> of Germany and its implications, are fundamentally identical to the efforts deployed after the First World War to reach the Treaty of Versailles, efforts which led in the end to the Second World War. We must choose: Either we create a situation which risks leading us, sooner or later, to a third world war, or we participate, loyally and without second thoughts, in the integration of a reunified Germany in a united Europe.

Allais opposed the war in Iraq launched by U.S. President George H.W. Bush, as well as the role of U.S. "coalition" partners in the Mideast. Writing in *Le Figaro Magazine,* on July 23, 1991, Allais said in respect to the Gulf War:

> Without question, since the collapse of the Berlin Wall, on November 9, 1989, a new era of the history of the world had begun. The world today must be reformed and a new international order is necessary. However, this international order should not be based on the oppression and humiliation of some and the insolent domination of others. The new international order that we strongly feel we need, must be based on equity and on justice, on an equal respect for all peoples, not proclaimed on by-ways in solemn declarations, but practiced in concrete realities each day. It must be founded on ethical principles that are at the basis of our humanist civilization.

Worldwide recognition of Allais's pioneering work in economic theory came late in his career, partly because his works were not translated from French, and, more so because he trampled on accepted academic economic dogma. Allais's promotion of State intervention in many areas, and his idea that economics should further the general welfare, especially offended economists of the Austrian School. But popular acclaim was not his goal. As he commented in the conclusion to his 1988 Nobel lecture:

> *Whatever the price he might pay for it in his career,* the scientist should never steer his course according to the fashions of the day, or the approval or disapproval of his contemporaries. His sole concern must be with the quest for truth. This is a principle from which I have never departed (emphasis in original).

The Scientific Work of Maurice Allais

Identifying a New Physical Field

by Laurence Hecht

Oct. 24—Maurice Allais' physical researches are often viewed as a counter-position to Einstein's relativity theory. Professor Allais indeed presented compelling evidence that the speed of light is not independent of its direction, and that therefore this precept, which is at the foundation of the special and general theory of relativity, renders the theory invalid. That shocking possibility much intrigued me in 1998, when I first learned of the work of this French genius whom I later came to know both as a friend and a source of scientific inspiration. I shall touch only briefly on that aspect of Allais's work here, rather emphasizing his own experimental researches with the pendulum, leading to the identification of a new physical field, which I believe constitutes the most important of his contributions to science.

As Einstein's unique formulation of the relativity of space-time subsumed the existing laws of mechanics in a new and more comprehensive framework, it would only be the discovery of new physical phenomena that could fundamentally undermine this conception. Einstein's 1921 visit to American physicist Dayton C. Miller, and his later published comments on the Mount Wilson experiments, indicated his openness to this possibility. Miller, who had taught at the Case School of Applied Science in Cleveland with Albert Michelson's collaborator, the chemist Edward Morley, was then attempting to demonstrate with an improved apparatus that the Michelson-Morley experiment had not produced a null result, but rather one which was in accord neither with the assumption of Einstein that there was no ether—that is, a medium through which light and other electromagnetic waves propagated—nor with the older view of a stationary ether. Einstein encouraged Miller, noting that if the experimental results should prove him wrong, a new theory would be required. That exchange, and Miller's experiments, played an important part in Allais' thinking. However, that is not the best way to introduce the reader to the significance of his work.

The Paraconical Pendulum

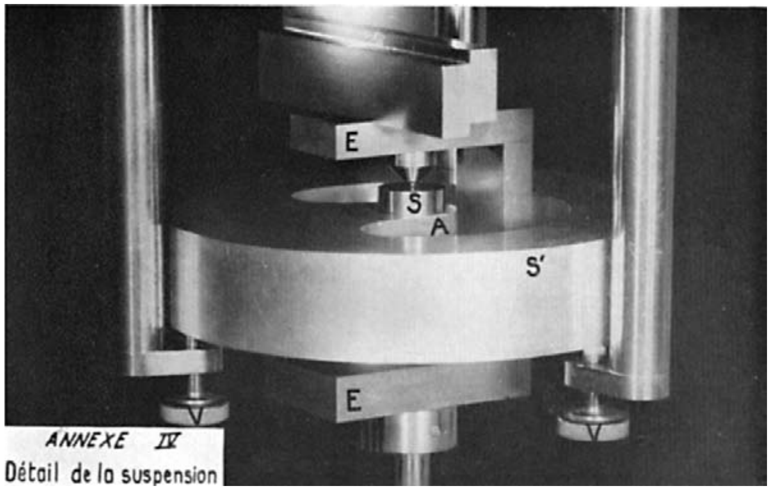
Let us rather go directly to certain experiments with a unique sort of pendulum, conceived in 1953 and carried out by Professor Allais and assistants from 1954 to 1960 in a laboratory in Saint-Germain, and during part of one year simultaneously in a quarry at Bougival, some kilometers distant. The idea for these experiments had come from Allais' conviction that the propagation of the gravitational and electromagnetic actions requires the existence of an intermediate medium. It would not be precisely the ether as conceived by Augustin Fresnel early in the 19th Century, but a modification of it, for this ether could not be motionless in relation to the fixed stars, as had earlier been assumed. A magnetic field, whose geometric expression in the form of a whirl is easily demonstrable, would then correspond to a local rotation within this presumed medium, or ether, in Allais' view. And from this thought came his idea for an experiment that could establish a never before observed link between magnetism and gravitation. If the magnetic field represents a local disturbance within the ether, it should produce some subtle effect upon the motion of a non-magnetic body, falling, as does a pendulum, under the influence of gravitation through that magnetic field.

