CHAPTER 1

Introducing Shakespeare's Psychological Thought Experiments

> The play's the thing
> Wherein I'll catch the conscience of the King.[1]
>
> *Hamlet* (2.II.633–634)

Years before I learned about experiments carried out in psychological science, I was fascinated by the "mousetrap"[2] Hamlet sets up to try to ensnare his uncle, the king, and prove he murdered Hamlet's father. The "mousetrap" consists of a play about the murder of a king, reenacting the way Hamlet believes his father was killed. This "play within the play,"[3] the "mousetrap" within the play *Hamlet*, is designed and carried out like a psychology experiment – one of a number I explore in the chapters to come.

The word "experiment" conjures up scientists in white lab coats, using super-advanced instruments to sequence genes, explore quarks, or test some clever new psychological theory about how humans make decisions. But before experiments are actually carried out in the laboratory or in the real world, they are first *thought experiments*, demonstrations or tests of particular ideas or hypotheses carried out in the imagination. Experiments have to be conceived, designed, and communicated before they can be put into practice (some of the greatest scientists in history only conducted thought experiments, a topic I discuss later in this and the next chapter). This book is about a variety of psychological thought experiments that were planned out by Shakespeare, who was aware of, and in some key respects evolving with, the scientific revolution underway in his epoch.[4] This was an exciting time when the ideas of Copernicus (1473–1543), Galileo (1564–1642), and other researchers paved the way for the Newtonian revolution of the late seventeenth century.

Shakespeare's psychological thought experiments are among his greatest but least recognized contributions to humanity. These experiments range

from tightly controlled studies that could have taken place in a twenty-first-century research laboratory, to large-scale field studies that could be conducted in real-life settings to test hypotheses about the influence of context on behavior. Shakespeare demonstrates an intuitive awareness of scientific research design.[5]

This intuitive awareness is not necessarily couched in our twenty-first-century terminology. Even when the same terms are used, they are not necessarily understood in the same way as today. For instance, we understand "experiment" to be different from "experience" (both are derived from the Latin *experior*, to try). But, as Cécile Alduy and Roland Greene point out, during the Middle Ages "the Romance vernaculars and English maintain an ambiguity around these concepts . . . A single term such as experiment or experience often appears to straddle meanings that modern readers will come to see as distinct."[6] These authors add, "experience and experiment have a stake in one another during the sixteenth and seventeenth centuries."[7] It is not until the rapid transformations of the sciences in the eighteenth and nineteenth centuries that the modern distinction between experiment and experience takes shape. But throughout these changes over many centuries, the thought experiment retained its importance in the advancement of a general understanding required for scientific progress.[8]

Shakespeare's thought experiments are part of the intellectual background to modern experimental psychology. I am not arguing that there is a simplistic, direct causal connection. Rather, Shakespeare's thought experiments are integral to a broad scientific revolution that accelerated from the fifteenth and sixteenth centuries, hand in hand with related developments in music, drama, and the arts broadly. For example, quantification and precision in music were significantly helped by scientific progress in this era,[9] paving the way for the increased complexity and sophistication of musical instruments and musical compositions from the seventeenth century to today.[10]

This integrated perspective requires us to interpret developments in science and the arts, including drama, as interconnected.[11] As Elizabeth Spiller points out in her study of science and Renaissance literature, "early modern science is practiced as an art and . . . imaginative literature provides a form for producing knowledge."[12] An important implication is that major innovations and creativity must be interpreted as related and arising from macro (societal), meso (group), and micro (individual) level processes, rather than only the individual level.[13] Traditional psychological research is reductionist and (wrongly) assumes cognitive processes within individuals as the

source of creativity,[14] using tests of individual creativity such as the *Torrance Tests of Creative Thinking* (TTCT). But a small number of researchers have (correctly) explored creativity as part of collective processes.[15] They refer to cultural context and zeitgeist as factors moving creativity along in certain styles and directions in particular historical eras.[16]

