Retrospective Analysis of
PLATINUM GROUP ELEMENT Development.

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Retrospective Analysis Asks:
What facts and sequential steps must have occurred to produce the results at hand?

Part A: Retrospective Analysis of Political and Technological Settings.

A.1. **Old-fashioned wars were won, or lost, primarily by manual combat, manpower and actual horse power.** The Industrial Revolution progressively replaced manual labor with machines and equipment, which also changed warfare. World War 1 was not the 'War To End All Wars.' To the contrary, World War 1 was the forerunner of futuristic high-tech warfare. Advancing technologies progressively replace manpower.

A.2. **New and significant World War 1 technologies: Chemicals, Materials and Equipment:**

A.1.1. **Ammonium Nitrate** facilitated limitless manufacturing of explosives and gun powder.

A.1.2. **Poison Gases:** In addition to chlorine warfare, many other poisonous gases were used. E.g. **Osmium Tetroxide,** in concentration, smells like chlorine, but was more effective and deadly.

A.1.3. **Demand for Metals of New Armory:** Motorized vehicles, ships, trucks, tanks, airplanes.

A.1.4. **The importance of High Tech Metals:** E.g. Platinum Group Metals (PGM).

A.3. **The political realization was a must: Resources Determine Military Victory or Defeat.** Consequently, governments authorized the securing and stockpiling of critical resources. Immediately after World War 1, in 1923, US and British militaries mandated the study "OCCURRENCE AND DISTIRIBUTION OF PLATINUM-GROUP ELEMENTS IN BRITISH COLUMBIA." A report, drafted by V. J. Rublee, was completed in the early 1930's, but remained a military secrete, designated to be laid open 50 years later, as: "Open File 1986-7." (Even today, military censorship and secrecy enshrouds government agencies: For public copies of Rublee's original type-written report differs radically from the edited, misleading internet publication by the administration of British Columbia, Ministry of Energy, Mines and Petroleum, Resources.)

A.4. **After World War 2, the political realization was even more acute:** Military victory or defeat is determined by resources. An arms race began: The new arsenals of weaponry were nuclear warheads, rockets, atomic bombs, jet fighters, stealth fighters, electronic devices, even warheads in space. Sword, bayonet and hand gun are merely historic metaphors.

A.4.1. **"Cold War"** eliminated the actual engagement of manpower.

A.3.2. **During the "Cold War," political super powers were engaged in political posturing;** they stockpiled enough weapons, to destroy and annihilate each other and humanity, which demanded of them unimaginably high amounts of High Tech Metals.

A.4.3. **The Platinum Group Metals assumed global significance.** They were declared "*vital to the defense of the USA*," under military control, classified, secretive, and not readily available to the global public. (Even presently, Canada must comply with the USA, if Canada wants to be in a military allegiance with the USA, such as NORAD. Canada cannot entertain military policies, which contravene military strategies of the USA.)

Part B: Established Scientific, Physical, Chemical PGE Facts on Demand.

B.1. Physical, Chemical PGE Characteristics correspond to listings in the Periodic Table of Elements.
The PGE are part of Group VIII, together with iron, cobalt and nickel. All members of Group VIII share common chemical characteristics. Thus, as expected, the PGE occur in the earth's crust simultaneously with ores of iron, cobalt and nickel, as (1) Salts (sulfides, arsenates et. al.) and as (2) Oxides (complex and simple).

B.2. General Characteristics:

1. PGM are deemed precious metals, which resist oxidation by acids and air. But they resist oxidation in air only below Red Hot Heat, 800° C. Above this temperature, PGM oxidize more readily than iron. Once oxidized, PGE ions are more difficult to reduce than iron.
2. PGM oxides are even less soluble than their metal counterpart.
3. Having a predominate valence of 4, PGE form complex molecular structures. E.g.: Ammines.
4. PGE ammines have mysterious bonding: (1) A mysterious covalent bonding with ammonia molecules (NH_3), and (2) ionic bonding with anions – salts. (E.g., $Pt^{4+}(NH_3)_xCl^-_4$)
5. To a greater or lesser degree, all metallic PGE (PGM) absorb atomic hydrogen.
6. All PGE serve as catalysts in various chemical reactions.

