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**Making Connections:
Science and Theatre in Complicite's *Mnemonic***

**A thesis submitted in partial fulfillment of the
requirements of departmental honors in theatre
at the College of William and Mary.**

**By
Stephen Cole**

Accepted for _____
(Honors, High Honors, Highest Honors)

Dr. Richard Palmer, Director

Dr. Laurie Wolf

Dr. Lizabeth Allison

“Putting on a play is a sort of a scientific experiment. You go into a rehearsal room which is sort of an atom and a lot of these rather busy particles, the actors, do their work and circle around the nucleus of a good text. And then, when you think you’re ready to be seen you sell tickets to a lot of photons, that is an audience, who will shine a light of their attention on what you’ve been up to.”

-Michael Blakemore, Director of *Copenhagen*

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Abstract

Science and the Arts are two seemingly polar fields, but a new “genre” of plays is emerging deemed “science plays.” This virtually unheard of genre has been investigated very little, and stands potentially to help unite these subjects. Through the use of a Second Season production of *Mnemonic* a set of characteristics is explored and redeveloped based on the findings of an audience survey. The survey investigates the roles of particular characters, settings and themes within this production of *Mnemonic*. The survey also asked about the audience’s beliefs about where and how science and theatre intersect. Ultimately, it is concluded that the science within a “science play” must play a more integral role than simply a plot device in order to be considered part of this genre.

Introduction and Background Information

Sitting two rows from the front while listening to two men discuss the origins of quantum physics, someone could safely assume that he was in a lecture hall. Recently, though, a likely possibility is that one could be sitting in a theatre. A new wave of plays has begun to integrate the worlds of the arts and the sciences into a less defined area. Previously, a dichotomy existed between the cold indifference of science and the emotional, amorphous art of theatre. As different as the two fields seem, the increase of the presence of science in theatre may be a direct result of those things that they have in common.

The form of this thesis mimics a scientific journal article, which reflects the scientific method of observation and collection of measurable data and the testing of a hypothesis. Using other successful science plays as models, I identified what

characterizes a science play and applied these to my senior directorial production of Theatre de Complicite's *Mnemonic*. Manipulating the characteristics of "science plays" within *Mnemonic* was an experiment itself. After defining my materials and methods, I will hypothesize on what the effects of these changes might have on the perception of the play. Next, I collected empirical data through surveys and talk back sessions. Lastly, I analyzed this data and formed a conclusion about what may have helped make *Mnemonic* fit the genre of a "science play" to a greater extent.

The following analysis of the development of the "science play" genre helped to develop the tools used to alter the William and Mary production of *Mnemonic*. To ask questions, one must understand what may have already been answered, that's why reading works that deal with science and looking at them in the context of theatrical theory and general connections between art and science helped to develop this production of *Mnemonic*. The research of these plays draws a parallel to the scientific process of research followed by hypothesis.

Charles Darwin, the father of modern biology and one the greatest scientific minds ever, wrote in a letter in 1868:

I have tried lately to read Shakespeare, and found it so intolerably dull that it nauseated me. I have also almost lost my taste for pictures and music. I am glad you were the [theatre's] 'Messiah,' but I dare say I should find my soul too dried up to appreciate it; and then I should feel very flat, for it is a horrid bore to feel as I constantly do, that I am a withered leaf for every subject except science. The loss of these tastes is a loss of happiness. My mind seems to have become a kind of machine for grinding

general laws out of large collections of facts. It sometimes makes me hate science.¹

He speaks of how science has made the other joys of the world, such as theatre, much less enjoyable because he dissects them, just like he does his specimens, down to their evolutionary basis.² His thoughts here reflect the general opinion of many people: that science and theatre are two very different fields. Their independence from each other, though, needs to be questioned. The majority of this thesis focuses on how theatre presents science, but it is also important to note that science also often presents itself in a theatrical fashion to establish these fields as reciprocal and complementary.

Science is performed in our daily lives; we see it in science classrooms when a teacher displays an experiment and in demonstrations of new technologies on infomercials. Science fascinates people and things that fascinate people tend to be shown off, so it is only natural that science be performed for less aware audiences. Sue Ellen Case in her book *Performing Science and the Virtual* says that “if theatre staged science, then science also staged itself as theatre.”³ An example of hers is the work of Mme. Blavatsky, who in the early 1900’s performed “phenomena” of physics. She did not present them as experiments but as “revelations of matter and energy.”⁴ Her tricks seem to be precursors to the experiments done to entertain children on television and experiments in classes to demonstrate scientific ideas.

¹Donald Fleming, "Charles Darwin, the Anesthetic Man," Darwin: A Norton Critical Edition, Philip Appleman. (New York: W.W. Norton and Company, 1961) 573.

² Fleming 579.

³ Sue Ellen Case, Performing Science and the Virtual (New York: Routledge, 2007) 2-3.

⁴ Case 70.

The theatricality of science, as well as its ability to engage may make science useful in performance situations.

Another example of science becoming theatre lies in the history of “anatomical theatres.” A strong tradition of watching surgeries and dissections has occurred over the past 700 years. The “stages” for these “shows” have grown from temporary structures built for viewing the body to permanent anatomical theatres being built in the 1600’s and galleries being incorporated for public observation of surgeries well into the 20th century. Modern surgeries are less frequently observed, but some argue that the metaphor of theatre is still relevant to, and important in, the operating room. Recently, nurses Robin Riley and Elizabeth Manias wrote an article for *Nursing Inquiry* in which they claim that the metaphor of an anatomical theatre still exists. They argue that different members of the surgical team “perform roles,” and they learn procedures and dialogue like actors learn the script and blocking as nurses play a “backstage” position.⁵

