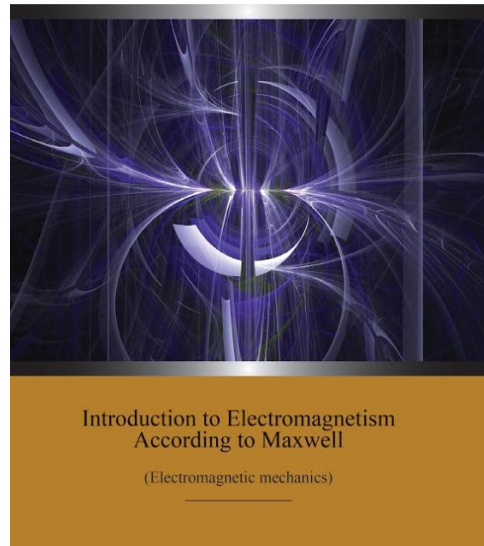
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## Introduction to Electromagnetism According to Maxwell

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Also available in French, Spanish and German

Final integration of the last three papers of the "*Electromagnetic Mechanics Project*" that were published after publication of the monograph:

For presentation of the book, the Table of Contents as well as the Foreword are provided.

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*"Things happen in this world  
when someone makes them happen"*

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# Foreword

For the first mechanical explanation of electromagnetic photons emission and absorption by electrons to currently make sense in the physics community, the explanation can be made at this point in time only from four unfamiliar aspects of electromagnetism, two of which are very recent developments that are unfamiliar for this very reason, which are the trispatial geometry that was proposed in 2000 and Paul Marmet's derivation that was published only 3 years later, both of which must be correlated with Louis de Broglie's hypothesis about localized photon's possible inner electromagnetic structure and Maxwell's initial conclusion that both electric and magnetic fields have to induce each other for the existence of electromagnetic energy to be correctly described.

Unfortunately, both de Broglie's hypothesis and Maxwell's initial interpretation, although formally available in the literature, are themselves unfamiliar to most in the current physics community, which is why the sequence of arguments presented in Chapter 1 of this work is arranged in such a way as to progressively relate these four unfamiliar aspects with the main familiar conclusions previously drawn about elementary particles, to make more obvious how these four unfamiliar aspects harmonize with observation, and can consequently be used as a solid foundation to ultimately explain photon emission and absorption.

This unfamiliarity with the conclusions of Maxwell and de Broglie is mainly due to the dominance for the past century of the Copenhagen interpretation, a dominance that eventually became so absolute in the orthodox physics community, that many of the major seminal papers that were published by Max Planck, Albert Einstein and Louis de Broglie, among other major contributors to the advancement of knowledge in physics, who opposed this interpretation, are no longer referred to, and to this day, have not even been translated to English to be made available to the global physics community. Nowhere is the nefarious influence of the Copenhagen interpretation on the physics community better put in perspective than in an analysis published initially in German by Franco Selleri, subsequently translated to French and Spanish, under the title of "*Die Debatte um die Quantentheorie*" ("*The Debate about Quantum Theory*") [1].

This translation issue is currently in process of being addressed by organizations such as the [Minkowski Institute Press](#) founded by Vesselin Petkov, dedicated to making available in English many of these ground breaking papers. Among the impressive list of such untranslated papers, my friend Fritz Lewertoff, who contributed in 2012 the first ever translation to English of Herman Minkowski's "*Das Relativitätsprinzip*" ("*The Relativity Principle*") [2], made me aware of two other major papers in this list, whose earlier translation could possibly have allowed progress to resume much sooner in fundamental physics, and that are now in process of being translated.

The first one is the text of a lecture given by Max Planck on November 12, 1930, titled "*Positivismus und reale Aussenwelt*" [3] ("*Positivism and the real outside world*"), in which he exposes the manner in which skepticism had been gaining ground in fundamental physics to the point of casting doubts on logical reasoning itself, and how such an attitude, that he had just witnessed being promoted 3 years before during the 1927 Solvey congress, was likely to mislead the community into the absence of progress that we have been observing for decades now in fundamental physics research. This damaging philosophy, that was actively promoted by Bohr, Heisenberg and Sommerfeld, became eventually known as the "*Copenhagen interpretation*", and, to the chagrin of all in the community who believe in the benefits of rationality, has become the dominant philosophy in the orthodox fundamental physics community for the past 90 years.

