PART I

Foundations of Nursing Science

CHAPTER 1

Philosophy of Science: An Introduction

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INTRODUCTION

Philosophy of science is a perspective, a lens, a way one views the world, and, in the case of advanced practice nurses, the viewpoint the nurse utilizes in every encounter with a patient, family, or group. A person's philosophy of science creates the frame on a picture—a message, which becomes a paradigm and a point of reference. Each individual's own philosophy of science will permit some things to be seen and others blocked. It allows people to be open to some thoughts and potentially closed to others. A philosophy will deem some ideas as correct, others as inconsistent, and some as simply wrong. While philosophy of science is not meant to be viewed as a black or white proposition, it does provide perspectives that include some ideas and thoughts and, therefore, must necessarily exclude others. The important key is to ensure that the ideas and thoughts remain consistent with one another, rather than being in opposition.

Discussions of science, philosophy, and philosophy of science could all fill books unto themselves. Although the aim of this chapter is to introduce readers to these topics, it is constructed on the form of a survey, which is designed to launch inquiry in myriad ways. The purpose is to encourage nurses to think in ways that they may not yet have discovered and to examine their assumptions and actions in their role as advanced practice nurses. If nurses leave this chapter without questioning their assumptions, the author has not done her job! One must appreciate the personal assumptions used in everyday professional life. Nurses, for example, must question their assumptions and reaffirm (appreciate and understand) what it is that they believe.

SCIENCE

Before philosophy of science is examined in greater depth and particular philosophies of science are specifically explored, it is important to begin by developing an appreciation of the meaning of science and philosophy. *Science*, which comes from the Latin word *scientia*, meaning "knowledge," traditionally refers to both a process and the outcomes of processes, such as general laws and observations. General laws are considered to be the laws of nature that guide physical life, such as the laws of gravity, energy, and motion. Generators of science utilize these laws in a systematic way to create a body of knowledge about a specific topic. The culmination of using the scientific method (systematic process) provides a set of data (evidence) supported by propositions about an area of study (Boyd, Gasper, & Trout, 1991).

Natural Hard Sciences

As an outcome, science is a body of knowledge. Physics, mathematics, and chemistry are three examples of scientific disciplines composed of unique bodies of knowledge. These sciences are often classified as natural sciences because they employ the general laws of nature and begin with the physical notion of the world. These natural sciences (which are sometimes referred to as the physical sciences) are also known as pure sciences. "Pure," in this context, means a unique body of knowledge. A pure science is independent of others; it is able to stand alone, and it may be developed and furthered for the abstract cause of the knowledge itself. Pure science is not pursued for its utility or value.

Natural and pure sciences are based on the assumption that reality is objective, rather than subjective. As a result of this objectivity, natural science is consistent—in other words, it is reproducible and reliable. Natural science further encompasses the assumption that human beings have the capacity to be accurate in their objectivity.

Lastly, natural scientists believe that explanations (using the method described later in this chapter) are present within the natural or real world. As a consequence, explanations are reasonable, constant and consistent, accurate, objective, discoverable, and understandable. Owing to its basis in objectivity, natural science is predicated on the belief that there is an external world structure independent of self that is grounded in reliability.

Natural physical sciences are referred to as "hard science." In recent years, quantum physicists have begun to integrate the role of the observer into their discipline, which is still categorized as a hard science. This conundrum will be addressed as part of the discussion of complexity science found at the end of this chapter.

Examples of the physical sciences present in health care include the biophysical and biochemical processes related to diabetes, cardiovascular disease, and cancer. Using the physical sciences in health care involves assuming a disease focus, rather than a person focus. The science is about diagnosis, treatment, and outcomes of treatment. It is about side effects and it is about pathology.

Soft Applied Sciences

Sociology, psychology, and anthropology are three examples of applied sciences. Applied sciences have their own unique body of knowledge, albeit a different one than is found in the natural sciences category. They are known as applied sciences because the focus is on the application of the related knowledge, usually to meet some type of human need (and not to generate knowledge for the sake of knowledge). Additionally, the term "applied" is used to convey the understanding that, in the development of their own knowledge, applied scientists use the knowledge from the pure sciences. Sociologists, who study people and behavior, rely on and use the natural sciences and their inherent assumptions to further their work. Thus sociology is an applied science. Mathematicians and physicists do not use psychology or sociology to add knowledge to their scientific disciplines, because mathematics and physics are pure sciences, whereas psychology and sociology are applied sciences.