Obsession with human anatomy and performance made an extreme intersection in 1810 when Saartje Baartman, also known as the Venus Hottentot, was put on display as an anatomical marvel in London and Paris. Suzan-Lori Parks dramatizes this story in her play *Venus* which emphasizes the cold scientific view that was taken of this woman’s body. In one scene of the play eight anatomists draw and measure virtually every part of her body in awe and amazement and in another scene the audience finds her dead body in an anatomical theatre. The play uses the

⁵ Robin Riley and Elizabeth Manias, “Rethinking theatre in modern operating rooms,” *Nursing Inquiry* 12 (2005): 2-9.

cold language and study of science to vilify what was done to this woman, such as these words spoken by her lover, The Baron Docteur:

While the uterus had the ordinary form of that organ in a
once or twice impregnated female,
the external characters,
especially of the reproductive organs,
form, in this view, the centerpiece of study.
The *labia major* were small.
The clitoris moderate to large
and had a well developed prepuce
all situated more conspicuously
than in the European female.⁶

The stage directions call for The Baron Docteur to struggle through this part of his speech and hang his head in shame at the end of it. He realizes the crimes that were committed against this woman in the name of performing science.

Emile Zola, father of the Naturalist movement vehemently supported the use of scientific thought and the scientific method to develop literature and theatre. He claims that at first literature supported science and that science borrowed its need for imagination from literature, whereas because of the shift that came with the scientific revolution and Darwin, literature began to borrow its analytical ways from science.⁷ In the 1880s Zola led a movement in playwriting that called for evolutionary naturalism. As Darwin began to point out the fact that men were no more than animals, playwrights of the naturalist movement began to embrace Darwin's theories and used them in their plays. Zola desired to reform theatre by writing characters where "the abstract personage disappear and give place to the

⁶ Suzan-Lori Parks, *Venus* (New York: Theatre Communications Group, Inc., 1990)148-149.

⁷ Emile Zola, "Naturalism on the Stage," *The Experimental Novel and Other Essays*. (New York: The Cassell Publishing Company, 1893) 113.

real men of blood and muscle.” He said that this could be done by following Darwin’s example of “observation and experience.”⁸

Jane R. Goodall claims in her book *Performance and Evolution in the Age of Darwin* that the naturalist plays of Zola and his contemporaries fall into a similar strain of performance as those given by the actual Venus Hottentot. Although against her will, she gave a type of performance that was trying to be recreated by the naturalists. The audience observed her like scientists observe their experiments, particularly like Darwin observed the animals in the Galapagos. Goodall sees these types of performances as fundamental in the discussion over the interactions between conscious performing and animal rawness.⁹ This discussion is one of the fundamental ones of modern theatre posed by the Naturalists and their successors. It is also relevant because scientific theory lead directly to the development of this type of performance.

Some acting theories reflect some forms of science that have been incorporated into theatre. The work of Vsevolod Meyerhold in the 1920’s exemplifies this connection. In his book *Stanislavsky and the Stanislavsky Tradition of Acting*, Jonathan Pitches claims that “Meyerhold’s work draws explicitly on the industrial and scientific thought of his time¹⁰”. He gives the example of Meyerhold’s interest in Reflexology, the study of higher parts of the central nervous system developed by Ivan Pavlov. The theory based its understanding of behavior on

⁸ Jane R Goodall, *Performance and Evolution in the Age of Darwin: Out of Natural Order*, (New York: Routledge, 2002) 168.

⁹ Goodall 165.

¹⁰ Jonathan Pitches, *Science and the Stanislavsky Tradition of Acting*. (New York: Routledge, 2006) 52.

physiological reflexes. Meyerhold did not believe in a theatre based in the inner psyche, but on the physical elements that are stable.¹¹ Other major theorists that Pitches indicates to have been influenced by science are Michel Chekhov, Lee Strasberg and Anatoly Vasiliev, who can all be “genetically” linked in theatre to Constantin Stanislavsky.¹²

One of the most influential men of modern theatre and its connection to the scientific mode of thought was Bertolt Brecht. In his essay *A Short Organum on Theatre*, he argues for the creation of a theatre for “the scientific age.” He argues that “science and art...[are] both there to make men’s life easier, the one setting out to maintain, the other to entertain us.”¹³ He claims that theatre should be as productive as science for example Brecht believes when developing a character, that if an actor chooses to indulge in empathy or self-identification during the rehearsal process, then he needs to remember that this is “just one of a number of methods of observation.” This is key to the relationship he established between science and theatre; observation is at the center of both.¹⁴

The work of these very influential men may have sparked the interest of others to start exploring the realm of science as a source for theatrical material. An entirely new genre of “science plays” has begun to emerge within the past couple of decades in popular theatre.¹⁵ Successful, canonical works such as Lee’s *Inherit the*

¹¹ Pitches 57.

¹² Pitches 59.

¹³ John Willet, *Brecht on Theatre*. “A Short Organum on Theatre.” (New York: Hill and Wang, 1988) 185.

¹⁴ Willet 184-195.

¹⁵ Kristen Shepherd-Barr, *Science on Stage*. (Princeton, NJ: Princeton University Press, 2006) 1.

Wind, Madden's *Proof*, Frayn's *Copenhagen* and Stoppard's *Arcadia* have put science and mathematics at the core of their stories. Yet, the tradition of a "science play" reaches back centuries before these relatively recent works, including works by playwrights like Marlowe, Durrenmatt and Brecht. In her book *Science on Stage: From Doctor Faustus to Copenhagen*, Kristen Shepherd-Barr outlines four main features of a "science play." These characteristics of a "science" play will be the basis for the elements used in this production of *Mnemonic*.

