Transactional Quantic Microphysics, Principles and Applications

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Thanks

I owe to William Beaty, webmaster of amasci.com, to have let me know in 2003 that I was preceded on several points, by nineteen years (1979) by par Giles Henderson, by fifteen years (1983) by C. F. Bohren, H. Paul, R. Fischer and by twelve years (1986) by John G. Cramer, though in 1998 everybody ignored it in IN2P3, Lyon 1 University.

I owe to Bernard Chaverondier fruitful discussions on Usenet, years 2005 to 2007.

I owe to Joël Brunet and to the electronics teachers Joël Robelin and (forgotten first name) Sainsaulieu having asked (1995) me to explain to our pupils the huge capturing section of the carbon monoxide molecule for the precisely resonating photons. It was the first time I was in front of the proof of the convergence of this very large photon on this tiny molecule, 4.7 Å its great diameter.

I owe to Lev Lvovitch Regelson to have put in sight the paper from Schrödinger : "*Über den Comptoneffekt*", 1927, when he had not yet the right equidistance.

I owe to Jean-Claude Coviaux to have given the initial impulse and to have explained the constraints in popularization.

I owe to Christiane Cesari to have read the first twenty pages of that time, to have found grammar mistakes, and to have said what was hermetic to her.

I owe to my daughter Audrey to have said where she dropped because she did not get in a too early calculus, then at page 3 (now at page 397).

Several contributors in researchgate.net protested against some of my shortcuts which were impenetrable for them, and made me to precise some points which lacked in the teaching they had received. My thanks to them.

In June 2017 on Usenet, Julien Arlandis, François Guillet, and Fabrice Neyret signaled some weakness in the writing.

All other mistakes that remain are mine.

Introduction: Why transactional? And why so late?

Did you hear *Mr. Tompkins Explores the Atom* where he was told that for killing the *quantic* tiger, one should shoot many bullets in all directions? Or were you thrust that as owing to Richard Feynman "*Nobody understands Quantum Mechanics*", so you should not dare to understand better than him? Or that the mysteries of the Holy Duality are so damned subtle, that only damned math-minded initiates can master it? Or that an electron in a cathodic ray-tube takes the time to explore beyond planet Jupiter? So much considering that the cat "*is*" simultaneously dead and alive, and that the submarine "*is*" *in a superposed state* between two miles further west and two miles further east, and maybe further north and further south… With so conceptual blurring, no wonder that charlatans praise their quacks medicine, but "*quantic huh!*": they were given all facilities to fool you so.

It was enough with these rags and blunders, and it was high time somebody draws a much more clear and much more competent popularization of quantic physics. From experimental results through experimental results, this initiation handbook gives you benefits of advances in the Transactional Microphysics, through conversations between four characters: the reader Mr. Curious, the professors Marmot and Castle-Holder, Mr. Open-Eyes. Through annexes, the reader can restart from the beginning of the Mechanics, and verify each point. The big secret that the high priests of the mystery kept tight, is that "quantic", in reality, it is periodic, undulatory, and transactional, where any **individual** wave of Quantics has **one** emitter and **one** absorber, but nothing at all that could be *corpuscular*, nor *dualistic*. Nothing *corpuscular* exists in Microphysics, and only approximately in Macrophysics.

Zero corpuscles at the microphysical scale, zero duality, but emitters and absorbers do exist. Individually, any photon has **one** absorber and **one** emitter. So is the individual scale in Microphysics. In this handbook, you'll see the geometry of the Fermat spindle of this transfer between emitter and absorber, and you'll find the many consequences in optics, radio-electricity, radiocrystallography, electronic optics, electrotechnics, and so on.

When the solution has been found by the finder, as anybody can see how it was simple, one may question the collective disability that compelled the other researchers to find nothing, to remain stuck in tribal faults since 1925-1927. And worse, to deny tons and tons of experimental facts that embarrassed them, especially in optics: specialized too early, the academics never learned to practice horizontal transfers of technology, from one craft to another, from one branch to another. *A specialist is a person who knows very much on very little, and at the limit, all on nothing at all*, when the trans-disciplinary synthesis are made by men of synthesis.

The discipline of interdisciplinary synthesis is taught in other crafts, as the craft of geographer, or the craft of engineering, but alas it is ignored in the teaching of "pure" physics. A cruel lacking. Typically, an author of creativity handbook was a qualified engineer **and** doctor in psychology. A good example of a trans-disciplinary collective work is the FAO-Unesco Soil map of the world: The geographer who coordinates each volume is not a geologist, nor a petrologist, nor a climatologist, nor a hydrologist, nor a specialist in vegetable physiology, nor an agronomist, nor a pedologist either, but he can understand the works from all these specialists, so these necessary atlases were well carried out of press.

This handbook puts an end to numerous omissions, even censures, which seriously isolated the quantic from other branches of physics, and worse, from their experimental results. In transactional microphysics, no more need to crush the students under "*Shut up and calculate!*", or under "*If you think you understand quantum mechanics, so you do not understand it!*". No more need to hide to the students the resonant transparency independently discovered in 1921 by Carl Ramsauer and J. S. Townsend: that the xenon atoms become transparent to incident electrons when their energy is about 0.6 eV, it is evident when you know that each electron **is** his de Broglie wave, but incomprehensible as long as you present them as corpuscles. No more need to hide to students that the radiocrystallography, application of the physical optics laws established by Fresnel in 1819, it works with neutrons too, and though less precise because of electrostatic repulsion, with electrons too, and not only with X-rays. In radiocrystallography, no more need to hide to the students that the Scherrer law links the width of the photon to the width of the crystallites, so never any photon become corpuscular. In optics, no more need to hide to students that each interference proves that every involved photon is long since Young and Fresnel. In optics, no more need to hide to the students that each anti-reflect coating, or each interferential color on beetles, green lizards, and many birds proves that each photon is at least several or even tens or even hundreds of wavelength wide, if enough far from its absorber and far from its emitter. In optics, no more need to hide to the students that the

plane polarized light exists and that some optical devices convert all or part of a polarization into another one, nor to hide to them how some chiral molecules rotate a plane of polarization of light. In solid state physics, no more need to hide to the students that conduction electrons are each wide and long enough to interact with phonons, plasmons and polaritons, which will never become small. No more need to hide to the students the electronic properties of the dyes, nor optical properties of the crystals. No more need to hide to the students the properties nor the consequences of the Dirac equation, 1928. And so on.

In **transactional** quantic microphysics, the isolation of a pseudo-science is over, the unity of the physics is restored, ninety years later.

1 Transactional Quantic Microphysics, Principles and applications.

1.1 Historic position

Curious:
- Nine years ago, it was in the New Year 2008, I had asked you to recommend a good textbook initiating on quantum mechanics. I saw you scrapping your heads, look at each other, and conclude that no such good initiation book exists, that you should roll up your sleeves and start writing this textbook. Now, what can you present to us, us the beginners, desiring to learn?

Professor Castle-Holder:
- First, we will collect some of the most spread false ideas in the heads of the laymen,

Open-Eyes:
- … before showing that they also lay in the heads of the most beyond suspicion academic authorities.

Professor Castle-Holder:
- Then we will tell the reader what we share in common to put him at the right level in the physics of atoms [1], electrons [2] and photons [3]. Further, he will have links to technical annexes, out of the dialog.
We should differ to open the controversy that lasts publicly between us for fourteen years. First putting the reader to the proper level, debating after.

1 **Atom**: one nucleus with its escort of electrons to balance the total charge to zero.
Atomic nucleus: composed of Z protons and Y neutrons, it needs Z electrons to make an atom.
2 **Electron**: The smallest part of electricity. Invented in 1891 and experimentally proved in 1897, as *cathodic rays*. Its charge is negative. It has a magnetic momentum. All the electron are indistinguishable.
3 **Photon**: The smallest transferable part of electromagnetic radiation. It transfers from its emitter to its absorber one quantum of looping of Planck, **h**.

1.2 The most common howlers, a collection.

1. *An electron, it is damned small, almost a point, it is a small green ball, and it orbits around a rose nucleus. But it is true! Believe it my children!*
2. *Even in the vacuum, an electron walks in random zigzags, it patrols in all direction like a young dog. But it is true! Believe it my children!*
3. *If the electron always keeps its electric charge, it is because it is very small, out of reach behind its damned hard walls. But it is true! Believe it my children!*
4. *An atom is mostly vacuum between the electrons. Just like in astronomy, with only the vacuum between the planets and the stars. But it is true! Believe it my children!*
5. *If we do not tell the beginners that an electron is a small corpuscle, they will be lost! They will not understand anything! But this is true! Believe it my children!*
6. *At 30 CH, a homeopathic drug is still efficient* [4]*. But this is true! Believe it my children!*
7. *A cat can be simultaneously dead and alive. But this is true! Believe it my children!*
8. *The behavior of the particles, it is just a mystery of the gods, and it would be a sin of pride, to pretend to understand it. But this is true! Believe it my children!*
9. *For killing the quantic tiger, which is a big fuzzy tiger, Mr. Tompkins must shoot many bullets in all directions. But this is true! Believe it my children!*
10. *The light is the shock of small grains, called photons. But this is true! Believe it my children!*
11. *Those who disagree with us, are just retired colonels of cavalry, and they want to return to classical physics. And they commit a mortal sin!*
12. *As long as you do not master the hermitian operators on Hilbert spaces, you have nothing to do in QM!*

4 The general public has not yet assimilated the Avogadro-Ampère constant, which links our macroscopic world to the atomic limit. There are six hundred thousands and two hundreds and fourteen milliards of milliards water molecules H_2O in 18,0153 g water (one **mole**). The charlatans abuse of this public ignorance. Worse: many academic leading figures are still in difficulty with it: they confuse the individual waves of the quantic, which all have one emitter and one absorber, with macroscopic waves such as gravity waves at sea or in a water tank, that diffuse on many, many absorbers.

Be the reader reassured, all the statements above are false.

Open-Eyes:
- The howler n° 2 is written in the Landau and Lifshitz, Volume 3.
The howler n° 4 is taught by Jean Bricmont and many others. It is incompatible with the existence of electronic capture, where a nucleus catches an electron from the deepest layer, and about 500 nuclei can do so. So is the reaction :
^{57}Co (captures an internal e^-) → $^{57}Fe^* + {}^0\upsilon_e$ (used for the Mössbauer effect).

