Physical Systems vs. Conceptual Systems:

The universe is comprised of physical systems which are comprised of objects (which in turn are comprised of systems, ad infinitum). However, the appearance of objects and all possible experiences and observations, is a result of consciousness.

Nick Herbert is a physicist and author of various books on quantum physics and philosophy. In his book "Elemental mind" he endeavors to make sense of the mind/body problem from a scientific standpoint. The universe, he writes, "…seems to consist of two kinds of phenomena: mental experiences and physical objects" (23). The nature of consciousness is the main subject of his book, but this paper ignores it and instead focuses on the conceptual nature of systems.

The human world is overrun with physical objects and concepts. One might not even be able to tell the difference between them. A rainbow might be thought of as a physical object, but it can not be touched. If one goes closer to it, it just seems to get farther away or disappears. The image of a rainbow is a mental phenomenon, like the illusion of water in a desert (a mirage). A rainbow itself is not a physical object, but there is a physical aspect to it. It is a physical system consisting of rays of light passing though many drops of water which are suspended in air.

The American Heritage dictionary defines a "system" as: "a group of interacting, interrelated, or interdependent elements forming a complex whole" (system). A physical system (PS) is comprised of matter and energy. The objects of a PS can be observed or experienced. A conceptual system (CS) is comprised of ideas or theories. The elements of a CS only exist in one's mind or by virtue of the CS itself. For instance, one does not have to mentally calculate every possible outcome of the equation "x-x" to know that "x-x=0" is always true; it is simply a fact by virtue of the system's rules.

Physical Systems (PS)

Every physical system is contained within, and contains, other PS. The PS that contains all other PS is called "the universe." An example of a PS is a pond, cat or wheel barrel. Every individual living thing, including a whole eco system, is a PS. There is a fine line between physical objects and systems. Generally, the more static an item seems to be, the more likely it is to be called an object. A baseball is generally considered an object, but at the molecular level is seen as a system. Conversely, a pond is generally considered a system, but if viewed macroscopically, as from a helicopter, it looks like an object.

There are two kinds of physical systems: physical systems created of, or occurring from PS (PP) and PS created of, or occurring from conceptual systems (PC). A pond or cat is a PP and a wheel barrel or baseball is a PC. PP are often thought of as "natural" while PC are considered to be "man made" or "artificial."

Physical objects and systems can only be defined relative to other PS and objects (and ultimately the universe itself). To say that there is a pond system is to say that the pond is some how distinguishable from something else, such as the ground or planet. It is easier for a human to see a baseball as a separate physical entity than a pond because the baseball is closer to the size of a human and its boundaries are more defined than the ponds. To the other extreme, it is even harder for a human to see an ocean as a single physical entity than a pond.

Physical systems are hard to define and some schools of thought (such as: Zen, Taoism and Buddhism) even consider such definitions to be purely conceptual. All PS in the universe are interconnected. “Quantum inseparability” refers to an everlasting, boundless connection that sub atomic particles have with each other after they interact. In 1964, John Stewart Bell, a famous quantum physicist, created the ultimate experiment to test quantum inseparability. “In 1970, John Clauser and Stuart Freedman carried out Bell’s experiment in Berkley, confirming quantum inseparability” (Herbert, 181). Thus, it is a scientific fact that the universe is inherently inseparable, implying that no physical object or system can ever be fully isolated from the universe.

Conceptual Systems (CS)

An example of a conceptual system is a simulation of a pond or the blue prints for a wheel barrel. CS provide means for communication and understanding. Math and science are the most fundamental CS. Science is the CS that is based on physical reality to the greatest extent possible. Because all scientific knowledge is attained by observation and experimentation, it is the most concrete CS. Math on the other hand, is the most abstract. It can be applied to almost anything.

There are essentially two kinds of conceptual systems: conceptual systems based on CS (CC) and CS based on physical systems (CP). In practice, most CS are complex CC. For example, imaginary numbers are a CS based on the CS mathematics. The imaginary number “i” is the solution to the mathematically unsolvable equation “x * x = -1.” Also, consider this: a simulation of a pond is a CP if it directly models the pond PS. It is a CC if the simulation is based on scientific laws without directly observing physical phenomena.

The major CS are communication, math and science. Communication is driven by language, primarily written and spoken, and also includes visual arts, music, dance and theatrics. Math and science are essential for defining objects and events in time/space, but without the ability to write to some extent, a society could not record enough scientific and mathematical information to progress in those areas. While only considering Latin and English, it is still hard to establish a hierarchy between written language, math and science. The three obviously evolved together. They are hopelessly woven into a tangled hierarchy known as “information.”

Written and spoken languages are used to express physical objects, events and concepts. “He died.” may be a factual account of an event, but if one says “Love died.” they are expressing a concept. There is no physical form of love that can die.

Math is a CS in which numbering units are defined. The fundamental aspects of math are addition and subtraction. A basic mathematical system allows one to express such concepts as “there are two oranges here” and “if one orange is taken away, there will be one orange left” or “if one orange is added, there will be three oranges total.”

Science is a CS in which physical observations and experiments are used to test theories and establish facts. If theoretical data is proven sound by multiple valid experiments then that data is added to the fundamental scientific bodies of knowledge such as physics, chemistry, and biology.

Conclusion

Electrical, chemical and mechanical engineering are applications of science in which CS are developed, then PS are constructed from them. An example of such a CS is an electrical circuit diagram. Such a diagram is a CC, and contains standard symbols representing certain physical objects, such as switches, compactors or diodes.

A complete circuit diagram represents a complete working physical electrical circuit (which is a PC). There is more chaos in the real circuit than in the diagram. The diagram can not account for all possible physical variables.

It is impossible to measure most systems, especially ones involving sub atomic particles, with 100% accuracy or to ever completely isolate a PS from the universe. That has not significantly affected scientific progress though. This alludes to an interesting question: "can a CS ever fully explain any PS?" H. V. Quine, author of the renowned book "Methods of Logic" wrote: "…physical objects are known to us only as parts of a systematic conceptual structure which, taken as a whole, impinges at its edges upon observation" (1). So maybe the answer is simply: "the only factor limiting the ability of a conceptual system to explain a physical system is observation." One even might venture to say: "all physical systems are inherently conceptual because experiences and observations are subjective."

Abbreviations

PS - physical system(s)
PP - PS from PS
PC - PS from CS
CS - conceptual system(s)
CP - CS from PS
CC - CS from CS

Works Cited

Herbert, Nick.
Elemental Mind.
New York: Penguin Books USA Inc., 188-189, et al.

Houghton Mifflin Company.
The American Heritage Dictionary of the English Language, Fourth Edition.
Houghton Mifflin Company, 2000.

Quine, W.V.
Methods of Logic, Forth Edition. Willard Van Orman, ed.
Cambridge, MA: Harvard University Press, 1982. 0-5, et al.

Other Works Consulted

Clapham, Christopher.
The Concise Oxford Dictionary of Mathematics, Second Edition
Oxford, New York: Oxford University Press, 1996.

Richards, Luana, et al. ed.
"Chapter 5, Temperature and Heat," "Atmospheric Optics: Rainbows, Halos, Blue Sky."
Inquiry into Physics, Third Edition. New York, et al: West Publishing Company, 1995.
205, 363-365, et al.