Although applied scientists use what they deem accurate and appropriate from the natural sciences, they do not subscribe to the rigid belief of objectivity and reliability. In applied science, the focus is on human beings and the utility of the science to them and for them. Consequently, objectivity, observation, and reproducibility are diminished or perhaps not present at all. Therefore, the applied sciences are sometimes referred to as "soft science."

Inherent in the distinction between hard and soft science are certain assumptions and beliefs. Hard scientists assume objectivity, whereas soft scientists do not. Hard scientists operate on a belief in an external world structure independent of self, whereas soft scientists do not. The hard sciences are grounded in a worldview of reliability and consistency as contrasted with the soft sciences, which allow for individuality and originality. These distinctions are not minor semantics, but rather indicators of major differences in philosophy and perspective.

Examples of using soft applied sciences in health care can be found in social work, the work of a psychotherapist, and the examination of healthcare disparities between people of color, those of wealth, and fragile elders. Some state practice acts define nursing as specialized knowledge integrating both

physical and social sciences. In these instances, the acts combine the concepts of hard, soft, pure, and applied sciences.

Human Science

In addition to the categories of science discussed previously, human science is an important type of science. Few scholars would choose to classify human science as either hard or soft, but rather might prefer to classify it as something totally different. Human science is not a new term. It was introduced by Dilthey in the late 1800s (Ermarth, 1978). As a German philosopher, Dilthey was concerned about the focus on objectivity and value-free science, which left the person out of the process. He expressed concern about a science and a subsequent knowledge base that did not include the everyday lived reality of individuals. Along the way, Dilthey created the discipline of human science, which captures human beings and their experiences as *the* source for knowledge.

With this understanding of human science, the scientist becomes as much a part of the experience as does the participant. This view is in direct opposition to the neutral or value-free experience of the physical scientist, whose *life* is irrelevant to his or her work. Thus the nature and focus of the science and the process and role of the scientist are different when the subject area is viewed as a human science. In the physical sciences, the scientist and the subject are not one. In the applied sciences, the science and the scientist are not necessarily one. In contrast, in human science, they are one; they cannot be separated from each other.

Is nursing a human science? Is the work of the advanced practice nurse inextricably interwoven with the population served? When nurses speak of patients and families in one breath, is this a function of a human science view or of something else? For nursing to be a human science, nurses must recognize themselves as scientists. The work they do in the provision of care to individuals, families, and communities may be viewed from a lens of science that is simultaneously physical (hard), applied (soft), and human.

SCIENTIFIC METHOD FOR THE PHYSICAL SCIENCES (TRADITIONAL)

As an approach or a method, traditional physical science uses a process of linear steps to solve a problem. Most nurses are familiar with the term *scientific method*, but few appreciate the assumptions inherent within the method itself. An assumption is a position about what one believes to be true and right. The scientific method is based on the assumptions that observation is universal, that laws of nature guide every action, and that the outcome of an

experiment will be useful in predicting and, therefore, controlling the object of the experiment. Being *universal*, as the term is used in relation to the scientific method and science, means that all essences are the same and that individuality does not apply. The laws of nature are those that are connected to the physical world structure independent of human consciousness, such as the laws of thermodynamics and gravity. Control through prediction is the ultimate aim of the scientific method. Control occurs through the accurate and reproducible predication of events.

The scientific method is more than a linear process to conduct an experiment. Although hard scientists would say that it is value neutral, the scientific method is an interwoven and value-laden approach to the solution to a problem. Objectivity is a key factor that is used to validate the scientific method, yet what the scientist considers to be part of the process is a value-laden decision, regardless of whether objectivity is used later. Arguments about science being value neutral versus value laden color the aims of the two categories of science: pure and applied.

Aim of Science

The pure hard sciences have a single aim of knowledge development for the sake of knowledge development and the search for truth. To the hard scientist, a single truth exists that can be discovered once human beings have the physical capacity to make the necessary discovery. This "single truth" approach is based on a belief that an objective world exists independent of human consciousness. Traditional science aims to describe and to explain this external world structure. Another aim of the physical, pure sciences is to control phenomena through an empirical approach to scientific inquiry. Control is achieved as a result of the accurate prediction of universal descriptions of outcomes. When it is known, the world can be controlled.