The first characteristic that Shepherd-Barr sets out is that science plays have a direct relationship with a scientific idea and integrate it further than simply acknowledging it. Secondly, the scientist is not an "ambivalent" character and virtually always portrayed as either a hero or villain. The third characteristic is the presence of a fundamental ethical discussion. She does not specify one revolving around science, but that seems to be an important requirement since most plays in general discuss a moral question. Lastly, the use of the science must be through performance and play an integral role in the themes of the play, not simply using it as a plot device like in early plays such as Marlowe's *Faustus* where science acts as a material goal in general.¹⁶

The characteristics Shepherd-Barr sets out do not completely define a science play because as with any genre there are exceptions. This means that a definition is not what is sought for in this thesis, but a set of linking characteristics of "science plays." The first problem with her set of characteristics is that the first and last tenets really depend on each other, so she should lump these two

¹⁶ Shepherd-Barr 2-3

characteristics together. The two principles about the play having a “direct relationship” with the science and it informing the performances and themes of the play, may be connected as the integration of science into themes, character and plot may create the relationship.

An example of the play that centers on a scientific theory and integrates it into its structure and performance is Michael Frayn’s *Copenhagen*. The play is centered on the Uncertainty Principle developed by Werner Heisenberg in the middle of 20th century, which states that position and momentum in quantum physics are indefinable at the same moment. The play wants to answer the question “why did Heisenberg come to Copenhagen in 1941?” The Uncertainty Principle is displayed anecdotally in the first act when Heisenberg relates it to skiing when he says “At the speed you were going, you were up against the uncertainty relationship. If you knew where you were when you were down you did not know how fast you’d got there. If you knew how fast you’d been going you didn’t know you were down.”¹⁷ The characters in the play explain the concept of Uncertainty by anecdotes throughout the play, as aforementioned, but the play also attempts to answer the main question using a structure that mimics the Heisenberg Uncertainty Principle. The audience sees the story from different perspectives of Heisenberg, Niels Bohr and his wife Margarethe, and how the story cannot be defined owing to the different perspectives of the observer. An example of this is the scene where they remember a walk between Bohr and Heisenberg:

Margrethe: You couldn’t even agree where you walked that night.

¹⁷ Shepherd-Barr 96.

Heisenberg: Where we walked? Faelled park, of course. Where we went so often in the old days.

Margrethe: Faelled park is behind the Institute, four kilometers away from where we live.

Heisenberg: I can see the drift of autumn leaves under the street-lamp next to the bandstand.

Bohr: Yes, because you remember it as October.

Margarethe: And it was September.

Bohr: No fallen leaves.

Margarethe: And it was 1941. No street lamps!

This demonstrates the relationship between the structure of the play and the science it is built around¹⁸. They are, therefore, integrally intertwined.

The scientific nature and structure of the play call for performances that invoke the concepts for the audience. The director of the original production, Michael Blakemore also commented on the performances of the actors and how they at points represent the science being portrayed. He said at the Symposium “Creating Copenhagen” at the City University of New York :

There are a number of walks that the characters take in the play. Of course there is only a certain distance you can travel on stage unless the motion is circular. But if it is a circle you can walk forever. I felt that if we had actors moving rather like particles in an atom, there would be times when this could be instructive and other times when as a metaphor it could be quite interesting.¹⁹

Copenhagen does not fall under the category of a “naturalist” or “realist” play, but from the perspective of acting style its performances still have a realistic nature to them. Shepherd-Barr claims that the new wave of science plays may also correlate with the rise of “alternative” theatre in recent years.

¹⁸ Shepherd-Barr 92.

¹⁹ Michael Blakemore, “From Physics to Metaphysics and the Bomb” New York Times (9 April 2000) 7, 20.

Scientific concepts being “performed” in a show started with representations of scientific demonstrations of principles that reflect those in real life, for example Galileo explaining the heliocentric model of the universe in Bertolt Brecht’s *Life of Galileo*. Galileo takes the time to explain the theory by setting up on stage, using chairs, how the earth must revolve around the sun. This contrasts modern pieces like the French trilogy *Les Variations Darwin* by Jean Francois Pyre and Alain Prochiantz which represent Darwin’s concepts that he laid out in his book *The Expression of Emotions in Man and Animal*. A scene, for example, has an actress replace her head with a cabbage as an actor kisses and eats it. It links together the violence and tenderness that is prevalent in all “animals.”²⁰ Representations like this, which are more abstract and directly address the science in the play as opposed to simply explaining it, were inspirational in devising the physicality in *Mnemonic*.

The second part of Shepherd-Barr’s first characteristic is that the science does not simply reference the science. Two contrasting examples of this are two living newspapers, a genre of play that addresses a social issue in a play format. Living newspapers show an early form of the science play genre. The Federal Theatre Project produced a show called *Spirochete* which staged the history of syphilis in 1937. Its primary goal was to make a statement on the social implications of the disease. The play “put in ‘human terms’ the costs of the disease...on women, children and unemployment” and only had a scene which showed the discovery of the spiral germ known as a “spirochete.”²¹ The production

²⁰ Shepherd-Barr 208.

²¹ John S. O’Connor, “‘Spirochete’ and the War on Syphilis” *The Drama Review*, (Cambridge, MA: MIT Press Journals, 1977) 91-98.

humanized the disease, but did not present the science in terms other than referencing it, which is the reason why the play borders on the edge of being a science play.

A change began a couple years later with the production of a play called *Uranium 235* by Ewan MacColl. It was a British version of a Living Newspaper produced in 1939, in light of the successes of the Federal Theatre Project. The playwright actually admitted to knowing “nothing about physics, or indeed, the science in general,” when he started. Yet he learned about and focused on the science behind atomic energy from the discovery of the atom to the work of Albert Einstein. The play included characters called “Miss Mass” and “Energy” which were allegorical characters used to display the relationship expressed in the famous equation $E=MC^2$. The ultimate goal of the play was to place the responsibility of the future of nuclear warfare in the hands of the audience; the actual science played a critical role in informing them of the consequences. The science was made accessible through the theatrical tool of character and made the audience feel informed.²² This play may show an initial step towards integrating science into the play at a deeper level than plot.

