Journal of Scientific Exploration, Vol. 10, No. 2, pp. 269–279, 1996 0892-3310196

ESSAY

Illegitimate Science? A Personal Story

BRUCE MACCABEE

6962 Eyler Valley Flint Road, Sabillasville, MD 21780

Abstract — In the 1960's experimental results were reported by physicist Erwin Saxl claiming certain small gravitational anomalies associated with solar eclipses. Saxl claimed that the period of a torsional pendulum inside a grounded Faraday cage was observed to increase during an eclipse. The "Saxl Eclipse Effect" was published in *Nature* and in *Physical Review*. This essay recounts the efforts of the author, at the time an enthusiastic graduate student, to replicate these experiments. This did not meet with success and the Saxl effect has now been forgotten. The essay discusses these efforts and their relevance to the question of what constitutes legitimate vs. illegitimate science.

Introduction

Although I present in this essay some experimental results never before published, this is not a formal report on my experiment, but more of a retrospective discussion inspired by the mention of Dr. Erwin Saxl in the paper of Volkamer, *et* al. (Volkamer, 1994).

Volkamer *et* al. claim to have detected unexpected changes in mass during chemical reactions (and speculate that the changes are evidence for "dark matter"). They mention, as one of their reasons for carrying out experiments to detect mass non-conservation in chemical reactions, the experimental results of Saxl (1964, 1971) and Allais (1959) who reported odd "gravitational" effects, especially during eclipses. Although the results Volkamer *et* al. report for their chemistry experiments suggest that further investigation is in order, it is not my intent to discuss their experiments in this letter. Instead I will discuss the experiments of Dr. Erwin Saxl and my attempts to duplicate them.

Probably few readers of the JSE have ever heard of Erwin Saxl and the "Saxl effects," and fewer still have actually carried out "Saxl experiments." However this latter number, small though it may be, is not zero (after all, I, too, am a reader of the Journal!). Therefore in this letter I will outline Saxl's experimental results so that the reader will have a better understanding of why Volkamer *et* al. referred to them. I will also present the history of my own involvement because it makes an interesting story and because it leaves us with an unsolved *mystery.*

I will begin by comparing the reasons given by Volkamer *et al.* for repeating some basic chemistry experiments with my reasons for attempting to duplicate the "gravitational" experiments of Dr. Saxl described below. Both of these types of experiments could be classified as scientifically "illegitimate." To repeat the chemistry experiments would be illegitimate, according to conventional scientific opinion (conventional wisdom), because there are no *theoretical reasons* to believe that a repeat of the experiments would find any evidence to contradict that the law of conservation of mass during chemical reactions (mass measuring instruments are not sufficiently sensitive to measure the extremely small mass variations expected at the energy levels of chemical reactions). To repeat Saxl's experiments would be "illegitimate" because, according to conventional wisdom, there are *no theoretical reasons* to expect any novel effect of the type reported by Saxl. However, there is a difference in the nature of the "illegitimacy" of these two different experiments. In the case of the chemistry experiments there has been, over the years, a voluminous accumulation of experimental evidence that is consistent with the law of conservation of mass (even though Volkamer *et al.* mention some biochemical experiments as possibly indicating a conflict with this law). In contrast to this, however, in the case of Saxl's experiments there was at the time of my interest 27 years ago, (and is, so far as I know, even today) a *complete lack* of experimental evidence to either support or deny Saxl's claims. In other words, although there was *no theoretical justification* for repeating Saxl's experiments, there was also *no experimental evidence* which had proved them wrong. And this is where I came into the picture in 1967. I decided that Saxl had done a "virgin experiment," one which no one else had thought of doing because there was *no theoretical justification* for doing such a "ridiculous" experiment. Hence, it was possible that he had truly discovered a new effect that could not be refuted without an experiment. In that sense, then, my attempt to duplicate Saxl's experimental results was less "illegitimate" than Volkamer's attempt to find a violation of the law of conservation of mass.

