Some Experiments that Shook the World

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It is generally believed by the physicists that various experiments/demonstrations/applications – experiments of Hahn-Strassmann, Walton-Cockroft, Fermi's Chicago Experiment, the explosion of the Little Boy and the Fat Man, the commercial reaction of nuclear fuel - prove **i)** conversion of gravitational mass into energy, and **ii)** usability of Uranium and other radioactive elements as proper fuels. We argue that these assertions have not been proved in any of those experiments/demonstarations/applications.

Introduction

To know whether a fuel is proper fuel or not is to determine whether the fuel gives off greater amount of energy when it is used than the energy involved in making the fuel from raw natural materials. A huge amount of energy is obtained when Hydrogen or thermite (a mixture of powdered Aluminium and oxide of iron) is burned. But energy obtained from combustion of those fuels is not greater than the energy spent to make them from natural resources. Therefore, Hydrogen and thermite cannot be treated as proper fuels. Electricity could be readily generated from combustion of those fuels, but, electricity made from those fuels must be more expensive than electricity made from coal or petroleum. According to Einstein's $E = mc^2$ formula, 1 Kg of any material (preferably Uranium) will give 9×10^{16} joules, or 2×10^{16} calories, of heat energy through complete nuclear reaction. [$E = mc^2 = 1\times(3\times10^8)^2$ joules $= 20\times10^{12}$ kilocals = 20 trillion kilocals .] If that would be true, then powerful states around the world would not compete for oil in the deserts of Arabia. If one ton of Uranium of someton 'Little Boy' bomb could take part in the so-called nuclear reaction, then some million of square miles of the world would burn, instead of only 1.7 square miles of Hiroshima. It not at all possible to give supply of electricity to the people from so-called nuclear fuels at a cost lower than fossil-fuel electricity for the reasons stated above. However, it is possible to give ontological lectures on nuclear fission/fusion or to earn immense money from so-called nuclear projects.

The Hahn-Strassmann Experiment

In 1938, Curie and Savitch exposed Uranium to moving neutrons and found that exposed Uranium had then the half-life period of 3.5 hours. They thought that some Uranium atoms had been converted to Thorium isotopes (which were two places below Uranium in the Periodic Table) by this method. Strassmann tried to separate Thorium from that irradiated Uranium using Iron as carrier, and being unable to do so, maintained that there was no Thorium in 3.5-hour substance.

Curie and Savitch carried out further tests which showed that 3.5 hour substance could be precipitated out of the solution with Lanthanum as carrier. Lanthanum is a rare earth element, and its atoms were believed to be the half of the size of the atom of Uranium. So, he hesitantly concluded that 3.5-hour substance might be Actinium- a transuranic element of the same chemical group as that of Lanthanum, but of much higher atomic weight than Lanthanum. [1,2].

Hahn and Strassmann believed that 3.5-hour substance was either Barium or Radium [3]. They made a solution of 3.5-hour substance and mixed barium chloride with it. They were unable to separate radium from mixture by fractional crystallization. Moreover, they found that radioactivity was uniform amongst the various Barium fractions at every stage of crystallizations. So, they concluded that 3.5-hour substance was not Radium, and no other element but Barium [4,5,6].

The conclusion of Hahn and Strassmann could clearly be disputed from many angles. In their micro analysis, they had used very Curie techniques. These techniques are interesting, beautiful, and elegant. But were these techniques dependable to the extent needed to demonstrate a few hundred atoms of an element in some grams of another element, especially when Curie and Savitch had been hesitant over the method to the extent whether the element was Lanthanum or Actinium? To prove Barium in irradiated Uranium, Hahn and Strassmann should have irradiated a good amount of Uranium for a long time and isolated some Barium from it, just like Madam Curie had isolated some amount of Radium from pitch blende.

But no one disputed over the techniques adopted or the conclusion drawn by Hahn and Strassmann, since the conclusion was in tune with the dream world of the then physicists. The then physicists did not question either the doubtful techniques, or over the reasoning of Hahn-Strassmann. On the contrary, they began to confirm the conclusion, even extend the conclusion, and began to report incessantly and quite enthusiastically the creation of any set of elements from another set of different elements. [7]

Lise Meitner [8] took the conclusion of Hahn-Strassmann Experiment to base her fission theory. According to her, in the 3.5-hour Curie-Savitch mixture, neutrons have divided Uranium into two parts. One part is Barium and the other part is possibly Krypton.