The role of the scientist in a “science play” is obviously important, Shepherd-Barr claims that he should not be ambivalent and should be characterized as a hero or villain. One may challenge Shepherd-Barr’s concept of one needing to define him as a “hero” or “villain.” Instead a clear defined story and a strong influence over the play may help to define the role of scientist. Heisenberg and Bohr both have well

²² Shepherd-Barr

defined stories and drive the plot in *Copenhagen*, yet, this play clearly lacks the simple concepts of villain and hero. At points Heisenberg is the “villain” because he is considering helping Hitler, but he has several moments throughout the play where we can begin to understand why he would choose to do so. The second portion of Shepherd-Barr requirements for the scientist character should be eliminated, and the first portion needs to be better defined.

She claims a scientist character cannot be “ambivalent,” but she does not clearly define ambivalence. In this thesis, a scientist character that is not “ambivalent,” is a scientist character whose character is developed further than explaining the science. The scientist characters must have a personal investment in the science in the story, such as Heisenberg and the impact of his research. The antithesis of this is the role that Einstein plays in Steve Martin’s *Picasso at the Lapin Agile*. Einstein represents science in general, and really does not connect with his science at all within the play. Any scientist could have been included here, and any artist in the role of Picasso. The play equally approaches art and science, which means that a scientist is a character within the play, but without a direct connection to the science then there is no “science play.” He is “ambivalent” to the science within the story that he is integral to.²³

A large flaw in Shepherd-Barr’s definition of a “science play” is the requirement of some ethical question in the play. She negates herself later in the book by saying “the heightened role of ethics in discussions of science and medicine deeply connects these field to the theatre, since at some level most dramas have a

²³ Steve Martin. *Picasso at the Lapin Agile*. (New York: Grove Press, 1997).

concern over a moral problem.²⁴ She claims that ethics are a tenet of a science play, but confirms that most plays have an ethical element. This vagueness implies that the ethical decision must be centered on the science.

Shepherd-Barr's definition of a science play focuses on mainly textual and performance elements of the plays, but neglects the important third element of design in theatre. A science play must have design elements that also reflect the nature of the science. The standard scenic design to discuss when connecting the scientific themes of a play and the set is again *Copenhagen*. The round set is often established as an atom so the actors seem like electrons. The original director of the play, Michael Blakemore, even acknowledges this metaphor in the aforementioned speech he gave at the City University of New York in April of 2000. Although the metaphor for the atom does not entirely fit with the major scientific principle that informs the performance of the play, the set was designed with the scientific concept in mind.

Ultimately, the characteristics of a genre need to be broad enough so several plays will fall into the category, but cannot encompass plays that should fall outside. For the purpose of this thesis and discussion a science play usually contains the aforementioned elements and becomes a "stronger" science play when it includes more of these elements. The basis of the definition though is that a science play does not only include a subject of scientific nature textually, but that the science involved also informs performance and design elements.

²⁴ Shepherd-Barr 53

Materials and Methods

Rehearsals for the production of William and Mary Theatre Second Season's *Mnemonic* began in late January of 2009. The rehearsal period lasted about seven weeks (including one week of spring break). The play was staged in the studio theatre of Phi Beta Kappa Memorial Hall at the College of William and Mary. Space, lights and large properties were provided generously by the Department of Theatre, Speech and Dance and financial aid given by the Theatre Students' Association and the Fall's Fund.

Mnemonic has two main story lines that interweave and parallel each other. The first story centers on Virgil, whose longtime girlfriend Alice mysteriously left several months earlier leaving a message telling him to wait for her. He searches deep in his and her memories trying to pinpoint why this happened. She reveals to him that her disappearance was due to her mother's death revealing that her father may still be alive. The play takes the audience on a cross-European journey as Alice investigates other people's memories for answers of her past.

The second story line is based on the true discovery of the Iceman back 1991 and the research done to investigate his story. Konrad Spindler, the chief archaeologist of the actual case, is the main character in this story line. Virgil later in the play explains to Alice the story of the iceman and how he is connected to it when she ends up in the same town the body is kept.

Science really plays two roles in the play. The one that is textually present throughout the play is the forensic science that archaeologists and scientists use to piece together the archaeological evidence that tells the story of the Iceman. The

other role is introduced in the opening speech of the play. Simon introduces the concept that memories are made when neurons make new connections in the brain. He virtually begins the play with a scientific lecture on memory.

This early lecture will inform a major motif that will reappear throughout the play. Simon delivers a speech at the beginning that describes that memories are made through connections. The performances of the actors mirrored the science presented within the play. They represent not only the people in the memories but also the act of creating memories as they mirror the actions of synaptic connections. The science behind Spindler's lecture inspired the contact improvisation sessions we used to begin each rehearsal. These sessions developed into a physical symbol that represents when a memory is restored during the play. The actors would grab each other at the elbow using their right arms while facing each other, release while leaning back and then reconnect again. This was based in the line that Simon spoke at the beginning of the play saying "it is not so much the cells that are important in the act of memory, but the synapses....the synaptic connections and these connections are being made and remade constantly."²⁵ This would be the best and most prominent example of actor's performances specifically reflecting the science that is specific to this production. A photograph depicting the "neuronal movement" is below:

²⁵ Simon McBurney. Mnemonic. (London: ,1998) 25.



A picture depicting the “neuron” movement devised by the company. This occurred during the montage in Scene 31. (Foreground: Beth Fagan and Andrew Whitmire. Photograph by Casey Scully)

Another example of integration would be that when the actors who played multiple roles were not actively playing a role in the story, they were active observant scientists who were taking notes and watching the stories unfold. This “neutral” concept emphasized the importance of science in the roles that they were playing.

This movement and character choice fulfill one of the major characteristics of a science play. The act was established in the opening monologue and repeated during a montage towards the end of the play as all three main characters search in their memories for answers to the questions they are asking. Actors, when not engaged in the story observe the memories from behind a screen that is painted with a representation of neurons on it, again reinforcing the themes of the synaptic connections as a major part of the science in the play.

