A BRIEF EXAMINATION OF NUCLEAR REACTIONS

With the new model of the atom developed in An Intensive Scrutiny of the Atom, we can develop a slightly better understanding of the nature of certain nuclear reactions. This paper will strive to develop a model of alpha decay and the splitting of the atom which is more comprehensive than our current level of knowledge. In other words, the specific *dynamics* will be outlined.

Firstly, alpha decay will be addressed. A critical cause of alpha decay was stated in the paper An Intensive Scrutiny of the Atom. Specifically, that neutrinos within the nucleus induce some degree of repulsion among the nucleons. However, this is obviously not the only factor that causes alpha decay since alpha decay only transpires with the higher elements, not the lower ones. Therefore, the dynamics that need to be understood are the following. How is some degree of repulsion transformed into a substantial amount of repulsion within a heavy nucleus?

When dealing with the lighter elements, the nucleons within a nucleus have far more freedom of movement than nucleons within higher elements. Or, to be more specific, the nucleons that are closest *to the central core of the nucleus* of higher elements have far less freedom of movement than the nucleons of lighter elements. This is for the simple reason that within higher elements, the nucleons closest to the central core are surrounded by a myriad of other nucleons. Within lighter elements, the nucleons are not surrounded by other nucleons on "all sides". The reader would object to this last point since elements that are intermediate in mass (let's say elements 21-50), do have a central core of nucleons which *are* surrounded on "all sides" by other nucleons. Although this is true, the point of contention is as follows. Alpha decay will not transpire until the nucleus is sufficiently massive to *greatly* inhibit the freedom of movement of the nucleons closest to the central core. This will only transpire in the more massive elements.

Even when the freedom of movement of nucleons closest to the core is greatly inhibited, there will still be some oscillations of the nucleons (even the ones closest to the core) as a result of the subtle dynamical interplay between attraction and repulsion of the nucleons (this tenet was dealt with in An Intensive Scrutiny of the Atom). Since there will be some oscillations, yet their freedom of movement is greatly restricted, an unusual situation would transpire (with the nucleons closest to the central core) that would not transpire if these pre-conditions did not exist. The exterior muon neutrino and antineutrino on the exterior poles of a proton and neutron (which, as stated in the paper already mentioned, would repel) would be brought much closer together than normal. At this stage, the repulsion among the nucleons would be much greater than normal and a certain "chain reaction" would be initiated. The nucleons closest to the core would be repelled with such a velocity that their neutrinos would also come in exceedingly close contact to the neutrinos of the nucleons surrounding them and cause these nucleons to repel at a high speed as well. This "domino effect" would continue until an alpha particle was ejected from the *outer periphery* of the nucleus.

The reader may feel that there is a substantial flaw in the theory just outlined. Namely, the lines of force from the neutrinos are significantly weaker than the lines of force from the nucleons. Therefore, it would be impossible for a repulsion of this nature to transpire since the lines of force from the nucleons would induce an attraction sufficient in magnitude to prevent this type of repulsion. A preliminary analysis would indicate that this objection is valid. However, there are other “mitigating factors” which would facilitate the type of repulsion outlined. It has already been stated that the spatial configuration of the nucleons closest to the core would be orientated in a specific way *at times*. The (primary) factor which would enable this repulsion to transpire is that the lines of force from the neutrinos would be orientated in a highly specific way. Specifically, the lines of force would come into *direct,* “*head on*” contact with each other. This type of direct contact (which as previously stated would not exist with lighter elements in which there is no alpha decay) is what induces an *intensive repulsion*. A (silly) analogy to expound upon this would be as follows. Let’s assume we have two bar magnets with their opposite poles facing each other. Furthermore, there are “entities” surrounding the magnets which induce a strong repulsive effect on each other (that is, the two “entities”). This would be comparable to nucleons which experience an attraction with each other with some degree of repulsion as a result of the neutrinos. In our analogy, the two entities could never come very close to each other as a result of the repulsion of the entities. However, let’s assume the following. There are a myriad of other magnets/“entities” surrounding these two magnets/“entities” which force them ever closer to each other. A spatial orientation may exist between the “entities” (as opposed to the magnets) which could not ordinarily exist. The lines of force from the “entities” would experience a direct contact with each other (which would not be possible under ordinary circumstances as they will repel away from each other before there could be this type of direct contact) and cause an intensive repulsion with the magnets/“entities”. This would be the situation with alpha decay.

With the lighter elements, although there is an interaction with these lines of force from the neutrino and muon antineutrino, the interaction does not transpire with the lines of force interacting in a “head on” manner thereby preventing *extreme* repulsion. However, the nature of the repulsion within higher elements is sufficient in magnitude as to cause the nucleons closest to the core to accelerate with a substantial velocity. The velocity is sufficient as to prevent the attractive force of the nucleons from stopping this repulsive effect. (It should be pointed out that the magnitude of this initial velocity would not prevail throughout the entire nucleus. As the repulsion continues from the core to the outer periphery, the velocity would be reduced as a result of certain intricacies pertaining to the spatial orientation of certain lines of force. However, the magnitude of the repulsion would be sufficient in magnitude so that once this “domino effect” reached the outer periphery, an alpha particle would be ejected.) Consequently, the two factors which would negate the nucleons’ “ability” to prevent this repulsion would be a *direct* contact among the lines of force from the neutrinos (which does not ordinarily prevail), and an extreme velocity of the nucleons once the repulsive effect is induced.