Then Frisch calculated classically the energy of motion imparted to the supposed parts of uranium atom on the basis repulsion, and Meitner calculated relativistically the liberated energy per Uranium atom from the so-called loss of gravitational mass [8,9,10] which according to her was equal to (U' - Ba -Kr) where U' was the gravitational mass of the Uranium atom with the absorbed neutron and $_{56}Ba^{145}$?and $_{36}Kr^{94}$? were, respectively, the gravitational masses of Barium and Krypton isotopes.

According to Meitner and Frisch, in both the calculations, the released energy in such a process should be 200 Mev per Uranium atom, which was a relief of both the classicists and the relativists. Frisch and others [11] were said to have succeeded also in demonstrating the 'burst of ionization'; *i.e.*, the release of high-energy in the so-called fission process.

To demonstrate Barium in the Curie-Savitch solution mixed with barium chloride is hardly justifiable, and the Frisch's observation on of burst of ionization when related with Meitner's calculation of the so-called differences of gravitational masses of U′ and (Ba+ Cr) crosses the limit of any standard of scientific knowledge.

The atomic masses of the Uranium atom with the absorbed neutron, of the Barium isotope, and of the Krypton isotope were unknown to Meitner, so in her calculations, she first assumed that the mass defects of an element is a measure of its binding energy, and then she calculated the expected available energy per Uranium atom from difference in packing fractions between Uranium and the elements in the middle of the Periodic Table using the results obtained from Aston's mass spectrograph.

There can be no physical theory that could match the theoretical values with experimental values exactly. To determine the atomic masses of the nuclei, Aston's mass spectrograph uses many parameters whose measurements certainly varied at that time within 0.1 percent accuracy, or within a more wide range. Consequently, a mass defect of 0.1 percent should not be considered as experimental proof for the destruction of gravitational mass. So, it was useless to explain the so-called mass defects by imagining that the mass defect has been converted into energy as per Einstein.

If the gravitational mass of Curie-Savitch substance is less than the masses of the absorbed neutrons and the Uranium lump, then Meitner should verify that loss of mass by proper weighing at source. How is it possible to ascertain the loss of gravitational mass in the Curie-Savitch substance from Aston's assertion that there is difference in packing fractions between uranium and the elements in the middle of the Periodic Table? Destructibility of gravitational mass should be well demonstrated by destruction of a good amount of gravitational mass at source. It is not logical to search for the loss of mass in Curie-Savitch substance in the lines of the photographic plates of Aston's mass spectrograph.

Moreover, neither Hahn-Strassmann nor Meitner-Frisch demonstrated the loss of 0.218 a.m.u. of gravitational mass per Uranium atom and consequent evolution of 200 Mev energy in any of their experiments. To consider the Curie-Savitch experiment to be an example of nuclear reaction for getting a greater amount of energy, Meitner and Frisch must prove that $E' > E$, where E is the energy spent to make Curie-Savitch substance and the moving neutron and E' is the energy given off by the reaction. They made no such effort. Thus neither the destructibility of gravitational mass nor the usability of Uranium as proper fuel could be verified by the Hahn-Strassmann Experiment.

Experiments *re* Mass-Energy Equivalence

In text books, it is said that one atomic mass unit (1a.m.u.) is equal to $1.66 - 10^{-27}$ kg (approximately). The rest mass of proton (the nucleus of Hydrogen atom) is 1.00731 a.m.u., and that of the neutron is 1.00867 a.m.u. A deuteron (nucleus of heavy Hydrogen) is known to consist of a proton and neutron. The rest mass of the deuteron is found to be 2.01360 a.m.u. Hence the rest mass of the deuteron is less than the combined rest masses of neutron and proton by .00238 a.m.u., which is equivalent in energy units to 2.22 mev, is called the binding energy of the deuteron which somehow cited as the proof of mass energy equivalence principle of the relativists.