The "Story"

What I will now recount is based on my recollections, upon some all too brief notes in a diary, and upon the published work of Erwin Saxl. It is the story of a graduate student's experience with "illegitimate science." Back in those days, some 27 years ago, I was young and naive and dared to go where no man (or woman) had gone before... where angels feared to tread... etc. (you get the idea). This was the UFO "heyday" of the 1960's, after the "swamp gas" sightings in Michigan (March, 1966) and during the time of the Condon study at the University of Colorado (1967-1968). I became interested in the UFO subject and read some books and magazine articles. If I recall correctly (I could be wrong on this), I first learned of the work of Dr. Saxl in a UFO article written by Lloyd Mallan for a magazine that existed back then called *Science and Mechanics. I* can't recall exactly what the article said about Saxl's experiments other than that they seemed to indicate that a pendulum had recorded some unknown gravitational effect that was reported in the journal Nature. In July, 1967, another graduate student and I obtained a copy of his 1964 paper (Saxl, 1964) and learned that Saxl had reported two different effects. The first might be called the "Saxl Voltage Effect" which was that the period of a torsion pendulum inside a Faraday cage (a complete metallic shield around the pendulum with the pendulum connected to the inside of the shield) would increase as the voltage of the cage was increased wth respect to ground. The second could be called the "Saxl Eclipse Effect" which was that the period of a torsion pendulum inside a grounded Faraday cage would increase during an eclipse. In his paper Dr. Saxl gave no theoretical reason for why the period should change under these conditions... nor could I or anyone else think of a reason.

(Note on torsion pendula: a torsion pendulum is the rotational analog of the horizontal spring-mass oscillator. In both cases gravity is not an important factor in determining the oscillation frequency. A torsion pendulum consists of a mass or "bob", usually a solid disc or a ring, which is suspended in a horizontal plane by a thin wire that is fastened to a rigid support at some distance above the pendulum mass. The term "pendulum" applies to the combination of the wire and the "bob". The bob is caused to rotate in its horizontal plane (with no wobbling) about a vertical axis through the center of mass, i.e., it rotates about the vertical line formed by the suspension. In this arrangement gravity does not play a primary role in determining the period, as it does in determining the period of a planar or a conical pendulum. The suspending wire, when twisted, exerts a restoring torque, just as a linear spring, when stretched or compressed, exerts a linear restoring force. For small angles (less than one rotation of the wire) the restoring torque, T, is very accurately proportional to the angle of twist: $T = -kA$ where k is a constant for a particular weight of the bob, A is the angle of twist relative to a nominal rest position and the (–) sign indicates that the restoring torque is in the (angular) direction opposite to the twist. The bob has inertia, I, which depends upon its shape and mass. ($I = mr^2$ for a solid disc.) In the absence of frictional or other forces (i.e., for a freely oscillating system) the pendulum obeys the rotational Newtonian equation which says that at any instant of time the angular acceleration is proportional to the restoring torque divided by the inertia: $(d^2A/dt^2) = T/I = -kA/I$, where (d^2A/dt^2) is the angular acceleration. The solution of this differential equation gives the period as $\rho = (2)(I/k)^{1/2}$. This period would be independent of gravity if the weight of the pendulum mass did not affect k. However, the bob suspension, typically a thin, drawn wire (a wire made stiff by pulling almost to the limit of breakage), stretches by an amount that depends upon the weight (= mg, where g is the acceleration of gravity) of the pendulum. As it lengthens its diameter shrinks causing the force constant, k, to decrease. Therefore, the period increases with increasing mass of the bob on a given wire for two reasons: increased inertia and decreased k. After the pendulum has been assembled and the oscillation period has been initially measured one finds a continual slow increase in the period because the wire continues to stretch ("creep" under load), and the diameter contract, very slowly. Eventually the wire may break if the bob is too heavy. Two other factors affect the diameter of the wire and hence, k: changes in temperature and changes in the weight of the pendulum without associated changes in the inertia cause the diameter of the wire to expand or contract. The temperature effect is obvious: the wire diameter increases slightly with temperature increases, and v.v. The weight change without inertia change is less obvious: changes in barometric pressure change the air density (assuming it is not in a vacuum chamber) and thereby change the buoyant effect on the pendulum bob. Such changes are extremely small. Temperature would also affect the period by changing the dimensions and hence the inertia of the bob. Random or periodic vibrations introduced into the pendulum through the suspension point can also increase the period. Because the value of k is ultimately determined by the forces between atoms in the metal of the wire, one can speculate that if these inter-atomic forces were to change, the value of k would also change. If such a pendulum were placed inside a perfect Faraday cage there would be, in theory, no electric field "contacting" the pendulum itself; it would be within an electric field-free region. If the cage were also vibrationally isolated and thermally stable there would be no reason (other than barometric changes) for the period to change. There would be no theoretical reason to expect the period to change during an eclipse or as a result of placing the cage at a high voltage, positive or negative, with respect to the earth (ground). If the period did increase under these conditions, as Saxl claimed, one could contemplate such "bizarre" explanations as the following: the diameter of the bob changed; the effective inertial mass changed; the force constant of the wire changed; a combination of the above, or something even more bizarre, such as time dilation without relative velocity, occurred.)

