Short note on particle masses ratios' approximation

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Abstract
Within our heuristic work in tracing the possible role of fractal geometry (understood in a more general sense) in scaling electrodynamics' fundamentals, approximation formulae to particle masses' ratios were found too (see such for the proton - electron rest mass ratio m_p/m_e in http://culetto.at/private_research_associates/sciencephilosophy5.pdf).The relations could be accidental, but further evidence seems to indicate some true core of the (hypothetical) period doubling oscillation ↔ particle duality.

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As a pretty good approximation (to 6.4ppm) to the proton - electron rest mass ratio's numerical value, $m_p/m_e = 1836.15267247(80)$ (CODATA 2006),

$$\frac{m_p}{m_e} \approx \frac{P\ln(\delta_{2D})}{|c_D|\ln(\delta)} e^{\pi+1}\pi^{e+1} \qquad \text{Eq.(1)}$$

was found (= Eq.1 of file sciencephilosophy5.pdf), where P is the Thue-Morse constant, c_D the Myrberg-Feigenbaum point's coordinate, δ Feigenbaum's universal number and δ_{2D} Feigenbaum's number for an area-preserving 2-dimensional map as given by Tabor (Chaos and Integrability in Nonlinear Dynamics: An Introduction, 225, Wiley, New York, 1989, a typographical error there corrected according to the value given by Gaidashev & Koch and lit. cited, arXiv:0811.2588v2, [math.DS] (2009)). And, rewritten in terms of the fine-structure constant α(0) approximation (Eq.1 of file sciencephilosophy.pdf) the above expression reads

$$\frac{m_p}{m_e} \approx \frac{P\ln(\delta_{2D})}{c_D\ln(\delta)} \left(\frac{1}{\gamma\ln(2\pi\delta^2\alpha(0))} - \frac{\pi P}{2} \right) \;, \qquad \text{Eq.(2)}$$

γ being the Euler-Mascheroni constant. The fact that Eq.1 fit's precision can be improved by almost two orders of magnitude – when stopping the period doubling (main sequence on the Mandelbrot set's real c-axis) at the 4^{th} bifurcation instead of going to the infinite k-limit of the (upper) external angles ending up with P – triggered further considerations in the "elementary" particles context. According to our working hypothesis' subnuclear world (the bifurcations linked to quarks(n=1), quinks(n=2), "teens"(n=3) and "polies"(n=4) in our diction, for n>1 maybe from Yang-Mills theories QCD', QCD'',…as was expected by Gell-Mann, in: Y.Ne'eman (ed.) To Fulfill A Vision: Jerusalem Einstein Centennial Symposium on Gauge Theories and Unification of Physical Forces, 259, Addison-Wesley Publishing Company, 1981), and these composite particles' number of (likely confined) constituents most probably being $N = (2^k+1)$, with $k = 2^n$, which gives three quarks per nucleon(n=0), sometime compositeness might end (ref. to file sciencephilosophy3.pdf, where gravity is suspected to close the game). A large (prime?) number of the finally "indivisible", maybe organized as kind of beaded strings or –membrane stripes, if one needed a mechanical picture, made up the $2^{(n_{crit.}-1)}$ period composite particle. As can easily be checked, the constituents' number N is prime for k = 1, 2, 4, 8, 16 (N(k) = 3, 5, 17, 257, 65 537) but not any more for k = 32 (as was already shown by L. Euler), the then N = 4 294 967 297 being divisible by 641 (this also reproduced in R. Taschner's book "Zahl Zeit Zufall. Alles Erfindung?", 161, Ecowin Verlag, Salzburg, 2007).

In line with our expectation that number theory might have much more impact on physics' foundations (suggested by the numbers content of the various fit relations) than had been thought of before, the hypothetical synthesis works like this: the ΠN_k = 4 294 967 295 is the number of *uud* quark composite's "final entities". The mass of such entity, dressed by electroweak, strong and further four even stronger /most complicated interactions, gravity included, thus formally were $\langle m_o \rangle = m_p/\Pi N_k$, which is 3.894 375…x 10^{-37} kg , using the proton's CODATA 2006 rest mass value. Both the *uud* quark composite and the electron belonging to period 2^0 oscillations (i.e. states with integer electric charge), there could be sense in looking at the electron mass – dressed "indivisible" mass ratio from a just formal point of view. Using the CODATA 2006 electron rest mass value m_e the mass ratio gives $m_e/\langle m_o \rangle$ = 2.339 112…x 10^6. Thus, analogous to our tentative & heuristic trial-and-error m_p/m_e ratio fit procedure, numerous period-doubling-specific quantities/ratios/parameters were tested in order to reproduce/approximate the numeric value, and the relation found (which grants approximation to 63ppm, still an order of magnitude off fit precision's range desired) reads

$$\frac{m_e}{\langle m_o \rangle} \approx \frac{2P\sqrt{P}}{2^{2P}} \frac{\ln(\delta)^2}{\ln(2)} \exp(P^{1/2} e^{\pi/2} \pi^{e/2}) \;. \qquad \text{Eq.(3)}$$

As was already indicated above, the ratio is a formal one, and quite probably accidental. Whereas there appeared relative "log-potentials" (~ $\ln(\delta_{2D})/\ln(\delta)$) in the Planck mass – electron mass ratio approximation (= Eq.2 of sciencephilosophy.pdf), and these fitted the 2D situation treated, things seem to be more complicated in Eq.3 (if this is not accidental) apparently containing $\ln(\delta)/((\ln(2)/\ln(\delta))$. So, getting low-D nonlinear complex dynamics married to the digital world possibly there above the maybe not accessible or not realized infinitesimal level were a quite speculative but appealing concept. The appearance of 1D and 2D mappings' Feigenbaum numbers in the potentials of our fit formulae much better arguable than is Eq.(3), reflecting the involvement of ratios of successive bifurcation root distances so reminds a little of Weyl's geometry, in which only "relative distance" has an invariant, i.e. frame-independent meaning, but this time distance referring to the absolute value of *phase functions*' difference, and angle to *phase functionals*.

The problem's inherent arbitrariness still gives way to variant procedures, e.g. inclusion of the 5th, 6th and higher bifurcations maybe fine-tuning the expected values of observables other than mass. Trying to get to the bottom of the role of finite-k convergents to P, δ and δ_{2D} in enhancement of found approximation formulas' quality of fit may prove supportive.