

Introduction to 7 Ideas Science

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1 The Nature of Science

One may ask, why are the Seven Ideas that Shook the Universe all Physics? Didn't anyone else have any great ideas? Of course, the suggestion that there aren't any other great ideas except physics ideas would be patently false, but there is a case to be made that Physics is the most fundamental of all sciences and hence its principle ideas might necessarily be expected to be universe shaking. If there is such a case to be made, then let's try to make it and at the same time not seem too self aggrandizing.

1.1 What is Physics?

If we are studying physics, then what is it? Simply put, it is the collection of information and explanation of the tangible world around us. It specializes in the root causes and foundation of explanations about tangible systems. It distinguishes itself from biology in that it does not study living things. It studies the organization and governing laws of the universe that would exist even in the absence of living things to experience them. Perhaps at first blush, such a distinction sounds a little bizarre and not something you would want your son or daughter to do. But, it support the assertion that physics is the most basic of all sciences. It gives physicists the right, in some sense, to claim they are investigating and understanding the cases of everything. Let's do some delineation of domains of the human endeavor along the traditional lines that one finds in use by so-called modern society.

- Physics: The study of causes and basic consequences of physics systems.

- Chemistry: The study of the process needed to make any material.
- Biology: The study of living systems.
- Archaeology: Study of dead systems.
- Computer Science: Study of artificial systems.
- Religion: Belief systems
- Mathematics: Logical systems
- Computer Science: Illogical systems.

What's left? Well, some people do more than study systems, some people make them work. They are called engineers.

We have had a little fun with the engineers, computer scientists and archaeologists. But, with apologies to them, we see that physics is investigating and understanding the knowledge base that the chemist needs to know, and they together provide a basis for the biologist. These in turn provide the basis for the engineers of living systems, Medical doctors. Pictorially, we might represent this as in Table 1.

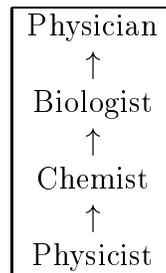


Table 1: A Modern Higherarchical View of Knowledge Chains

Was that a little too slick? Perhaps so and that is why we are calling this the *modern* perspective. The modern perspective that arose in our culture in the industrial age was that everything has a root cause, everything has an answer, everything that is complex arises from simple origins.

We are now in, and some people may claim we have just passed through, a shift in societal view that says sometimes complex questions need complex answers. Simple answers are often too simplistic and thus inadequate.

Causes are often multiple, variable and poorly understood - possibly not understandable. Our responses to complex system can not be analytical because we will wait forever trying to get all the information and constructing a perfectly rational plan. Instead, we have to employ value judgments and weigh perspectives and act without being sure we are right. Such a view is this laymen's description of the *postmodern* approach. This age with its complex systems and our thinking about these systems is, in the vernacular, *postmodernity*.

1.2 What is knowledge?

This issue of what is knowledge is itself of earth shaking importance to intellectuals and academics. Kenneth Gergen, a Professor of Psychology at Swarthmore, introduces his book on this subject, *The Saturated Self*, with the observation that "Virtually all of the assumptions regarding both reason and research over the past century are coming under sharp question." The discussion of postmodernism and related issues is central to the current debates. Of these debates he says, " Yet these are meager indications of the radical reconsideration of our longstanding traditions of truth and knowledge."

Dr. Gergen (one of a long list of authors who write on this subject) is intense about the challenges to our understanding of what constitutes knowledge. We used to know what knowledge was. Some of us still think we do.

Before leaving modernity and post-modernity, we should not that there is also the *classic* view of knowledge. At the risk of doing them the same disservice to classic knowledge that we have done to our contemporary colleagues, we might say that the classic view was that knowledge existed and scholars just had to find it. Mother nature, or some other supreme intellect had fashioned the great universe and mankind was stumbling along learning about it. Education was simply a matter of providing the student with the discoveries thus far made.

What makes classic different than modern? Perhaps we should characterize classicists as believing in the creator and believing in the need to understand the *philosophy* of a creator whereas a modernist would believe we need to understand the *logic* of the natural world. A logical view would hold that we who are studying the knowledge system can objectively and logically enunciate it without leaving room for interpretation. The classicist

would believe that we may behold the beauty of the creator, but probably not possess or tame it.

1.3 What is science?

Trace back to Ancient Greece. The Mediterranean, the birthplace of civilization.

Notwithstanding the other cultures of china and south America,

We take mathematics as the indication of the first inklings of civilization. Mathematics and formal logic are the epitome of objectivity and clarity of delineation of knowledge.

Allegory of the cave

Pythagoras and the perfect solids