The mass of a proton (a Hydrogen ion) was determined by the following method. First of all, the value of e / μ_0 where e is the charge and μ_0 the rest electromagnetic mass of an electron is determined by Thomson's method, which is possibly a sufficiently accurate physical method. Still, that value depends upon the proper determinations of $\mathbf{E}, \mathbf{B}$, and r (radius of curvature of the path of the moving electron) and probable errors in the determinations of those quantities are not known. Butherer (1909) performed the experiment with accuracy within the range of 8 per thousand. But it is said, its latest value 1.75921×10^{11} coulombs/kg contains standard error of 0.000258×10^{11} coulomb/kg; *i.e.*, .16 per thousand, calculations being made on the averages of various workers, but neglecting the calculations on propagated errors in fundamental measurements [13].

Then by passing a definite amount of electricity (Q in coulombs) in acidulated water, the amount of evolved Hydrogen (M in kg) is determined. Determination of a definite amount of electricity passed through acidulated water depends on the determinations of many parameters and the standard errors of such determinations are not generally known. Moreover, to measure the mass of evolved hydrogen, a scale pan is to be used in the long run, which is also another source of inaccuracy. Consequently, the standard error of determining Q / M electrochemically is high. Edmund C. Potter comments that an accuracy of 1 part per thousand is attainable under carefully controlled condition [14].

The determination of the magnitude of the charge on the electron again depends on many parameters *e.g.*, η (viscosity coefficient of air inside the chamber), δ (distance), ρ_1 (density of oil), and ρ_2 (and density of air), and also on the exact validity of Stokes's law. It contains a high amount of standard error. Millikan's own value is half a percent less than the modern, tacitly adjusted, value $1.6021917 - 10^{-19}$ coulomb [15].

Now, the mass of a proton is determined in substance by the following equation combing Faraday's laws of electrolysis with Arrheneus' notion of electrolytes: $W = eM / Q - e / A$ where W is the mass of a proton in kg, e is the magnitude of electronic charge in coulomb, M is mass of hydrogen evolved by passing Q coulombs of electricity in acidulated water, and $A = e / \mu_0$, being the ratio of the charge to rest electromagnetic mass (in coulomb/kg) of an electron.

The measure of fundamental constants (including c, e/μ_0 or e) measured by different measurer are all different and the range of variation is wide (even 5 per thousand in some cases) and statisticians correlate the results and shorten the range of variation with desperate mathematical analysis.[*cf.* **i)** R.T. Brige, Rev. Mod. Phys. 1 (1) (1929); **ii)** R.T. Birge and D. H. Menzel, Physics Rev. 37, 1669 (1931); **iii)** R.T. Birge , Report in Progress in Physics 8, 90 (1941); **iv)** R.T. Birge, Supplement to Nuovo Cimento 6, 39 (1957); **v)** E.R. Cohen and J.W.M. Du Mond , Rev. Mod. Physics 37, 537 (1965); **vi)** B.N. Taylor, W.H. Perker and D.N. Landenberg, Rev. Mod. Physics 41, 375, (1969).] Thus we see that in determination of the mass of a proton, there is always an error of much more than 1 part in a thousand.

The masses of nuclei determined by mass spectroscopy are based on the mass of a Hydrogen nucleus. Hence, the determination of the mass of deuteron nucleus contains an error of much more than 1 part in a thousand, even considering that the error in determining the required ratio in the mass spectrograph is 0 part per thousand. The position remains unaltered with the replacement of the Hydrogen standard by the Oxygen/Carbon standard, or any other standard.

Chadwick determined the mass of neutron by using a collision method based on Newtonian mechanics. He also used some parameters whose degrees of accuracy are not known. Chadwick's calculation was at first 1.15 a.m.u. But later he calculated the figure to be between 1.005 to 1.008 units. Therefore, it could be concluded that the masses of nuclear particles as determined by physicists are not absolute.

Consequently, the mass difference if really exits in the cases of any so-called nuclear processes as in **i),** or any nuclear experiments as in **ii),** are well within the experimental errors, and the explanations given by the relativists as $E = mc^2$ does not seem to be an example of reasonable analysis.