Allais began in 1952 with observations of a glass ball suspended on a thread about 2 meters long, but with no magnetic field other than that of the Earth. "To my great surprise, I found out that this movement did not reduce itself to the Foucault effect, but displayed very significant anomalies in relation to this effect," Allais wrote in an autobiographical essay completed in 1988, the year he won the Nobel Prize in Economic Science.[1]

In 1861, Léon Foucault had famously demonstrated that a long pendulum, mounted so that it was free to swing in any vertical plane, would gradually change the azimuth of its plane of oscillation, turning through a full circle to return to the starting position after a length of time which depends upon the geographic latitude. At the installation in Paris where Foucault first demonstrated the effect, the pendulum took about 32 hours to return to the starting azimuth, while at either of the poles it would take just 24 hours. Foucault had found a means to demonstrate the rotation of the Earth from a point upon the Earth. It was an astounding demonstration, followed a year later by use of a gyroscope to show the same. However, as Allais lamented, despite the installation of Foucault pendulums at many universities and public buildings around the world, no study of the finer motion of the pendulum had ever been conducted over an extended time period.

Experiments with the glass ball pendulum in magnetic fields of a few hundred gauss did not provide definitive answers to his original hypothesis, and, unable to obtain a device for producing more powerful magnetic fields, Allais turned to a study of the anomalies in the motion of a short pendulum. For this purpose, he constructed a device which he called a paraconical pendulum, suspended such that the full weight of the pendulum rod and bob rested upon a small steel ball. A precision ball bearing resting upon a plane surface provided a very sensitive low-friction apparatus, which allowed the pendulum to swing to and fro in any figure, and to change azimuth in response to whatever forces might drive it. The means of realizing this can be seen in the photographs of the Allais pendulum. **Figure 1** shows the detail of the suspension. The

FIGURE 1



1. "My Life Philosophy," *American Economist*, Vol. 333, No. 2 (Fall 1989) as excerpted in *21st Century Science & Technology* (Spring 1998), pp. 32-33, available at http://allais.maurice.free.fr/English/media13-1.htm

weight of the pendulum rests upon a small ball bearing which is held within the removable bearing surface S, made from aluminum. The pendulum weight, rod, and stirrup (E) are made from bronze weighing a total of 12 kg. The horseshoe-shaped cutout in the large aluminum disk S′ (labeled A) allows a rotation of the azimuth of the pendulum of just over two right angles.[2]

The experiment was conducted by allowing the pendulum to swing freely for a 14-minute period every 20 minutes. The azimuth attained was determined by a graduated measuring circle capable of attaining an accuracy of 0.1 centesimal degrees (**Figure 2**). (There are 100 centesimal degrees in a right angle and 400 in a circle.) On each re-launching, the ball bearing was replaced with a new one, and the azimuth attained on the previous trial was used as the starting azimuth. The bearing surface was changed at the start of each week. These observations were carried out continuously day and night for periods up to a month during June and July 1955. Three years later, simultaneous experiments at two locations established the same results.