Professor Marmot:
- I forbid you to criticize the professor Bricmont: he is a recognized politic writer. I will denounce you as extreme rightist!

Open-Eyes:
- Jean Bricmont has no excuse: he is a professor of theoretical physics.
The howler n° 9 is from George Gamow.
"*Damned small, almost a point*"? And what is the *length* of a liter of milk? One can show dye molecules, where the oscillating electron, responsible for the selective absorption is more than 15 ångströms long, and more than 3 ångströms wide (0,3 nanometers). In pure metals at low temperature, a part of the conduction electrons have practically all the crystal size.
"*Small*" and "*punctual*" are geometrical notions bound to our macrophysical world, but without meaning, and without coherence in microphysics, as the atomic limit exists.

Yes, the photon is the smallest unit of transferable electromagnetic radiation, but this does not make it a small grain: it remains electromagnetic radiation. That still comes under the laws of physical optics given in 1819 by Augustin Fresnel, and still comes under the Maxwell equations, 1873, modernized by the bosonic interaction between photons. Yes the plane polarized light exists, and we have thousands of proofs; it would not exist if the photons would be *small grains*. At school, we have performed experiments of light interference, but they would be impossible if photon would be *small grains*. Beetles and pawns, some duck feathers, some fishes have interferential colors, and they would not exist if the photons would be *small grains*, geometrically "*small*".

Professor Castle-Holder:
- What is really small by our human scale, is the Planck quantum, and often the wavelengths, at least for the visible range and beyond, in the UV.

1.2 The most common howlers, a collection.

2 Some recalls for the non-specialist in physics, the curious reader

2.1 Planning for action

Open-Eyes:
- In these first chapters, we will precise the stakes of the transactional physics, this one which explicitly deals with individual waves, that each one has **one** emitter and **one** absorber. Then we will revise the key-constants of the microphysics, the basics of the atomics, and the electronic clouds around the nuclei, why spectral lines and spectrography, then we will see the chemical bonds, crystalline solids, the spectral lines, atomics, the metallic state, and plasticity of metals. We'll have to revise some parts of astronomical optics, of radio-electricity, and the interferences in optics.

Professor Castle-Holder:
- I protest! The metallic state and plasticity of metals belong to physics of solids, not to Quantic! And astronomical optics and radio-electricity are only classical physics. We do not intend to have anything to do with classical physics!

Open-Eyes:
- Lots of requisite knowledge do not cross the distance from one lecture room to another, on the same campus. I insist on the itinerary, and that you trust me the necessary time. Many basic pieces of knowledge from other branches of physics lack to those who presently teach *Quantum Mechanics*. They are not even conscious of the gravity of their lacunae. No way to correctly explain the photo-electric effect (Lenard 1900, Einstein 1905), without the necessary knowledge on the metallic state, that did not exist in 1905. No clear view on the photons, without taking account the experimental results in interferometry and astronomical optics, obtained from the 19th century, nor without the performances of the anti-reflect coatings, and of the birefringent quarter-wave plates, used for converting a polarization; it would be monkey business. Among the detrimental consequences, the exacted cost on the students by misunderstanding, even disgust, is exorbitant, and the yield of the scientific teaching is dismaying.

Curious:
- If you already disagree about the program, then you must explain what divides you. What is the stake in your controversy?

Open-Eyes:
- Ouch! Precisely the controversy that Mr. Castle-Holder wisely tried to cool down!
At least the formalism of the QM (according to their own designation: "*Quantum Mechanics*") is mostly correct, though futilely obscure. BUT the teachers of QM discard half of the boundary conditions, only taking account of the emitters. They are encumbered with inherited and surreptitious postulates, whose the worst are the anti-relativist, the corpuscularist, the anti-undulatory, the confusionist, and the anthropocentric ones. The students approach the QM formalism – strictly deterministe and strictly undulatory – only when they paid submission to a semantics [5] rooted in the 1925-1927 years, which is unjustifiable and inexcusable.
Not only this corpus of doctrine hinders the yield of the teaching of physics, alas a very low yield, but it also obstructs the heuristic [6] means the researchers should access. Their semantics, said *copenhaguist* because it was elaborated in Göttingen and adopted and defended by the Institute of Copenhagen bossed by Niels Bohr, is a knot [7] of faults in methodology, and of inexcusable absurdities. It misleads lots of researchers to swamps, where they are sucked. The repetitive faults of methodology obstruct the future of the country and of its youth.

This doctrine where they reason as gunners of the first World War, who poured on zone (see George Gamow, *Mr. Tompkins explores the atom*: to kill the *quantic* tiger, he must shoot many bullets in all directions), is invalidated by the Ramsauer-Townsend transparency effect, by all the spectral absorptions, by all the spectra of dark lines discovered by Fraunhofer [8], and by all the spectral

5 **Semantics**: the study of the meanings. In physics, the semantic axioms have a structure in "*This denotes…*" followed by the experimental protocol by which you can have an evidence that will further serve of reference. For instance, for electromagnetic waves, you could have a set of emitting dipolar antennas, rightly retarded in phase (the same general aspect as a Yagi antenna) and a dipolar detecting antenna you can move in the room of the experience. So you may have evidence of the polarization, directivity of the device, even knots and bellies if a stationary wave is organized by the operator.
6 **Heuristics**: the art of finding.
7 A Gordian **knot**, to be cut off by the sword.
8 The **spectrum**, or separation of the light through a prism according to the wavelength is known from Isaac Newton. The spectroscope was invented by William Wollaston in 1802; he discovered that the solar spectrum has dark lines. The German optician Joseph von Fraunhofer performed

measures in the chemistry of gases (including the on-the-orders propaganda, and on-the-orders arguments in the on-the-orders media on the myth of "*evil greenhouse gases that will make the oceans to rise*"), by all the dyes and colorimetric methods practiced in analytic chemistry, by the technology of anti-reflect coatings in instrumental optics, by the methods of atomic absorption, by the black color of biotite micas [9], by all the success of the Mössbauer effect, including the historical experiment from Pound and Rebka, and even by the practice of the men who mount antennas on the roofs.

Professor Castle-Holder:
- After so many unkind words, you must justify by showing pieces of evidence.

Professor Marmot:
- Moreover, I demand you to prove at once that Rudolf Mössbauer is on your side.

Open-Eyes:
- About Mössbauer, the answer is in annex D, including the first basis of information the reader needs as a beginner. Experience proved that if I obeyed to your trick, here the vast majority of the readers would fail to keep up: they do not master this calculus – though familiar to more advanced students.

The first and enormous surreptitious and clandestine postulate you teach is the **anti-relativist** one.

2.1.1 Anti-relativistic postulate

For them, the time remains the Isaac Newton's one, where his god could simultaneously see all.
According to the formalism they teach, their time is a universal and ubiquitous parameter. However, any photon violates their postulate, as its proper time is null. The creation and annihilation reactions are simultaneous in the photon's time. However, its coherence length and duration are not null: interferences exist! Any interference demands that each participating photon has an appreciable length of

the first spectral analysis in 1811. Fraunhofer listed 600 lines in the solar spectrum. The spectrum of the solar photosphere is now called the Fraunhofer spectrum. More than 26,000 lines in the solar spectrum are listed, where 6,000 are unique to the iron.

9 The **biotite** mica is found in the most of the granites, in diorites, norites, in a vast variety of plutonic and metamorphic rocks, less often in effusive rocks. When the kids think to *find gold* in rocks, very often it is weathered biotite, now golden yellow.

coherence. Two molecules of a gas, with different speeds in different directions, do not have the same flowing of time; all the relativists know that, though all teachers of QM remain ignorant on that. Those who handle a particles accelerator know well that the accelerated electron or proton no more dwells in the laboratory time, but the teacher of QM ignores it and writes the contrary on the blackboard.

Professor Castle-Holder:
- But we had to simplify! You already complain that the formalism is heavy and so hard to master. What would be your complaints if it was relativistic?

Open-Eyes:
- If you dared to have your standard output supervised by a qualitician [10] and by a didactician [11], your pride would be unpleasantly surprised.
Let's go on your Newtonian time, and take an experiment in optics, such those performed at the *Institut d'Optique d'Orsay*. Twenty meters from the emitter to the absorber, that is a temporal shift of 66.7 ns (nanoseconds). If we trust the Lorentz transformation, then the departure and the arrival are simultaneous in the "point of view" of the photon, though their duration is not null in either of the two frames, about one ns each. Therefore there is a fault and incoherence in the Newtonian time of the laboratory, and there are plenty of this kind, for any photon emitted from anywhere to anywhere, and it is an amount for very many. And the affairs become dramatic with astronomic distances, with proved photonic short-circuits in the several milliards years range, up to fourteen-fifteen milliards years.

Curious:
- 66,7 ns? I can read it means nanoseconds. The electronics engineers know these prefixes for units, but my young daughter does not. So please give us a table.

Professor Castle-Holder:
- At primary school, we were introduced to deci, centi, milli, deca, hecto (a hecatomb is the sacrifice of a hundred oxen) and kilo. Now we have more needs.

10 **Qualitician**: an engineer in charge of quality, preferably from the beginning of the design, when the quality is still for free.

11 **Didactician**: Teacher or researcher, devoted to coherence and sturdiness of the course the teaching assigns to pupils. The teacher is in charge of tactics, and the didactician is vowed to strategy; his/her horizon is for several years on the scholar or academic curriculum, then in the efficiency of the applying in the professional life.

Decimal prefix	abrevia-tion	Power of 10	Multiplica-ting prefix	abrevia-tion	Power of 10
deci	d	-1	deca	da	1
centi	c	-2	hecto	h	2
milli	m	-3	kilo	k	3
micro	µ	-6	méga	M	6
nano	n	-9	giga	G	9
pico	p	-12	tera	T	12
femto	f	-15	peta	P	15
atto	a	-18	exa	E	18
zepto	z	-21	zetta	Z	21
yocto	y	-24	yotta	Y	24

Open-Eyes:
- The second surreptitious and clandestine postulate they carry is corpuscularist.

