Undermining the Foundations Of Relativity

by Rémi Saumont

***L'anisotropie de l'espace* (The Anisotropy of Space)**
Maurice Allais
Paris: Editions Clement Juglar, 1997
750 pp. 280 francs

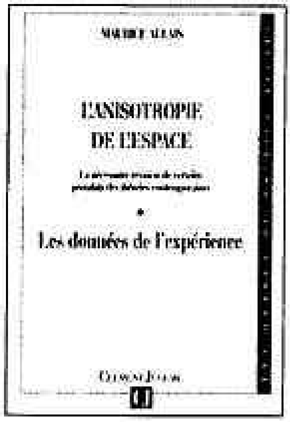
This is an important volume of more than 750 pages, which Maurice Allais has just published, in French, through Editions Clement Juglar (1997). In fact, it is the first volume of an iconoclastic work of physics reporting on experimental researches which, according to the author, will succeed in undermining the foundations of the theory of relativity.

Beginning in 1953, Maurice Allais carried out a long series of experiments studying the influence of the Earth's motion on terrestrial phenomena, experiments along the lines of the famous Michelson-Morley experiments.

One of the most original characteristics of this work, is that it is the work of an economist—and not just any economist: Maurice Allais was awarded the Nobel Prize for economic science in 1988. As a matter of fact, Allais's orientation towards economics was primarily the result of necessity—World War II—for he tells us, in the opening pages of his book, that he had originally wanted to devote himself entirely to physics. He estimates that, since 1950, he has spent at least a quarter of his time in theoretical and experimental researches in this field.

From the book's opening lines, Allais hoists his colors, asserting:

"This work will limit itself to the analysis of experimental data, the only real source of our knowledge, and, in particular, to the analysis of the new experimental data which open up new perspectives in four related domains of research: on the behavior of the pendulum, on the optical deviations of sighting instruments and collimators, on the [hitherto] unremarked regularities in the experiments of Esclangon, and on like things in D.C. Miller's interferometric observations."



Allais insists, with equal emphasis, on the fact that, as opposed to other researches of this type, his are based on very numerous, continuous observations, day and night, carried out over long periods of time:

"The new data deduced from [these] experiments . . . appear equally incompatible with the theories of the pre-Relativistic period, and with the Special or General Theory of Relativity."

This is thus a work resolutely "out of the ordinary," which is presented to us as such, graced with a great number of citations denoting a profound knowledge of the history of science.

Allais tells us that, early on, he became convinced that gravitational and magnetic actions take place gradually, implying the existence of an intermediate medium: the ether. However, contrary to the notion which pre-relativistic physicists had of the ether, to Allais it seemed necessary to admit that this medium cannot be considered as a system of absolute reference, but that it is subject to motion with reference to the so-called fixed stars.

But it is only very succinctly, that he indicates to us how he was brought to making observations of the motion of the "paraconical" pendulum.

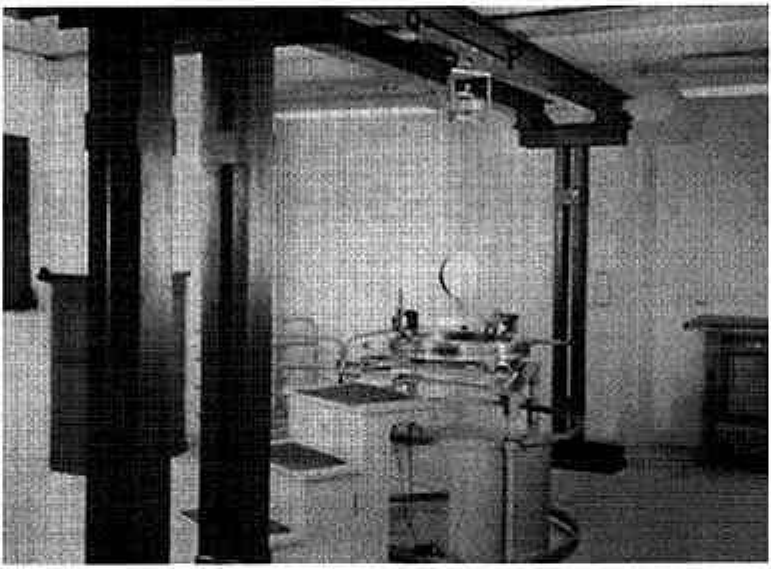
In his first researches, starting in 1950, his intention was to establish, experimentally, a relation between magnetism and gravitation, by observing the effect of a magnetic field on the movement of a pendulum made of a glass ball. These experiments did not give him significant results. On the other hand—as happens so often—the most interesting thing came in as something subsidiary, merely noticed, whose existence had not been foreseen, and, consequently, was not further researched: Namely, that the movements of the pendulum he first studied, in order to compare its motion to another one, in the absence of a magnetic field, "could not be reduced to the Foucault effect, but presented very important anomalies, which varied over time."