Although we only know the basic outline of Shakespeare's life, we have detailed knowledge of the context and era in which he lived. We also have his extensive writings, which we can use to reflect on his life. These combined sources have enabled Stephen Greenblatt to arrive at a compelling portrait of *Will in the World*.[17] Shakespeare received a rigorous education at the King's New School in Stratford-Upon-Avon, probably starting at the age of seven and leaving the school aged fifteen or sixteen. His teacher was an Oxford-educated man and school discipline was extremely strict, involving beatings as an aid to learning (we look back in horror at such practices. However, I attended a traditional school in London, where caning and other physical punishments were still used. I found physical punishments less distressing than some of the emotional manipulations of children by their parents that I witnessed in middle-class families).

Shakespeare's more profound education came when he moved to London, probably in the late 1580s. His life in the theater brought him into contact with people who were relatively worldly, intellectual, and knowledgeable. Greenblatt speculates about Shakespeare arriving in London: "At some moment in the late 1580s, Shakespeare walked into a room . . . and quite possibly found many of the leading writers drinking and eating together: Christopher Marlowe, Thomas Watson, Thomas Lodge, George Peele . . . . "[18] Some of Shakespeare's friends in London, such as the printer Richard Field, probably provided him with access to resources very few of his contemporaries could afford (books were relatively expensive at that time). Field moved from Stratford to London as an apprentice and worked as a printer for thirty-six years, during which time he printed books such as *The Method of Phisicke* (Philip Barrough's often reprinted medical book).[19] Field also printed mathematical treatises and works on the cutting edge of scientific knowledge.[20] Field and Shakespeare had close connections back in their home town of Stratford, Field printed some of Shakespeare's works, and he would have been an invaluable connection for Shakespeare to access cutting-edge works and ideas.

It is easy to imagine Field and Shakespeare, friends from the same hometown, getting together and talking over drinks about their current

work projects and new ideas. The printer would have updated Shakespeare about the latest volumes he was printing and the exciting changes taking place in the intellectual world represented by books. Shakespeare had opportunities to visit his friend, the printer at work and look over the manuscripts he was printing – including his own works, but also new works in medicine and science.

I have argued, then, that we must treat Shakespeare's plays not as the products of a writer in isolation, but one enmeshed in group (meso) and societal (macro) level creative processes, and that Shakespeare's thought experiments are integral to a broad scientific renaissance.[21]

The Neglect of Shakespeare's Thought Experiments

But why have Shakespeare's thought experiments been neglected for so long? The first group responsible for this neglect are researchers in psychological science. From the time of the first systematic efforts to develop psychology as a science in the nineteenth century, research psychologists have put as much distance as they could between their discipline and the arts. In this process, research psychologists have become highly allergic to literature, in particular. This is especially true in research universities, where psychologists still struggle to be accepted as bona fide scientists (in Tom Stoppard's play *The Hard Problem*,[22] the hard-nosed psychology tutor, Spike, recommends to the aspiring student, Hilary, that she not cite fiction in her job interview at a prestigious research institute – citing fiction would give the wrong signal by positioning her as less rigorous). As a consequence of this deliberate "distancing" by psychologists (a topic I discuss in more depth later in this chapter), Shakespeare's brilliant thought experiments remain neglected, although there already are discussions on different aspects of cognition, consciousness, and Shakespeare's plays.[23]

This neglect is also a result of increasing specialization and compartmentalization in modern academia.[24] As a general rule, researchers who specialize in Shakespeare are rarely also trained in experimental methodology. According to traditional academic norms, Shakespeare scholars need not have interest in or knowledge of experimental design. Their understanding of psychology tends to be limited to the ideas of Freud, Jung, and other psychodynamic thinkers. A classic work in this genre is *Hamlet and Oedipus*,[25] in which the procrastination of Hamlet is interpreted as arising from the Oedipus complex: Hamlet is motivated to sleep with his mother and finds it difficult to kill his uncle for doing what he unconsciously desires.

