

Pluto and plutonium — any connection?

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Uranium 238 Uranium 239 Neptunium 239 Plutonium 239

The above series shows the stages in the formation of plutonium from naturally-occurring uranium, and that three extra-heavy metals have been named after the outer planets. They belong to the seventh period, the last period containing the heaviest elements, of the periodic table, all of whose elements are radioactive. The above series shows a transmutation, that is the changing of one element into another. So large are the nuclei that all seven of the possible electron shells are occupied. The seventh period of the periodic table is thus occupied with elements that are in a state of perpetual disintegration.

Time was when alchemists dreamed of transmuting a few grams of gold, and spent a whole lifetime in pursuit of this aim. Now one ton is created every year in Britain of an unnatural, man-made element. But whereas gold is the most perfect and noble of metals, plutonium is surely the most terrible element in existence, of which atom bombs are made. About ten pounds, or a grapefruit-sized lump of plutonium makes a bomb. An awesome and one cannot but feel rather hellish transmutation takes place inside all of Britain's nuclear power stations in which the above reaction turns uranium fuel into plutonium. And then what happens to it?

Pluto — we digress now — was god of the Underworld. At least for astrologers, Pluto represents sudden and disruptive energies, the 'bomb in the basement'. Their views on Pluto seem to be to a considerable extent derived from the unleashing of nuclear power soon afterwards. The planet Pluto was predicted in 1919 and discovered in 1930. In 1932 artificial transmutation began, with neutron bombardment of atomic nuclei. Atomic energy was first unleashed in 1938. The new metal plutonium was recognised and named after the new planet in 1941.

Without taking too seriously specific associations between the other planets and these extra-heavy elements, one cannot deny that Pluto as underworld god presides appropriately over plutonium. It is a powerful metaphor.

As befits its infernal character, reactor-grade plutonium will ignite spontaneously if exposed to the air, and so has to be surrounded by nitrogen all the time. When the staff of Windscale went on strike, the army had to be called in to ensure that the nitrogen supplies to the plutonium store were maintained, otherwise it would have caught fire. And airborne plutonium is the most dangerous form as it can then be inhaled: its toxic dose in the body is measured

in millionths of a gram, its radiation being very harmful to living tissue.

The element is used amidst stealth and secrecy. Government officials, (skulking beneath the Official Secrets Act) did not tell the public that Britain's first nuclear reactor, Calder Hall, was built primarily for the generation of weapons-grade plutonium. The CEBG continues to claim that civil nuclear power programmes cannot be used to generate weapons-grade plutonium. Some say they are Siamese twins, 'atoms for peace' and 'atoms for war'. One makes the plutonium, the other uses it. The US plutonium bomb dropped on Nagasaki was more compact than the uranium bomb dropped on Hiroshima, so most atom bombs are made of plutonium, its critical mass being less than that of uranium.

I incline to an old-fashioned view that all elements heavier than lead are probably best left alone. Uranium when it is mined exists in a concentration of one part in two thousand in the richer seams. Nature does not concentrate it. If we do concentrate it, and move over to a 'plutonium economy', it will be like summoning Pluto himself up into the light of day.

Plutonium can be unmade as well as created by nuclear reactors. The so-called Fast-Breeder Reactor, that final nightmare which is the dream of the Atomic Energy Authority, has a plutonium pile a-glow at its centre, surrounded by a few thousand tons of hot liquid sodium. It burns up, i.e. transmutes plutonium, so in theory all plutonium could be unmade by feeding it into such a pile.

The issues involved are by any standards astronomical. Indeed fiercely opposed views have been expressed by two of Britain's leading astronomers. Sir Fred Hoyle in 'Energy or Extinction' (1977) expressed the view that civilisation would collapse if we did not develop nuclear power intensively. Sir Martin Ryle in 'Towards the Nuclear Holocaust' (1981) said, conversely, that this was the route to annihilation, and that conservation and alternative energy sources should be used instead. Plutonic stuff indeed.

The trans-Saturnine planets may be linked to the dissolving of matter into energy. During the slow 1905—1910 opposition between Uranus and Neptune, the Theory of Relativity was born.