Thus it was this unexpected observation, that led to the researches which constitute the subject of this book.

Allais's Experiments

The pendulum used was characterized by the author as "paraconical" because its suspension consists of a ball-bearing, 6.5 mm in diameter (the amplitude of release was 0.11 radians, to prevent the ball-bearing from sliding). The envelope of the various extreme positions of this pendulum had the approximate form of a conic surface.

Unlike the Foucault pendulum, installed under the cupola in the Parisian Pantheon, and because of the particular suspension of Allais's pendulum, its motion (especially that motion he calls isotropic) with respect to the Earth, is not subjected to significant forces tending to



Overview of the paraconical pendulum apparatus used by Allais.

restore equilibrium. In fact, in the contrary case of the Foucault pendulum, where the plane of oscillation turns relative to the Earth (theoretically, remaining unchanged with respect to the fixed stars), a torsional force develops in the suspension wire that causes perturbations in the experiment.

Nothing of the sort is produced in the case of Allais's pendulum. There, the orientation of the plane of oscillation depends, in principle, in the case of the "isotropic" pendulum only upon the structure of the inertial-gravitational field—Coriolis effects having been taken into account.

Allais's experiments were conducted from 1953 to 1960, in a laboratory in the basement of the Iron and Steel Research Institute (IRSID) at Saint-Germain, and, starting in 1958, in a subterranean quarry (under 57 meters of rock) in Bougival.

The photographs of the experimental apparatus are not very clear, and a good series of drawings would have been much better. Nonetheless, its description is sufficiently detailed.

In order to minimize the causes of error which might have come from the irregular wear on the ball-bearing, it was changed regularly. The same is true for the platform on which it rests.

The pendulum was released every 20 minutes from a position of rest by burning a string. Its movement was observed for 14 minutes, through a sight calibrated to the azimuth of the plane of oscillation, with a precision on the order of a tenth of a degree. The pendulum was then stopped and released again after 6 minutes, in the plane of the last observed azimuth—and this was done night and day, during observation sessions during one month.

Actually, all of the experiments of the first series (during a four-year period), were done with a so-called *anisotropic* pendulum. This is similar to the one described above, except that in the anisotropic (unlike the case of the isotropic), the rotation of the plane of oscillation was not totally free, but was limited to 210 grades [400 grades equal 360 degrees.] Moreover, the support for the system was made in such a way that a slight difference in its elasticity occurred in two perpendicular planes. Thus, a slight force tending to restore equilibrium did exist, and this tended to turn the plane of oscillation to an azimuth of 171 grades, counting clockwise from due north.

As a result, whenever the pendulum was released in a plane along an azimuth other than 171 grades, the pendulum's motion would have a slight tendency to describe a very flattened ellipse. Thus, it was the major axis of this ellipse which became the basis for measurement.

It was the variation of the azimuth, as a function of the time, and the orientation of the response to the equilibrium-tending force, which was studied first. Allais tells us:

"During the course of an uninterrupted series of observations, the tendency of the plane of oscillation was not to fix itself in the neighborhood of the direction of anisotropy of the support, for example, but the variation of its azimuth as a function of time, presented itself as an oscillation that appeared to be very regular, at least at first sight."