The most striking statement in Planck's lecture is a remark that certainly was meant as a warning about the dangers of this skepticism with regard to logical reasoning that was gaining more and more ground at that time in the fundamental physics community, according to which we will never be able to understand reality at the fundamental level any more clearly than the vague outlines allowed by Heisenberg's statistical description method, which is an axiomatic dogma directly contradicted by the current state of our understanding of the subatomic level from the electromagnetic perspective:



*"Ein Menschenkind, das seine eigene Zukunft als durch das Schicksal zwangsläufig vorherbestimmt ansieht, oder ein Volk, das den Prophezeiungen seines naturgesetzlich festgelegten Unterganges Glauben schenkt, bekundet damit in Wirklichkeit nur, daß es den rechten Willen zum Aufstieg nicht aufzubringen vermag." ([3], p. 34).*

Translation:

*"A human being who sees his own future as inevitably predetermined by fate, or a people who believes the prophecies of its downfall determined by natural law, in reality only shows that it cannot muster the right will to ascend."*

Planck's concern about this loss of confidence in logical reasoning that seemed to become the orthodox belief in the fundamental physics community soon proved to have been justified, and already in 1953 Schrödinger bluntly denounced it in a work that still has not been translated to English to be made available to the international community ([4], p. 16). See quote of this denunciation in Section 2.1.

Planck's analysis clearly highlights the limited range of possibilities for progress offered by the statistical approach that was gaining ground in the physics research community compared to those offered by the dynamic approach, in the clear identification of the laws of nature.

The second text is an incredibly important paper from Albert Einstein dating back to 1910 [5], and that practically nobody has read nor referred to for the past century, for the simple reason that the only existing version of this text is a translation to French of the lost German original, titled *"Le Principe de relativité et ses conséquences dans la physique moderne"* (*"The Principle of Relativity and its Consequences in Modern Physics"*).

The importance of this paper lies in the fact that it reveals that as early as 1910, Einstein already was aware of the 1:1 identity relation that exists between the electrodynamic force related to the acceleration of the electron charge  $e$  when subjected to an  $\mathbf{E}$ -field, and the gravitational force related to the acceleration of mass  $m$  of the same electron, as established by Newton for macroscopic masses, which he summarized with Equation (2) on page 143 of this paper:

*"On peut, par exemple, obtenir de cette façon les équations du mouvement d'un point matériel de masse  $m$  portant une charge électrique  $e$  (par exemple un électron) et soumis à l'action d'un champ électromagnétique. On connaît, en effet, les équations du mouvement d'un point matériel à l'instant où sa vitesse est nulle. D'après les équations de Newton et la définition de l'intensité du champ électrique, on a:"*

Translation:

*"We can, for example, obtain in this way the equations of motion of a material point of mass  $m$  carrying an electric charge  $e$  (for example an electron) and subjected to the action of an electromagnetic field. We know, in fact, the equations of motion of a material point at the moment when its velocity is zero. According to Newton's equations and the definition of the electric field strength, we have:"*

$$(2) \quad m \frac{d^2 x}{dt^2} = e \mathbf{E}_x \quad ([5], \text{p. 143})$$

This correct understanding on his part of the relation between the invariant rest mass and the invariant charge of the electron certainly explains his persisting intuition that gravitation had to be related to electromagnetism, as we will further analyze in Section 1.7.1. It is well known that towards the end of his life, he had become adamant that gravitation had to be related to electromagnetism, and was openly advocating that this avenue should be investigated, even if this meant that his brainchildren theories of Special Relativity (SR) and General Relativity (GR) had to be abandoned as physically inapplicable, that is, even if his theories ultimately turned out to only be *"a castle in the air"*, as he wrote in 1954 [6].

In fact, the development of these *relativity* theories at the beginning of the 20th century came about due to an alleged impossibility of demonstrating absolute motion in the universe, giving precedence to the concept of *relative motion* as opposed to *absolute motion*, that was brought to

general attention by mathematician Henri Poincaré in a short note widely distributed by the French *Académie des Sciences*, in June of 1905. This issue will be addressed in Section 3.4, and Subsections 3.5.1 and 3.17.1.

Unfortunately, when Einstein formulated this recommendation that more attention should be given to electromagnetism a few years before he passed away in 1955, the Copenhagen interpretation had already conquered the whole fundamental physics research domain, as confirmed by Schrödinger's denunciation in 1953 (See Section 2.1), and the whole orthodox community apparently purposefully immediately rejected his recommendation without a second look, as reported in 1995 by Archibald Wheeler, a major Copenhagen interpretation opinion leader:

*"A distinguished physicist even published in his very last years' works, the main point of which is to claim that gravitation follows the pattern of electromagnetism. This thesis, we cannot accept, and the community of physics, quite rightly, does not accept."*

Archibald Wheeler, 1995. ([7], p. 391)

The unfortunate outcome of this outright rejection was a 40 years hiatus before this investigation could be re-initiated in the late 1990's, right after this author became aware of this comment by Wheeler in the work that he co-authored and published in 1995 with Ignazio Ciufolini [7]. This apparently incomprehensible refusal to proceed with fundamental research in such an important direction will be analyzed in Section 1.7.2.