Because of an asymmetry or anisotropy in the modulus of elasticity of the upper support, S′′, there was a preferred azimuth to which the pendulum might tend to return, barring other effects. (The direction is indicated by the arrow PQ in **Figures 3 and 4**.) As a result, the pendulum did not rotate through a full 360°, like the Foucault pendulum, but rather varied its azimuth over a range of about 100 centesimal degrees (one-quarter circle). It was the periodicity of the variations in azimuth which proved to be most interesting. After discounting for the Foucault effect and the "return effect" due to the anisotropy of the support, Allais found very strong evidence for a periodic effect, which could not be attributed to any known cause. Harmonic analysis by a mathematical technique known as a Buys-Ballot filter showed that

FIGURE 2

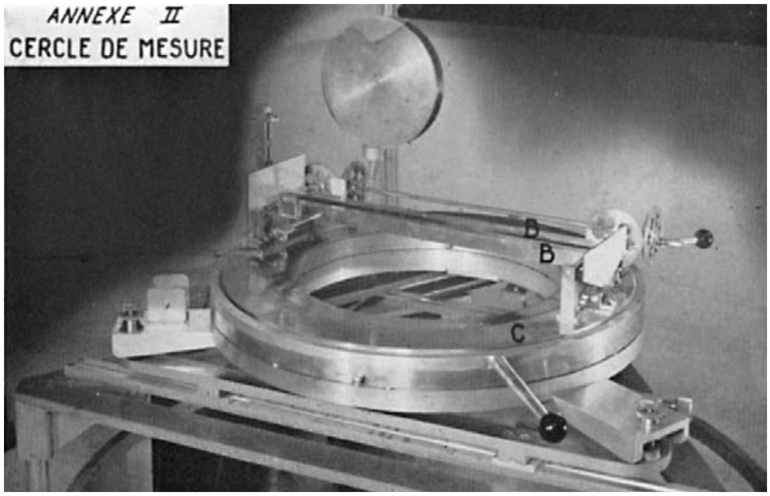


FIGURE 3

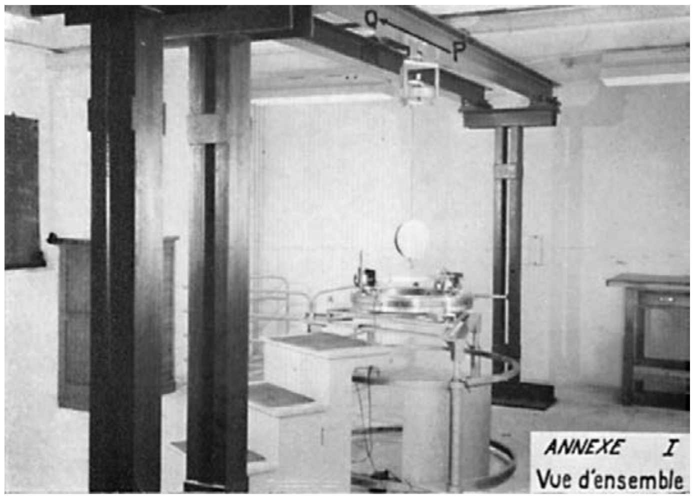
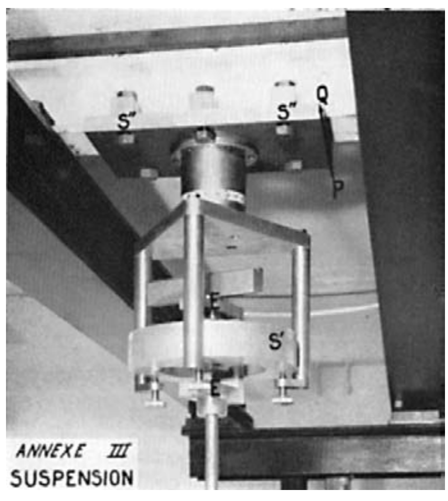


FIGURE 4



2. See Maurice Allais, "Should the Laws of Gravitation Be Reconsidered" (1959) reprinted in *21st Century Science & Technology* (Fall 1998), pp. 21-33. An electronic copy of that reprint is at http://allais.maurice.free.fr/English/media10-1.htm. The paper was originally published in English by the American Institute of the Aeronautical Sciences at the recommendation of Wernher von Braun. It appeared in *Aero/Space Engineering*, Vol. 18, Nos. 9 and 10 (September and October 1959).

the periodicity manifested itself on a cycle of 24 and 25 hours. Analysis showed that the unknown disturbing influence or influences giving rise to this periodicity was of a strong character, with a strength on average and as a whole about twice that of the Foucault effect.

Luni-Solar Influence?

The rising of the Moon occurs later each day, by an amount varying from about 20 to 80 minutes and averaging about 50 minutes over the course of a month. Thus, the position of the Moon overhead obeys a cycle of about 24 hours 50 minutes. This fact might lead one to suspect that the observed cyclicity in the pendulum data is due to the gravitational effect of the Moon, or the combined effect of Moon and Sun. The behavior of the pendulum during a total eclipse of the Sun on June 30, 1954 gave added reason to suspect a gravitational influence linked to the luni-solar alignment. A sudden variation in the azimuth of the pendulum of a magnitude never observed in any other continuous observation period took place at the start of the eclipse. Similar anomalous behavior of a pendulum during solar eclipses has since been observed by others.

