“In other words, Murphy’s law strikes again: in the 14 BILLION years of our universe’s existence, there must have been direct hits between PBHs and PABHs. My guess is because they’re faster, they dominated the mergers losing matter 20% in the process.”

- from Stephen+

If there’s anything we despise, it’s a lot of hand-waving combined with zero content. The statement above is logical, but that hardly gives credence to the idea. Because the previous paper depends so heavily on the statement above, we’re little better than charlatans in a side-show without some kind of appropriate math to back it up.

What do we have as conditions?
- an actual real existing topology of our universe
- an expanding volume, depending on topology
- 14 billion year time frame
- the estimated population statistics over those 14
- the direct-hit cross-section for each member over those 14
- merger dynamics

Tall order? Anything for Stephen .. Since we don’t have evidence to the contrary, we’ll assume the simplest topology for our universe, a closed hyper-sphere [a closed hyper-torus would work just as well]. This should make volume calculations fairly straightforward. The time-frame is trivial. The population statistics we can represent by a suitably truncated and carefully chosen metric on W(t), an infinite time-dependent vector accurately representing the populations of PBHs and PABHs over the time-frame. Metric here is used to mean a frequency-domain analysis of populations focusing on relevant sub-populations. Cross-
sections for each sub-population, in theory, should be calculable. Merger dynamics we’ll represent with a conditional probability function: \( P_{md}(A_d|m_r) = f_A(m_r) \) where:

- \( P_{md} \) is the probability of merger dynamics
- \( A_d \) = the event the PABH dominates in a collision
- \( m_r \) = the mass-ratio \( m_A/m_M \)
- \( m_A \) = the mass of the PABH
- \( m_M \) = the mass of the [matter] PBH
- \( f_A \) = the explicit probability function, \( 0 \leq f_A \leq 1 \)

Further, we'll initially simplify the outcomes:

1. if \( m_r \geq 1 \), we’ll assume the PABH dominates and the new \( m_A = m_{A-\text{prev}} + m_M \)
   we’ll call this the coup-option because all of the PBH is absorbed into the PABH

2. if \( m_r \lt 1 \), we’ll assume the PBH dominates but diminishes to \( m_M - m_A \)
   we’ll call this the suicide-option because the remaining PBH is less the PABH

Because this is an initial endeavor, we’ll ignore spin and charge considerations. Cross-sections are also simplified thusly: \( P_m(m_{BH}) = f_m(m_{BH}) \) where:

- \( P_m \) is the probability of a black hole mass direct hit
- \( m_{BH} \) = the mass of the black hole
- \( f_m \) = the explicit probability function, \( 0 \leq f_m \leq 1 \)

\( f_m \) is initially chosen to be a sigmoid function of \( m_{BH} \) such that the inflection point has some physical relevancy. The range of \( f_m \) is 0 to 1 inclusive.

\( \text{Pop-loss}(t) = f(V(t), W(t), P_m, P_{md}) \) is a time-dependent vector function of volume, population statistics, direct hit cross-section, and merger dynamics. All but volume are vectors themselves. If the assumptions above are valid, the integral from \( t=0 \) to \( t=\text{now} \) of \( f \) normalized should equal 20%.
Discussion:

If only Stephen were still here. I miss his spunkiness. I’m fairly certain he’d not object to “simplify the outcomes” above if only because of the labels. I envision little dictators running around the cosmos with hand-vacs whilst all matter heads for the hills. I’m a little concerned with the expression “if it seems to good to be true”, but it only applies IF Stephen had actually considered this scenario. True, it’s wacky enough for his style, but the associated assumptions would have likely turned his stomach:

“Recall the characteristics of PABHs: they attract antimatter, they repel matter, and they do this really fast because they speed-up local time. So as they clean-house / clear the universe of baryonic antimatter, they accelerate expansion because they’re growing [in numbers]. The 20% matter loss must have been incidental/friendly-fire.”

-from Stephen+

Stephen wasting the last 4 years of his life is nothing compared to the father of Relativity, 20. If he had only known about the strong force; well, we can’t cry over spilt milk. The implication that it’s at least analogous to what happens outside the event-horizon of PBHs and PABHs should be encouraging. And if the past is any indication, we at least have time on our side.

I, personally, am not too worried about the details of f mentioned above; I’m fairly certain we can do it analytically without a single simulation. However, the Prize should go to someone who honestly did not think about the 20% before they started their work. Do we still operate on the honor-system? Not sure we ever did..

Anyway, I’m eternally grateful Stephen got to get out of this gravity well before he started flying with the angels he so adamantly denied.

sgm, 2018/JUN/18