In the provocative article “Understanding STEM Compression in Universal Change,” author John M. Smart describes his theory of STEM Compression and how it organizes evolutionary development. He begins by explaining that development of the universe may be summarized into systems of Space, Time, Energy, and Matter evolving into faster, smaller, and denser sub-systems. He refers to this process as STEM Compression.

Smart builds on the foundation of Buckminster Fuller’s findings regarding “ephemeralization” that as nature evolves it moves away from physical elements and towards information abstractions. He suggests the future is inner space rather than outer space. By this, he means development resolves in “computer or human minds” rather than biological advancements. To unpack these concepts he begins with the four categories.

Space Compression is easiest to recognize as most can observe computational complexity in a small habitat compared to the larger environment that habitat is a part of. One can consider levels of complexity in terms of biogenesis emerging from archaebacteria leading to bacteria that creates conditions fertile for plant life. Human civilization has laid the fertile landscape for artificial intelligence and digital systems, which virtually ends the need to cross geographically and localizes large space into a small, dense, fast space.

Time compression is the evolutionary development in informational terms that show an accelerating succession of information processing emergences. When we look at technology over history, the trend is faster, smarter, and smaller. Smart claims there has presently become a ten million fold difference between human processing power and that of machine intelligence.

To open his thoughts on Energy compression, Smart enlists the work of Eric Chaisson who describes hierarchical systems emerging from less complex systems with development resulting in greater “free energy rate density” (Phi). This can be interpreted as when systems become more efficient, computation takes less energy to process higher more complex developments.

To address Matter compression Smart establishes biological systems as the pinnacle of computational systems up to their emergence. Now Moore’s, and related laws regarding computers, imply trends are leading towards higher functioning systems with less space or matter. The extreme example being the black hole forming process.

He includes while many forward thinkers trust the Kardashev scale as a measure of development in a civilization, STEM compression proposes that development would be measured by miniaturization of engineering and the density of engineered objects. Although, human exploration appears to expand outward, no new territory has been colonized. Rather, the accumulation of new information is accessible to the species.

While STEM concepts pertain to the physical world, two more elements play a large role in evolution and development. Information and Computation(IC) are major influences and guiding factors of physical systems; aptly called “infodynamics.” Smart labels this relation between the development of physical STEM dynamics and IC as STEM+IC with the plus symbolizing either an “emergent image” or “more fundamental.” While it is clear that there is a relationship, it is yet to be defined how and to what degree IC relate to STEM. Many theories have been proposed that include all the elements, but they don’t directly parallel STEM theory. Some examples would be M theory or string theory. We are still missing a theory that gives these definitions authority. In conclusion, Smart expands on the importance of IC due to it being the fundamental way to understand reality and the success of reductionism.