The aim of the applied sciences, by comparison, is the application of knowledge for a specific purpose, thereby yielding utility. Applied science is not focused on generating knowledge for the sake of having knowledge, but for the development of applications that can better a situation, improve a process, or change the way that situations are viewed.

In human science, the aims are all about individuals, families, and communities. Aims of human science may be to improve quality of life, assure dignified beginnings and ends to life, uncover meaning in everyday life, and highlight the roles of individuals within this examination. The aims of human science may be simply stated as *to know and understand what works for people to maximize their ability to be fully functioning individuals, families, and communities at whatever level they are able to function.*

Scientific Methods in Human Science

Human science requires different methods. While the scientific method may be applied in the abstract, the end for the human scientist is greater than the sum of the parts. Thus varied methods are needed. In human science, the scientists and the subject (content area) being studied are treated as parts of the same whole. Therefore, the methods used can be neither linear nor constant. Instead, the methods need to be dynamic, while still meeting the same expectation of rigor found in the hard sciences. Rigor—a notion usually associated with randomized control studies, reliability, and validity in the hard sciences—is not the goal in human science. Rather, contextual consistency, purposive sampling within the population experiencing the essence to be described, validity of questions, a detailed audit trail of data collection and data analysis, and a return to the participants for validation of the message sent and received are emphasized.

Criteria for Science

An important distinction to address is the difference between science and non-science. This discussion has been going on for centuries. Some scholars may look at human science as non-science. Pseudoscience—comprising scientific theories that are not falsifiable—is the bane of existence for the hard physical scientist, even though it clearly has popular appeal. Therefore, it is important for the hard physical sciences to demarcate themselves from pseudoscience and, perhaps, applied and human sciences. Five criteria are used for this purpose: intersubjective testability, reliability, definiteness and precision, coherence, and comprehensiveness and scope (Feigl, 1988).

Intersubjective testability is based on a belief in the value of corroboration and on the idea that two people who view the same entity in the same manner should obtain the same results; if this criterion is met, the method is objective. Using the word "objective" as a synonym for intersubjectivity means that "the belief is not based on hallucination or deception and it is not a state of mind but truly exists . . . the belief is neither private nor unique. It can be and must be verified . . . and be empirically tested" (Polifroni & Welch, 1999, pp. 3–4).

Reliability, the second criterion, means that researchers achieve the same result time and again when the circumstances of their study have not changed. If findings demonstrate reliability, then the same outcomes are achieved with repeated tests, thereby confirming the beliefs and premises set forth by the scientist. Reliability is the basis for prediction and subsequent control.

Definiteness and precision, which collectively constitute the third criterion, are words used to convey exactness and rigid adherence to objectivity. Precision is not about approximates, but rather exactness; it is about specifics, not generalities. If experimentation meets the criterion of definiteness and

precision, creating the same circumstances for repeated experimentation leads to a reasonable expectation that the same results will be achieved. Definiteness and precision are not about inclusion of the researcher or fluidity of ideas; indeed, they focus on the opposite goal.

Coherence or systematic character, the fourth criterion, addresses connectedness and wholeness. How do the parts relate to one another to form a unique body of knowledge? The connectedness (the sense of a whole with integrated parts, not disparate ideas) is the coherence required in science that is not necessarily present in pseudoscience. It is important to distinguish the wholeness of coherence from holism in human science. In coherence, the focus is on the parts and their relation to one another. In contrast, holism in human science focuses on the whole from the outset, and not the parts.

The fifth criterion, comprehensiveness and scope, encompasses the ability of the science to be used for something other than its intended purpose. Comprehensiveness and scope define the application based on that which was not the planned study and achieving the expected outcome through appropriate utilization. "The thrust of this criterion is the maximum explanatory power of the science and its related theories. . . . a science is not a science if it does not explain and address events and related concerns beyond the issue under study at the present time" (Polifroni & Welch, 1999, p. 4).

QUESTIONS FOR THE PRACTITIONER

The five criteria—intersubjective testability, reliability, definiteness and precision, coherence, and comprehensiveness and scope—serve to separate science and pseudoscience, as well as common sense. It is important for advanced practice nurses to ask, "Is nursing a science?" Is nursing work that of pure science or applied science? Is the care provided to patients, families, and communities done for the purpose of prediction and control? Are there universals within patient care provision? Is there an external world independent of human consciousness that colors the care delivered? Does nursing as a science satisfy the five demarcation criteria? Is nursing practice objective?

