Approaching Understanding: A Double-Ended Method with Feynman's Hierarchies of Ideas

The pursuit of knowledge about the world we live in motivates not only scientists who look for technical explanations and those in the humanities who search for philosophical arguments that ring true, but many of us who simply live in this world. At the end of his fifth lecture, Feynman questions how we obtain a deep understanding of our physical world; the epitome of this knowledge means possessing an understanding not only of the classic features of nature such as atoms and planets, but features such as human ideas as well. In looking at this question, Feynman says of the physical laws that "one does not, by knowing all the fundamental laws as we know them today, immediately obtain an understanding of anything much" (122). This line makes it clear that it is not effective to approach this understanding by starting from the physical laws, which are the most extreme of quantitative concepts. If a quantitative approach is not the key to this understanding, it is natural to next consider a qualitative approach using philosophical arguments pertaining to things such as *beauty* and *hope*. Yet Feynman does not offer up the qualitative approach as the solution either, saying "all the intellectual arguments in the world will not convey an understanding of nature" (58). As neither the quantitative nor qualitative approaches are adequate alone, Feynman argues that achieving a deep understanding of the physical world requires both the quantitative and qualitative approaches; Feynman qualifies this argument by contending that a quantitative understanding is especially important to reach a deep understanding of the physical world.

In order to appreciate how one reaches this understanding of nature, it is necessary to understand that the quantitative approach is simple and objective, the qualitative approach is complex and subjective, and that these approaches are situated at the opposing ends of Feynman's hierarchies of ideas. At one end of the hierarchies of ideas, Feynman places the laws of physics. The laws of physics are unique in their simplicity. Feynman describes simplicity as being simple in pattern, but not being simple in action (33). This means that while physical laws are "complicated in [their] actions…the basic pattern or the system beneath the whole thing is simple" (33). Additionally, the laws of physics are objective within the scientific community's current understanding. While there is always an "edge of mystery" to the physical laws (33), if a law has been accepted, then it has been never been "proved wrong" and can be used to make accurate calculations about nature (157). As nothing else in the scientific community is so universally accepted as likely to be true, the physical laws are the most objective form of human knowledge. Additionally, as no other expressions in the world are known to so precisely express the patterns exhibited in nature, the laws of nature are considered to be the most simple form of human knowledge. As they are the most objective and the most simple, the physical laws are placed at the end of Feynman's hierarchies of ideas. At the opposite end of the hierarchies are ideas which are subjective and extremely complex, such as "evil, and beauty, and hope" (125). In moving up the hierarchy from the physical laws, each successive concept becomes increasingly subjective. The physical laws are the most objective expressions of nature, so each move away from the physical laws requires that people associate invented meanings with the definitions of the concepts. Thus, any idea past the laws of nature is subjective, and ideas further from the laws of nature are more subjective than concepts which are close to the natural laws. Additionally, as subjectivity increases, complexity increases because of the additional layers of meanings which are added to the words. For example, Feynman characterizes the concept of *heat* as a term we have invented and believe is ultimately explained by the fundamental laws (124). As one moves up the hierarchy, at first many ideas exist whose origins can be traced back to the natural laws; for example, specific natural laws can be identified as the ultimate origins of the terms *refractive* *index* and *surface tension* (124). Yet past a certain point in the hierarchy, the terms are so subjective and complex that it is not worth it to think all the way back to the natural laws. As Feynman puts it, “the higher up we go the more steps we have in between, each one which is a little weak” (125). These layers of weak connections make it impossible to connect concepts such as *storm*, *frog*, *political expediency*, and the highest extremities of the hierarchy like *beauty*, *evil*, and *hope*, to the natural laws (125). Thus, concepts at the furthest end of Feynman’s hierarchies of ideas are extremely complex and subjective, while the natural laws at the opposing end are as simple and objective as possible within the current understanding of nature.

As neither a quantitative nor qualitative approach to understanding the physical world is adequate alone, Feynman argues that both approaches are necessary to reach this deep understanding. He says, “what we have to look at is the whole structural interconnection of the thing; and that all the sciences, and…all the efforts of intellectual kinds, are an endeavor to see the connections of the hierarchies” (125). It is important to note that while some ideas can be directly connected to each other, Feynman says “we cannot, and it is no using making believe that we can, draw carefully a line all the way from one end of this thing to the other” (125). This line makes it clear that a point exists in each hierarchy at which someone is unable to clearly connect an idea all the way back to the physical laws or the upper reaches of the hierarchy. At this point, the ability to connect an idea to surrounding concepts differs based on every person’s individual schema. While Feynman does not explicitly discuss this aspect of the hierarchies, his theory regarding the inability to carefully draw a line from one end of the hierarchies to the other makes this examination relevant (125). A word that falls past this point in the hierarchy is *storm*. The word *storm* carries different meanings for different people. Where someone lives or has traveled, the different conversations someone has had about storms, and particular associations someone may have with similar words such as *stormy, rain storm,* and a place being *taken by storm* are just some of the causes for the different schemas people have regarding this word. So while it is possible to connect some aspects of storms, such as the water molecules within a cloud, back to the physical laws, there are aspects of the word that are different for every person who hears the word. As an outsider has no way of knowing every possible association a person may have regarding the word *storm*, it is impossible for an outsider to map the connections between ideas past a certain level of subjectivity and complexity in the hierarchy. Thus, it is impossible to clearly draw a line from one end of the hierarchy to the other. This dilemma is the cause as to why a deep understanding of the world can only be approached by using both ends. Say for example that having an understanding of a storm is part of this deep understanding of the physical world. As there are aspects of a storm which can only be connected to the physical laws, to the upper ends of the hierarchies, or to unique concepts in the middle of the hierarchies which are based on each person's schema, both ends of the hierarchies must be examined.

The case for working from both ends of the hierarchies is strong. However, while both the quantitative and qualitative approaches are necessary to gain a deep understanding of the physical world, the quantitative approach's ability to strengthen one's appreciation of the *beauty* of the physical world makes it more significant. Feynman says, "To those who do not know mathematics it is difficult to get across a real feeling as to the *beauty*, the deepest *beauty* of nature" (58). Understanding mathematics is important to appreciate nature's *beauty* because it allows someone to appreciate the physical laws and thus, to appreciate simplicity. When someone appreciates simplicity, they recognize that the laws which make up everything in the world exhibit the same patterns; this fact can create a strong sense of awe. For example, someone can be struck by the majestic expanse of the ocean, but the experience is more impactful if they are also truly stunned that such a complex creation is created by such simple patterns. By being simultaneously overwhelmed by the *beauty* of the view and by an understanding that the light dancing on the waves, the hydrogen bonds between each water molecule, and the atoms making up those molecules are all similarly simple, a much deeper sense of the *beauty* of the physical world emerges.

By examining Feynman's double-ended approach for achieving a deep understanding of the physical world, we obtain a more subtle understanding of how our physical world is characterized, whether those characterizations pertain to simplicity, complexity, interconnectivity, or something entirely different. As life-long learners with curious minds, a better understanding of the characteristics of our world will push us to pursue an even deeper understanding of the physical world. For while we are now more aware of our world's character, there is always the ever-elusive "edge of mystery" to be pursued (33).

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Works Cited

Feynman, Richard P. The Character of Physical Law. Cambridge: M.I.T., 1967. Print.