In certain cases, the shift of the azimuth appeared to be considerable, and might have reached 100 grades.

Thus, the choice of experimental criteria that Allais kept for this series of experiments, appears to be somewhat unusual and difficult to discuss, because the reasons for such a choice are not given in detail, except in a short subchapter that comes later in the book—pp. 171-182.

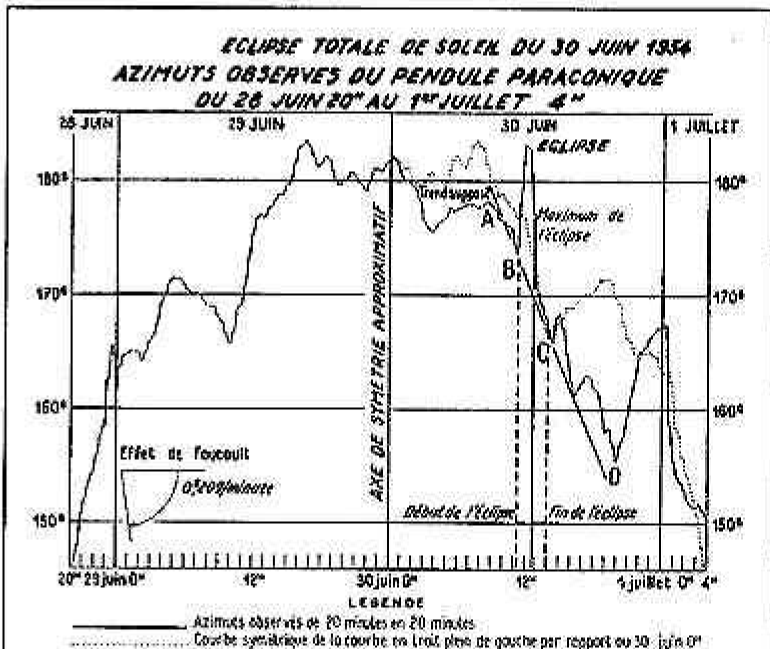
Fortunately, a second volume has been announced, which will be perhaps more explicit. A summary of this book is provided us in the second part of the table of contents of the present volume.

Several Periodicities Seen

The results of this first series of experiments show the existence of several periodicities, of which an analysis has been made by statistical methods. The principal periodicities of 24 hours, and 24 hours and 50 minutes, correspond to waves K1 and M1 in the theory of tides. These are thus classified as luni-solar by the author. What is remarkable, is their amplitude.

One knows, in effect, that the field of solar and lunar gravitation must play a role in the movement of a pendulum at the surface of the Earth, but according to Newtonian theory, later corrected and updated by relativity theory, these effects would be very slight, and not of the magnitude found by Allais. This is one of the reasons that his experiments are so interesting.

Pages 118 to 136 provide us with calculations concerning such phenomena, looked at from the standpoint of classical physics. Then comes an extremely short discussion of the possible causes of error. The only cause proposed, and then refuted, concerns the possible defects in the level of the platform on which the suspension ball-bearing rests. This is perhaps discussed a little too summarily, but it will be taken up again in the final



AZIMUTHS OF PARACONICAL PENDULUM OBSERVED DURING TOTAL ECLIPSE OF THE SUN, JUNE 30, 1954

During the 1954 total eclipse, Allais observed that the plane of oscillation of his pendulum turned sharply by 15 grades, and then returned to its previous azimuth.

chapter. However, the similitude of the results obtained at Saint-Germain, and at Bougival in the "Blanc Mineral" quarry, 60 meters underground, shows that we must exclude a host of other potential culprits.

In this regard, and to broaden the discussion, I would pose the following question: How is it possible, that the gyroscopic compass, in such widespread use today, seems not to have shown anything to date, that is at all similar to Allais's findings? Is it then that the luni-solar effect on the pendulum, found by Allais, does not perturb the gyroscope, even though the two instruments are supposed to have in common, the capability of serving as an angular inertial reference plane? What must one conclude from that?