PHILOSOPHY

Whereas science is about knowledge, *philosophy* (originally from the Greek word *philosophia*) means "love of wisdom." Enjoyment of the thought process, the notion of thinking for the sake of thinking (how often have you said, "If I only had time to think. . ."), the examination of ideas, and the

Box 1–1 Questions for Advanced Practice Nurses

1. Is nursing a science?
2. Does your practice "fit" with the five criteria of a science?
3. How do you use universals in your care and make it individualized?

search for truth are all part of philosophy. Philosophy also involves a search for meaning; it represents a perspective, and it is a set of beliefs. Philosophy, like science, is both a process and an outcome. The process of philosophy is the critical inquiry and examination of meaning and the method one undertakes when beliefs are examined, ideas are proposed, and assumptions are challenged.

Box 1–2 Essential Terminology in Philosophy

Analytic philosophy
Antirealism
A priori
Chaos
Complexity science
Continental philosophy
Empiricism
Epistemology
Essence
Experience
Hermeneutics
Idealism
Logical positivism
Ontology
Phenomenology
Positivism
Post-structuralism
Pragmatism
Priori
Realism
Truth

Philosophy encompasses more than rhetoric; it is the guide by which situations are approached, the viewpoint used to *see* what is before one, and the method by which one searches for truth, as well as an understanding of what truth is. Philosophy is contextually grounded; it relies on the present but is embedded in the historical past. Philosophy is dynamic, it evolves, and it is subtle while simultaneously being overt.

Philosophy captures the essence of a human being, such as the essence of what it means to be a provider in a caring profession. The deliberate use of the word "caring" here indicates a philosophical belief based on the author's experience, gender, and role as a scientist. Philosophy is more than just a belief—it is the *application* of that belief to situations known and unknown. Philosophy is epistemology *and* ontology, the knowledge of and the belief about something. Epistemology is the study of knowing, of determining what knowledge is and how that knowledge is relevant and related to extant knowledge. Ontology is the study of being and of meaning.

All schools of philosophical thought cannot possibly be explored in a single chapter. One way to undertake a large survey of philosophical thought is to examine the various perspectives in terms of two major schools of philosophical thought: analytic and continental. Analytic philosophers originally were those primarily located outside of Europe, whereas advocates of continental philosophy originally emanated from Europe. While the two schools are often discussed in opposition to each other, their discordant viewpoints are actually a matter of the philosophers using a different lens, differing approaches, and

differing subjects. Analytic philosophy is wedded to objectivity and reproducibility, whereas continental philosophy is about essence and experience.

Continental philosophy is grounded in the viewpoint that the phenomena of interest are deeply embedded in the human experience. Analytic philosophy, by comparison, focuses more on the use of the process of logic and rational discourse than on the subject itself. Analytic philosophies include positivism, empiricism, instrumentalism, pragmatism, and rationalism, whereas continental philosophies include phenomenology, hermeneutics, critical social theory, feminism, structuralism, post-structuralism, and postmodernism. Some of these views will be discussed later in this chapter.

PHILOSOPHY OF SCIENCE

Philosophy of science exists at the intersection of philosophy and science—where the two meet to form a new perspective that aims to examine the body of knowledge *and* the approaches to the study of the body of knowledge. Philosophy of science in nursing is an "examination of nursing concepts, theories, laws and aims as they relate to nursing practice. Through such an understanding and deliberate thought, praxis evolves" (Polifroni & Welch, 1999, p. 5). Praxis is the planned, deliberate, and thoughtful creation of a plan of action to achieve a set goal. Philosophy of science in nursing explores the meaning of truth, the meaning of evidence, and the meaning of life through praxis.

It is nurses' responsibility to view science from a multitude of perspectives: as nurse scientist; as care provider; and from the perspective of the patient, family, and society. Each perspective potentially offers a different lens for examining the same concept. Each lens brings certain assumptions to the forefront, which colors both the lens and the object of review.