2.1.2 Corpuscularist postulate

Or anti-optical postulate, as any quantitative law of optics is incompatible with the corpuscularist ideation. All the spectrography, the interferences (photonic, electronic, or neutronic), the radiocrystallography, the antennas and their directivity, the anti-reflective coatings, the interferential colors, the quarter-wave plates, the Ramsauer-Townsend transparency effect, many fine effects in polarized light, all these facts are incompatible with the myths of the corpuscularism.
For an erroneous half-sentence by Albert Einstein in 1905, they were all convinced that the resurrection by Einstein of the Newtonian corpuscle, was right. However this concept is internal to macrophysics, very far from the atomic limit, and such extrapolation to microphysics has never been validated by any experiment.

Professor Marmot:
- If the highest scientists need the corpuscles, so they are necessary.

Open-Eyes:
- Remember the answer from Pierre Simon de Laplace to Napoleon: "*Majesty, I did not need that hypothesis!*".
At the scale of our familiar macroscopic world, sure, some things appear so small. For instance, a grain of sand passing through the sieve of 200 µm but refused on the160 µm looks like a good *corpuscle* by our human scale: excepted if it is of glass and cutting, or metallic and cutting or even toxic, it will pass through our bowels without harming much. Another example of "*corpuscle*": the spore of a mold. You cannot see it in the air with your naked eyes, but it may do noticeable damages if it falls into something it can *eat*. But the extrapolation to micro-physics, beyond the atomic limit, was never validated; it is no more than a religious dogma, droned in the lectures rooms.

Professor Marmot:
- Ah no! All the trajectories observed in bubbles chambers prove that the particles are real particles, and not your vague and muddy waves! A particle is a small place in the field where all the energy is con-centrated. We have taught that all the time.

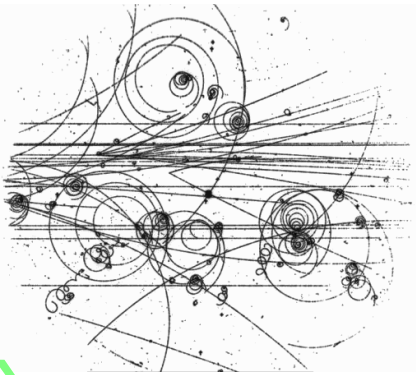


Figure 2.1.

Open-Eyes:
- I can not encourage you too much in reading again the optics handbook, especially the chapter on the ultra-microscope; then further, to open a textbook on colloids and dispersoids, especially their optical properties. Please tell us what is the minimum diameter of the fog droplets in fog chambers, or bubbles in bubbles chambers, that is necessary to have them recorded on the photosensitive film.

Professor Marmot:
- You cheat! Photographic optics is not Quantum Mechanics! And colloids are not QM either!

Open-Eyes:
- Thanks for your confession of ignorance. These tracks are at least 0,5 µm wide, a wavelength of visible light. But you pretend that they are the proof of corpuscles that would be about hundreds of millions to milliards times smaller…

Though they are historic, these tracks only prove the law of conservation of the momentum. Worse, you confuse "wave" of the quantic scale, with collective of divergent waves, and with waves in a collectivity of matter.

For many years, the multitude of the dim-witted insist on confusing three classes of waves:
1 – Waves in a collectivity (of atoms or molecules). So are the gravity waves between two fluids [12], and acoustic waves, seismic too. And in microphysics, the spin waves in a ferromagnetic material, the phonons, the plasmons, and polaritons.
2 – The collectives of waves, as light, or a beam of electrons, ions or neutrons. These collectives comprise many individual emitters and many more potential absorbers.
3 – The individual waves, for each quantic "particle", photon or neutrino for instance. Each one of these waves converges on **one** individual absorber.

So many years they deny the 2 and 3 classes and demand that all should be of class 1. Put differently, they deny the atomic limit in undulatory physics, so they could synthesize the absurdities they want to disparage – their real tactical goal.

Professor Castle-Holder:
- Here I must intervene to emphasize that each of us was raised in ambient corpuscularism, from which we used to draw hundreds of conclusions that Mr. Open-Eyes contests. It is a matter of routine to underestimate, even cover with scorn and insults the transactional thesis sustained by Mr. Open-Eyes. But his diehard coherence is revolutionary. Maybe it will force us to agonizing re-appraisals, but in balance, it pretends to offer considerable simplifications in the concepts.

Open-Eyes:
- Thanks! I had the luck to be learned: "*Do not stop your idea! Go further up to its ultimate end!*". Too many people just throw a sally in the air, just for surprising

12 On surface **water-air**: waves, soliton of a tsunami.
Air-air: Leeward of some reliefs of simple shape, a set of stable altocumuli, each one marking the top of a wave, as the wake of the island or mountain. Cf. The wake of the Amsterdam island: http://cache.boston.com/universal/site_graphics/blogs/bigpicture/eobs_01_14/e13_amsterdam_tmo.jpg
Water-water: in front of the mouth of the Amazon, underwater waves of the interface salt water – fresh water; they are known by the noticeable slowing they inflict to ships.
Source: **Traité d'océanographie physique** ***. Jules Rouch, Payot 1948.

the strollers, but alas avoid further deepening.

Next, we will see that everyday applications of the physical optics, like the anti-reflect coatings you see in use on the photographic lenses, bring proofs of the optic width of each photon; especially with short focal, wide fields. Other proofs, even more widespread and compelling, are the interferential colors (feathers of birds, scales of fish and reptiles), and their variations under oblique light. It was under their eyes, and they did not see.

The third surreptitious postulate is the tribal postulate anti-Broglie and anti-Schrödinger, therefore anti-frequential.

2.1.3 Tribal postulate anti-Broglie, anti-Schrödinger, so anti-frequential.

An obligation to negate any frequential phenomenon, except those electromagnetic and massless. Negate the intrinsic frequencies of any particles with mass (spinorial frequency of Louis de Broglie **mc^2/h**, and electromagnetic frequency of Dirac-Schrödinger, **$2mc^2/h$**). Negate the two retrochronous components of the electron wave, brought by Dirac equation in 1928. Negate the Zitterbewegung. Hide the Ramsauer-Townsend transparency, 1921, because it proves that the electron IS its broglian wave.
And retaliations against those who do not participate to the negation of the reality...
If we examine the big textbook on MQ in two volumes from Claude Cohen-Tannoudji, Bernard Diu, and Franck Laloë, the word « frequency » appears once on page 18, then disappears forever in page 18. Never they made explicit any value of frequency. As they remain submitted to the anti-relativist postulate, they had no chance to grab the essential point. Just one exception: Volume 2, Complément E_{XIII}, they mention the frequency of the Mössbauer photon; and a little before, chapter XIIIb, they mention the resonant character of the probability of transition. Only the photon frequency is evoked, but never of which frequencies it is the beat. Instead: « *Il se produit donc un phénomène de résonance lorsque la pulsation de la perturbation coïncide avec la pulsation de Bohr associée au couple d'états* $|\varphi_i\rangle$ *et* $|\varphi_f\rangle$. ». In their opinion, only the photon is frequential, and nothing else is. Obviously, they never practiced radiocrystallography [13] with neutrons or

13 **Radiocrystallography**: By the diffraction of X-rays, obtaining the equidistances of crystallographic planes, therefore finding the crystallographic structure. This invention by the father and son

electrons, and do not know it exists. The magic adjective « *associée* » will never have a definite meaning.

Professor Castle-Holder:
- I hope you have strong evidence of these de Broglie frequencies, which are disdained by all. Are not you afraid of the retaliations? See how promptly Claude Cohen-Tannoudji brandished the war ax against Shau-Yu Lan, Pei-Chen Kuan, Brian Estey, Damon English, Justin M. Brown, Michael A. Hohensee, Holger Müller [14] because they used these de Broglie frequencies, so forbidden by the community. For your sake, you must have strong proofs!

Open-Eyes:
- We have lots of proofs mentioned above: first, each time intervene a resonance on the absorber end, then all the radiocrystallography practiced without the X-rays, but with electrons, neutrons, protons or other ions. Sure: it had needed a young electronics teacher to arouse my suspicions: they handle lots of oscillators and superheterodyne [15] frequency-changers. This colleague Sainsaulieu was enough to make me get rid of the blinkers; he will not be enough thanked. They think frequential and resonances, and he was right. Furthermore, the experimental proof [16] was done in 2005 at the linear accelerator in Saclay.

Professor Marmot:
- So a mere electronics teacher may be right against our highest authorities, awarded by Nobel prizes!

Open-Eyes:
- The Spirit blows where it will; even where nobody has access to peer-reviewed scientific publications. Sooner or later, humble people will discover that "*Midas, the King Midas, has donkey ears!*".
Another class of experiments is systematically discarded by all the authors of QM textbooks (D. Sivoukhin excepted), is the Ramsauer-Townsend transparency, discovered independently in 1921 by these two authors.

Bragg has revolutionized the metallurgy and the mineralogy.

14 **A Clock Directly Linking Time to a Particle's Mass**. Shau-Yu Lan, Pei-Chen Kuan, Brian Estey, Damon English, Justin M. Brown, Michael A. Hohensee, Holger Müller. Science-2013-Lan-554-7.

15 **Superheterodyne**:

16 http://aflb.ensmp.fr/AFLB-331/aflb331m625.pdf **Experimental observation compatible with the particle internal clock**

It is a fading of the diffusive obstacle of say a xenon atom, when the incoming slow electron has some energy, about 0.6 eV to 1 eV; it was accurately confirmed many times; it can be explained only if the electron **is** the wave imagined in 1923 by Louis de Broglie, and if it is an **individual wave**. This systematical censure is a “smoking gun”.

The fourth surreptitious and clandestine postulate is the postulate of macroscopic geometry.

2.1.4 Postulate of macroscopic geometry

The copenhaguists postulate auto-similitude of time and space at any scale, with unlimited extrapolations. Furthermore, they extrapolate to microphysics the statistical irreversibility of the macroscopic time, and the topology [17] with unlimited fineness, inherited from the mathematicians of the 19th century, down to under the atomic limit where it is no more valid at all. No, the two electrons of a helium atom are not geometrically distinguishable one from another.