If there was still some doubt about the reality of the effects observed by Allais, the remarkable facts that occurred during two eclipses of the Sun, even though the author appears to minimize their importance, bring out an element worth noting to the results of his research taken as a whole. During the course of the first eclipse in question (the total eclipse of June 30, 1954), for example, the plane of oscillation of his pendulum turned brusquely by 15 grades, only then to return to its previous azimuth. An analogous effect was noted during the eclipse of Oct. 2, 1959.

Inertial-Gravitational Equivalence

In the conclusion to his chapter on the anisotropic suspension pendulum, Allais analyses the arguments posed against him. He then draws from the results obtained, the conclusion that inertial space is anisotropic.

Here lies, its seems to me, a problem of interpretation. Is it a question of inertial anisotropy, or of gravitational anisotropy? According to general relativity, one is forced to think of inertia and gravitation in the same breath—that is the famous principle called equivalence, between gravitation and inertia. We forget that, even from the point of view of relativity, the equivalence is strictly local.[1] On an astronomical scale, the mechanisms which correspond to these two phenomena must be differentiated, because they do not have the same dimensional representation, intrinsically speaking.[2] The reported anisotropy, therefore, would seem to be gravitational, rather than inertial, because it seems that the gyroscope is not affected.

In the second phase of his experimentation, Allais wants to determine in a rigorous manner, the direction of spatial anisotropy manifested, without having to worry about the anisotropy of his pendulum, whence he turned this pendulum into one that was completely isotropic; that is, without any equilibrium-tending effect in any chosen plane of oscillation. This required installing some equipment, quite large and heavy, that was tested immediately in a series of correlating experiments. The results he obtained, corroborated the earlier ones.

The measurements carried out during the eclipse of 1959, for example, made it possible to confirm that one effect of eclipses, is to rotate the plane of oscillation of the pendulum towards the Moon and the Sun (p. 316).

In general, there would exist at any moment, a preferred direction towards which the plane of oscillation of the pendulum would tend to displace itself, and this direction would vary with the course of time, as a function of the astronomical conditions of the moment.

The Consequences of His Work

Thus, these results taken together would indicate the existence of an anisotropy of physical space, where the direction is variable over time, but whose mean direction would be oriented East to West.

Allais has provided us with a detailed description of these different observations and calculations, a description which takes the form of laboratory reports, the study of which, one must say, is quite arduous and detailed, because it requires specialist technical knowledge beyond that of the average reader, or even a scientist.

As for these minutiae in the exposition of each element of the results, we must perhaps attribute them to a desire for rigor, perhaps somewhat exacerbated by the opposition that he found within the scientific community. In this regard, Allais tells us an anecdote, not lacking in flavor. He cites the following passage from a rejection letter sent him by Jean Leray:

"The publication of your notes, wherever that might take place, will cast

"The new data deduced from [these] experiments . . . appear equally incompatible with the theories of the pre-Relativistic period, and with the Special or General Theory of Relativity."
—Maurice Allais

doubt onto the methods which you employ, not only in the physical, but also in the economic sciences; in this sense, their publication might be useful."

Allais adds acerbically: "I wonder what his reaction was when I was awarded the Nobel Prize in economics."

We must admit that the notes rejected for publication by Leray, concerned a very particular subject, whose technical approach seems to be only perfectly understood and mastered, by specialists in topographical geography, or by a few astronomers or opticians: "The deviations of optical sights and collimating lenses."

If one were to judge it by the manner in which Allais expounds his method and his results at the beginning of Chapter 3, Leray might perhaps have been somewhat right in being reticent. Indeed, Allais does not include an explanation to teach us the technique that he utilized, or the reasons behind it; but, above all, neither does he give us anything that might justify the manner in which he was able to interpret the results obtained. Hence, these results and their final interpretations are delivered to us in crude form, without its being made easy for us to appreciate, critically, their validity. It is clear that Allais wants to be believed on his word. You have to keep reading his book, and then further on, when he is talking about the experiments of Esclangon and Miller, you discover some developments whose particulars, had they figured at the head of the chapter in question, would have made it much more comprehensible.