Analytic philosophers, who are often physical scientists, examine the nature of truth using a lens of objectivity, linear thinking, and rationality. Continental philosophers explore the meaning and nature of truth from an individual lens focusing on the experience of truth from the perspective of the person (including the perspective of the scientist), which leads to some subjectivity in the results. These two lenses or perspectives require practitioners to examine their own perspective of truth and ask, "Is there only one truth? Does truth reside in the external world structure independent of human consciousness, or is truth found within the individual and highly contextual? Is there more than one truth? Is truth even a relevant subject for discourse, or should the focus of practice be on the outcomes of treatment modalities?" The answers to these questions enable providers to become comfortable with the assumptions and underpinnings of the various philosophical perspectives.

How Do We Know?

Answering the question "How do we know?" is key to helping anyone understand philosophy of science. This question can be pondered by considering where knowledge and knowing originate. A first thought is that people know because of tradition: Experiences that happened yesterday color and shape what is known about today. Tradition often shapes experiences into a repetitive pattern of behavior. Authorities also inform what is known. An authority may be a person, a role, or an institution. A police officer is an authority; a college professor is an authority; an institution of higher learning is an authority, as is a church. In addition, doctrine can shape what is known. Without evidence or in the face of contradictory evidence, those who believe in and practice a religion profess it as their knowing. Reason, without regard for religion or tradition, is yet another realm of knowing. Reason may lead to a path that contradicts religion or tradition; thus individuals must decide what to believe.

Common sense is a form of knowing also: People know that they become wet when it rains and, therefore, they should seek shelter. If people do not eat, they know that they will become hungry and should find food. These are two examples of common sense.

Finally, there is science as a way of knowing (*to know = science*). Science is knowledge derived from methods that may be linear or complex (chaotic) depending on the view and approach. Science could be physical science, social science, human science, or nursing science. Science is how people know, regardless of the type of science.

Analytic Philosophy of Science

The analytic and continental categories are merely one way to examine philosophical schools of thought. Other options are to use received and perceived views (Suppe, 1977), a historical timeline, a context of major events in history, or many others. Choosing the analytic and continental categories as criteria implies nothing more than a framework choice for examination. It is important to note that continental philosophers analyze and analytic philosophers examine applications.

The analytic perspective is closely associated with positivism and, more specifically, with logical positivism. Given that a significant amount of what can be read about philosophy today is contrary to logical positivism, it is important to understand that base. Logical positivism is a school of thought that originated in the early twentieth century under the aegis of the Vienna School in Austria. That geographic location, while on the European continent, does not mean that the analytic perspective is necessarily associated with continental philosophy, however.

Logical positivism actually began earlier than the twentieth century, with Comte's (1788–1857) view of positivism. Comte, the father of positivism, asserted that human history progresses from the theological to the metaphysical to the positivistic. By the last term, he asserted the *positive* role that the universal laws of nature provided. Following in Comte's footsteps, Kolakowski (as cited in MacKenzie, 1977) suggested four characteristic rules of positivism: phenomenalism, nominalism, the denial of cognitive value in value judgments and normative statements, and the essential unity of the scientific method.

The major tenants of logical positivism, consistent with the use of an analytic approach to problem solving, require a rigid adherence to the scientific method (deductive nomological approach), a belief in cause and effect, a solid underpinning of replicability, and an unwavering belief in an external world structure that remains independent of self. It is the final point that provides the platform for the cause-and-effect relationship and the needed objectivity divorced from humans and subjectivity.

The noted philosophers Carnap, Feigl (demarcation criteria), Hempel and Oppenheim (1948), and Popper (2002) developed logical positivism with an aim to affirm the external world structure, solidify a reliance on the inherent laws of nature, and promote the deductive method of analysis to achieve a problem's solution. These logical positivists believed in the verifiability principle—the belief that a statement is meaningful only if it is proven true or false through the means of experience (experiment). They suggested that there is a logical structure of scientific theories, probability is meaningful in science (as opposed to possibility), science is a deductive experience, and the sources of knowledge are twofold (logical reasoning and empirical experience).

A large amount of literature in the nursing field has criticized logical positivism as being too rigid, too deductive, and without an appreciation or recognition of the human experience. To overcome these objections, logical positivism eventually segued into empiricism. Empiricism, which relies on the scientific method for the production of truth, held to tenets similar to those underlying logical positivism, except that the empiricist required actual experience. The logical positivist accepted the external world structure, whereas the empiricist, while neither accepting nor dismissing the existence of the external world's structure, required that science be generated through the senses of experience. Empiricism is what is commonly called science in today's world.