However, an analysis by Allais showed that the difference in gravitational attraction exerted by the luni-solar alignment upon a point on the Earth could not give rise to such variations in the pendulum, for the order of magnitude of such effect is 100 million times smaller than the gravitational field that drives the pendulum's fall. The difference between the attraction of the Sun and Moon upon the center of the Earth, as compared to a point on the Earth's surface, is of the order of 10^{-8}, a value of such insignificance that none of the 19th-Century authors who worked on the theory of the pendulum ever took it into consideration. In addition, for the change in luni-solar force to affect the azimuth of the pendulum, one must take into account the difference between the attraction at the mean position of the pendulum and its magnitude at a nearby point, a difference in force of a tiny order of magnitude, equal to 10^{13} that of the pull of gravity at the Earth's surface.

Thus, neither the regular cyclical variation of the pendulum, nor the anomalous behavior at the time of solar eclipse, can be explained by the presently understood theory of gravitation. Something else is at work.

Jacques Bourgeot, laboratory director, operating the Allais paraconical pendulum, photographed by Maurice Allais. He is operating the measuring circle for the pendulum, which allows measurement of the direction of the swing and the two axes of the flat ellipse which the pendulum bog traces out.

Other Possible Causes

In order to arrive at an explanation, Allais considered a wide range of known periodic phenomena, including the terrestrial tides, variations in the intensity of gravity, thermal or barometric effects, magnetic variations, microseismic effects, cosmic rays, and the periodic character of human activity. Yet, on close examination, the very peculiar nature of the periodicity shown by the change in azimuth of the pendulum forced the elimination of all of these as cause. For the pendulum, the amplitude of the 25-hour wave was of the same order of magnitude as that of the 24-hour wave, and very much greater than the amplitude of the 12 and 12.5-hour wave. Yet for all of the phenomena considered as possible causes, the total of the amplitudes of the waves having periods close to 25 hours is small as compared to the 24-, 12-, or 12.5-hour series.

By the elimination of such causes, Allais was led to his hypothesis of spatial anisotropy which I first learned of on reading a review of his 1997 book, *L'anisotropie de l'espace* (*The Anisotropy of Space*). On closer examination of this work, I discovered the existence of many little-known anomalous phenomena, which he supposed to be evidence of a dissymmetry or anisotropy of space. Among these were the measurements carried out by Ernest Esclangon in the 1920s, when he was the director of the Strasbourg Observatory. These involved certain systematic shifts that occurred in the sighting of a refracting telescope, depending on whether the instrument was aimed toward the northwest or northeast, and showing a periodicity which coincided with the sidereal, but not the mean, solar day. Prior to this, Esclangon had made an analysis of 166,500 hourly observations of the Adriatic tides, which he interpreted as demonstrating a dissymmetry in the sidereal space, not affected by the luni-solar alignment.

Allais believed that the variations noted by Esclangon were closely related both to the results of Dayton Miller's extended observations at Mount Wilson with the upgraded Morley-Miller interferometer,[3] and to his own results from the paraconical pendulum. Indeed, Allais suspected that a wide variety of anomalous periodic behaviors might also be comprehended by this conception of spatial anisotropy. It is instructive to reproduce the list of such effects, which he included in his 1959 paper, "Should the Laws of Gravitation be Reconsidered?":

1. Abnormalities in the tide theory;
2. Motions of the top of the Eiffel Tower;
3. Size of the deviations to the South noted on falling bodies;
4. Variations in the amplitude of the deviations to the east noted on falling bodies;
5. Abnormalities noted in the action of terrestrial rotation on the flow of liquids (Tumlirz's experiments);
6. Abnormalities noted in the motion of the horizontal gyroscope of Föppl;
7. Abnormalities noted in the experiments carried out with the isotomeograph;
8. Abnormalities noted in experiments carried out with a suspended pulley;
9. Various abnormalities noted in geophysical measurements, ascribed until now to experimental errors;
10. The apparently unaccountable results obtained by Louis Pasteur (a general in the French Medical Corps, not the 19th-Century scientist) in his experiments on the oscillation of the pendulum (1954);
11. Remarkable characteristics of the Solar System, for which there has been, until now, no satisfactory explanation.