Therefore, the basic mechanism behind alpha decay is as follows. With the heavier elements, the nucleons closest to the core of the nucleus have a greatly reduced freedom of movement. It would only require one neutron (which is the binding force of the nucleus) to have one of its exterior neutrinos come much closer than it ordinarily would to a muon antineutrino of a proton. The lines of force from the neutrino and muon antineutrino will experience *direct* contact with each other. A very fast repulsion will be initiated which will induce a "chain reaction". Other neutrinos and antineutrinos will come in contact and induce other rapid repulsions until an alpha particle is emitted from the outer periphery of the nucleus. The reason an alpha particle will be emitted (as opposed to a singular proton and neutron) is that it is the most stable "unit" within a nucleus. Specifically, the most stable way one proton is bound to another proton is via two neutrons.

Although the purpose of this paper is to outline the dynamics of alpha decay and the splitting of the atom, another precept should be briefly addressed. If the reader is familiar with the theory of neutron decay outlined in An Intensive Scrutiny of the Atom, he may be wondering how this model could be extrapolated to the transformation of a neutron to a proton within the nucleus of an atom. To be specific, it would seem that only a free neutron could ever decay. A neutron within a nucleus is constantly surrounded by other protons. Consequently, when an antineutrino impacted against one of the sub-components of the proton, the sub-component could not move slightly further away from the neutron (even for the briefest period of time) since there is no room for it to do so. *Certain* dynamics pertaining to alpha decay, provide a modicum of insight as to how a neutron within a massive nucleus is transformed into a proton. As a result of the inordinate level of repulsion within a heavy nucleus, there will be *incremental* periods of time when there will be more room within the nucleus. Assuming that alpha decay does not transpire, during these incremental periods of time the sub-component of the proton will be able to move further away from the neutron. At that very brief stage, the sub-components of the electron will be drawn closer together (as a result of the attractive force of the free antineutrino) before the sub-component of the proton is drawn back towards the neutron. When the proton's sub-component is drawn back to the neutron, the neutron will be "one step closer" towards becoming a proton. (The sub-components of the electron will not be drawn any closer together until there is space once again *within* the neutron as the electron's sub-components are "jammed" between the proton's sub-components.) This process will not transpire within a lighter element as there is insufficient repulsion within the lighter elements to enable there to be a sufficient amount of room for a proton's sub-component to move further away from the neutron.

In a similar way that the new model of the atom provides a superior comprehension of alpha decay, the new model can provide a better understanding of the dynamics pertaining to the splitting of the atom. There are two primary factors which enable a slow neutron to split the atom. The first factor is the spatial orientation of a fissionable (let's say U^{233}, U^{235}, Pu^{239}) nucleus. There are two components pertaining to the spatial orientation of a fissionable nucleus which enable a slow neutron to split the atom. (The following terminology is rather "loose", but should suffice to convey the desired precepts.) Firstly, the nucleons on the perimeter of the nucleus are configured in such a manner as to allow certain "spaces" which would allow the entry of a slow neutron. Secondly, within the nucleus itself there are certain "passageways" (it was stated that this terminology would be loose) which enable a slow neutron to propagate through the nucleus. It is these two components ("spaces" on the outer periphery of the nucleus and "passageways" within the nucleus itself) of the nucleus which enable certain nuclei to be fissioned via a slow neutron. The reader may feel that there is a flaw in this theory. It has been stated that the nucleons are in a state of constant oscillation. Therefore, these "spaces" and "passageways" wouldn't necessarily be present on a consistent level. However, the spatial orientation of fissionable nuclei is of such a nature, that despite the oscillations of the nuclei the "spaces" and "passageways" would always be there to one extent or another. To be specific, there may be times when they're slightly larger or smaller, but they would, nevertheless, consistently be there. However there is a second factor which is independent of the nucleus itself which enables fission to transpire. This, of course, is the neutron itself. The reader may feel that this is obvious. However, is there a clear understanding of the dynamics involved as the neutron propagates through the nucleus? The neutron splits the atom by propagating between a proton and another neutron. During the neutron's propagation through the nucleus, it is the sub-components of the proton which are involved in the splitting of the atom. Since the poles of the sub-components of the proton have two different poles facing outwards (in contrast to the sub-components of the electron which have the same poles facing outwards), one pole of the slow neutron will repel the pole of the neutron already within the nucleus while the opposite pole of the slow neutron will repel the proton within the nucleus. As the slow neutron propagates through the nucleus, this process would continue until the atom is split.

Therefore, the two elements involved in the splitting of the atom are the spatial orientation of the nucleus (which "allows" a neutron to enter *as well as* effectively propagate through the nucleus) and the opposite poles of the sub-components of the proton (on the slow neutron) interacting with the neutron and proton within the nucleus to induce a repulsive effect.

Consequently, the new model of the atom has provided us with a better comprehension of the dynamics of certain nuclear reactions.