Over time, both empiricism and logical positivism were incorporated into the received view described by Suppe (1977). The received view of science states that a theory is either right or wrong, mature or developed theories must be formalized, a theory must be axiomized (taken apart into propositions and independently tested), all sciences should be patterned after physics, and there is a clear separation between theoretical and empirical understandings.

The received view is strongly supportive of the prominence and dominance of physical sciences. It is based on the search for truth, wherein a single truth is desired and possible to identify. Put simply, empirical (scientific) methods lead the knower to *the* answer.

This view of empiricism, which is embedded in analytic philosophy, is commonly known as traditional science. It is how most people are taught in elementary and high schools throughout the United States. Learning physical science by having opportunities to experience through observation is the gold standard of science, knowledge, and truth. Prediction, using descriptive laws and understanding initial conditions, is the purpose of science for scientists who advocate a received view. Such value-free science relies on a single universal scientific method. The received view is sometimes known as *realism*.

Continental Philosophy of Science

Whereas the analytic philosophy of science focuses on the search for a single truth through a scientific process of controlled experimentation, the continental philosophy of science is concerned with the connection of an idea to the world around the idea and its historical context. Continental philosophy is not about theories or truths, but rather about the relationships among people, ideas, meaning, and their historical connectedness.

Georg Hegel, Wilhelm Dilthey, Pierre Duhem, Paul Thagard, Philip Kitcher (2001), Edmund Husserl, and Martin Heidegger (1962) all have written from the continental philosophy of science perspective. Their works focus on the applied sciences of sociology and psychology, the historical approach and context, the understanding of power (Foucault, 1976), and the lived experience of the subject and scientist (philosopher).

Human science is the domain of the continental philosophy of science. As described earlier, human science deals with persons and their connectedness to the world in which they live and the lived experiences of their life. Continental philosophers examine this lived experience in the past as well as the present. Using continental philosophy requires an examination of historical context as much as it does what is happening in the present time. Continental philosophers of science believe not in cause and effect, but rather in connectedness and the often used proverb "Past is prologue."

Phenomenology is an example of a philosophy that emanates from the continental philosophy of science perspective. In phenomenology, as in philosophy, value is placed on universal experiences. Husserl (1990), a continental philosopher, believed that while human experience is personal, the essence of it is universal. For example, the essence of grief is strikingly similar whether one is grieving the loss of a limb, a loved one, a home, or a pet. For Husserl, phenomenology entails a focus on examining phenomena that appear in the

consciousness of the subjects. It is about personal experience; from an examination of such experience, the essences of the phenomena are drawn.

Hermeneutics is another continental philosophy. As a philosophy, hermeneutics deals with the interpretation and understanding of a message that is being delivered. The name of this school of thought derives from Hermes, the messenger of the Greek gods. Hermeneutics is characterized by the assumptions that people are social and dialogical beings; that culture, language, skills, and experiences create shared understandings; that there is a continual circle of connectedness and understanding; that understanding precedes interpretation; and that the interpreter and the interpreted are seen as *one*. In hermeneutics, meaning and understanding are identified as the aims of the philosophical inquiry.

Post-structuralism, another philosophy that falls under the broad rubric of continental philosophy, speaks to the premise that the study of structures (above and below the surface of relationships and contexts) must be viewed as a cultural phenomenon. As a result, the analysis is open to a variety of interpretations and likely misinterpretations. Post-structuralism conveys the message that both the object and its context for creation, development, and evaluation must be studied. This view is similar to that taken by all the continental philosophies, which are based on a contextual grounding for the analysis. The assumptions of post-structuralism are typically that the meaning of a message is based on the perception of the receiver and that the person who conveys the message is not necessarily significant in terms of the message itself. For example, this view would suggest that an advanced practice nurse is not the important component in the delivery of a message; rather, what is important is what the patient hears and interprets the message to be. This approach serves to equalize the imbalance of power between healthcare providers and patients noted in the healthcare field today.

Although the three varieties of continental philosophy described in this section certainly demonstrate some differences, all revolve around context, meaning, and the knowing subject of the discourse or action. Collectively, continental philosophies may also be called the *perceived view*, *antirealism*, or *idealism*. These terms are meant to intrigue the reader and encourage further exploration, as the space limitations here do not permit an adequate discussion of them.

