

## “Particle Physics”, the intellectual weaponry for research workers

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### Abstract

Most spoken, yet not clearly defined is the genesis and integration of osteoblasts. Should the implant surface be threaded, as it is, and be anodized only to roughen it for the coatings to be adhered to? Or smoothed and polished to absorb photons and pour out electrons by virtue of the Nobel-Prize-awarded “photoelectric-effect”, to anodize and create ( + ) ions for attracting ( - ) osteoblasts?. By adhesion of osteoblasts to coatings the bonding is superficial; between oppositely charged ions, chelation (ionic bonding) reaches beyond. Another key issue is “metaplasia” for transforming adult fibroblasts into adult osteoblasts spontaneously, versus osteogenesis out of stem cells, taken about -8- cell divisions. The answers are given in terms of Particle Physics, only by which cutting-edge science, the shroud of myth and mystery is step by step clarified clean-cut.

**Keywords:** particles, metaplasia, “photoelectric-effect”, distant- electric-charge, chelation.

**Key issues:** the source of osteoblasts, the mode of integration, by means of which two issues, particles shall be introduced.

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### Introduction

There were in the past, clinics, where general dental practice was limited to only fillings, extractions, crowns and dentures. Today, with effective “Continuing Medical Education” (CME), general practice have greatly advanced, a good few having already started setting implants. With this awareness, the present paper is prepared to introduce Particle Physics for CME that no one should run the risk of being left behind.

### What is real?

What are we made of, where are we living in, is the interest since the ancients. All kinds of matter were believed to be different combinations of Earth, Fire, Air and Water, the -4- classical elements of Empedocles (460 BC) [1]. Next were the atoms (atomos-not able to cut) based on pure reasoning by Democritus (430 BC) [1]. Today, we look inside atoms, even beyond. The smallest are the “particles”, the first observed were the electrons by J.J. Thompson in -1897; and the last, Higg`s Boson ( the God Particle ) was measured at CERN ( European Centre of Nuclear Research ) on July 2012, for a total cost of \$13.25 billion! The zealous effort

of so many scientists from so many centers and such huge the expenditure for so small these particles, all for what?

It is by the biggest discoveries these smallest particles have put wonders into our whole society; just imagine life without W W W, electronics, computers, mobile phones, and digital cameras. Even more impressive are developments in medicine, such as M R I and P E T scans, the neutron therapy for destroying cancer cells, all together extending our life expectancy and changing our life-style.

What do we have for our profession? Recently most distinctive is the Nobel Prized technology for induced pluripotent stem cells by Shinya Yamaka and John Gurdon, the brand new source of mesenchymal stem cells for regenerative medicine and regenerative dentistry [2]. But the most discussed and yet still shrouded is the genesis and integration of osteoblasts, every single step of which could have been clear-cut explained in terms of particles.

### **Everything is in Pathology**

Osseointegration is in reality a chronic inflammatory response (CIR), in exact accordance with "Inflammation and Healing", the chapter in every text book on Pathology [3]. To any infection, tissue responds by acute inflammatory response (AIR) to destroy and prepare for healing. Unable to destroy, such as the unbeaten tuberculous bacillus ( or the persistent foreign body such as the dental implant), tissue responds by -CIR- to limit spread and isolate by encapsulation in fibrous tissue; 'tubercles' in tuberculosis best exemplify. As for the implant, being charged ( + ), for CIR, ( + ) fibroblasts are repelled. The tissue responds

instead, by alternative cells, by ( - ) osteoblasts in place of ( + ) fibroblasts. By chance or by necessity, the process is spontaneous, because both these cells are initially fibroblast-like progenitor cells of the same connective tissue of mesenchymal origin in their two identities. Osteoblasts are but mineralized fibroblasts.

Like after E L A, there are in the blood clot, osteoprogenitor cells, not enough although for encapsulating the implant. Many more have to be recruited. There are no osteoblasts roaming in circulation, no ready-mades sitting in the neighborhood, they have to be produced from stem cells. Such precursor cells, however, are to be relied upon only for osteogenesis by convention. They can be from two sources: the osteoprogenitors, so many varieties of them in the oral cavity; and from adult somatic cells from anywhere in the body, induced into pluripotent cells. None of these stem cells, nor any intermediating precursor cells are required for procurement by "metaplasia". Defined as changed identity from fully differentiated cells of one kind into fully differentiated cells of another [4], by metaplasia, adult fibroblasts are transmuted into adult osteoblasts, spontaneously, because these two cells are just two identities out from the same stem cells, like the same money out from the same bank in two different currencies.

In pathology, the etiology of metaplasia are the "abnormal stimuli" associated with regeneration or neoplasia, osseous metaplasia being exemplified in incision scars, carcinoma stomach, gallbladder, salivary gland and several more. Step by step explanation, however, is possible only in terms of particles and particle interactions.

## In the inside of inside

Particles are the smallest, so small relative to the atom, as the football is relative to the globe. Particles add into atoms, atoms add into elements, elements into chemical compounds of molecules, making up all the material substance, the earth and earthlings.