Professor Castle-Holder:
- So? Do you recuse all the statements about the Planck length?

Open-Eyes:
- Yes, all.

Professor Castle-Holder:
- And moreover, do you recuse the geometric calculus of the state of the helium atom?

Open-Eyes:
- The lower limits of our familiar macroscopic geometry involve some paradox, the solutions of which are not yet resolved. The paradox here is that our familiar metrics still works, though the familiar indicted topology is no more valid.

The fifth clandestine and surreptitious postulate is the geometric corollary: “*something very small*”.

17 **Topology**: Branch of mathematics devoted to the study of who is the neighbor of who, and up to how many, in which hierarchy of neighborhoods. Every metrics induces a topology, but the reciprocal is false. Some topologies exist without a metrics.

2.1.5 Geometrical corollary n° 1: "*Something very small*".

Postulate that you always can find a smaller something, enabling you to assert that something, says an electron, is "*small*", corpuscular, even "*punctual*". Bad luck: this smaller something does not exist. Though a smaller thing exists for the mold spores already mentioned: the biologists have the right microscopes, even scanning electronic microscopes if necessary.

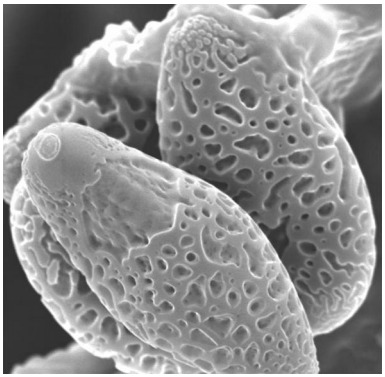


Figure 2.2

Enough accelerated (0.1 V is enough), an electron has a wavelength much smaller than the spores:

Law de Broglie : $\lambda = \frac{h}{p} = \frac{h}{mv}$

(non-relativistic domain) = $\frac{h}{m}\sqrt{\frac{m}{2qV}}$

= $h\sqrt{\frac{1}{2qmV}}$

where **λ** is the wavelength, **V** is the difference of potential for acceleration, **v** the speed of the electron, **m** its mass, **p** its momentum, **q** its charge and **h** the Planck quantum. So the wavelength under a 150 V potential is 1 Å (100 pm, a hundred picometers), 0,5 Å for 600 V, or 0,1 Å (10 pm) for 15 000 V.

Now for the needs of the microscopy, we must distinguish the width of the wave of each electron, from the width of the whole beam of electrons. A distinction that the copenhaguist QM tradition is unable to do: they have confused the statistical laws of the collectives in a beam, with the physical laws of the electron.
In transmission microscopy (light or electrons), mainly the wave width matters, and makes the resolving power; it depends on the wavelength, and on the qualities of the focusing optics. By equal dimensions and by a same geometry of the electronic microscope, the wave width is tied to the wavelength, depending together on the accelerating potential. We shall give the law later, with the **geometry of the Fermat spindles**.

Curious:

- But give now the order of magnitude; we will verify later.

Open-Eyes:
- I suppose 20 cm of beam length before, and 20 cm after, and 15,000 V accelerating. It gives 1,2 µm of wave width for an electron, in transmission. However, a metallography microscope does not work by transmission, but by spectral re-emission; after careful polishing, the metallurgist uses specific chemical etchants (such as 2% nital), to enhance the contrast between grains.

Professor Castle-Holder:
- Objection! A SEM (Scanning Electron Microscope) does not work by transmission but by detection of backscattered electrons or by secondary electrons emitted by atoms excited by the electron beam. For biological targets, their surface may be made conductive by a fine coating of gold, by high-vacuum evaporation.

Open-Eyes:
- Sure! Working on backscattered electrons. So the optic width of each of these electrons on the golden surface is just the width of the reaction absorption-emission. This width is far lesser than it was at mid-journey, here one to five nanometers, that is five hundred times smaller, at least. Though the optical width of the incident beam and of the re-emitted beam is a **beam width**, containing a huge quantity of electrons, it depends on the sharpness of the emissive cathode, on the quality of the magnetic optical device, and on the precision of the scanning. However, a beam of electrons is always diverging, whichever the quality of the focusing optic device, by the electrostatic repulsion of all these negative charges. Moreover, they are all **fermions** [18], so they all must be in different states. Increasing the accelerating potential allows to restrain the diameter of the electron beam on the golden target, and to minimize the relative importance of the electrostatic repulsion.

Professor Castle-Holder:
- The attentive reader has noticed how much our colleague separates the geometry and the physics of the electron, from those of a beam of electrons. For him, only the electron is a wave, with a wavelength and a wave width. For him, the beam of electrons is not *one* wave, but a collective of waves. It too has a width at some

18 **Fermion**: any particle of spin 1/2, such as electron, neutron, proton, neutrino… They are ruled by the Fermi-Dirac statistics. They avoid each other; only one fermion by distinct quantic state.

distance from the source but disperses inevitably. The width of a beam is always much larger than the width of each individual electronic wave.

Open-Eyes:
- And one may doubt – understatement – that the beam could have a wavelength itself. However, this mistake is a standard. We do not do the same physics as what is taught as standard.

The sixth clandestine and surreptitious postulate is the

2.1.6 Geometrical corollary n° 2, anti-absorbers.

"*There are no absorbers in microphysics. Only artillery of corpuscles, exactly as in macrophysics*".

The seventh clandestine and surreptitious postulate is the

2.1.7 Positivist and opportunist postulate.

Systematically put a macroscopic "*observer*" in the middle of the picture, to rule the microphysical realities. Big animals with slow perceptions, instead of analyzing which may be the proper size of mesh for analysis, they deny realities, and they set the territorial comfort of the leaders above all. Slow perceptions, no common magnitudes with the frequencies involved in Microphysics. So they throw to the ***Memory Hole*** [19] the whole of the experimental results obtained along the 19th and 20th centuries in interferential optics with incoherent light, noticeably all the experimental facts proving the lengths and durations for each photon. We daily use these results in radiocrystallography, either with photons or with electrons or neutrons.

Even practiced by chiefs – and by definition, *a chief is always right* – refusing to search the right size of mesh for analysis remains a professional fault, in every craft.

The eighth clandestine and surreptitious postulate is the

19 ***Memory Hole***: George Orwell. *1984*.

2.1.8 Anthropocentric and positivist postulate.

"*The physical laws are made for satisfying the curiosity of the copenhaguist physicist, therefore to furnish him information*". If the copenhaguist physicist can not more know for sure the position of the submarine, then the submarine ***is*** *in a superposed state between three miles further north and three miles further south (and west and east)*. Banesh Hoffmann *scribit*...
Daring to distinguish the microphysical realities from the knowledge we have on them, is said to be a heresy and relapse crime. We came about fifteen milliards years too late to dictate that the physical laws should be made for us, but they do not even notice this discrepancy.

The ninth clandestine and surreptitious postulate is the positivisto-corpuscularist and anthropocentrist, anti-Fourier corollary:

2.1.9 Anti-Fourier corollary.

The properties of the Fourier transform were established one century earlier: For all wave packed, the product of its indefinition in frequency by its indefinition in length is restricted by a lower limit. Less precisely but more popularly said: the product of its length by its width on the frequency spectrum. Anyway, for each photon, its amount of electromagnetic energy in a given frame is fixed to ***hv*** by its central frequency in the same frame, say the frame of the laboratory. The shortest the photon is, the highest is its local amplitude of field, and the shortest it is, the widest is its spectrum in frequencies. Said differently, the most its impulsion and energy are poorly definite.

All together:
- No pity! You must explain all!

Open-Eyes:
- There are two ways to compute the energy of a photon. The spatial one uses the density of energy, summed on the volume instantaneously occupied by the traveling photon. The volumic density of energy comes from the square of one of its specific fields, such as the electric field, the magnetic field, or even the magnetic potential $\vec{A}$, provided we choose the gauge with null at a great distance. It will be enough to compute only in the vacuum. The volume is the product of an equivalent length by an average circular area of the beam or of the Fermat spindle

at this point of the propagation. We won't tell the beginner that this product of averages comes in reality from a triple integral – whose we do not know the details. If we sum this volumic density of energy on a section, we obtain a lineic density of energy, which propagates along the trajectory of the photon, and that is weaker at the ends than at the middle. So let **Δx** be the length of the photon, as an equivalent average.

The second way of computing is frequential, from the frequency spectrum of the photon. This spectrum is graduated in frequency ***ν*** for abscissa, and density of energy by interval of frequency **δ*ν***: $\mathbf{E_\nu = E/\delta\nu}$. But the total area of this spectrogram is precisely the total energy of this wave pack, here an individual wave, a photon. Keeping a cautious silence on the way to obtain this sum (an integration), we say we have here an average width of the spectrum: Δ***ν***.

We will see farther the detail of the transformation of Fourier, and **the rule of dilation**: if you double the length of a wave packet without changing its central frequency, you define it two times better in frequency, and the width of the spectrum in frequency around its center is divided by two. In other words, the central peak of frequency is two times more elevated. To the limit, a perfectly definite frequency corresponds to a wave pack of infinite duration and length, spreading from - ∞ to + ∞. The product of the imprecisions **Δ*ν* . Δx** is constant and proportional to **h**. Now we convert the frequency into impulsion **p**, **h*ν*/c** for a photon. This constant $\mathbf{\Delta p_x . \Delta x} = \frac{\hbar}{2}$ (0,52728633 . 10^{-34} j.s/rad) is universal for any individual wave, photon, electron, neutron, proton, and so on.
In the ideally simple case where the amplitude is a Gaussian, the spectrum is a Gaussian too, and we take the product of the average widths of these Gaussians, of known areas.