To these considerations, we would like to add one other case of an unexplained periodicity corresponding to the solar and lunar day, as well as to longer cycles, which came to our attention only recently. The nature of it is such as to lend an added breadth to the considerations raised so far. These are the periodicities in metabolic activity observed in organisms as diverse as crabs, salamanders, potatoes, seaweed, and carrots, as reported some decades ago by Northwestern University biologist Frank A. Brown and colleagues.[4] In one especially provocative series of experiments, Brown and collaborators observed the cycle of shell opening and closing in oysters that had been transported in a photographic dark box from New Haven, Conn. to Evanston, Ill. Maintained under conditions of artificial light, pressure, and temperature, the bivalves nonetheless gradually changed their time of opening to correspond with high tide as it would have occurred in their new, landlocked location.[5] How they received the time signal remains a mystery. Brown later found an inverse correlation of the metabolic activity of these and other organisms to the intensity of cosmic ray flux.

The similarities and differences of these observations of cyclical activity exhibited by living organisms, compared to those of a purely physical nature noted by Allais, are worth closer study. As the experiments of Allais and Brown occurred within the same epoch, some very precise comparison of data may be possible.

I am reminded of a meeting in Paris in the Spring of 2001 at the offices of the political movement associated with Jacques Cheminade. That was one of two occasions on which I had the pleasure to meet Maurice

3. Maurice Allais, "The Experiments of Dayton C. Miller (1925-1926) and the Theory of Relativity," *21st Century Science & Technology* (Spring 1998), pp. 26-34, available at http://allais.maurice.free.fr/English/media12-1.htm, and the accompanying background piece, Laurence Hecht, "Optical Theory in the 19th Century and the Truth about Michelson-Morley-Miller," *21st Century Science & Technology* (Spring 1998), pp. 35-50.

4. See, for example, Frank A. Brown, Jr., M.F. Bennett, and H.M. Webb, "Monthly Cycles in an Organism in Constant Conditions during 1956 and 1957." *Proceedings of the National Academy of Sciences*, Vol. 44 (1958), pp. 290-296.

5. Frank A. Brown, Jr., M.F. Bennett, H.M. Webb, and C.L. Ralph, "Persistent Daily, Monthly, and 27-Day Cycles of Activity in the Oyster and Quahog," *J. Exp. Zool.*, Vol 131, No. 2 (March 1956), pp. 235-262.

Henry Aujard

Maurice Allais (right) in Paris in 2001, with (left to right) his wife, Jacqueline, Laurence Hecht, Emmanuel Grenier, and Marjorie Mazel Hecht.

Allais. Also in attendance were the biophysicist Vladimir Voeikov, Allais' associate Henry Aujard, Remi Saumont of the CNRS (National Center for Scientific Research), and others. I recall the enthusiasm with which Allais responded to the suggestion that an international organization be created to carry out investigation along the lines similar to those I have outlined here. That proposal did not take off at the time. Now, however, in a new generation of thinkers associated with Lyndon LaRouche's Basement Project, it has taken shape.

Beyond Sense Certainty

What is most intriguing about the new physical field, of which Allais' experiments give evidence, is the suggestion of an effect not clearly linked to visible objects, nor to any sensible phenomenon of which we are presently aware, even including cosmic rays as presently understood. The introduction of the sort of considerations epitomized in F.A. Brown's works, allows us to more easily view the matter from the standpoint of a universal field not limited to physical effects, in the strict sense, but acting upon the three domains of living, non-living, and cognitive as identified by V.I. Vernadsky.

Here I raise a point of difference with Allais in his formulation of an anisotropy of space, my objection being not so much to the anisotropy, but to the space. There is no empty space; on this point we would not have differed. However, I believe one must go beyond filling the apparent distance between the objects of naive sense certainty with a medium, of whatever composition. Rather than space, time, and matter, we might better say a universal continuum with singularities, borrowing these, actually imprecise, terms from mathematics, for lack of a better image. Thus, the radiation-filled interstellar space is not truly distinct from the objects which appear to fill it, and from this flows the necessity of the next revolution in our scientific understanding, to reconstruct the Periodic Table of Dmitri Mendeleyev from the standpoint, not of particles, but of a universal cosmic radiation or field. I believe that Allais and myself would have found common ground, if not perfect agreement, on this approach, had we had the opportunity for extended discussion of the matter.

Immortality exists as a real and even measurable phenomenon, far more than most today are willing to recognize; the greater the soul, the more manifest. Herein spiritual greatness is distinguished from the common sort of passing fame, which is never won without moral compromise. For such unfortunate cases, in the end, after all the ceremony and intoning of empty words is over, there is little left. It is quite the opposite with great souls, who leave behind a legacy of thought and action from which the living still wish to learn and with which they still desire to consult. In the renewed dialogue I here initiate with my dear friend Maurice Allais, that elementary truth is about to be proven once more.