Perceived View

Suppe (1977) examined the perceived view with a different lens. As with the view evinced by the continental philosophers, who engaged the notion of human science and the human experience in the search for truth and knowing, the perceived view is more fluid and dynamic than the received view. Within

the perceived view, theories are neither right nor wrong. This position stands in stark contrast to the verification approach of the received view.

In the perceived view, observation leads to the generation of theory, which in turn is value laden. Both the received and perceived views rely on observation, but the meaning of this term and the process by which observation is achieved differ for the two views. Observation for the received, analytic philosopher is precise, detailed, physical, objective, and inherently value neutral or value free. For people subscribing to the perceived view, observation involves the utilization of the senses and the mind. Observation is accurate but is not reliant on precision; it is both physical and mental; observation is detailed but not necessarily measurable; and it is subjective. Therefore, observation from the perceived view perspective is inherently subjective. What one chooses to observe is as much a part of the process as is the observation itself.

The received view supports the beliefs that progression in science leads to a deeper understanding and that this understanding leads to theories for examination. Perceived view proponents believe in using different kinds of theories and many methods to obtain truth, although some do not seek truth at all, only understanding. Whereas following the tenets of the received view requires use of the scientific method, exploration, and experimentation, proponents of the perceived view use varied approaches to science and seeking truth, such as phenomenology, grounded theory, case method, and hermeneutics. Received view scientists use the quantitative method in their pursuit of science, whereas perceived view scientists use methods appropriate to the question asked, which may be either quantitative, qualitative, or mixed methods.

Box 1–3 What Image Emerges?

"Work-up"
"Diagnose"
"Fine-tune"
"Prescribe"
"Industry"
"Engineer"
"Design"
"Operate"
"Control"
"Check"
"Evolve"
"Adapt"
"Emergent"
"Self-organize"
"Diversity"
"Ecology"

CHAOS AND COMPLEXITY SCIENCE

Contemporary philosophers of science synthesize the work of both the analytic and continental philosophers into a new and emerging philosophy of science. The emerging philosophy incorporates chaos and complexity science, which is closely aligned with quantum physics. Truth, the domain of the analytic scientists and philosophers, and understanding, the realm

of the continental philosophers and scientists, come together in a different and dynamic way in chaos and complexity science. Complex adaptive, dynamic systems (organic or inorganic) are connected to environments and are influenced by what has come before and what will come after; these systems are irreducibly whole.

Complexity science and a view of complex adaptive systems with the language of fluidity and dynamicism push the scientist to look at things differently. Is there a real difference—not just a semantic difference—between the images conjured up by the terms "fine-tune" and "emergent" or "work-up" and "evolve"?

Bohm (1980) stated that the "universe is no longer seen as a machine, made up of objects, but rather pictured as one indivisible whole whose parts are essentially interrelated and can only be understood as patterns of a cosmic process" (p. 29). The assumptions about complex adaptive systems are many, and include the characteristics of embeddedness (meaning patterns that can be traced backward and forward); distributed control (an equalization of power bases); nonlinearity; multidirectionality; emergence in the dynamic, diversity of subjects and objects; a simultaneous coexistence of order and disorder; and outcomes that are inherently unpredictable. This perspective stands in direct contrast to the notion of traditional science that aims to explain and predict so as to control.

QUESTION THE ASSUMPTIONS

Box 1–4

Provider Questions

1. What is my view of truth?
2. Are there multiple truths?
3. What if my patient and I do not agree on the truth or the view of truth?
4. Is the lived experience important?
5. Is the lived experience more important than lab values and blood gases?
6. How do I *justify/juggle* evidence-based practice guidelines and individuality?

Discussion Questions

1. What are *my* assumptions that color/shape *my* approach to care?
2. Describe the revolution needed within health care to address the major issues facing us today.

There is more to philosophy of science than what is presented here. Whole schools of thought have not been addressed. Throughout the chapter, several underlying questions have colored all else: What are the assumptions of each nurse's philosophy of science? Do nurses aim to diagnose and treat, or to diagnose and treat human responses? Do nurses aim to control through prescription, or do they aim to understand and co-create meaning and action? Is there a single way to resolve a problem, or are different views and approaches permissible? Is one's praxis dynamic and wedded to a guideline, a critical path, or a set of standing orders? What do nurses need to be the best practitioners that they can be? What do patients, families, and communities need? Finally, each nurse is encouraged to ask, "Am I the nurse that I want to be?"

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