Complicite originally performed the production with eight actors (six male and two female) performing the roles. This cast consisted of nine actors (four male and five female). Only the actors who originated the roles of Virgil and Alice played simply one role. The rest adopted other personas of different characters throughout

Europe as Alice takes her journey. In this “experimental” production the actors who played Virgil and Alice, Chad Murla and Beth Fagan respectively, played strictly their roles, as did Dan Plehal who played only Spindler and Simon. The other actors include Melissa Bailey, CJ Bergin, Megan Castle, Nora Ives, Kay Schellman and Andrew Whitmire, who all played multiple roles. Originally the opening speech of the play was given by the director Simon McBurney, who also played the role of Virgil. The speech was given by Dan Plehal portraying Simon McBurney giving the speech.

Two major implications were made by having Plehal give the speech. The first is linking the roles that a scientist and a director play in their respective fields. They both perform experiments, using the processes of hypothesis, trial and error and research of other’s techniques to generate a finished product which will be presented to their peers. Both also most possess strong leadership skills, training, inquisitiveness and be willing to take risks. When the “director” of the show presents a scientific concept to the audience a connection will form between these two seemingly opposite professions.

Secondly, and more importantly, the character of Spindler became more central after giving the opening monologue (as well as the closing line of dialogue) to the actor who plays him. Originally the opening speech was given by the director of the play. To reiterate, in a science play the scientist cannot be an ambivalent character to the science at hand. As written, Spindler’s only role is to describe the Iceman and act as exposition. He speaks in long monologues that just lists facts and gives very little opinion and very little insight into his character. This issue sits at

the basis for calling into question the inclusion of *Mnemonic* on Shepherd-Barr's list of science plays.

The first step in changing the ambivalence status of Spindler was to answer the question: "What is Spindler passionate about?" Plehal claims

As an archeologist, Spindler is fascinated by the origins of people and cultures, as well as artifacts. The passion he brings to this work, however, does not lie in the extracting of information, but rather in filling in the gaps between the facts. It is thrilling for him to come up with the questions, then attempt to find answers by using the known merely as a jumping-off point for finding the unknown. As these answers fill in the gaps, a story begins to develop. It is this story that gives life and humanity to the subjects of Spindler's research, in this case, the Iceman. Spindler is devoted to finding the story, the humanity, the reality of the Iceman.²⁶

This allowed the actor to piece together an arc that Spindler's character takes through the play. The story was lacking for Spindler, but Plehal setup this story : Spindler starts uninterested in the project of the Iceman, thinking the find is of little significance. Once Spindler realized the scale of the discovery, his interest and knowledge grew exponentially until his curiosity in the story of the Iceman begins to consume him. He becomes frustrated with the petty arguments over who the Iceman belongs to and how much he is worth. As his passion for the subject increases, those around him begin to lose interest. At the climax of the show he also reaches the climax in his character development. He frantically searches amongst his colleagues and the audience, looking for someone who will listen. Finally, he reaches his moment of catharsis when Virgil reaches his as the both describe the death of the Iceman. He, like Virgil, finally understands the story he has been desperate to understand. Having the dramatic structure of the two storylines

²⁶ Daniel Plehal, Personal Communication. April 2009.

mirror each other more closely emphasized the journey that Spindler makes which Virgil's probably overshadowed in the original production.

Another attempt to make Spindler less ambivalent towards the science within the play, was to give him some of the lines that Virgil originally spoke that asked more personal questions about the Iceman such as: How many children did he have? What did he call winter? What made him laugh repeatedly? These personalized questions helped to allow his connection to the science to be even more close to his heart.

Finally, as aforementioned, in an effort to emphasize both science and Spindler within the show, the actors who play multiple roles in the show will return to their scientist character when they become "neutral." They constantly play the role of the observer, piecing together the story as they watch it unfold. The emphasis on these characters over the other ones that they portray implies their importance to the overall theme of the play.

The design elements of the play will also help to legitimize *Mnemonic* as a "science play." The scenic design uses a similar device as the 2007 revival of *Inherit the Wind*: the scientist characters will sit up on a platform that mirrors that of the audience. Not only will this act as a way to constantly remind the audience of their presence and significance, but will also draw the audience in as other scientists that are watching these stories unfold. The entire ground plan is similar to that of an anatomical theatre, which was a key part of the research performed prior to the show, as the entire audience will look down on a lot of the action. This is a fairly well known theatrical setup that emphasizes the voyeuristic nature of the audience.

The scientists sitting on the other side will be engaged in the show, like the audience should. On the top tier of the platforms was a curtain that was painted with a pattern that was reminiscent of neurons to emphasize the importance of connection in memory and the play. The pictures below illustrate the setting:



Top: Set design by Dan Plehal including the painted neuron pattern on the screens. (Pictured L to Andrew Whitmire, Melissa Bailey, Kay Schellman, Dan Plehal, Nora Ives, CJ Bergin and Megan Castle) Bottom: Arrangement of the audience with respect to the set.

At the basis of scientific research is a quantifiable set of data. The data for this research project come from a survey given to each member of the audience. They were told about the survey prior to the show and reminded following it. The survey was completely voluntary and took between five and ten minutes to complete. A copy of the survey can be found in Appendix A.

The first question asks the audience to identify who the main character of the play is from the options of Virgil, Spindler, Alice and the Iceman. If the character of Spindler was not “ambivalent” and was well developed through the work of the actor and myself then the answer “Spindler” will have plurality. Other factors may influence this prediction, but those will be discussed later.

The second question asked what the main themes of the play are and asks the audience members to rank them. In theory if the integration of the performance of science into the actual production was successful then the theme of science will rank among the top themes.

The third question evaluated the use of technical elements in the show to affect the perception of the audience. The question asked where the principle setting of the play is with the options of Virgil’s apartment, a laboratory, across Europe or “the mind.” If the technical elements (specifically lighting and scenic designs) helped to elucidate the scientific themes of the play then the laboratory would be ranked highest as the main setting.