Psychological science has moved sharply away from this kind of psychodynamic psychology. The ideas of Freud, Jung, and their collaborators are seldom studied or researched seriously in leading twenty-first-century psychology departments at research universities. As a result, what is considered as "psychology" in leading English departments and arts centers is very different from what is accepted as psychology in psychology departments at research universities, where the focus is on experimental research. The compartmentalization of research and knowledge in twenty-first-century research universities ensures the continued huge gap between researchers in psychological science and scholars in English literature.[26]

This book serves to bridge the gap between Shakespeare scholars and researchers in psychological science. On the one hand, the terminology and basic approach of twenty-first-century experimental psychologists are introduced in discussions of Shakespeare's plays. On the other hand, Shakespeare's psychological thought experiments are discussed within the framework of experimental research. In this way, a bridge is constructed across psychology and literature, not on the basis of Freud and psychoanalysis, but on the foundations of twenty-first-century psychological science.

Telling Our Stories

> And in this harsh world draw thy breath in pain
>
> To tell my story.
>
> (*Hamlet*, 5.II.383–384)

At the end of the play *Hamlet*, Hamlet's closest friend, Horatio, signals his desire to commit suicide and join Hamlet in death, but is persuaded to continue living "in this harsh world" to tell Hamlet's story. We all die and pass on, but our stories can live on. In all of life, including science, what we come to accept as "truths" are conveyed by the stories that survive us and are passed on to subsequent generations.

At a low level of abstraction, in concrete terms, psychology and literature are fundamentally different. As a psychologist I am trained to use objective research methods, such as controlled laboratory experiments and structured psychological tests (e.g., tests of personality and intelligence), to arrive at quantitative data. I analyze this data using powerful inferential statistics to test precise hypothesis about how people think and act. In concrete terms, this is different from literary authors, who use their

imaginations to conjure up stories, plots, characters, and all the other ingredients of a work of fiction.

But at a high level of abstraction, psychology and literature are both engaged in storytelling.[27] Indeed, all of science is engaged in storytelling. I agree with George Levine when he argues that "literature and science, whatever else they may be, are modes of discourse, neither of which is privileged except by the conventions of the cultures in which they are embedded."[28] At the most advanced, "cutting edge" level, stories in science are contested. For example, currently there are competing stories about black holes: how they are born, what they are, how they develop and die, how they can collide and merge, and how they are related to planet earth.[29] Similarly, psychological science has produced competing stories about important psychological phenomena such as intelligence:[30] What is intelligence? What determines intelligence? How plastic is intelligence? Can intelligence can be changed, and if so, by how much and at what age? Research psychologists working on intelligence have developed competing narratives about these kinds of issues, just as physicists have developed competing narratives about black holes.

Storytelling in psychology and other sciences takes place according to a set of rules that are in some respects different from the rules that apply to storytelling in literature. For example, research scientists write manuscripts for publication in journals, using a specific structure. This includes an introduction in which the research literature is discussed and a key gap in the research is identified – a gap to be filled by the study or studies to be reported, a "methods and procedures" section in which the research instruments and the detailed steps taken to conduct the studies are described, a "results" section in which the new data yielded by the research is reported, and a "discussion" section in which the new findings are interpreted. Since 2014, I have served as the editor-in-chief of a psychology journal published by the American Psychological Association (APA). Authors who submit manuscripts to APA journals must adhere to this traditional format, which is common to science journals. Literary authors develop their narratives using a different structure and according to a different rule system. For example, plays typically have acts and scenes, major characters, heroes and antiheroes, plots and subplots, and so on, according to long-established traditions. The Aristotelian play structure has directly or indirectly influenced playwrights for thousands of years.[31] The "manuals" available for writing science papers and writing literary works set out the different formats for each genre.[32]

But the stories developed in science and those developed in literature both have to be persuasive, and some of the main devices they use are similar. For example, they may both involve a mystery that needs to be solved – will the hypothesis in the science paper be proved true or false? Who in the novel or play will be revealed as the real murderer? Most importantly, the stories told by scientists and by literary authors must construct an engaging and convincing picture of the world, one that moves and persuades a given audience.

