



## **Black Holes Categorization, along with the Space(s) they inhabit, to explain the Astro-Geophysical Processes**

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We define and categorize black holes (BH) and the space they inhabit. We describe mechanisms for their formation and mechanisms of black hole collisions and explosions/bursts, inside of the universe. These are linked to the formation of galaxies, stars, planets and planetary processes. Insight is gained regarding the formation and evolution of galaxies and the matter contained therein.

Space itself must be categorized as to its purpose and properties as it relates to the various categories of black holes and processes ongoing within the space in which the processes occur.

What we herein refer to as category-1 (c-1) black hole, formed the universe, by generating category-2 (c-2) black holes, say about 10% of which formed galaxies and 90% remain as dark matter in the form of c-2 BHs that are still evolving.

C-1 BHs can explode/burst by collision or on their own, and give off great numbers (e.g., trillions) of c-2 BHs inside the universe, in c-2 space, which can become galaxies and which is the start of the universe.

C-2 BHs can explode/burst and form a galaxy, containing c-3 space, filled with c-3 BHs.

C-3 BHs are somewhat more modified and expanded than c-2 BHs and are formed from exploded/burst c-2 BHs on their own due to instabilities or by colliding with another c-2 BH and exploding/bursting to form gas and dust clouds peppered with c-3 BHs. Additionally, remnants from the exploded c-2 BH may include a range of sizes from minute particles that would contribute to the formation of massive gas and dust clouds peppered with the c-3 BHs; to about 10 to 20 solar masses that form large stars; and others, much smaller (tiny) stars that eventually become planets and moons. Some, eventually explode/burst inside the galaxy to produce the gas and dust clouds that we see inside the galaxy. These gas and dust clouds are peppered with c-4 BHs that eventually are seen as new stars forming in the dust clouds (described below).

We envision three mechanisms (a,b,&c) for stellar origin, formation and evolution. The first type 'a' is well known (accepted); whereas, the other two 'b&c' are new and presented herein. The presently generally accepted process 'a,' consists of an accretion and gravitation process where mass comes together from interstellar gas and dust, left over from previous stars' deaths/explosions; or, from some other gas and dust accumulation. In addition, to this process, we propose a process 'b,' where a star originates as an expanded, modified Black Hole (BH) (described later with Figure 4) with none or little help from accretion/gravitation, begins to radiate, and continues to grow into a star. A third process 'c,' is also possible in which a star would originate from a combination of the two mechanisms 'a & b' described above. This latter mechanism is perhaps the most common type. This type starts as an expanded, modified BH inside of a gas and dust cloud. This, then serves as the nucleus that starts the subsequent accretion/gravitation process; however, it greatly accelerates the accretion/gravitation formation process as in the standard process. This mechanism could then explain how some super-cluster complexes, which have been estimated to take 40 to 60 billion years to form, can occur in a universe of a much younger age of 13.5 billion, as exists.