Modern physicists cite another nuclear reaction as proof of mass-energy conversion. Walton and Cockcroft, two students of Rutherford bombarded ${}_3\mathrm{Li}^7$ nucleus with protons [of energy ranging (.5-1) mev] *i.e.*,

$${}_3\mathrm{Li}^7 + {}_1\mathrm{H}^1 = 2\,{}_2\mathrm{He}^4$$

Mass difference of both the sides is .01864 a.m.u., which is equivalent to an energy (.01864× 931.1=17.35 MeV, which is said to be equal to the experimental value.

From those examples, modern physicists insist on the conversion of mass into energy.

In 1919, Rutherford bombarded gaseous nitrogen with moving alpha particles and demonstrating the creation of protons by this bombardment, he declared that he has been able to convert nitrogen to oxygen through nuclear transmutation. To declare such a tall claim he should produce some good amount of oxygen and should demonstrate this new element as oxygen through proper chemical analysis, which he avoided.

In 1932, he again declared that his students have been able to create Helium by bombarding Lithium with Hydrogen. They seemed to demonstrate alpha particles by this bombardment but did not demonstrate by proper chemical analyses that the alpha-particles are really Helium.

Fermi's Chicago Experiment

Enrico Fermi is said to have set first nuclear chain reaction to get continuous release of energy from U-238 in a 'pile'. The experiment was performed at the end of 1942 in Weststands at the campus of the University of Chicago. It is said that after having been operated there for a few months, the pile was moved to the Aragonone laboratory near Chicago.

Fermi described the so-called chain reaction in this experiment in two famous articles, one in Science (Jan. 10, 1947) and another in Am. J. of Physics (June 27, 1952). It is known from the articles that the pile was constructed in the shape of a flattened ellipsoid having the equatorial radius of 388 cm and the polar radius 309 cm. Six tons of uranium were distributed through the graphite mass in lumps partly of metal and partly of metal oxide arranged in a cubic lattice array with about 21 centimeters in cell side. According to Groueff [17], one commentator on the production of nuclear bombs, the Chicago pile (CP-1) required 500 tons of graphite and 50 tons of uranium. According to Hewlett and Anderson [18], the pile required 400 tons of graphite and 50 tons of uranium oxide.

The controlling of the reaction was obtained by inserting in the pile some strips of neutron absorbing materials (cadmium and in one case boron steel). When the pile was not in operation, several of such cadmium strips were inserted in a number of slots so as to bring the effective reproductive factor considerably low. According to Fermi, the pile could be operated indefinitely at a power of 2 KW, and was often operated for the periods of order of 1hour or 2 hours up to about 100 KW.

It is not clear from the articles what types of radiation was used in the irradiation hole to initiate the nuclear reaction. Energy expended to extract and to cast 6 tons of uranium and uranium oxide from their natural sources were not tabulated. Energy stored in the huge amount of carbon used in the pile was also not considered. Energy expended to make cadmium rods and other neutron absorbing materials were not recorded.

Thus, in this experiment Fermi did not demonstrate that $E' > E$, where E' is the energy obtained from the pile and E is the energy spent to make the ingredients of the pile from their natural sources, plus the energy of any chemical reactions ongoing in the pile during the experiment, plus irradiation energy to initiate the reaction.

The Chicago pile experiment of E. Fermi is a secret defense experiment of the U.S.A. Ingredients used in this experiment to initiate the reaction as published by American war officials were expected to be doubtful. Thus we may conclude that there was nothing in the Chicago pile experiment to prove that gravitational mass was converted into energy, or that Uranium-238 acted as proper fuel in the experiment.

What was more interesting is that the experiment was not at all intended to do so. The experiment was intended to show that Fermi was able to make in the laboratory a huge amount of gamma radiation. Gamma radiation is a form of energy like many other forms of radiation originating from chemical reactions. Therefore, it could not be out of expectation that he had converted such energy out of chemical reactions.

We know that chemical reactions of certain substances liberate heat energy, which could be transformed to a ready supply of electricity. This electricity could again be stored as chemical energy in batteries, and could be transformed again as heat / electricity at a controllable / uncontrollable rate by suitable methods.

