The Hard Sciences versus **The Harder Sciences**

Many social commentators and naïve observers routinely use the term "hard" science to refer to physical and biological sciences and the term "soft" science to refer to social sciences. While this false and simplistic distinction secures prestige, resources, and esteem for those in the physical and biological sciences, it does not accurately portray the heightened "degree of difficulty" facing the social sciences relative to the physical and biological sciences.

Many working in the physical sciences and some working in the biological sciences have the privilege of studying phenomena that can be relatively easily manipulated and examined in highly controlled settings. Such scientists aim to develop simple, often deterministic models of the phenomena in these controlled settings, and much of their work entails acquiring, building, using, and repairing physical equipment/instrumentation and performing the requisite mathematical operations. In such highly controlled settings, causal mechanisms are often simple and readily identifiable. Much of the physical and biological sciences ultimately comes down to engineering challenges and mathematical problems. Utilizing the right equipment (be it a telescope, large hadron collider, electron microscope, etc.) and figuring out the mathematics will eventually sort the science out. Indeed, Eugene Wigner (1960) famously wrote about "the unreasonable effectiveness of mathematics" in the physical and biological sciences. By this he basically meant that physical and biological scientists have it deceptively easy since much of what they study in the natural world seems to operate according to strict mathematical laws. And it is simply often just a matter of time, money, and equipment until scientists identify those laws.

Social scientists study cultural, economic, political, and social systems that are highly complex, interdependent, adaptive, and partially stochastic. Further, social scientists are often simultaneously examining phenomena across multiple levels of analysis (e.g., individuals, organizations, communities, societies), which operate very differently. Neither the beliefs nor behaviors of social actors at any of these levels generally obey simple mathematical laws. Rather than aiming for deterministic models, social scientists typically build multi-causal and probabilistic models—which mirror the multi-causal and probabilistic phenomena they study. Here are three key features of social phenomena (just at the individual level of analysis) that help explain the high degree of difficulty in the social sciences.

Because humans respond to their surroundings, the mere presence of a researcher may affect the beliefs and behavior being studied. An astronomer gazing at the moon has no effect whatever on that celestial body. But people often react to being observed. Some may become anxious or defensive; others may try to "help" by providing the answers or actions they think researchers expect of them. This makes social science really hard to do. Over time, the results of social science research become known to people (via the media, peers, word of mouth, etc.). Anthony Giddens (1984) calls this the "double hermeneutic." Often, then, the actual social phenomena being studied are then influenced by the growing awareness of earlier results. This presents a constant challenge to social scientists, and renders what many consider "cumulative knowledge" problematic.

Social patterns change constantly; what is true in one time or place may not hold true in another. A water molecule today is the same as a water molecule 5000 years ago. Such is not the case for social actors, be they individuals, organizations, communities, or societies. Atoms and molecules do not consciously shape their environment, but human beings do, in remarkably variable ways. The study of social phenomena, therefore, must account for this great diversity, stochasticity, and change. Indeed, much social science focuses on explaining that social change across many varying contexts and time periods. This makes social science really hard to do.

Because social scientists are part of the social world they study, "objectivity" in social research is especially challenging. Barring health hazards, chemists are not personally affected by what goes on in test tubes. Astrophysicists do not have to get permission from the stars they study to publish their results. Physical and biological scientists regularly have the privilege of studying phenomena toward which it is quite easy to remain "objective" or value neutral. After all, do we have a moral or ethical obligation toward atoms, stars, or plastics? But social scientists live in the social world they study. Therefore, social scientists face a greater challenge in controlling—or even recognizing—the values, worldviews, and prior experiences that may affect how they pose research questions, interact with human subjects, or analyze their data. Further, the process of gaining formal approval to conduct research on human subjects regularly limits the types of questions that social scientists can ask and how they may interact with human subjects. This makes social science really hard to do.

Giddens, Anthony. 1984. *The Constitution of Society*. Berkeley, CA: University of California Press.
Wigner, Eugene. 1960. "The Unreasonable Effectiveness of Mathematics in the Natural Sciences." *Communications on Pure and Applied Mathematics* 13(1):1-14.