One of the very surprising things about Saxl's report was the extreme simplicity (we thought) of the experiment and the relatively big voltage effect: the period of a pendulum would change from about 35 seconds to about 35.3 seconds, a 1% effect, if the Faraday cage voltage were raised by a mere 5,000 volts! Saxl reported a smaller effect, about 1 part on 3500, for the change during a lunar eclipse, but even this effect was considerably larger than the noise level (random changes in pendulum period) that he reported. My friend and I presumed that Saxl was making his claims with some authority since, according to his paper, he had worked as a post-doctoral student with Einstein and they had discussed the possible connection between inertia, gravitational mass and the electromagnetic field. Saxl further stated that he had carried out similar experiments over a ten year period, which suggested that he might have begun these experiments while Einstein was still alive. Yet, my friend and I were puzzled that this work was published only in Nature and that we had to first learn of it in a UFO article, of all places!

Although I cannot now recall our thinking, I presume it went something like this: we haven't read about this effect in any physics book so it must be essentially unknown... possibly because it isn't real and possibly because *no one would believe it even if it were real.* But would a friend of Einstein lie in a published paper? We could ignore Saxl's results and go about our normal lives, pursuing our "ordinary" Ph.D.'s. On the other hand we knew that fame and fortune awaited anyone who could connect gravity with electromagnetism. *So let's* do *an experiment.*

According to my diary, on July 13, 1967, two unknown graduate students at The American University in Washington, D.C. carried out what we assumed was the first independent test of Saxl's claims. *And we found he was right.* (Would that it were that easy!)

Our first thought was to grab onto the most convenient torsion pendulum we could find in the laboratory... a so-called "wall galvanometer" (so-called because it was mounted on the wall, of course). These devices probably don't exist in physics laboratories nowadays, so let me explain: it consisted of a roughly rectangular coil of wire suspended by vertical wires above and below it and placed between poles of a magnet in such a way that when an electric current passed through the coil the coil would rotate. The amount of rotation was proportional to the current. Fixed to the coil was a small mirror which would reflect a narrow light beam onto a scale such as a meter stick. By measuring the amount of motion of the reflected beam on the scale one could calculate the amount of rotation and hence, after calibration, the amount of current flowing in the coil. The galvanometer was used in undergraduate electricity experiments. However, our use was different. We wanted to mechanically rotate the coil a small amount and then release it to rotate freely so we could measure the period of oscillation at different voltages "above ground." Saxl had used direct current (D.C.) but had reported a *quadratic* voltage effect: the period varied roughly a the square of the voltage and so the period increased whether the pendulum was positive or negative with respect to ground. We could not immediately find a D.C. high voltage supply. However, because of the quadratic voltage effect we assumed that our use of an alternating current (A.C.) supply should make no difference. We connected it to one terminal of a variable 10,000 volt A.C. power supply (5,000 volts more than Saxl reported using; we were going after a *big* effect!). We connected the other terminal of the supply to a water pipe (ground). We did not enclose the galvanometer in a Faraday cage. (We couldn't; after all, it was mounted on the wall.) Twenty-seven years later I don't recall the details of the experiments we did. However, you can bet that we were careful of the 10,000 V. My diary reads "high voltage changed (increased) the period of a galvanometer used as a pendulum." I presume we were moderately ecstatic. (Like, put in a call to the King of Sweden right now!) On July 17 1 wrote to Dr. Saxl. I can't recall what I said and have no copy of the letter (my letters and laboratory notes on this investigation were lost twenty or more years ago). I presume I received a reply, but have no indication of it in my diary.