That is the major defect of the book, otherwise very original and interesting: The cart is often put before the horse, and in order to read the book more easily, and with pleasure, you have to go hunting in later chapters, for what should have been laid out in the first, as a preliminary.

Allais tells us that it was the experimental work of Esclangon, as much as that of Miller, which led him to the conclusion of a dissymmetry of optical space.

The first, published in 1928, concerns 40,000 measurements made in the course of a series of 150 observations, made by day and by night. The experiment involved alignment of a horizontal wire and its mirror image, sighted through the telescope at the Strasbourg observatory. This series of observations was carried out first in the direction northeast, and then northwest. A systematic difference was found in the readings in the two directions, a difference which depended upon the mean sidereal time of the period of observation, and which corresponded to a sinusoidal fluctuation with a period of 24 sidereal hours. The conclusion to be drawn from these observations, thus, would be that space is optically anisotropic.

Dayton Miller's Experiments

The interferometric observations of Miller proceed from the same philosophy. They were carried out between 1925 and 1926 at the Mount Wilson Observatory in California. They were all in the tradition of the celebrated experiments of Michelson and Morley. Hence, their aim was to determine if it were possible to experimentally discern a translation of the Earth with respect to the ether, by using interferometry to measure its velocity. Allais does tell us, this time very explicitly, the methodology and results of these researches, demonstrating that there again, the experiment came down to measuring the velocity of light, in two perpendicular directions. However, unlike the preceding experiments carried out at Mount Wilson—and he insists on this point—here the observations were carried out, in a completely continuous manner, to all azimuths, and at every moment of day and night, over long periods of time. Thus, he considers these experiments more decisive, than those of brief duration, which were used for the confirmation of the isotropic propagation of light.

Allais then applies himself to a scrupulous study of the results, the which permit him to isolate the periodicities not perceived by the authors of the observations, in particular, a semi-annual and annual periodicity in sidereal time, not noticed by Miller.

Beginning with these analyses, Allais notes the great coherence that exists between the observations of his pendulums, the optical observations with telescope sights, the observations of Esclangon, and the interferometric observations of Miller—a coherence whose principal characteristic is that there exists a very strong correlation with the position of the Earth in its orbit.

Allais concludes from this, that any theory that rests on foundations which are incompatible with the temporal periodicities and patterns that he established (Relativity Theory, for example), must be rejected, and that the possibility of determining the position of the Earth in its orbit, by purely terrestrial experiments, would follow from what has already been demonstrated experimentally.

Conclusion

Space must thus be considered as endowed with an anisotropy caused by the stars and the solar system, with the result that, contrary to what is now believed, the velocity of light would not be the same in all directions. The differences noted would be as much as on the order of 10^{-5}, that is, about 3 km/sec. (It should be mentioned, that that velocity, is within the range of error in measuring the speed of light, foreseen by A. Kastler, for example.)

So, if we agree with the author, these conclusions would impose a return to the conception of an intermediary milieu, that is to say the ether of Fresnel, of Faraday or Maxwell—but with this difference: that one should consider the medium as itself being able to be the locus of relative motion.

This is clearly an affirmation which goes wholly against the reigning concepts of current physics. At this time, in fact, the ostracism of the anti-relativists has no parallel, except for the ostracism that formerly was applied against the original proponents of relativity.

Nevertheless, even if Maurice Allais were wrong—which merits discussion, because it involves experimental facts—Allais's book is of great interest, if only because of the wealth of the author's erudition. One must hope that this great work will have a distribution commensurate with the importance of the problems that it raises, and that the deadweight of "scientific correctness" will not, in this case, become a hermetically sealed cover for the book. If Maurice Allais turns out to be right, his work would lead to a major scientific revolution.

We await with impatience the appearance of the second volume of this work.

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Notes

1. See M. A. Tonnelat, *Les principes de la théorie électromagnétique et de la relativité*, Paris: Masson.
2. Rémi Saumont, "The Generalization of the Laws of Physics," ("La généralisation des lois de la physique") *Fusion*, No. 49, Jan.-Feb., 1996.