The project that the present work is part of is meant to repair the damage caused by this rejection, by exploring and analyzing the subatomic magnitude level of physical reality from the long established experimental foundations of electromagnetism, by means of an expansion to Maxwell's 3D vectorial space. Among the various aspects of the subatomic level that will be analyzed, Sections 1.26 and 1.27 cover what the study of electromagnetism leads to with regard to gravitation, apparently confirming that Einstein's conclusion that gravitation follows the pattern of electromagnetism may well have been right.

Most of the freely available previously published papers in this project, that refocus the conclusions drawn about the various observed phenomena at the subatomic level according to this new perspective, have been regrouped in a monograph published separately [8]. The three remaining articles that were subsequently published, also in open access, including the final synthesis of the project, are now being regrouped in the present work.

Chapter 1 reproduces the content of the article cited as Reference [9] Titled "*Electromagnetism according to Maxwell's Initial Interpretation*" formally published in January of 2020 and that constitutes the final synthesis of this project. The required sequence of arguments is organized in this chapter so as to progressively connect all four unfamiliar aspects initially mentioned with the main familiar conclusions previously drawn about elementary particles, to make more obvious to what extent these unfamiliar aspects harmonize with observation, and can consequently be used as a solid foundation to ultimately explain photon emission and absorption.

Chapter 2 reproduces the content of the article cited as Reference [10] titled "*The Hydrogen Atom Fundamental Resonance States*", formally published in April 2018. It retraces the origins of Quantum Mechanics and refocuses its understanding according to the conclusions of its initial originators, who were Louis de Broglie and Erwin Schrödinger, to finally explain, in context of the previously mentioned expanded space geometry, why electrons cannot crash onto atomic nuclei in Nature, but are rather captured in various stable stationary action orbitals at some distances from these nuclei.

Finally, Chapter 3 reproduces, with a few complementary Subsections, the content of the article cited as Reference [11] titled "*Gravitation, Quantum Mechanics and the Least Action Electromagnetic Equilibrium States*" formally published in November 2017. It provides a simplified overview of the states and processes described in the series of articles that were regrouped in the monograph titled "*Electromagnetic Mechanics of Elementary Particles*", that was published separately in 2017 [8]. So that the present introduction to electromagnetism can serve as an index into both the complete series of freely available papers, and also into the related monograph, all references to the separate papers will also refer the specific chapters that integrate them into the monograph, for readers who prefer to use the integrated monograph.

A certain amount of overlap of the descriptions will be observed between all three chapters, but since each chapter reproduces the actual content of a separately published paper, it was chosen not to reduce these overlaps so as not to interfere with the equations numbering sequences, and most importantly, not to interfere with the specific lines of reasoning that each paper was meant to emphasize. This allows all three chapters to remain independent of each other so they can be read in any order without prejudice.

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A very positive recent development has occurred concerning the three articles reproduced and completed as Chapters 1, 2 and 3 of this book, which can only accelerate the re-familiarization of the community with Maxwell's original interpretation and thus contribute to the better understanding of physical reality that it seems to favor.

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The paper titled "*Electromagnetism according to Maxwell's Initial Interpretation*" reproduced as **Chapter 1** was chosen to be republished as Chapter 4 with a new title, to account for the clearer explanation of the reason why Einstein suspected that gravitation might be related to electromagnetism, in the book titled "[\*New Insights into Physical Science Vol. 10\*](#)", which is part of a collection that pre-selects articles deemed worthy of attention from the global offering, to be put at more immediate disposal of the community.

The paper titled "*The Hydrogen Atom Fundamental Resonance States*" reproduced as **Chapter 2** was chosen to be republished as a chapter of the Book titled "[\*New Insights into Physical Science Vol. 6\*](#)", by "[\*Book Publisher International\*](#)", whose aim is to provide the global academic community with works that its editors deem worth of attention in the global offering. The title of the republished article was changed to "*An Overview of The Hydrogen Atom Fundamental Resonance States*" due to its having been expanded to include some Sections from the articles being reproduced as **Chapter 1** and **Chapter 3** of the present book. These new sections cover the mechanics of photon emission and absorption initially published in Reference [9], object of **Chapter 1**, and the analysis and resolution from the trispatial perspective of the "*absolute motion / relative motion*" conundrum previously published in Reference [15].

Finally, the paper titled "[\*Gravitation, Quantum Mechanics and the Least Action Electromagnetic Equilibrium States\*](#)" reproduced and expanded in **Chapter 3** was chosen to be republished as one of the chapters of the eBook titled "[\*Prime Archives in Space Research\*](#)", by [\*Vide Leaf Prime Archives\*](#), whose aim is to promote scientific research in the world by making research results considered state-of-the-art available to young researchers to facilitate their application in their research practices.

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