Then, after the initial flush of success, reality reared its ugly head. Like good little scientists we tried to repeat the experiment with better equipment and to understand the effects which could introduce errors into the results. It became apparent during the subsequent experiments that the high voltage caused the galvanometer coil to become displaced from its normal hanging position, probably as a result of corona and the "ion wind" from various edges of the magnet pole pieces. (Corona is a glow in the atmosphere caused by electric charges exciting and ionizing the molecules of the air. It is associated with a "wind," an actual macroscopic flow of air as the ions rush toward or away from, depending upon the polarity, a conductor that is held at a high voltage relative to the surroundings.) The result of this effect was to increase the oscillation period. We assumed that in order to eliminate that effect we would, indeed, need a Faraday cage for the pendulum.

Although the explanation for the increased period was enough to dampen the spirit of adventure of my friend, I didn't give up. After all, there was a Nobel prize waiting in the wings... or at least a paper to publish. I realized that if I were to prove or refute Saxl's claims I needed a better apparatus. Unfortunately Saxl specified neither the weight nor size of the pendulum he used, so I had no guidance in that regard. (If he had specified the size in the ***Nature*** article we probably would not have attempted to replicate his results.) I, therefore, decided to try a thin disc, about 5 cm diameter, that was cut out of thin aluminum sheet. I fastened a small vertical rod to the center of the disc and attached a small mirror to the rod. I suspended this pendulum bob from the top of the rod with very thin wire. I hung the pendulum inside a large jar which I had mostly covered with aluminum foil. In order to see the small mirror from the outside I left a hole in the aluminum foil near the top of the jar. I then proceeded, over many hot August nights, to carry out experiments with A.C. and D.C. voltage supplies. I did my period timing with a 1/100 second stop clock that I operated by hand upon seeing a light beam reflection from the small mirror. I assumed this method would be sufficiently accurate if the effect on the period were as large as 1%.

These experiments were done when no one was around, because I didn't want anyone, other than my friend, to know what I was doing. I felt it would be embarrassing to be "caught" by one of the professors while I was doing an experiment that had no justification, and, worse yet, one that had been associated with... (gulp!) UFOs.

My diary indicates that my nightly experiments were interrupted for numerous "social activities." A week or so after building this pendulum I wrote in my diary that there seemed to be a difference in pendulum period between (+) and (-) voltages, just as Saxl had reported (he reported positive voltage delayed the period a bit more than negative voltage) but the effects were not consistent. I continued to improve this little pendulum and carry out nightly experiments through August, On August 15 I mailed another letter to Saxl. I don't know what I said. However, I probably learned from his response that the small pendulum I was using, which weighed several tens of grams could not compare with his, which I found out was a ring with an outer diameter of about 50 cm and an inner diameter of about 13 cm and it weighed about 23 kg (Saxl, 1969). His wire suspension was about 1.8 m long, whereas mine was about 2 cm.

Since Saxl had given no theory for his effects, there was no way to estimate the relative importance of size, weight, period, wire stiffness, or whatever. In other words, there was no way to scale his results to a pendulum of the size I was working with. At this time I held out hope for the possibility that what was most important was the pendulum period and I continued working with my small pendulum through August 24. After that there are no more "pendulous entries" in my diary for 1967. I presume that I gave up primarily because I hadn't discovered any repeatable effects definitely associated with voltage. Furthermore I realized I couldn't come close to duplicating his results with my "baby" pendulum if the magnitudes of the effects he reported were dependent on mass or size or both. If the magnitudes of the effects did scale with either of these, then I would have needed a period timing system capable of a .0001% accuracy or better to see an effect in my pendulum, even at 10,000 volts. I didn't have access to such a system.