Thought Experiments in Science

A simplistic, logico-positivist view of science is that it concerns the accumulation of facts.[33] Put bluntly, "hard sciences" are about gathering "hard data." Unfortunately, many researchers do seem to act as mere "fact gatherers," with their studies having little connection to wider theoretical developments. However, actual scientific progress depends in important ways on theory building, in which thought experiments play a central role.

From its early beginning, science has also been driven and shaped by thought experiments[34] (in Chapter 2, I discuss experiments and thought experiments in psychology in more depth). For example, consider the spear-thrower who is standing at the edge of the universe in the thought experiment by Lucretius (c. 99BC–c. 55BC).[35] Either you believe the thrown spear flies on far away, or it is stopped by something. Whatever option you choose, you must accept that the universe continues beyond "the (supposed) edge" where the spear-thrower is standing. This (admittedly problematic) thought experiment was used to argue against the Aristotelian depiction of the finite universe. Since the time of scientists in ancient Greece, thought experiments have continued to play an important role in constructing scientific views: "Thought experiments are . . . common in science. Some famous examples include . . . Maxwell's demon, Einstein's elevator (and train), Shrödinger's cat, Newton's bucket (and cannonball), Heisenberg's microscope, Galileo's falling bodies (and pendulums, inclined planes, and ship) . . . . They are found also in pure and applied mathematics, where they play important roles from geometry to infinity."[36] In the twenty-first century, thought experiments have developed in new directions through the use of computers and the creation of virtual worlds inhabited by creatures who only exist in the imagination (later in this chapter, I discuss the example of a virtual world created by Richard Dawkins, a leading Oxford scientist).

Some of the most important scientists only develop stories and thought experiments *without* gathering empirical data, so the actual testing of the ideas through empirical evidence is achieved by others at a much later time. For example, consider the case of Albert Einstein (1879–1955), generally regarded as one of the two or three greatest scientists in human history. Einstein's thought experiments[37] led to the four papers he published during his "miracle year" (*annus mirabilis*) of 1905, which are foundational for modern science. However, it was almost a century after publication that experimental evidence was available to support some of Einstein's most important thought experiments and their implications, such as the idea that the universe is still expanding.[38]Einstein did not spend time in laboratories gathering data. He used his stupendous imagination to construct new theories based on thought experiments.

Thought experiments were also used by Charles Darwin (1809–1882), and have continued to be influential in biology and related research fields in the twenty-first century.[39] Darwin ranks with Einstein in the very top tier of scientists. He gathered extensive empirical evidence and field experiences, but commentators have noted how his theory of evolution rests on thought experiments[40] (the philosopher of science Rom Harré writes, "Darwin's account of organic evolution and the origin of species is for the most part a thought experiment"[41]). For example, in a number of instances in his writings, Darwin hypothesizes different scenarios and thinks through their consequences, such as when deer and other food become scarce and the swiftest wolves have the best chance of survival. The surviving wolves would then pass on their characteristics to some of their offspring, who would again have an advantage in situations of food scarcity.[42] James Lennox refers to these arguments by Darwin as "thought experiments" and adds that their role in Darwin's theory "is to display in a vivid and concrete way that, *if* each of the mechanisms and processes referred to by Darwin's theory were to interact in particular ways, there *would* occur an accumulation of minute, random variations in a particular direction, culminating in distinct varieties and, eventually, new species."[43]

The evolutionary biologist Richard Dawkins has used thought experiments involving computer simulations of imaginary creatures in imaginary worlds to demonstrate the workings of Darwinian principles of selection.[44] Dawkins reports surprise at how much change took place in the *biomorphs* (the imaginary creatures) in his computer simulation. Starting with an ancestor that was similar to a single dot, *biomorphs* evolved quickly to become creatures that looked different from their ancestor and from one another. Dawkins writes, "in 100 mutational steps, much can happen.