B.3. Table of General PGE Characteristics, and Statistics Compared with Gold and Iron:

			Valence	M.P. °C	B.P °C	Density	ppb	Mohs	OxyBnd	Acid Solubility
B.3.1.	**Ruthenium:**	**Ru**	2,3,4,6,8	2500	4900	12.2	1.0	6.5	126	sl.so. Aq.R.
B.3.2.	**Osmium:**	**Os**	2,3,4,6,8	3000	5500	22.6	1.8	7.0	143	sl.so. Aq.R.
B.3.3.	**Rhodium:**	**Rh**	2,3,4	1966	4500	12.4	0.7	6.0	96	ins. Aq.R.
B.3.4.	**Iridium:**	**Ir**	2,3,4,6	2454	5300	22.5	0.4	6.5	99	ins. Aq.R.
B.3.5.	**Palladium:**	**Pd**	2,4	1552	3980	12.0	6.3	5.0	91	ins.a. / so. Aq.R.
B.3.6.	**Platinum:**	**Pt**	2,4	1769	4530	21.4	37.0	3.5	93	ins.a. / so. Aq.R.
	Statistic of PGE Total In Earth's Crust						46.9			
B.3.7.	**Gold:**	**Au**	1,3	1063	2970	19.3	3.1	2.5	53	ins.a. / so. Aq.R.
B.3.8.	**Iron:**	**Fe**	2,3	1536	3000	7.8	63,000,000	4.0	93	so. a

B.3.9. **Comparative Global Productions:**

2013 Actual Global Production of Pig Iron	1,170,000,000 tons
2013 Actual Global Production of Gold	2,770 tons
2011 Actual Global PGM Production	484 tons
2013 Potential PGM Production Relative to Gold (2,770 x 46.9 / 3.1)	41,907 tons
2013 Potential PGM Production Relative to Iron (1,170,000,000 x 46.9 / 63,000,000)	871 tons

B.4. Additional and Unique PGE Characteristics:

B.4.1. **Osmium, ruthenium and iron, Group 8, have similar characteristics and chemistry.**

1. Osmium:

a. Is the hardest of all metals; cuts all, but cannot be cut by any other metal.
b. Osmium (iridium?) is heaviest of all elements, with the highest density.
a. Osmium is not really a precious metal; it oxidizes readily, as phosphorus.
b. Osmium metal, in time, evaporates into humid air as a gas (H_2OsO_4).
   i. Osmium tetroxide (H_2OsO_4) is the most potent/toxic of all oxyacids.
   ii. It vaporizes as readily as water.
   iii. It has a density 8.8 times heavier than air.
   iv. It destroys organic cells, blackens nerve cells. (Medical Term: Fixation)
   v. It causes red acid burn on skin, and permanent dark spots. (Tattoo)
   vi. It causes blindness and deadly respiratory problems.
   vii. If it reaches lungs, it destroys lungs.
   viii. It turns golden yellow corn oil to black muck. (A Standard Test.)

2. Ruthenium:

a. Ruthenium, to a lesser extent than osmium, has the osmium characteristics.
c. Ruthenium is hardly a precious metal; it oxidizes readily, as aluminum.
b. Unique feature of ruthenium: It oxidizes explosively.

B.4.2. **Iridium, rhodium, and cobalt, Group 9, have similar characteristics and chemistry.**

1. Iridium:

a. Iridium is similar to, yet tougher than, rhodium. It is said to be very rare, but is found lying exposed on ultramafic rock of the Cariboo Cottonwood River.
b. Iridium naturally and commonly combines with osmium to form the inter-metallic compound, osmiridium, which has a twofold significance:
   i. Osmiridium may containing 19% gold. The gold cannot be recovered, unless iridium and osmium are (1) recognized and (2) dealt with.
   ii. A global deposit of an iridium layer is credited for destroying the dinosaurs. Originally, it may have been a layer of osmiridium, which over time decomposed; for osmium was lost since to "evaporation."

2. Rhodium:

a. As metallic Ir, Pd, and Pt, Rhodium has face-centered cubical crystals. The surface of rhodium crystals reflects light like a mirror.
b. Metallic rhodium slowly dissolves only in sulfuric and hydrochloric acids. Rhodium (as iridium) resists oxidation, even in aqua regia. But when oxidized, a chalky rhodium sesquioxide, Rh_2O_3, is perfectly insoluble.

B.4.3. **Platinum, palladium and nickel, Group 10, have similar characteristics and chemistry**.

1. Platinum:

a. Platinum is the only metal with the identical coefficient of expansion as glass. Platinum may be installed into glass and heated without breaking the glass.
b. Platinum is the softest PGM. It is malleable, similar to gold, and readily combines with other metals to form alloys at relatively low temperatures.