Although I hadn't measured a consistent effect, I had discovered something which I thought could possibly explain the voltage effect. I had found that even with my best efforts at creating a Faraday cage by wrapping the jar with tin foil, the fact that I had to have a sizeable hole (about a centimeter in diameter) to let the light beam in and out meant that there was some corona that I could see at the edges of the foil around the hole. I could see this because, as I have pointed out before, the experiments were done at night (stealth experiments!) and I had the room lights turned off so that I could see the light beam reflected from the small mirror. I decided that the corona might have created an ion wind that would cause a disturbance of the atmosphere inside the pendulum, and such a disturbance could increase the period of the pendulum by introducing slight extraneous vibrations. Also, it looked to me as if the pendulum did not hang straight downward when the voltage was very high, as if it were being attracted to the hole (even though it was connected to the inside of the aluminum shield). I thought that this effect, too, might introduce slight vibrations and hence increase the period. These possible explanations for the increase of period with voltage provided another reason for stopping the experiments.

Yet another reason for dropping the pendulum experiments at this time was the fact that I was now involved in the construction and operation of the apparatus which I would use the following year in my Ph.D. thesis work. During the fall and into the winter I concentrated on conventional activities: taking classes, teaching classes, building equipment and chasing girls. However, things picked up again in February, 1968. I was planning to travel to Boston to present a paper (on critical point phenomena in carbon dioxide) at a meeting of the American Physical Society and so it would be convenient for me to visit Saxl's laboratory in Harvard, Massachusetts (*not* Harvard University, but a small town west of Boston). I wrote him a letter outlining my plans and we agreed to a meeting date and time. I arrived during the afternoon of February 28 and stayed for about an hour and a half. During that time my interest was rejuvenated. I could see that Saxl's pendulum was a precise and rugged device, indeed. He told me that he had picked the location of his house and his laboratory specifically so that his pendulum would be mounted on a large piece of bedrock to minimize the effects of nearby traffic and seismic disturbances. As I recall, the pendulum was suspended beneath a small platform that was held up by three or four metal pipes that were about 5 feet long. The bob itself was a short ceramic ring with a conducting surface that was connected by means of the suspending wire to the surrounding cylindrical Faraday shield. Although he did not open the Faraday shield, I could see in through the hole that allowed the light beam to pass in and out. The size of the hole, probably several inches square, surprised me. I again wondered, *could the hole in the Faraday cage be causing* ***his*** *voltage effect?*

While I was there he proved to me that the voltage effect was real. He gave me a printout from his automatic period measuring system. Although I have not seen that piece of paper for 25 years or so, I recall that it showed the period running at about 35 seconds when the voltage was zero and increasing by perhaps as much as a tenth of a second when the voltage was high. The effect of the voltage was large enough to be immediately obvious. Saxl told me that he attempted for several years to get his work published in the *Physical Review* and that it was rejected by several referees, presumably because he had no explanation for the effects (illegitimate science!). He then submitted it to *Nature* which accepted it after careful reviews by several other scientists.