Similarly, by combustion of fossil fuel, electricity could be generated. This electricity could, when passed through appropriate substances, make billions of negatively-charged high-energy particles, and billions of high-energy Hydrogen ions, which could be arranged to combine to create high-energy neutral Hydrogen particles. As a store of high energy, these high-energy neutral Hydrogen particles could be absorbed/adsorbed in small volumes of heavy metals through physico-chemical process, and could again be liberated at controllable/ uncontrollable rates by suitable methods, as had been demonstrated first by Fermi in the December of 1942. There was nothing against the classical physics/chemistry in the demonstration. There was nothing to conclude that what was demonstrated was a fission reaction that converts mass into energy.

In the Chicago pile experiment, Fermi demonstrated before the American war officials and war technologists the conversion of formal forms of energy into gamma radiation. Nothing else was done by him.

Atomic Bombs

Journalists generally consider the explosions of the "Little Boy" and the "Fat Man" as a definite proof of the usability of Uranium as a proper fuel and the instance of the conversion gravitational mass into energy. We do not know the ingredients used in those bombs. Nor do we know the amount of energy spent to make those ingredients.

Both the bombs radiated a huge amount of gamma radiation in the area of explosions. The Hiroshima bomb destroyed only 1.7 sq. miles of the town. 30 tons of gasoline bombs [24 tons of Petroleum / 8 tons of Hydrogen) could destroy such an area. Therefore, the Hiroshima bomb is not so powerful as publicized by war officials of U.S.A.

Usability of uranium as a proper fuel and conversion of gravitational mass into energy have not been proved from those explosions.

Nuclear Power

Everything in the nuclear engineering industry is mysterious. According to Einstein's $E = mc^2$ formula, 1 Kg of any materials (preferably Uranium) will give through complete nuclear reaction heat energy of 9×10^{16} joules, or 2×10^{16} calories. [$E = mc^2 = 1 \times (3 \times 10^8)^2$ joules = 20×10^{12} kilocals = 20 trillion kilocals.]

But according to Fermi, the electrical energy available (considering the overall efficiency of conversion of heat into electricity 30%) is 6,000,000 Kwh /Kg *i.e.*, total heat energy is 20 billion Kilocalorie / Kg of Uranium. With the same consideration, Hoyle [21] describes that the minimum electrical energy available from 1 Kg of natural Uranium = 30,000 KWH. But according to one nuclear man in India, minimum electrical energy available from 1 Kg of natural uranium = 60, 000 KWH.

According to ERDA, available electrical energy from 1 Kg of enriched Uranium is 2,58,200 KWH. But, Miller [23] has strongly doubted over the value. According to him, available energy is hardly over the half of the publicized value.

Nuclear physicists insist that the nuclear fuel, *viz.* so-called 'enriched uranium', is a mixture of Uranium-238 (96%) and Uranium-235 (4%). According to them, Uranium-235 is a natural isotope of Uranium-238. Nobody till this day has been able to release energy from Uranium-235 in open experiments. Therefore, fuel viability of the isotope is doubtful. It is more probable that fuel element of the so-called 'enriched Uranium' is made artificially by the procedure given in the penultimate paragraph of **Fermi's Chicago Experiment.**

However, if the enriched Uranium is a mixture of Uranium-238 (96%) and said natural Uranium-235 (4%), still then it may not act as proper fuel.

According to Hyett [24], 2000 kilograms of ore (0.1-0.5 % Uranium content as used by recent Uranium producers) are required to make 1 kilogram of natural Uranium. Natural Uranium -238 contains only .7% Uranium 235 which is said to be used as fuel. Therefore, 12000 kilograms of ore are required to produce 1 kg of enriched Uranium (with 3%-4% Uranium-235)

After preliminary concentration to remove sand and clay, the ore is leached with sulphuric acid and the solution is treated with an excess of sodium carbonate to precipitate Iron, Aluminum, Cobalt and Manganese. The filtrate is then treated with hydrochloric acid and saturated with hydrogen sulphide to precipitate Lead and Copper. The filtrate then is treated with an excess of sodium hydroxide to precipitate uranium as ammonium diurate which is strongly ignited to prepare U_3O_8. This U_3O_8 is reduced to UO_2 by Hydrogen. The di-oxide is converted into fluoride by heating it strongly in gaseous hydrogen fluoride. The fluoride is then reduced to the metal by means of pure metallic calcium.