Sir Isaac Newton spent many years in pursuit of the secret of transmutation. Eventually, as a disappointed man, he expressed the view to Robert Boyle, that, if such a thing were possible, its discovery would be "not without immense damage to ye world." It is a phrase that those involved in the nuclear power programme could well take to heart.

The Creation of Plutonium.

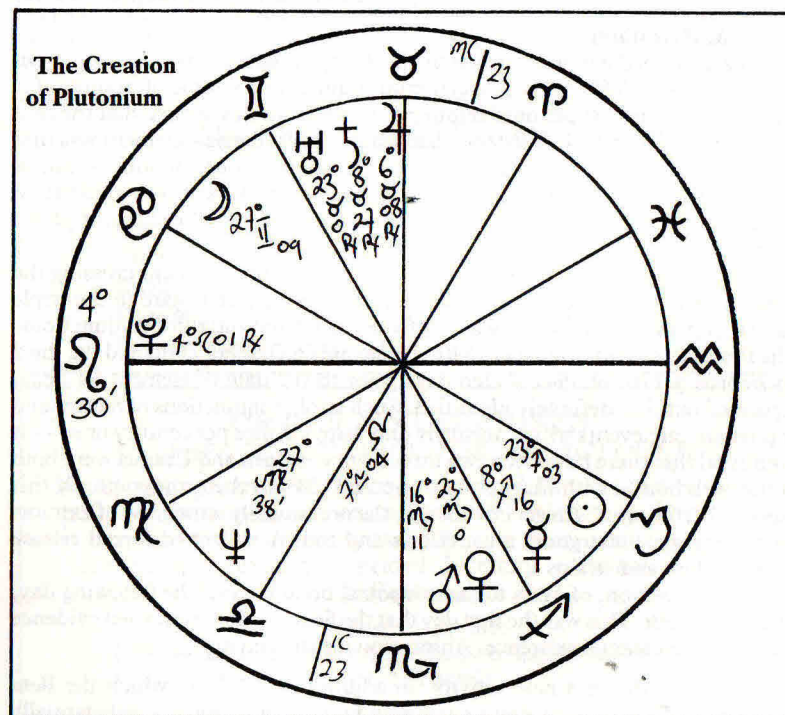
The new element was made and identified by a team led by Glenn T. Seaborg at Berkeley College, San Francisco, over 1940-41. Surprisingly, no detailed account of the stages of discovery giving relevant dates, is in print. However, Professor Seaborg has kindly sent copies of relevant pages of his diaries to the writer, enabling the dates to be specified and enabling a birthchart of plutonium to be given. The research was secret owing to the war, thus a letter written by Seaborg to the *Physical Review* in 1941 announcing the properties of a new element was held back until 1945... until Nagasaki, when the world heard about plutonium. Its density is twenty time that of water. Element neptunium, of atomic number 93, had been identified by 1940, as formed by the bombard-

ment of uranium, element 92, with alpha-particles, helium nuclei, and the question was whether anything further would be generated by continuing the process.

Astrologically, the very first generation of what subsequently came to be recognised as a new element would be the time of its birth. That takes us to a time two months before the new element was separated out from the irradiated sample, and a couple of years before its name was agreed upon. The Seaborg diaries give 8.00 pm on Saturday, December 14th, 1940 as this hour. That would have given a slight trace of the element, detectable optically or by its radiation, but not enough to weigh. Larger, weighable quantities were later produced by a different method, of setting up a pile of uranium which would go 'critical', i.e. start breeding the ultra-heavy elements within itself. The diary record for December 14th is quoted, and a chart for the time is given (04.00 am December 15th GMT).