2. Palladium:

a. Palladium is harder, lighter, and more shiny than platinum. Thus palladium has even more unique industrial applications than platinum.
b. Palladium metal (sponge) has the un-paralleled ability to absorb 900 times its volume in hydrogen, which is gradually released, when gently heated. Thus Palladium is used to extract sour H_2S gas from natural gas, by simply passing the gas through a palladium mesh. Pd reduces/absorbs H; and solid S precipitates.
c. Palladium has the unique feature, not combining with organic acids/matter.

B.5. Retrospective Analysis leads from one AHA Experience to another, as it reveals the past. Hopefully readers will take unresolved past issues to higher and better future levels. Such as:

1. How do we stop the poisoning by osmium tetroxide in tobacco smoke? (Informing the public?)
2. How do we manage osmium rich food, which digestive fluid, HCl, changes into osmic acid?
3. Did decomposing osmiridium change golden vegetable oil into black mineral oil and Tar Sands? Is the culprit of burning fossil fuel really CO_2, or is it Osmium Tetroxide (H_2OsO_4)?
4. What are the effects of acid rain oxidizing natural and benign OsO_2 to OsO_3 and H_2OsO_4?
5. Only an OsO_4^{2-} ion is potent enough to strip Cl^- from K^+ and cause instant death, when KCl enters human veins. Is 'iron' in blood, not Fe but, another member of the 'Iron Group,' Os?
6. Are we already in a military/police state, where military strategy, and secretive government bureaucrats over-rule public interest and health; where critical information is withheld from the public, preventing the public from making democratic, economic and medical decisions? (See. pgeau, No. 2., Sec. A. B. C. D.)

Part C: Destructive Military Applications and Cruel PGE Development.

C.1. Three Examples of Military Use and Application of Technological (PGM) Warfare:

1. **Theory turned into fact, when the author stood inches away from F-117 Jet Stealth Fighter**, which was on public display at an Abbotsford International Air Show. What makes Stealth air planes 'invisible' to radar? Paint? Soft cloth? Based on the evidence at hand, and the author's experience with PGE chemistry, electro-plating/precipitation, the answer was obvious: Stealth airplane surfaces are exposed to a unique electrolytic process that deposits innumerable, cubical, microscopic, metallic, rhodium crystals (cf., B.4.2.2.a.), which diffuse radar and light that virtually nothing is reflected back to its original source. The Stealth Fighter appears to be black, not because it absorbs light; to the contrary, it reflects and diffuses light super-efficiently on tiny silvery reflective mirrors.

   Facetious Questions:
   a. How many wedding rings or how much dining cutlery could be rhodium-plated with the amount of rhodium used on the surface of one F-117 Jet?
   b. How many platinum/rhodium thermocouples and heat sensors are employed in one F-117?
   c. How many palladium electrical contacts are used in one F-117?

2. **Military Osmium Applications:** (Cf., B.3.; B.4.1.1.ff)
   a. Osmium Projectiles (compared to iron bullets):
      i. Osmium has a threefold density – a threefold striking power of iron bullets.
      ii. For equal striking power, osmium projectiles may be one third the size of iron: Having one third the air resistance; going three times faster and further.
      iii. Being harder than any other metal, osmium penetrates armor, as if butter.
      iv. If alloyed with ruthenium, and combined with hydrogen-enriched palladium, the osmium projectile will explode violently on impact, like a grenade.
      v. If not protected by cladding, osmium may burn as a visible tracer bullet, for the osmium affinity/bond with oxygen, is equal to that of phosphorus.
   b. Chlorine Gas Warfare of World War 1 was, at least in part, Osmium Tetroxide Warfare. With a density 8.8 times the density of air, the Tetroxide flowed in drenches like water, smelled like chlorine in concentration, blinded and killed. (Historical Research will verify that Chlorine Warfare was also Osmium Tetroxide Warfare) (See March 2000, Article on Osmium.)