Werner Heisenberg relabeled these properties of the Fourier transform, into *Unschärfeprinzip*. Then began the fantasies in interpretations and translations. A simple and honest translation could be: « imprecision » or "not sharpness", but it became « *uncertainty* » in English, and « *incertitude* » in French. Even with « imprecision » would remain the original fault in methodology: Heisenberg believed in corpuscles and was upset because the due-because-corpuscle sharpness was not supplied by nature. Worse: infantilely overreacting to the butcheries of the World War by the obsession of "Me! Myself and I, and My measurement and My information!" these Knabenphysiker put themselves and their feelings in the middle of the microphysical image. Eugen Wigner was

perhaps the most caricatural of them: Wigner, E.P., 1963. *The problem of measurement*. Am. J. Phys. 31, 6-15. They emphasized their own personal feelings and frustration, up to "*uncertainty*", and so on: "*If I know, if I do...*", etc. Only a cruel conspiracy of Nature could hide from Heisenberg the exact position of the supposed corpuscle…
So the postulate: As the properties of the Fourier transform were established one century earlier, and as Joseph Fourier was a Frenchman, and considering the emotional feelings in Germany against France in 1925, Werner Heisenberg was perfectly right to relabel these properties into "*Principle of Cruel Uncertainty of the Immortal Prophet*"[20].

Niels Bohr added to the mystic by his myth of "*duality wave-corpuscle*." These two mysticisms to conceal the properties of the transformation of Fourier (old of one century at the time) in the microphysical scale, it is as honest as the other mythologies exploited by the other clergies: that doesn't have any foundation, it is to throw to the trash can, like all the remaining of the corpuscularism.

Curious:
- So this *Heisenberg's Principle of Uncertainty*, you pellet it, and throw it in the wastebasket!

Open-Eyes:
- In the wastebasket, yes. When Albert Einstein came to Princeton, they asked him what office furniture he needed: "*A table, a chair, and a big and sturdy wastebasket, to throw my mistakes into.*" So now Einstein is dead, nobody has

20 *It is a guy who suspects his wife to cheat. He hires a detective. Here is the report from the detective:*
- Your wife followed a man in a hotel.
- And then?
- They took a room.
- And then?
- I went up in the building in front.
- And then?
- Both undressed completely.
- And then?
- They got on the bed.
- And then?
- They switched the light off, they closed the shutters, and I did not see anything more.
- Ah! ***Cruel uncertainty****!*

any more use of a wastebasket into which to throw his/her own mistakes, nor the mistakes we were taught?
In English as in French, the vocabulary is fallacious and egocentric: nature does not have anything to do with holding us in some "*uncertainty*" on a corpuscle that has never existed. It is only a matter of indefinition, about things or "particles" which remain 100% undulatory: If a photon is well defined in frequency, so it is long, and its position is poorly defined. On the contrary, if it is short, then its frequency is more spread; it was known for a century, from Joseph Fourier.
The trick from the hypnotist to make the *suckers* to believe it was new (in 1927, a century later) and *deep* was to be negligent, egocentric and fallacious in the vocabulary: the word "*uncertainty*" relates to us and our emotions. The indefinition below the Planck quantum is an intrinsic property of any wave pack, even for an individual wave. It is intrinsic and impersonal, so damned less exciting, not commercial enough… To sell well, you must make personal and concerned! "*Indefinition*" does not upset you enough, but "*uncertainty*" does, wow the anxiety!

The Fourier transform and its reverse (from the signal to its spectrum or from the spectrum to the signal) will be detailed later (paragraph 10.10).

The tenth clandestine and surreptitious postulate is the

2.1.10 Postulate of separability and delimitablity (or postulate of triumphal laziness).

As we can only write a limited system, and as anyway, we are impatient to alleviate already heavy formulas, **therefore** a quantic system **is** naturally delimited, naturally separated and independent of the remaining of the world. Alas, this postulate is heavily wrong.

The eleventh clandestine and surreptitious postulate is the

2.1.11 Magic and supernatural postulate.

Or if you prefer: *goblin* [21] and *poltergeist*: postulate that each quantum particle (electron, photon, neutron, proton…) is individually exempted from any physical

21 A ***goblin*** is a mythologic dwarf, able to appear and disappear as they like.
Poltergeist: same popular mythology, invisible strikers.

law, but magically, in big numbers, its statistic rejoins some statistical physical laws, just as this collectivity blurs the corpuscular properties they were postulated to have. Never the copenhaguists detail the physical miracle by which the individual no-laws is transmuted into a collective law.

The twelveth clandestine and surreptitious postulate is the

2.1.12 Anti-undulatory postulate.

Though the chemists use it with success, the copenhaguists postulate that any wave under the Schrödinger equation must be fictitious, without any physical meaning, and its only use is to be elevated at the hermitian square to obtain the probability of apparition of the magical and supernatural corpuscle. This goblin and *poltergeist* corpuscle is allowed to explore "*beyond the planet Jupiter*" during its travel from the electrons cannon to the cathodic screen or the microchip to engrave. Feynman and Hawking have written it [22], so it must be true...

The thirteenth clandestine and surreptitious postulate is the

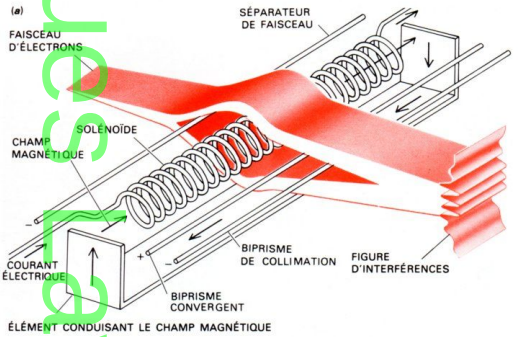
2.1.13 Confusionist postulate.

To deny the atomic limit in undulatory, prescribe to confuse all kind of "waves", each individual wave (quantic wave) with any collective of waves, and these collectives with gravity waves or elastic waves in a collective of matter, then mathematically unify all these kinds: the individual waves (quantic ones), the collective, and the waves in material collectivist. The Born-Heisenberg copenhaguism is founded on this trick, and it is so for ninety years. A hegemonic swindle.
Tip: an individual wave has only one emitter and only one absorber.
This mistake is less dangerous when applied to photons (the smallest quantity of electromagnetic transfer): They are bosons, so they attract each other and pack into herds of same frequency and habitus, especially on astronomical distances.
But this mistake becomes enormous when you apply it to electrons (the smallest quantity of electric charge). On the one hand, their minus charges energetically repel each other, so the collective energetically diverges. On the other hand, they are fermions, so they avoid each other, each in a distinct quantic state.

22 http://www.physicsforums.com/showthread.php?t=513139

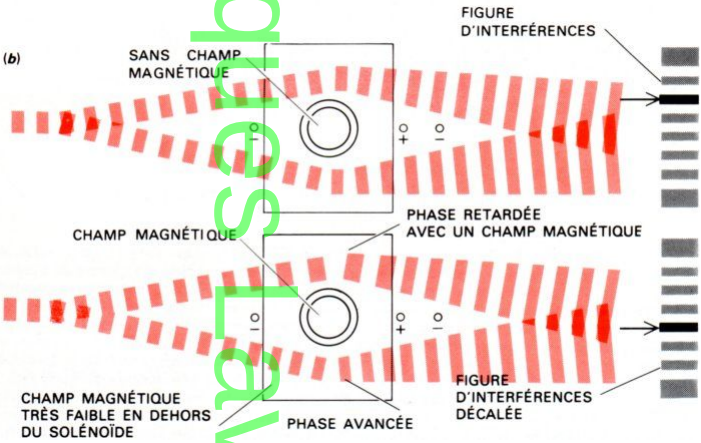
The teaching and the popularization pull your leg on this matter: they tell you that in an interference experiment, like an Aharonov-Bohm style, the beam of electrons has **a** common phase!

Example, fig 2.3.



As a fooling offering, this one is huge. See, they draw a unique and common phase for the entire beam, spreading on all the sensitive screen:

Figure 2.4.



And from who, these two schemes, technically well done, but physically fallacious?
Herbert Bernstein and Antony Philips, in *Les particules élémentaires*, Pour la Science.

Without having ever assimilated the difference between the microphysical scale, with only one or very few quantic particles, and the macroscopic scale with enormous quantities of electrons, photons, or atoms, they still do not discern that though each electron has a phase, the bundle of electrons doesn't have any, and every electronic wave is disjointed from the other.

Curious:
- And how do you correct it, this drawing?

Open-Eyes:
- For the individual scale, I pinch the departure, and I pinch the arrival: only one electron leaves from a place as small as about ten atoms, and arrives at a small place. So the electron is diluted during the journey, and is split in two by the first met negative thread, then passing respectively on both sides of the micro-solenoid, before beginning its meeting on absorber, thanks to the two focusing threads, first positive next negative. The meeting of the two spindles of the electron (= of the electronic wave) is only complete at the arrival on the absorbing site. And yes, there was indeed a phase from the beginning to the end of every branch of the journey.

The vertical scale of the drawing is enormously exaggerated. This drawing is very simplified, as it omits all the electrostatic splitting and focusing apparatus, that constrains the electron (the electronic wave) to split into two spindles converging on the same absorber. So for each transaction between the thermionic cathode and the sensitive screen. I did not draw the wavefronts, and you'll see why: we will compute the magnitude. We need a low accelerating difference of potential, we will take 6 V. So the wavelength is 5 Å. Did you expect to draw a 5 Å wavelength? And at which scale? Furthermore, to easily split an electron on a separation about 30 to 60 µm, we need a not too short apparatus, at minimum 1 m from the source to the screen. With an excellent shielding against any perturbation by any external electromagnetic field. Maybe cutting the rotary vane pump for suppressing its vibrations.

Curious:
- What is the interfrange we can observe?

Open-Eyes:
- Say 0.5 m between the screen and the splitting device. Admit 50 µm separation at this splitting. Developing the sine (very small) at first order only:

Interfrange = $\frac{0.5\,m\,x\,0.5\,nm}{50\,\mu m}$ = 5 µm. Five micrometers… I let you imagine how you will engrave the sensor that will resolve better than 0.2 µm. I fear that the only solution will be the fine motion (as in a microtome, by dilation) of a unique optimized sensor.

You could increase the interfrange, provided you diminish the distance between the two Young slits, that implies the diameter of the micro-solenoid, and increase the distance to the screen. But beware! All that in a vacuum chamber, of excellent stiffness. And you were hoping we could sketch all this at the scale? And for each electron...

Curious:
- No, in popularization books or magazines, never a magnitude computing, by fear of the fear of the readers.