Sulphur, sulphuric acid, hydrochloric acid, hydrogen sulphide, ammonium hydroxide, hydrogen and calcium are not available in Nature. In the ultimate analysis, fossil fuel or energy from fossil fuel is needed to prepare those things.

The quantity of energy needed to extract a metal from its ore is directly proportional to the purity of metal and the poverty of the metal in the ore. It is seen that to extract Iron from its 80% rich ore, the minimum quantity of coal required is equal to the quantity of ore by weight. To produce highly pure Uranium from an ore with 0.1%-0.5% Uranium, the minimum energy must be 10 times that needed in the iron extraction. Thus, to extract 6 kg Uranium-238, fossil fuel equivalent to the energy content of 120,000 kg of coal may be required. This amounts to 96×10^{10} calories of heat energy. It is said that to make 1 kg of reactor quality enriched Uranium, 12,250 KWh electrical energy (3.57×10^{10} calories of heat energy) in some 1400 stages is spent [25, 26] (Enrichment is a secret technology. Therefore, truthfulness of the datum is doubtful).Therefore, to make 1kg of reactor quality of enriched Uranium, a minimum of 100×10^{10} calories of fossil-fuel energy seem to be required (the fossil fuel energy spent for fluorination before enrichment, fabrication, preparation of Zirconium alloy and cladding of fuel elements is not considered). But, it is said that 1 kg of enriched Uranium burns to give some 100×10^{10} caloriesof heat energy [27, 28].

Similarly, to prepare Plutonium, 9.793×10^{13} calories of heat energy per Kg are required [29]; but, it is said that plutonium gives 1.88×10^{13} calories of heat per Kg through fission [30]. Therefore, either uranium or plutonium does not seem to be proper fuel. When there will be no fossil fuel to burn, it appears that there will be no nuclear fuel to kindle. Nuclear reactors must need, as it is said, things such as heavy water, Cadmium rods, and many other ancillary materials. Energy spent to make such things is also not known.

Lastly, to trigger the so-called chain-reaction in the reactor, it is said that some irradiation techniques are necessary. We do not know the amount of energy spent for making such initial radiation in the reactor.

So, for want of required data, it is not possible for us to judge the proper fuel viability of enriched uranium. Any reactions of the so-called nuclear reactors could hardly prove that gravitational mass converts into energy or that uranium could be used as proper fuel.

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Correspondence

On the Poynting-Theorem Paradox

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Therefore, at all times the electric field inside the sphere Ω will vanish, and the electric field on and outside Ω will be that corresponding to a charge Q situated at the center O. Thus, on Ω and outside of Ω the electric field is radial, directed outwards, and in the Gaussian system of units is given at a radial distance R from O by $E = Q / R^2$.

By virtue of the spherical symmetry at all times, no magnetic fields arise anywhere at any time, *i.e* H vanishes everywhere at all times. Therefore, the Poyinting vector $\mathbf{S} = (c / 4\times)\mathbf{E} \times \mathbf{H}$, representing the flow of field energy, vanishes everywhere at all times. Also, since $H = 0$ everywhere, the field energy density everywhere is $W = (1/8\pi)E^2$.

Suppose at time t the charged surface is Ω_1 with radius R, and expands to Ω_2 having a radius $R + \Delta R$ at time $t + \Delta t$, where Δt is small. The total energy W of the system will be given by $W = W_1 + W_{\rm tran} + W_2 + W_{\rm mech}$, where W_1 is the field energy within Ω_1, W_2 is the field energy outside Ω_2, $W_{\rm tran}$ is the field energy in the transition zone between Ω_1 and Ω_2, and $W_{\rm mech}$ is the mechanical energy of the moving charge system.

The Principle of the conservation of energy demands that W remain constant - that is to say, $\Delta W = 0$.

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