I was now convinced that further work on my part was worth while if I could construct a pendulum that was much bigger than the one I had used previously. Fortunately my Ph.D. experimental work was placed on hold while a new apparatus was being constructed so I had time to build a pendulum. Unfortunately, I had no budget, and I didn't dare ask the department outright for support (UFOs... gravity... woo, woo!). So, instead, I asked the department machinist to make "a few simple" parts, including an aluminum pendulum bob about 12 cm in diameter, a supporting cylinder consisting of a copper stovepipe about 60 cm high, metal plates for the top and bottom of the stovepipe and a rotatable fastener in the top plate that would hold the wire supporting the pendulum bob. This worked but the pendulum bob wasn't massive enough by itself (the period was too short) so I started adding weights to the bob. I overdid it and several weeks into the experiments the stovepipe crumpled. I asked the machinist if he would "kindly" make a replacement that consisted of a thick walled brass pipe about 15 cm in diameter that stood about 60 cm high. The new pendulum was built to the best accuracy I could achieve with "no money." I suspended the bob from a drawn brass wire attached to a rotatable fixture at the center of the top plate of the brass pipe. The bob had a small mirror attached and the pipe had a hole about 1/2 cm in diameter through which the light beam would pass. Following Saxl, I designed an electromagnetic clutch mechanism which would hold the bob at a fixed angular displacement away from equilibrium until the current through the magnet was removed, after which the bob would start to rotate slowly towards its equilibrium position. The A.C. magnetic field from the clutch decayed quickly to zero before the mirror aligned with a light beam that came in through the hole in the pipe. The brief reflection of light back out through the hole hit a photocell which turned on an electronic period counter which counted oscillations of a quartz crystal oscillator (oven controlled; accurate to 1 part in 10^6 or better). The pendulum would swing past its equilibrium position to its far excursion (about 170 degrees) and then return to its initial position, once again allowing the mirror to align with the light beam and thereby turning off the counter. Finally the pendulum would be "grabbed" by the electromagnetic device, thus completing one oscillation. The electromagnets would hold the pendulum steady until I manually initiated the next cycle. This method of allowing the pendulum to swing through only one cycle at a time was devised by Saxl to assure that vibrations would be damped out between cycles and to assure that the mechanical energy in the pendulum was always the same for each period measurement. Unfortunately for me the operation was totally manual: I had to start and stop the pendulum and record the elapsed time. There was no room for automation in my budget.

According to my diary I did some work on the pendulum almost every day and finally made it operate correctly in early April. I kept improving it and finally did my first good experiments near the end of April. For April 28 my diary reads "took first real data which showed nothing." During the following months I continually improved the accuracy and stability of the apparatus and increased the mass of the bob. I even added heater wires around the outside of the cylinder in order to control the temperature of the pendulum. By the middle of the summer I had confirmed for myself that I was not detecting any voltage effect. I was now operating a pendulum of a mass roughly 5 kg and 12 cm in diameter. I was able to read the period, which was about 11 seconds (if I recall correctly) to six significant figures and the period "noise" (random fluctuations in the period from oscillation to oscillation) was detectable in the millisecond range. An effect as strong as Saxl had reported, period changes much larger than the noise level, would have been easily seen with my apparatus, but there were none. I decided that the edge corona effect was probably the explanation for Saxl's voltage effect and that by using a very small hole I had eliminated it. However, I had to admit to myself that I had not actually refuted Saxl's claim because I had not duplicated his pendulum. If the interaction between the voltage and the pendulum were simply ***proportional*** to the mass then I would expect to see about 1/5 the effect that Saxl reported, an effect I could measure. However, if the interaction were proportional to the inertia or to the square of the mass or to a higher power of these, then with my relatively small mass and small inertia the effect would be lost in the noise.

In spite of my belief that I had probably "explained" the voltage effect, I did not give up with the pendulum. I continued to run it on nearly a daily basis in order to obtain a good statistical data base in preparation for the "ultimate" test, which was to measure the period during a lunar eclipse in October.

I visited Dr. Saxl a second time in late June. Again I observed his experiment and the voltage effect. Although I cannot now recall exactly what we discussed, I did tell him of my failure to obtain any voltage effect. If I recall correctly, he didn't accept my "hole in the shield" explanation. Before I departed I pointed out that a lunar eclipse was coming in October and that I thought a joint experiment would be in order. I felt that I could barely see an effect of the size he had reported in his 1964 paper. He agreed that a joint experiment would be worthwhile.

From July through September I continued to operate the pendulum nearly every day. This is because the period was always changing as the wire stretched. One time the wire broke and I had to replace it and go through another long period of "running in" the pendulum. Finally October came and I called Saxl to coordinate our operations on the night of the eclipse. Unfortunately he had other plans for the night of the eclipse. There would be no joint experiment. I was disappointed, but I went ahead anyway. With the help of a friend I managed to take data nearly the whole night of October 5-6, 1968. My diary contains the following terse note: "stayed until 7 AM when eclipse over. Experiment is also eclipsed."