Professor Castle-Holder:
- Though your so discouraging computing about the observable interfranges is correct, you lack a piece of information on the optimized experimental apparatus, which you'll find an example at the addresses:
http://iopscience.iop.org/article/10.1088/1367-2630/15/3/033018/pdf
and http://stacks.iop.org/NJP/15/033018/mmedia
They have used electrostatic lenses after the double slit - and eventual mobile mask – to lengthen the focal in a modest apparatus length, and a handlable vacuum chamber. The device magnified about 16 times, and if applied here, the observable interfrange would become 83 µm instead of 5 µm. So finding a suitable sensor, with the appropriate resolution becomes less difficult.

Professor Marmot:
- But you do it deliberately! You multiply meters by meters and divide by meters! You were never allowed to do that! One is only allowed to multiply numbers, or divide numbers, nothing else!

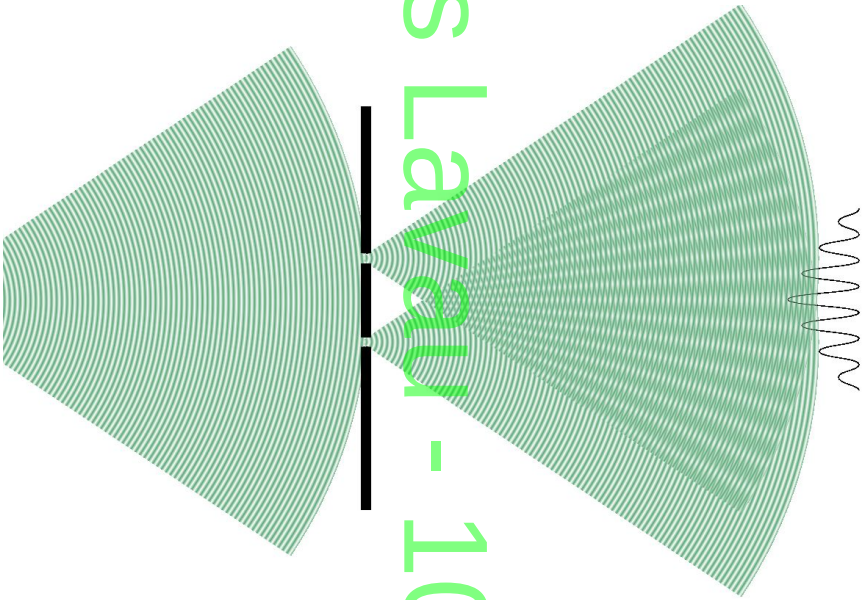
Open-Eyes:
- Blistering Barnacles! I forgot that you were never a physicist, just a disguised mathematician, who mistakes physical quantities for numbers, and who is apt to add geese with goats to obtain the age of the captain, or to add two dead boars and a small dog with a small Gaul and a big Gaul to pretend been attacked by "*a very outnumbering band of Gauls… They were five, as to say!*". In their ivory tower, despising the rest of the crafts, never the pure mathematicians taught the basics of the physical quantities, nor computing in physical quantities, nor the equation to dimensions. They do not have the slightest idea of what it can be, nor what use we have for them. It is one the most shaming secrets of the massive failure of the scientific teaching in this country.

Professor Castle-Holder:
- I suggest that you put in **Annex I** the pages of course on the **Physical quantities.**
But here let us stay concentrated on the matter. We were on the postulate of confusion between the individual waves, according to you, and collectives of waves according to the tradition. A postulate that you criticize.

Curious:

- To sum up, for the readers who never practiced **interference experiments**. At the lycée, we had seen only macroscopic experiments, where the beam of light contained milliards of photons per second. We had no mean to distinguish the photons, and the resulting pattern of interference did not show any perceptible feature of discontinuity nor random. It is summed up by such a sketch:

Figure 2.6. (Public domain image)



Open-Eyes:
- However, one can only ascertain the light at its arrival, so to know its path, you must intercept a part of it. And about *seeing* the wavelength, about 0.4 to 0.6 µm for the visible, quite impossible. This figure is largely fallacious, even for our macrophysical scale. It extrapolates from the water tanks, where the wavelengths are centimetric, and celerities very slow, about two to three centimeters per second.

Professor Castle-Holder:
- Since then, were done experiments with ultra-low intensities, where one can discern the arrival to the screen of each particle, or *individual-wave*-according-to-Mr.-Open-Eyes, photons or electrons. Each impact is so small that one may assimilate it to a point, and its position is unpredictable, but if the experiment last

enough – several months – on the large numbers emerges the interference pattern already known in macrophysical optics, with alternating dark and bright fringes.

Open-Eyes:
- Each "*particle*", electron or photon, even neutron in radiocrystallography, even ultra-cold helium atom, has interfered only with itself, indeed passing through the two holes or slits. So it is indeed a wave, an individual wave, and never a corpuscle. Even the helium atom… And where the dephasing is half a period, no photon nor electron arrives; the optical impedance is infinite. The calculus we did in the classroom by trigonometry remains fully valid.

The main change is that in classroom, we handled a beam of light, that is a big collective of individual waves coming from a concentration of emitters, but in Quantic, we look down to the laws for individual waves. And the individual wave has **only one emitter and only one absorber**. So its maximal width at mid spindle is limited about 2z, with $z = \sqrt{3a\lambda}\ /\ 4$ where **λ** is the wavelength. 2**a** is the distance from the emitter to the absorber, in a homogeneous medium. This approximation relies on the simplification with constant curvature, that is arcs of circle for the frontier of the Fermat spindle.

Curious:
- I demand a figure, a clear sketch.

Open-Eyes:
- Of course! However, no sketch in the public domain, and even in copyrighted domains may suit:
They all sketched macroscopic experiments, where milliards of milliards of photons spread on milliards of milliards of milliards of potential absorbers. To illustrate the Microphysics, we must recollect old sketches from geometric optics, when they drew how through the optical device, a point of the object projected on a point in the image.
Or interferences, one computed and drew the difference of optical length between the supposed source and different points of the screen.

Professor Marmot:
- What a retrograde! He is coming back to the geometric optics of the 17th and 18th centuries! We are the moderns, and he is the past!

Open-Eyes:

- The only difference with the physical optics from Augustin Fresnel, in 1819, of the quantic transactional optics of the 21st century, is that now we can evaluate the widths of each photon during its journey. Pierre de Fermat (1601 – 1665) had proved why, but could not achieve the computing, as he could not know the wavelengths in the visible.

Curious:
- Please explain why.

Open-Eyes:
- Fermat had proved that each real optical path is minimal compared to its near neighbors. Now we know that the real condition is not so restrictive: minimum or maximum or extremum. Otherwise said: this geometrical path only differs by a second order infinitesimal from its near neighbors. So no optical path is of null width. Since then, we have computed this Fermat width, beyond which the transmitted power is null.
It will be impossible to draw at scale these tiny widths, so we only draw the axis of the Fermat spindle-beam, photon by photon, just like the astronomers of previous centuries learned to do.

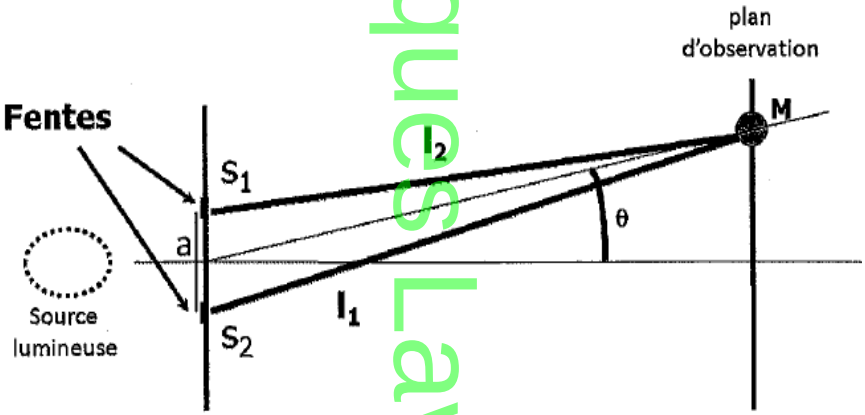


Image in the public domain: Fig. 2.7.

Between two fringes of maximal illumination, the difference of times of journey l1 and l2 must be an integer number of periods. At the minima of illumination, the difference of travel time must be an uneven number of half-periods, so the two **possible** electromagnetic fields coming from the two slits are in phase opposition, and their sum is null or nearly null.

Professor Castle-Holder:
- You must articulate better. You have just added the adjective "*possible*" to the traditional discourse, and it is not clear enough. In classical discourse, the causality flows from source to screen, so an electromagnetic field flows by one slit to the following half-space, another field from the other slit, and where they come in phase opposition, there will be no field or a very weak residual difference.

Open-Eyes:
- This classical discourse surreptitiously proceeds from the fact that the source emits milliards of milliards of photons, so at our human scale, we observe the result of a crowd of independent events. On the contrary, in transactional physics, we think and compute each transaction that evolves to a synchronous transfer from one of the emitters in the source to one of the potential absorbers of the target. So where you say "*there is no field*", we state that the optical impedance between this emitter and this absorber is practically infinite, so no transaction for a transfer of photon can achieve.

Curious:
- I see that you completely change the interpretation of the laws of optics and electromagnetism. You replace "*There is some field*" or "*There is no field*" and the intermediate cases according to phase shift by what, exactly?
And how do this emitter and this absorber to know that the impedance is too large?

Professor Castle-Holder:
- And what does mean your expression "*synchronous transfer*"?

Open-Eyes:
- On the one hand, some emission power is offered with the given optical device, on the other hand, there are different impedances according to the positions of the potential absorbers; this determines the statistical probabilities of transfer of photons. I will return later on the impedance, and its inverse the admittance. Indeed, groping the environment by the potential emitters and potential absorbers does not proceed in our Newtonian macro-time of the laboratory. We had to revise those familiar concepts, so "above any suspicion".
Synchronous transfer: during all the transfer of the photon, which may take more than a million periods, the emitter holds the absorber in frequency, in phase, and in polarization, and conversely the absorber holds the emitter; each one holds the other. The proper time of the photon is null, so in its "*photonic world*" absorption and emission are simultaneous – Relativity and Lorentz transform compel so – but not of null duration.