Inside the atom is the nucleus like a pea in the center of - 6 - football fields; inside the nucleus are protons ( p ) and neutrons ( n ); inside - ( p ) - and - ( n ) - are the quark "particles". Combinations of only - 2 - quarks, the up quark - ( u ) - and the down quark - ( d ) - make up - ( p ) - of - ( uud ) -, and - ( n ) - of - ( udd ). The atom is complete when orbited by electrons - ( e ) -; where atoms are, there are electrons. Electrons are everywhere to complete the 3- ingredients, only - 3 particles: - u d e for the "creation"; without electrons, no atoms, no molecules, no chemistry, no biology, nor you and me.

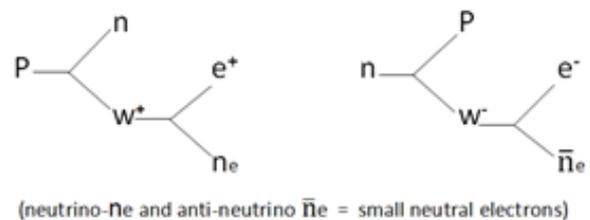
## Why are we different?

Inside the nucleus - ( p ) - and - ( n ) - are always paired, together called nucleons. Matters are different due to different combinations of nucleons, different combinations being the result of different particle interactions. Many biochemical reactions are under the microscope, particle interactions.

One most fundamental interaction in particle physics is one - ( u ) - out of - ( uud ) - converted into - ( d ) - out of - ( udd ) - or vice versa ( uud ----> udd or udd ----> uud ). The big result is change in number of - ( p ) -! With every such change, chemical identity changes, species change, characteristics of element change [5] (alchemy); fibroblasts change into osteoblasts! How?

## The force behind the changes

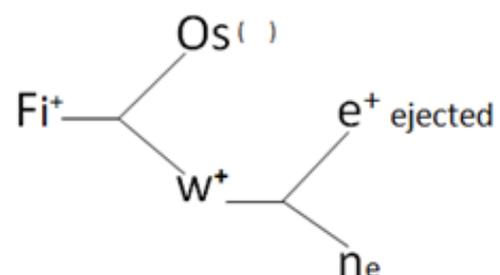
Always behind the changes there are the weak nuclear forces dictating, mediating; they are the weak force particles (bosons):-  $W^+$ ,  $W^-$  and  $Z (W^0)$ ;  $W^+$  for positive interactions, and  $W^-$  for negative interactions. All interactions are represented by Feynman diagrams (Richard Feynman 1918-1988), the rest are modifications.



Only charged particles can interact,  $e^- = (-)$ ,  $e^+ = (+)$ ,  $p = (+)$ . In most matter  $e^-$  and  $e^+$  are paired, making atoms and molecules naturally balanced and stable. Stripped or added  $e^-$  or  $e^+$ , the atom becomes destabilized and changes into a (+) ion or a (-) ion. The atom is 'ionized'.

Around the charged implant (anodized) is the cloud of (+) electric field, rippling away from which are waves of "distant-electric-charge" (DEC). Bone marrow fibroblasts hit by these waves, like those "abnormal stimuli" in pathology, run into metaplasia, osseous metaplasia.

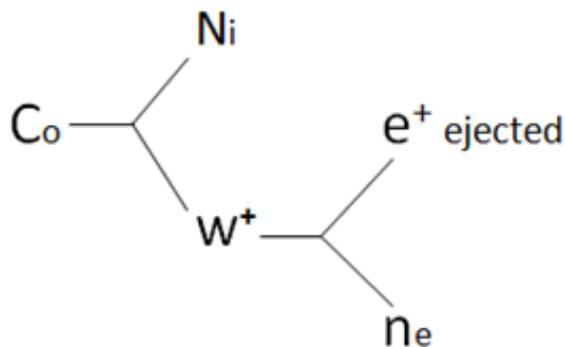
Feynmen`s diagram illustrates:



Triggered by DEC, mediated by  $W^+$ , the adult

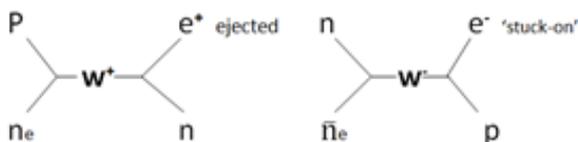
fibroblast ( $Fi^+$ ) transmutes into the adult osteoblast ( $Os$ ). The blank ( ) is to become (-) due to ( $e^+$ )s ejected and ( $e^-$ )s leftover in excess.

“Cobalt reaction” by Chien Shiung Wu (1957), (as cited in Lederman and Teresi, 1993) [5] further exemplifies:



The cobalt - 60 - nucleus changes spontaneously into a nucleus of nickel, a neutrino and a positive electron (positron) which was suddenly shot off.