Conclusion

That was the end of it. I believed that I had done the best I could do under the circumstances but regardless of how hard I tried to see some effect, I couldn't. I never published the results of these experiments. I didn't want to write a paper that only told what "every intelligent physicist would know," namely that a torsion pendulum is not affected by voltage or eclipses.

By the time my experiments ended I had several notebooks full of records, papers, calculations, etc. Over the next few years my time was dovoted to Ph. D. experiments and the pendulum apparatus became scattered around. Sometime after I left American University in 1971 my notebooks and papers were all thrown away. I had not taken care of them. I didn't think it worthwhile at the time. Now I wish I had kept them for historical reasons.

Five to ten years later, for some reason I cannot now recall, I thought about Dr. Saxl again and wondered whatever had become of his work. I did a literature search and found he had succeeded in publishing a paper in the Physical Review in 1971. His paper, written with Mildred Allen (Saxl, 1971), reported that the pendulum period changed by about 1 part in 3,000 during the solar eclipse of March, 1970. While preparing this essay I did a search of the Dialog data base but found no other publications on the voltage and eclipse effects by

Dr. Saxl or Mildred Allen. A phone call to the Harvard, Massachusetts Information operator gave no listing for Dr. Saxl, nor for his business, Tensitron Corp.'

Does that mean no one is interested? I hope not. Perhaps someone has actually duplicated Dr. Saxl's pendulum or made one even larger. If so, I would like to know the results (I presume they weren't spectacular or they would have become known one way or another). If not, then there still is room for another experiment. I did not prove there are no Saxl effects; I only proved that, if they exist, they can be detected only with a larger pendulum than I used. Anyone for another illegitimate experiment? (Note: no doubt some liberal scientists will argue that there is no such thing as an illegitimate experiment, just as there is no such thing as a stupid question. However, try to convince a funding agency to support an experiment without a theory and you'll soon learn the difference between that which is legitimate and that which is not.)

References

Allais, M. F. C. (1959). Should the laws of gravitation be reconsidered? ***Aerospace Engineering,*** 18, 46.

Saxl, E. (1964). An electrically charged torsion pendulum. ***Nature,*** 203, 136.

Saxl, E. and Allen, M. (1971). 1970 solar eclipse as "seen" by a torsion pendulum. ***Phys. Rev.*** D, 3,823.

Saxl, E. and Allen, M. (1969). Period of a torsion pendulum as affected by adding weights. ***J. Appl. Phys.,*** 40,2499.

Volkamer, K., Streicher, C., Walton, K., Fagan, J., Schenklun, H. and Marlot, H. (1994). Experimental re-examination of the law of conservation of mass in chemical reactions. ***Journal of Scientific Exploration,*** 8,217.

'Editor's Note: The following information is taken from American Men of Science, 11th ed., 1967. Erwin Joseph Saxl was born in Vienna in 1904 and obtained a Ph. D. in physics in Vienna in 1927 (no university listed). His career includes: mem. staff, Cent. X-ray Inst., Austria, 1925-26; physicist, Gen. Elec. Co., Germany, 1927; asst. prof. physics, Freiburg, 1928; fel. L. I. Biol. Lab., 1929-30; mem. staff exhib. color, Mus. Sci. & Indust., NY, 1930-31; dir. res. & develop, Waypoyset Mfg. Co. 1934-36; pres. Saxl Inst. Co., 1935-53; pres. & gen. mgr., Tensitron, Inc., 1953-. Also listed is: Lectr. State Dept. Ed., Mass., 1938-42; consult. physicist and chemist, 1931-; Am. Wire Asn. medal, 1960; Fel. AAAS; Soc. Exp. Stress Anal; Soc. Photog. Sci. & Eng.; Geophys. Union; Inst. Elec. &Electronics Eng.; Phys. Soc.; Chem. Soc.; Soc. Test. & Mat.; sr. mem. Instrument Soc.; Photog. Soc.; fel. Royal Soc. Arts. The last entry is in the 14th edition (1979) in which his address is listed as Indialantic, Florida.