Professor Marmot:
- What nonsenses! The phase is not conservative and is not observable. So it has no physical meaning.

Open-Eyes:
- Tss tss! You pretend the contrary of what was asserted by Herbert Bernstein and Antony Philips, cited above. They wanted that the electron beam had **a** phase, as a collective beam.
You never stop to think your "*wave of probability*" in big numbers. It shares just only one feature with the real waves of the microphysics: they share the same equation of evolution, and this equation is correct. They do not share nor the same time, nor the same space, nor the same boundary conditions, nor anything of the

concrete meaning. The real waves, the individual waves, have a real phase, that your sect denies.

Professor Castle-Holder:
- And during this transfer, what produces the statistical randomness? By what do you diverge from the quantic theory we were taught in the same lecture rooms and in the same textbooks?

Open-Eyes:
- Just no! For us transactional physicist, the randomness does not take place during the transfer of a photon (or so little, if any). From the ground noise, the lapping of the de-Broglie-Dirac waves, some transactions emerge and succeed. They are three-partners transactions: the emitter, the absorber, and the optical space between them. As soon as the handshake occurs, the synchronous transfer is under deterministic laws. The subsequent questions, about how long lasts this transfer, how long last the emission and the reception of a photon, physical case by physical case, require a much more fine physics that what is now available. A Mössbauer photon is finely defined in frequency, so it is very long (say more than 10 meters).

Curious:
- You were just in a brawl for the phase. May we observe it? Measure it?

Open-Eyes:
- We are not at the appropriate size to mount an experiment, and we never will be! We need the phase of the individual wave to build a coherent and predictive theory. It is up to us to prove it is more coherent, more economical, and more powerful than the concurrence. It is up to the concurrence the task to prove some eventual faults.

After this recall on the interferences, let us come back on the schedule. We were on comparing the fermions with the bosons about their wave behavior.
I have re-diffused lots of evidence that Laue [23] and Debye[24]-Scherrer [25]diffractions have mediocre sharpness with electrons, compared with X-rays (or even neutrons). First because of electric repulsion between electrons. Next, comes the

23 Max von **Laue**, German, 1879 – 1960. Nobel of physics in 1914.
24 Peter **Debye**, 1884 – 1966. Nobel in chemistry in 1936. Born in the Nederland.
25 Paul **Scherrer**, 1890 – 1969, Swiss physicist.

quantic but limited repulsion between fermions, which affects the neutrons too. Each neutron has a phase, no beam of neutrons may have **a** phase.

I return to the calculus we did on the orders of magnitude for an interference experiment, with electrons. Farther at § 10.2, we will exhibit the sketches that Richard Feynman drew for his students, in 1964 in Caltech. A small flaw, however: never Feynman computed the orders of magnitude, never; never he practiced himself the experiments he blindly cites. It one of his flaws in methods (he had others, alas) he used to be able of *cock-a-doodle-doo*ing "*Nobody understands Quantum Mechanics*". These corpuscularists took the right means to understand nothing. The professors Matthew Sands, Robert B. Leighton and H.V. Neher who were assisting him, were far too subdued by Feynman, to dare to criticize and correct these flaws in methods, this lack of experimental magnitudes. You, you will understand QM because this handbook is the good one, it does not tell you contradictory tales.

Curious:
- So you are at thirteen postulates, that you all throw away.

Open-Eyes:
- These thirteen postulates are hegemonic but in the clandestinity, they are surreptitious, and all are in contradiction with experimental results. But science differs from all the others systems of transmission of knowledge in that: Science is the belief in the ignorance of experts. The experts who are leading you may be wrong. We have to verify, by experiments.

As a corollary of the postulate n° 13 (the confusionist postulate), the Copenhaguists forbid to articulate one's investigation between the crowd scale and the individual scale. For instance, the second principle of thermodynamics, of never-decreasing entropy, is a crowd effect. That all the gravity waves and all the acoustic waves disperse an are damped, is a crowd effect. But at the individual scale, a photon is still an electromagnetic wave, that does not diverge nor damp: it travels to an absorber, an individual absorber. The attenuation and the dispersion of a light beam are crowd effects, which the laws of electromagnetism are not guilty.

A fourteenth postulate, not scientific but tactical, is invoked for each controversy:

2.1.14 Tactical postulate.

In each controversy, agglomerate the formalism and the Göttingen-København semantics, and teach they may not be separated. Then you deny any meaning to the word “semantics”.
This is only for a tactical purpose. Each time our common formalism wins a victory, they yelled that it *proved* their copenhaguist semantics, and that any other “*is just philosophical preferences without any real interest*”. With its **Philosophy of Physics**, Mario Bunge had aroused many foes: he advocated that the semantic axioms should become explicit, instead of remaining clandestine. Every day we prove that one can throw away their copenhaguist semantics, without throwing the formalism – which is strictly determinist and strictly undulatory – and they immediately deny this fact.

Professor Marmot:
- All that is just philosophical fog! You ought to read books, shut up and calculate!

Open-Eyes:
- Well! Let’s turn to the calculations! Ulteriorly we will detail the blunders from Georges Charpak, Roland Omnès, Stephen Hawking, Leonard Mlodinow, Walter Greiner, who all recopy the blunders of Richard Feynman. There is a factor of hundred to spare on the clumsiness of some calculations inherited from the Feynman’s *Integral of paths*. Feynman rediscovered the Principle of Fermat (17th century) but in far less practical, as burdened with anti-relativist and anti-undulatory presuppositions.

Professor Marmot:
- *Et voilà*! The crank who imagined to be a genius, and dares to put Nobel laureates in doubt!

Open-Eyes:
- Reminder from the same “expert”: *Science differs from all the others systems of transmission of knowledge in being the irreverent belief in the ignorance of experts. The experts who are leading you may be wrong. You have to verify, by experiments.*

Avoiding to burden the rhythm of the discussion, we put off to Chapter 6, § 6.2 the details of the 15th postulate:

2.1.15 Göttingen postulate.

Only "*states*" exist, forget the transitions.
Already in 1927, coming back from Brussels in a perplexed mood, Erwin Schrödinger wrote: "*Odd physics that concentrates on the states, and omits the transitions!*".
The durations and the properties of the transitions, such as the length of coherence of photons revealed by the interference phenomena described since Thomas Young, are incompatible with the corpuscularist postulate. We will detail more, later.

Curious:
- After such ferocious indictment, which I have not yet fully understood, as there too many words that are new to me, I hope you have plots of agreement. No?

Professor Castle-Holder:
- Indeed we have. We agree on the fundamental quantities of the atomic domain, (we will expose them next). We agree on the experimental facts. We agree on the equations of evolution.

Open-Eyes:
- We disagree on the list of experimental facts that are to hide so that you could not see the dirty tricks. In my sense, they hide from you all the spectral absorptions, an extensive list. They have hidden the Ramsauer-Townsend transparency effect: it is strictly undulatory. If the electron is always undulatory, strictly

undulatory, how will they keep their mystical "*wave-corpuscle duality*", which impresses so much the flabbergasted crowds?

We agree on the time-independent static Schrödinger equation, so useful to the chemists for calculating and predicting the molecules. However, on three crucial points, we transactional physicists disagree with the copenhaguists and their heirs about the dynamical, time-dependent Schrödinger equation:

1. Their time is the Newtonian macroscopic time.
2. We explicitly write the real, intrinsic and relativistic frequencies, instead of the fictitious and unusable ones, written by the copenhaguists.
3. As soon as the problem is no more unidimensional, we explicitly part the concurrency function among the potential absorbers, from admittance function. The admittance is the inverse of the impedance. Nobody before us did this partition in optics, either photonic or electronic.

Curious:
- But what is the necessary academic level, required from me, to be apt to follow you?

Professor Castle-Holder:
- Officially in France, you tackle the quantic domain in Licence, Bac + 3.

Open-Eyes:
- Alas in an abstract and hyper-mathematized manner I do not approve.
In Annex F, you will find a glossary explaining the main words you are not so sure about, with the references to experimental facts you can verify. The cited authors are in chronological order, not alphabetical.

You must have read or seen some popularizations about the atom (or better the course of the two first years of Bachelor Degree). I will explain later theirs lacunae, but if you do not have these basics, you have no idea of what is the matter.

The required level of calculus, allowing you to verify you are not kidded, is the second year of Bachelor Degree. In maths, you must know the beginning of the vectorial analysis and at least the limited developments of the sine and the cosine; you have not forgotten the inscribed angles. On the experimental skills, you must know the experiments with the Snell-Descartes refraction, and the Young interferences with two slits. If you discover them only today, and do not know how to

verify, you can not control whether I do not fool you, with lies good enough for the kids.
You must have seen the optical spectrum of a sodium and mercury lamp. In mechanics, you should master the conservations of the linear momentum and of the angular momentum – and not only when you recognize a scholar case [26]. You should be familiar with at least one oscillatory movement, such as the swinging pendulum or an elastic pendulum. You should have seen a guitar cord and waves on the water. Preferably, you have sung in the bathroom and felt the sensation that the room is coupled with your mouth, as its damping is low: I will evoke some sharp frequential resonances, and it is a novelty in the teaching of Quantics. Without these requisites, you will be reduced to believe our word, but in Science, no one believes: he or she verifies. For helping you, some annexes are put at the end of the volume, out of the dialogue. To verify and criticize the sketch on the electronic structure of dyeing molecules, you should have half of the bachelor degree in organic chemistry; sometimes also some knowledge in analytical chemistry. But on the Dirac's bi-spinors algebra, you should have the first year of Master in maths, to be able to criticize. Otherwise, you'll have to believe our word.