I never dreamed *how* much."[45] This kind of dramatic "demonstration" is made possible through thought experiments.

What has been described as the world's most famous thought experiment is Schrödinger's cat,[46] which is at the center of debates in twenty-first-century physics. Erwin Schrödinger proposed this thought experiment in 1935 to challenge the accepted wisdom in quantum physics, by showing that according to the rules of quantum theory the cat placed in a box under certain conditions could be *both* dead and alive until the box is opened and the cat's actual state is ascertained. The original thought experiment by Schrödinger and the most recent variations[47] cannot in practice be carried out. However, they have served a vitally important purpose in the progress of physics, often taken by psychologists to be their "model" for science.

Thought experiments have been conceived as having an important role in science by various thinkers (e.g., Thomas Kuhn, 1922–1996[48]). My argument here is that thought experiments by themselves have an enormously important and irreplaceable role in scientific research. They point to new directions for experimental researchers to gather empirical evidence, sometimes centuries later. Thought experiments are also common in literature; as Catherine Elgin has argued, "works of fiction are thought experiments. Like literary fictions, thought experiments neither are nor purport to be physically realized. Nevertheless, they evidently enhance understanding of the phenomenon they pertain to . . . what is common to fictions, thought experiments and standard experiments is that they exemplify, and thereby provide epistemic access to features of the real world."[49] It is, then, simpleminded and misleading to propose that science only deals with "facts" and literature with "fictions." All scientists, including psychologists, construct stories and thought experiments[50] – a characteristic they share with literary authors.

A central theme of such stories is the idea of choice and free will: in everyday life we assume that humans normally have some measure of choice in how they behave, and this assumption is shared in much of great literature. But this assumption contradicts the causal model in mainstream psychology. By looking across from psychology to Shakespeare's plays and other great works of literature, we can critically reflect on the assumptions underlying mainstream psychology. In this way, the relationship between psychology and literature is not just one-way, with ideas from psychology being applied in literature, but becomes two-way, with insights from psychology and literature both casting light on human behavior. Thus, a closer relationship between psychology and

literature in the twenty-first century would also benefit psychological science. But in order to achieve this outcome, we must critically reconsider the positioning of psychology in relation to other disciplines. This positioning has been undertaken on the basis of some myths.

Repositioning Psychology

> In nearly all modern (psychology) texts, experiment is defined as manipulating an independent variable, holding all other events constant, and observing the effect on a dependent variable ... This strategy is ... presented as, generally, the best and frequently the only way to discover causes. These views are typically described as *the* scientific method, which, according to the dominant mythology, psychology acquired from more established sciences, particularly physics. No source is cited or provided for these ideas, yet they form a cornerstone of psychological pedagogy.
>
> Andrew Winston and Daniel Blais[51]

In a study of 236 introductory texts from psychology, biology, physics, and sociology, Winston and Blais (1996) discovered that psychology texts, without citing sources, claim that the terms independent and dependent variables have been imported to psychology from physics and other sciences. Winston and Blais found that, while adopting "positivist traditions,"[52] psychology texts used terminology that is absent from physics texts. Indeed, research methods as a topic is seldom included in biology and physics texts. In contrast, by the 1970s, psychology textbooks had developed a uniform approach to discussing research methodology, defining an experiment as *the* superior method, as well as defining the independent and dependent variables as an essential part of any scientific method.

Following Winston and Blais's critical review of psychology, physics, and other texts 1930–1970, I examined some twenty-first-century physics texts (as well as psychology texts, discussed below). Standard physics texts, such as Knight (2016), do not include a research methods chapter (which is always included, typically as chapter 2, in mainstream psychology texts) and do not include discussions of independent and dependent variables. When a physics text does include "scientific methods" (as in Ford, 2016, section 3 of the Prologue), it is clear that this could not be the source of discussions by psychologists of independent and dependent variables. When causation is explicitly discussed in physics texts, again it is not as