Feynman`s diagram can be represented also by “neutrino- collisions”:



By double effect, ( $e^+$ )s ejected and “stuck-on” ( $e^-$ )s accumulated, the adult (+) fibroblast is transmuted into the adult (-) osteoblast.

### Thanks to Einstein

The ‘distant-electric-charge’ (DEC) and ‘metaplasia’ both are consequences of the “photoelectric-effect” (PEE) [6], the observation awarded the Nobel Prize to Albert Einstein in 1921 [7]. When a metal is exposed to high energy light (blue violet of short wave length), photons get absorbed into the metal; by random

collisions with electrons in the metal, energy of electrons is raised so much, so strong to breach the surface and pour out of the metal in globs. Stripped of ( $e^-$ ) and left with excess of ( $e^+$ ), the metal becomes positively charged (anodized).

### The big difference

Whereas osteogenesis takes about - 8 - cell divisions [8], metaplasia is spontaneous. For anodization to be thorough, the implant surface must be smooth, free from any treatment and freshly polished. Clearly, for the implant and osteoblasts to be bonded, the two must be oppositely charged. Simple physics. And the real purpose of anodization should be no other than making the implant become the anode, expressly to attract the anion osteoblasts. However, in one recent journal were displayed images of surface roughening as results of anodization for varying surface treatments [9]. Was anodization meant only for roughening the surface? Was it not to ionize the implant in order to attract negatively charged osteoblasts?

In spite of the common knowledge that the titanium oxide layer is positively charged and the osteoblasts are negatively charged, varieties of surface treatments still remain valued for ‘adhesion’. It should be clearly understood that adhesion is superficial, effective only at the surface level, whereas ionic bonding (chelation) reaches into the substance. Chêlê in Greek means claw, chelation is clawing, the lattice of substance molecules attracted and bonded to those ‘stuck-on’ electrons carried into by osteoblasts. It is the magnitude of too many electrons tight and compact in the wall that is preventing you from passing through.

If osseointegration should be of the strongest, and the period of healing process, the

shortest, it is high time to make the most benefit of the golden merits of 'metaplasia' and 'ionic-bonding'. For the osteoblasts in the adjacent bone marrow to reach across the space of only 20-40 nm [8], chemotaxis would take less than half-turn for the cells in the order of microns.

### **Time to keep pace with particles**

Additional to histology, pathology and biochemistry, particle physics is the latest intellectual weaponry only by which the cloud of mysticism might be cleared-up, and osseointegration might no more be labelled a miracle [10].

Nothing should be stopping changes for the better. The older generation had no idea of particles, anything fixed one against another, was taken to be due to glue, suction, or adhesion, although chelation-therapy for metallic poisonings was also aware. If that be so, why not then apply it to chelating osteoblasts to the implant? Nobody knows!

Other than adhesion and chelation, one other bonding is by 'polymerization' as in superglue, where atoms and molecules reach into substance, then combine among themselves into larger molecules and get locked (as also are bonding agents). The bonding is due to electromagnetism, responsible for binding electrons with their nuclei inside atoms, and binding atoms to atoms to form molecules. Among themselves, between similar molecules, such as in polymerization, they are the 'cohesive' forces; between dissimilar molecules, as between saliva and glass slide, they are the 'adhesive' forces. Surplus cohesive forces on the surface tenses into 'surface-tension'. Of weaker surface-tension, saliva yields and 'wets' the glass slide, also referred to as 'wettability'. The

significance of this difference in surface tensions is the differing condensations of electrons in solids and fluids, which is exactly the difference in electromagnetic forces due to the difference in magnitude of electrons.

### **The texture**

It is the texture of the alveolar bone, more than the threads of implant that really matters. An over exaggerated comparison would be the same screw into metal and into cheese. Unlike the post screwed into solid dentine, much cannot be expected out of those different designs. Still, because the screw is so overwhelmingly superior to the nail, no one so far has dared to venture with smooth implants. State of the market will depend upon the producers and consumers.

### **Tomorrow's implant extrapolated**

For the osteoblasts, their source being so generous and their integration so spontaneous, aspiration should be towards promoting the texture of bone, which in terms of particle physics is the density of electrons in bone; to which end our laboratories should be finding ways added or not to different other means.

With new frontiers on smooth implants, for the upper posteriors, their roots might be dwarfed and possibly just seed them into place. The test of a theory is whether results might be predicted that can be measured. The latest 'God Particle' was measured after -50- years of extrapolation. At no cost, this whole paper also an extrapolation, but very minutely, might be boiled down to just - 2 - words: 'metaplasia' and 'photoelectric-effect', only - 2 - vocabularies for all you need to produce and integrate fully mature osteoblasts.

## Conclusion

The explanations could not have been mathematically interpreted based on only histology, pathology and biochemistry. Particle Physics is a sine qua non, without which before, many conclusions were drawn with assumptions, with which today, conclusions should no more be clouded. Particles have become the latest intellectual weaponry for any research worker to advance further. Particle Physics is for C M E, ought not to be missed; better to start catching up, be it slowly, rather than standing still and remain further behind.

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