The fourth question asked simply whether science and theatre are compatible fields and allowed for exposition on the subject. With success of the integration of the two fields within the play the audience would overwhelmingly agree that they are compatible.

Finally, the last question asked for the audience to identify which of the tenets of science plays were present in this production. The one exception is the presence of a moral question since the play does not have a particularly central one. After checking which elements were present, if any, the audience was asked if they

would consider this a “science play.” Again, if successful, the majority would agree this is a science play.

In addition to this survey, a talkback session after each performance allowed for discussion with an impartial leader. The discussion was included to give me a “case study” situation to gather anecdotes and more qualitative data.

Results

After three performances the number of completed surveys was 133. They were completed immediately after the performance and collected by the house manager. The audience was given roughly 10 minutes to complete the survey before the talk back session began. Audience members retained the surveys throughout the talkback session, and it was apparent on multiple surveys that additional comments were made on the reverse side during the talk back session.

The responses to the first question, which asked which character was the main character of the show, varied quite a bit. Table one shows the number of responses which selected each character. No single character received the majority of the answers, but the response “Alice” did receive the plurality. “Alice” received 36.8%; “The Iceman,” 24.8%; “Virgil,” 20.3 % and “Spindler,” 6%. The remaining responses were those surveys that did not have an adequate response to the question to be considered statistically relevant. These include responses which indicated more than one response, claimed that they were all main characters or indicated abstract ideas like “connections” or “humans.” These survey responses were not particularly quantifiable.

Table 1*

Response	Virgil	Spindler	Alice	Iceman
Number of Responses	27	8	49	33

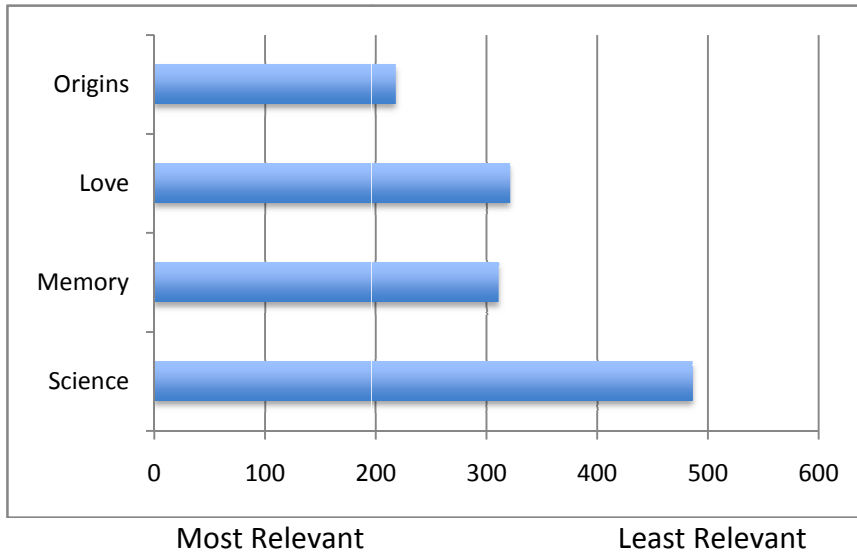
*Sixteen participants did not respond to this question appropriately.

The sum of the rankings for the four different theme options for the production constitute the data set for the responses to the second question of the survey. The values were simply added; meaning that the lower the value the more prominent the theme. Table 2 shows the raw sums for the responses, which are then graphed onto Figure 1 for a visual representation. The closer the bar is to the vertical axis of the graph the more relevant the audience considered the theme. All surveys completed had appropriate answers; only one participant abstained. An interesting result was that 76.3% of the audience believed that “science” was the “least important” theme in the show and only one person of those surveyed (<1%) deemed it the most important theme of the show.

Table 2

Theme	Origins	Love	Memory	Science
Sum of Responses	218	311	321	486

Figure 1



*Fifteen participants did not complete or gave non-repeated answers to this question.

Owing to a printing error the third question was printed without options for a setting for the play. The responses to the third question, which was open ended, fell into mainly three categories. While no answer had a majority, 47.4% of the audience claimed the principle setting of the play was “Europe.” This category includes responses such as the naming of a specific town or country on the continent of Europe. Of those surveyed, 28.7% said in an ambiguous or a particular character’s memory, mind or brain, and 14.3% believed it was set in a research laboratory. 11.2% of responses were not quantified because there was no response or an answer that had no other responses that matched, including “a theatre” and “the connection between the cell phones.”

Table 3*

Setting	“Europe”	“A lab”	“The mind/ Memory”
Number of Responses	62	19	37

The fourth question on the survey asked whether or not science and theatre are compatible fields. An overwhelming majority (90%) believed they were compatible fields, whereas only 6% believed they were not compatible and 4% abstained. The nature of the question, as an open ended and opinion-based question, lead to some ambiguous answers, but if the response mentioned any sort of similarity between the two fields, the answer was considered to be “compatible” for the sake of the study. The second part of the question asked respondents to give their reasoning behind their response; commonalities between these answers will be elaborated on in the discussion section of this report.

Table 4 *

Response	Compatible	Not compatible
Number of Responses	120	8

*Five participants did not complete this question.

The fifth question asked which characteristics of a science play were present in this production of *Mnemonic*. All of the elements on the list were selected as present by the majority of those who responded to this question on the survey. The audience substantially agreed both that “science is not just a plot device” and that “the science within the play informs the performances of the actors” by 79.5% and 74.8% respectively. The audience selected that the “main scientist character (Spindler) was not ambivalent” by 55.9%. Lastly, by only a difference of three participants, the audience believed that the “technical elements in the show should reflect the scientific themes” of the production.