3. **What had to occur to produce a mushroom cloud of an atomic bomb? – The Palladium Bomb. A very specific example and application of Retrospective Analysis:**
   a. Saturate 2 cubic meters of metallic palladium powder with 1,800 cubic meters of hydrogen.
   b. Destroy what you just created by a primary explosion, which scatters and ignites the hydrogen-enriched palladium.
   c. The ignition of 1,800 cubic meters of hydrogen will instantly, cause not an explosion but an implosion, withdrawing from 4,500 cubic meters of the atmosphere 900 cubic meters of oxygen.
   d. 100's of meters of surroundings are devastated by the implosion of inrushing oxygen.
   e. Inrushing oxygen will produce a double whammy: Next, the lighter-than-air hydrogen torch, at 2,400° Celsius (4,320° F), will shoot upwards, 10 kilometers into the atmosphere, where the resulting water vapor is cooled, condensed and produces the "mushroom."
   f. At ground level is an expanding ring of super-heat, which incinerates everything in its path – Hell.
   g. The Palladium/Hydrogen Bomb is an atomic bomb. Like a mini-sun, it burns hydrogen so hot, that by transmutation it transforms and alters atomic elements – atomic bomb.
   h. That is what Hiroshima and Nagasaki was like.

N.B.: Espionage, secrecy and deliberate dissemination of disinformation are common military strategies.

C.2. **"OBJECTION!! Where is all that platinum supposed to come from?!"** is a doubt-creating misleading question. For almost a century the public has been told: The global platinum suppliers are South Africa and Russia. But the USA, communist Russia, and Apartheid South Africa had dismal trade relationships: Where did the US military get its Platinum from?

1. **Some global supplies of exotic / jewelry platinum did come from South Africa and Russia.** But as observed and mentioned above (B.1.), there are two sources of PGE supply: (1) Salts and (2) Oxides. Deceptive promotions and the propositions, claiming that PGE supply comes from salts, has allowed the (PGM) steel industry artificially to inflate PGM prices. (Cf., pgeau, No.1. , Sec. 2.D.2.)

2. **The richest PGE resources on earth are high grade iron oxide ore deposits:**
   a. The steel industry has the greatest PGE resource, the most efficient extraction process.
   b. Blast furnaces, reduction by carbon monoxide, produce pure metal, including the PGM in amounts, almost beyond imagination. (Mining PGM salts cannot compete with iron industry.)
   c. Statistics are actually higher, than listed: (cf., Table B.3.9.)
      i. Osmium and ruthenium resources are much higher than the generally reported ratio with iron: 1.8/1/60,000,000, which contradicts predictable Periodic Table ratios.
      ii. Also gold mining extraction could be higher, were it not for PGE interferences.
   d. Examples of publicly hidden PGM production:
      i. HERAEUS, the world's oldest and largest Platinum and Precious Metal producer is situated adjacent to the German Steel Industry, Krupp Steel, and the "Ruhr Region." (It is no secret: (1) The astronomical German World War 1 debt had to be paid in Gold Mark, or "*in kind*." (2) Germany has no gold mines, "*in kind*" is Platinum. German paid with PGM from the "Ruhr.")
      ii. The USA supposedly has no native Platinum. But why did Platinum Smelters set up shop in the steel industry of Eastern United States? (E.g., Eastern Smelting and Refining.)
      iii. The steel industry is messy, not healthy, yet it makes wealthy. Almost everyone heard of the Cuyahoga River, burning in Cleveland, Ohio, and the Sydney Tar Ponds in Nova Scotia. To reduce toxic gases, scrubbers were installed, fumes percolated through oil to trap the Osmium Tetroxide (cf.,B.4.1.1.b.viii.). (When steel industries shut down: Cartel tycoons move to more lucrative locations; records are lost; poor local people are stuck with toxic 'Tar Ponds' and oil burning rivers; yet the military got what it wanted and are tight-lipped; the police enforce classified PGE info; but Retrospective Analysis reveals the facts.)

CONCLUDING QUESTIONS and ACID TEST:

(1) Have Steel Tycoons PGM To Waste? (2) Has The Military Enough? (3) Is The Public Cheated?
TEST: Make commercial grade stainless steel, or antique steel donor electrode; use a platinum negative electrode; use 30% hydrochloric acid electrolyte; apply 20 VDC until steel electrode is completely dissolved; let sit for 24 hours, that hydrochloric acid digests residual base metals, including chromium; remove, rinse, and dry residue; fuse residue in carbon cupel and oxygen deprived environment. Note: Oxy-propane torch is barely hot enough to fuse PGM metals. Rinse residue in warm hydrochloric acid; repeat fusing to produce larger metal agglomerates. CAUTION: Do not submit results (pictures) to conventional Fire Assay. (See pgeau, No. 1., Sec. 1. C.1.a.)