What is sometimes referred to as the date when plutonium was made is its separation by a precipitation method from all other elements, over 23-25th of February, 1941. Success was reached on working 'past midnight' on the 25th. The diary for that day records:

"With this final separation from thorium, it has been demonstrated that our alpha activity can be separated from all known elements and thus it is now



Diary of Glenn Seaborg for December 14th, 1940

“Wahl made a target today by decomposing UNH into U_3O_8 on a copper plate. Between the hours of 8.00 pm and 12 midnight the target, which was placed in a bell jar, was bombarded with 16 Mev deuterons through a 2-mil aluminium window for a total of approximately 230 μ ah in the 60-inch cyclotron (bombardment 93-7). From the resulting material, Kennedy, Wahl and I plan to isolate a chemical fraction containing 93, study its radioactivity, and also look directly for element 94.”

clear that our *alpha* activity is due to the new element with the atomic number 94.”

The name of plutonium was recommended as a logical — and somewhat inevitable — consequence of the names of the previous two elements 92 and 93, and simply followed the sequence of the outer planets. A paper by Seaborg on its properties

“includes for the first time the suggestion that element 94 be given the name plutonium (symbol Pu) after Pluto, the second planet beyond Uranus, in line with McMillan’s suggestion that element 93 be given the name neptunium (symbol Np) after Neptune, the first planet beyond Uranus, from which uranium derives its name.”

(From the Seaborg diaries, 18/3/42)

Chart for Plutonium.

The chart shows the moment when the Berkeley cyclotron was switched on, on December 14th 1940, to focus a deuteron beam onto a sample of uranium for four hours, from 8.00 pm until midnight. It was from this sample that the first evidence for element 94’s existence came, and from it the new element was first separated out. The transmutation reaction uranium \rightarrow neptunium \rightarrow plutonium would presumably have started at once, when the sample’s irradiation commenced, so it seems reasonable to take that moment as the chart for plutonium.

It is noteworthy that the new planet Pluto was at that moment crossing the horizon, being 27’ from the ascendant. Pluto was then in square to the triple Saturn-Jupiter conjunction, then in between its second and third conjunctions. The first occurred in August of 1940, the second on October 20th, and the third on February 14th of 1941 — ten days prior to the date of element 94 being separated out, i.e. definitely identified. Such triple conjunctions of Saturn and Jupiter are rare events which normally only happen once per century or so — it is unusual that there have been two this century. Saturn and Uranus were both in the 10th house, with Mars closely opposed (28’) to their midpoint. Of this aspect Ebertin says: “An act of violence, the occasionally wrong use of extraordinary energy, undergoing great efforts and toil. A violent or forced release from tensions and strains....”

That opposition, of Mars to the midpoint, became exact the following day, December 15th. This was the first day that the Seaborg diaries showed evidence for the new element’s existence. Absorption measurements

“seem to indicate a new activity (in addition to 93^{239}) in which the Beta particles have an end point corresponding to an energy.... substantially

higher than that of 93^{239} . More intense gamma rays seem to be present.”

For two months after that the various isotopes produced by the radiation were separated out.

Neptune squared the midpoint of Uranus and Pluto in December 1939 then again in February 1940, this being around the time when the Manhattan Project to produce fissile material for war purposes was started. Neptunium, the first transuranic element, beyond the 92 of Nature, was made in May of 1940 at the same Berkeley cyclotron. This element 93, not being itself fissile, is only of importance as an inbetween element linking uranium and plutonium, the atom bomb elements. Neptune returned close to the Uranus/Pluto midpoint at the beginning of 1941, being less than a degree away on December 14th, 1940, and ten minutes away at the beginning of February, 1941. On the night of December 14th 1940, during the hours of the initial irradiation period, the Full Moon crossed over that midpoint at around 10.30 pm.

The chart of the preceding eclipse is commonly taken for reference when dealing with an event horoscope such as the present one, and this seems pertinent enough with a Full Moon in the chart. Two lunar months earlier an eclipse occurred, falling exactly on the MC of the plutonium chart.

In March of 1941 Seaborg showed that his newly-discovered metal was a fissile element, i.e. its atoms could be split by neutrons. Everything then followed on: later in the year Seaborg was put in charge of a secret, top-priority project in Chicago, taking his unweighable, sub-microgram quantity of the yet-unnamed substance and told to make kilograms of it; which he did. The rest, as they say, is history.