We will not treat on nuclear physics, nor fundamental particles. It will be enough for us with the bestiary already known in 1932: electrons, protons [27], neutrons [28], and positrons [29]. They are enough for the chemistry, and for usual radiations, those of the atomic physics. Though our body is crossed through by a cosmic ray about once per second, and though we are crossed through by unnumerable neutrinos of low energy, we will not treat nor muons [30], nor neutrinos [31]. No optical experiment is feasible with muons, nor with any short-lived particles; it is

26 See revision at Annex G.
27 **Proton**: heavy particle or *hadron*, composing the atomic nucleus. The proton has a positive electric charge, opposed to this of the electron. This hadron is composed of three *quarks*: u u d (and of *gluons* to glue them together). It has a magnetic moment.
28 **Neutron**: heavy particle or *hadron*, composing the atomic nucleus, but without global electric charge. It has a magnetic moment resulting from the quarks, which have a fractional electric charge and a spin. This hadron is composed of three quarks: u d d.
29 **Positron**: anti-particle of the electron. Its charge is positive.
30 **Muon**: unstable and short-lived heavy electron. The muons which come to the ground were produced by collisions of cosmic rays (often protons) with some atom in the high atmosphere. The *tauon* is an even heavier and even more transient electron.
31 **Neutrino**: ghostly and ultra-light particle, which however carries away a spin, a momentum, and some energy. Breaching the other symmetries, the neutrino has only the left helicity, though the antineutrino twists on the right. The density of low-energy neutrinos in the Cosmos is unknown, hardly perceptible, and is suspected to be huge.

impossible with neutrinos, too, as only a very small part of them are detected. And here, the optics experiments are fundamental and discriminating.

Unlike the ordinary courses of atomic physics, we will use the relativistic frame, as without it, it would be monkey business. Experience has proved that a remedial course on the relativistic frame applied to microphysics is necessary; this chapter is the most difficult, and many readers will skip it first.

Professor Castle-Holder:
- Arhem! To *master the linear momentum and the angular momentum*! Maybe you ask too much.
The experiment has been done in several countries: two-thirds of the students in the second year in University, replace the Newtonian mechanics by a folkloric one, rooted in the Antiquity, as soon they do not recognize a scholar case. As to say: an ice cube, laid on the table, in a plane engaged in a flat turn; they are asked to draw the run of the ice cube in two frames, one bound to the plane, the other bound to the ground. How will they master the relativistic dynamics, while 400 years after, they still do not master the Galilean relativity, and 330 years after, they still do not master the Newtonian mechanics?

Open-Eyes:
- Alas! So Richard Feynman devoted two volumes in Caltech in teaching Mechanics, before the two volumes on Electricity. These two laws of mechanical conservation are only experimentally proved in University. The involution of the programs during the 20 past years does not pull toward up: the pupils have their lungs crammed with "*citizen science*" under odd dogmas and "*green energies*" (but intermittent and frisky, which plunge countries into blackouts, as in South Australia). They are toadied in the illusion that as being promoted as auxiliary militants, they will give lots of advice to their parents. In the meantime, the linear momentum and angular momentum are set aside, *sine die*. The linear moment should be mastered in the Gymnasium: they have the necessary mathematical (vectorial) background. The students may feel that the basics of Mechanics are not *sexy* enough, it remains that it is up to them to work the basics. But if we have to remedy their lacunae in the course and the experimental work, Ouch!
They will need to master the recoil, to attend the Compton scattering (a photon is scattered when it reacts with a conduction electron, almost free), and to distinguish the Mössbauer resonant absorptions from the other nuclear absorptions.

Curious:
- No, you will not escape so easily! If really you think that *the mass of the proletarians* (and of the bourgeoisie as well) *squelch in the mud of marsh of error*, you scientists must pull them politely out of this marsh.

Open-Eyes:
- Carried! In Annex G, you will find a short collection of fool traps, surreptitiously laid by the folkloric Mechanics inherited from the Antiquity, which trap so easily the general public. We will give the solutions, and the experimental means to not again fall into these traps. We begin with the basics of static mechanics, and carry you two academic years later.

2.2 Six transactional postulates.

2.2.1 The absorbers exist. No corpuscle exist.

No "*corpuscular aspects*" exist.

2.2.2 De Broglie-Dirac postulate.

As soon as a particle has a mass, the intrinsic frequencies $\mathbf{mc^2/h}$ and $\mathbf{2mc^2/h}$ play each one their role. The broglian $\mathbf{mc^2/h}$ for each interference of a quantic particle with itself. The Dirac-Schrödinger $\mathbf{2mc^2/h}$ for all electromagnetic interactions, for instance, the Compton scattering.

2.2.3 Fermat-Fresnel Postulate.

For each individual wave, all the real journeys come in phase to the absorber, eventually at an integer number of periods (it is then an interference).
Hence the geometry of the Fermat's spindle between emitter and absorber - several spindles in case of interference on the travel. Of course, any individual wave inherits the properties of the Fourier transform.

2.2.4 Every photon has an absorber.

A photon is a successful transaction between three partners: an emitter, an absorber, and space or optical devices between them. This transaction transfers by electromagnetic means, a quantum of looping **h**, and an energy-momentum that depends on the respective frames of the emitter and the absorber.

2.2.5 Macro-time ≠ micro-times.

We distinguish the macro-time of macro-systems such as the laboratory, from the micro-times where dwell all the gropings of broglian waves from which emerge the successful transactions. The macro-time is a statistical emergence, and it flows the same way as the entropy, a statistical emergence too. It has no causal properties in microphysics.

Corollary: We cease to presuppose that the causal irreversibility proved in macrophysics for the macro-time could be extrapolated to the micro-times the transactions emerge from. This irreversibility is a crowd effect. We cease to disdain and censure the two retrochronous solutions resulting from the Dirac equation for the electron, or any fermion.

2.2.6 No, it is impossible to isolate a quantic system.

No, it is impossible to isolate a quantic system as we isolate its equations at the blackboard: No mean exists to shield the Dirac-de-Broglie noise. It is impossible to predict which transaction will emerge from this lapping, nor when. The implied de Broglie frequencies are inaccessible from our human scale, and the theorem of the requisite variety, from William Ross Ashby, is here to ruin all our fantasies of panoptical omniscience. Moreover, the unnumerable involved micro-times are bi-directional: orthochronous and retrochronous.

Then the moral principle: we refrain from censuring the experimental results that embarrass the doctrine in power.

2.2.7 Hiding so many experimental facts to the students is wrong, and it violates the scientific deontology.

Sure, so many experimental results embarrass the copenhaguists:
All the spectral absorptions, all the interferences as the anti-reflective coatings, quarter-wave plates, interferential colors, Goos-Hänchen effect in plane polarization, Imbert-Fedorov in circular polarization, all proofs of the non-negligible width of each photon. A very long list!
They hid from you the transparency effect Ramsauer-Townsend, which is strictly undulatory. But if the electron is strictly undulatory, how will they continue to impress the naive public, by their mystic "*wave-corpuscle dualism*"? Many other everyday experimental results are incompatible with the corpuscular ideation of the Göttingen-Københavnists.

2.2.8 The economy of postulates and concepts is on our side.

No more need to erect the properties of the Fourier transform as a new postulate: they are simply inherited. The magical concepts of "*superposition of states*", "*intrication* (of supposed theoric and corpuscular states), *measurement, psychism and consciousness of the observer*" all that is dropped: **Majesty, I did not need that hypothesis!**

So is the transactional microphysics we shall develop in the body of this handbook.

2.3 The protagonists of this popularization

The protagonists of this popularization are a curious amateur, wishful to understand, and a transactional physicist, that is one of the physicists who independently re-discovered that the transactional re-reading of the quantic experimental facts was unavoidable. He is baptized "*Open-Eyes*". We know that a specialist is a man who knows very much on very little, and at the limit, all on nothing at all. On the contrary, our "*Open-Eyes*" science-venturer practiced several disciplines,

rarely brought together in a same head; this facilitates to him the confrontations of facts, and the synthesis that the too much specialized person cannot achieve.

The professor Marmot is frozen in the same theoretical position since the Solvay meeting in October 1927. Sometimes physicist, sometimes not physicist at all, the Professor Marmot is an anti-transactionist as he is a conformist animal of pack. He always intervenes for the worst. Sometimes condensed, sometimes literal, his interventions were written on Usenet and on Internet, some in English. In conformity with the violent traditions of his pack, this anti-transactionist still may heap abuses on the science-venturer who co-discovered the transactional micro-physics, but what is wholly new is that here he cannot ban nor erase the innovator. His pseudonym comes from "*La famille Fenouillard*" by Christophe, as the doctor aboard the cargo noted that Mr. Fenouillard slept in the way of the bears, Mrs. Fenouillard in the ways of the marmots, and their daughters in the way of the dormice. But a pseudonym as "*Dogmatix & Idéfix*" could do well, too.

The professor Marmot is a composite assembly of quotations from several persons, so do not be surprised if he contradicts from places to places. Please forgive some of them who are honest persons, but are prisoners of a perverted system.

It would be unfair to leave alone on the stage this violent and dishonest character, so the professor Castle-Holder is in charge of the honest pedagogical tasks, where he prefers scientific spirit to pack spirit. Even when his tribal tribe induced him in error when he was a young student.

Professor Marmot:
- Please be more respectful! We are the official science, anyway! And you are only a little shrimp of conspirationist!

Open-Eyes:
- Please clear up us from doubt: Your argument above, is it a scientific argument, according to you? Or a communautarist and tribal argument?

Professor Marmot:
- Your strong expressions undoubtedly belong to the "classical world": this is the classical reaction of one who has no arguments to respond. Let me repeat Wittgenstein's maxima: "Limits of my language are limits of my world".
Available from:

https://www.researchgate.net/post/Is_there_classical_counterpart_for_Plancks_constant_and_State_Vector.

Open-Eyes:
- The institutions may use successively four tactic tricks against the man who dares to innovate:

1. First suppressing the troublemaker, at least by bureaucratic means. So Dan Schechtman was kicked out of his laboratory - the discoverer of the quasi-crystals.
2. If the physical or bureaucratic suppression does not work, disqualify him: "*This is new, so this is false!*"
3. Then: "*OK, it is true, but it is not new! We already knew that*."
4. Then: "*Hm well, it is new, and it is true, but it is not him who discovered it, it must be somebody else!*".

According to professor Jean Bernard, the three last tactics were used against Jean Dausset, and his discovery of tissue groups HLA.

Curious:
- Say! It is the war among the scientists!

Open-Eyes:
- The physicists are territorial animals like the others: rats and dishonest like the others as long as they do not feel supervised. The institutional Superego of deontology of knowledge only intervenes in rare cases, only when they fear the regard of the general public whose taxes pay their wages and their laboratories.