*Table 5**

Characteristic	A	B	C	D
Yes	92	71	65	101
No	35	56	62	26

*Six participants did not complete this question. The following are the tested characteristics of a science play. A) The science within the play informs the performances of the actors B)The mains scientist character is not ambivalent C)Technical elements in the show should reflect the scientific theme D)Science is not just a plot device.

After a description of the characteristics of a science play the audience was asked if this production of *Mnemonic* could be considered a science play. Unfortunately, forty-five (33.8%) of those surveyed did not answer the question. Of those who did respond, over three-quarters (76.1%) believed that *Mnemonic* met the requirements to fit into this genre. The remaining 24.9% believed that it did not or were not sure of their opinion, but did respond.

*Table 6**

Science play?	Yes	No
Response	67	21

* Forty-five participants did not answer this question.

The survey also included the option for those who wished to include any comments that they felt were relevant or necessary on the back of the form. The majority of these comments were simply compliments to the production staff and actors, but some comments were relevant to the questions of the survey and the topic of this thesis. Those that were helpful or interesting will be included and considered in the discussion section of this thesis.

Discussion

Originally, it was hypothesized that if Spindler was “not ambivalent,” then he would play an integral role in the play and be ranked as the main character in the play. The hypothesis was not fulfilled because a very small percent of the audience chose Spindler as the main character, even though the majority of the audience did agree that he was not an ambivalent character. One of the major reasons for this may have been the fact that Spindler’s name was not actually mentioned in the script and people may not have associated the name with the character. In contrast, Alice is addressed by Virgil many times. Although speculation, the questionnaires showed a small increase in the belief that Spindler was the main character in later performances when some references to his name were added. Those who believed, or supported those who claimed, that Spindler was the main character believed that they “saw the human side of him,” which led them to choose him as a main character. Multiple people pointed out the lines that were reassigned to Spindler that originally belonged to Virgil as questions that helped them identify with Spindler. They, themselves, would have been ambivalent, as in not feeling for him, to Spindler if not for his interest in the human side of the science. Another reason though, may have been the other characters taking away from him owing to factors identified below.

During talk back sessions the first person named each night as the main character was consistent with the survey results as the character “Alice.” The general consensus on the reasons stated was that she was the main character because she was “the one that moved the plot along” and “the majority of the other

characters in the play were touched and affected by Alice.” This result was potentially the most surprising in this study. Alice does not show up and in the play until scene thirteen and exists mainly in Virgil’s memory. The major change in this production compared to the original production was that originally the majority of Alice’s lines were recorded instead of spoken by the actress who played Alice. In this production the audience may have identified with Alice more because of her almost comparable stage time to Virgil and Spindler and having potentially the greatest amount of lines in the show. Another contributing factor was potentially the blocking which staged her listening to multiple phone messages and telling her story down stage center. This position is easily one of the most prominent locations onstage and may have overemphasized her story line from the perspective of the audience. Potentially using more recording and changing Alice’s blocking, while putting Spindler in more of her positions onstage may have aided in fulfilling the hypothesis.

One of the more surprising results was that so many people pinpointed the Iceman as the main character. A character who does not speak or really even move could rarely be considered a main character in any play. During the talkback sessions the audience argued that the Iceman was “a central character in both story lines.” One audience member believed that the whole play was the Iceman’s story because of the obsession that two characters engulf themselves in his story. Another audience member claimed that the Iceman “made the biggest change” within the show. They perceived the revelations about the iceman’s life and the staging of the Iceman’s death at the end of the play (see below photograph)

indicated a change and an importance to the character. Multiple people brought up in the talkback sessions and on the back of the surveys that it is the “human element” of the Iceman that makes the Iceman the central character. The ending of the play really supports this idea when Alice (and Spindler in this production) says the lines “What does nakedness remind us of? Dear God, what does nakedness remind us of?... There is nothing innocent about the naked. only the newborn are innocent. when we see a naked body of any age we remember our own, putting yourself in someone else's position. In the gully, for example, 5000 years ago.” Then each of the actors took the position of the Iceman on the table reemphasizing the idea that Iceman represents many people. This leads to an interesting idea of Spindler taking on the role of the Iceman when Virgil is contemplating him. The popularity of the Iceman as a main character may have shifted more emphasis on Spindler as a character, if they were more associated.



One of the final tableaux of the show, right after Spindler and Virgil describe the death of the Iceman to Alice. (Picture Clockwise: Dan Plehal (Spindler), Beth Fagan (Alice) and Chad Murla (Virgil))

Unfortunately, no data for the first production of *Mnemonic* exist that would sufficiently answer the questions being studied here, but one may predict that the

audience could conceivably have chosen Virgil overwhelmingly as the main character for multiple reasons. The first are the aforementioned reasons that would downplay Alice's importance (virtually none of Virgil's lines were pre-recorded). The role of Virgil was also played by the popular director of *Complicite*, Simon McBurney, who also delivered the opening speech of the play. Both this early introduction and star power may have lead the audience to believe that he was the main character. Those who named Virgil as the main character of the Second Season production said they believed he was the main character because "he was who [they were] introduced to first" and that he is the "most affected by the story of the play." This probably means he is one of the more dynamic characters displaying many emotions and internal conflict throughout the play.

The fact, as well, that Virgil can conceivably also be the "Iceman" may have an effect on how he is perceived by the audience. He is very important in both story lines, and the one who connects the two through his obsession with Alice's and the Iceman's stories. The actor who plays Virgil is present in both story lines, and plays both characters virtually at the same time, becoming a universal presence and an obvious choice for main character. Again, if Spindler had taken part in playing the role of the Iceman, maybe his role in the Virgil/Alice storyline may have helped make him a more obvious choice for the main character.

The surveys showed that 100% (8 respondents) of the respondents who believed Spindler was the main character, also believed he was not ambivalent. This of course should be no surprise and helps to support the hypothesis of the two facts being connected, but unfortunately the sample pool was clearly not that large. An

even more interesting cross-comparison was that 69% (23 respondents) of those who believed that the Iceman was the main character also believed Spindler was not “ambivalent.” This may show a strong connection between Spindler and the Iceman which may show the importance of Science in the play over the Scientist.

The idea that the subject of the science is a more important character in this “science play” than the scientist is an interesting point to consider here. Spindler and Virgil stories would not exist or be severely lacking if it were not for the character of the Iceman. Another example of a play that does this is *Inherit the Wind*, where the science is under great amount of analysis and debate and acts as a character itself. A foil to this is Durrenmatt’s *The Physicists* where “the scientists” (actually mental patients) are the main characters, but the science is not very present, resulting in this play being considered more of a precursor to the science play than a true one by Shepherd-Barr. This will be discussed later, when identifying what tenets of a science play were present.

The hypothesis of the second question claimed that the theme of science would rank highly among the themes if it acted as more than a plot device. It failed, as well, since the theme of science ranked considerably lower in importance than any other theme, even though the audience overpoweringly agreed that science was not simply a plot device. Multiple times throughout the talkback sessions participants mentioned that science itself was not a very strong theme in the play since it was not particularly under question throughout the play like origins and memory were. Instead, it was a tool by which the themes were unraveled. If the science were not present, neither of the aforementioned themes could be explored

adequately. For example, Spindler's entire approach to getting his answers would be non-existent without science. Simon's description of memory would be incomplete without the knowledge of neurons and synaptic connections being conveyed to the audience. The science in this play helps elucidate its other themes of origins and memory.

An example that uses science as a tool to elucidate non-scientific themes is Shelagh Stephenson's *An Experiment with an Airpump*. The play interweaves two story lines that both take place in the same house two hundred years apart. The stories are set at the turn of the 19th and 21st centuries. The early story deals with the dilemmas of using cadavers as a means of exploring human anatomy. It eventually leads to the murder of a deformed housemaid in order to examine her. The second story deals with a female geneticist and her ethical struggle with the use of embryos in stem cell research. The two story lines intersect when the family finds the skeleton of the murder victim in the basement in 1999. The play uses science as a way of exploring the themes of gender roles (both in science and the household) and the value of human life when used to make both scientific and personal gains.²⁷

It may be that science is not a theme of *Mnemonic*. One may even question if "science" could be a theme of a play. It may be far too broad and too esoteric of a concept. Science has themes within itself like memory, origins, genetics, ethics and chaos. These themes are things that drama could (and does) explore, but not as wide as science itself. Science is the tool that is used to convey these and even more

²⁷ Shelagh Stephenson, *An Experiment with an Airpump*. (New York; Dramatist Play Services, 2000)

themes. These themes may not even be scientific in nature (like gender roles) but the science acts as a vehicle to elucidate them to the audience. During the talkback sessions and on some surveys the idea of “science” as a theme was rejected on multiple occasions. In some cases it was highly objected to as a theme. The other themes that were included in the survey were either subjects typical to literature such as love, and themes very specific to the play like memory and origins. The theme of science is not a common theme and too broad to have been specific to *Mnemonic*.

Origins, to no surprise, was the most important theme according to the audience. This theme would most likely predominate because Spindler and Alice are both looking at their origins, just 5000 years apart. The fundamental question of the show is “where do we come from?” At least half of that question is answered using science within the show. The origins are a subject of the science at work here, thus it may still be part of the most relevant theme of the show. The play has a much more specific theme which is how we assign almost seemingly pointless objects a meaning. Alice and Spindler both do this throughout the show. They piece together their “pasts” by assigning deductively reasoned uses to objects like a shoe, a lighter, tufts of grass and a broken stick.

The second most popular theme was memory, which may be a flaw with the show. The show, a part from the opening speech, has very little to do with memory. There are memories within the show, but in fact Virgil imagines the majority of Alice’s “memories” which the audience sees. This was probably picked as a theme due to the leading nature of the title of the show and the opening speech.

The opening speech also sets up the theme of connections within the play. Originally, the concept of this question was to prove that “Love” was not a major theme in this play, but a mistake was made by making the option “Love/Relationships.” This led the audience to think about the connections between all the characters and the rest of the world, which is established in the leaf exercise at the beginning of the play. The audience was very keen to discuss the theme of connections during the talkback sessions. One audience member believed the show was “about genealogy and how we are all related...this was established by the last moment of the show where everyone became the Iceman.” The word “relationships” overshadowed the word “love” in this situation and should have been left out of the survey, if it was going to function as a counter to the other themes. This general thought is probably what led to this being a more popular choice as a relevant theme within the play than “science.”

The third question’s hypothesis claimed that if the technical elements elucidated themes of the play, then a large number of audience members would identify “the lab” as the setting. The hypothesis did not hold steadfast, though, as “the lab” ranked third among locations. Unfortunately, due to a printing error, the choices for the third question did not make it onto the survey. The error was noticed too late into the process, but the data will still be analyzed and interpreted. The appearance, though, of some of the options that were originally planned as the main answers, may indicate a successful use of technical elements to help reflect the scientific nature of the show. The other answers that were popular may help to prove this fact.

The number of audience members that claimed that the setting of the play was a laboratory would have been considerably lower in the original production. In fact the original setting definitely reflected multiple setting much more, including Virgil's bedroom with a bed, sink and mirror on the set and the mountain with a rock. The setting for the William and Mary production was much more bare and included plastic all around to give the stark and sterile feel of a laboratory. Industrial shelves on which props and costumes were packed in storage boxes that you would find in an academic/office type setting and the row of stools along the top platform where the scientists sat gave a laboratory feel as well. One audience member wrote on the survey of the operating theatre setup that "it helped to elucidate the observational, yet active role the audience played with the production." Another audience member identified most with the scientist characters because of the scenic design. She said "We are also scientists in this equation" which was the goal of the setup, to ask the audience to be like the scientist ensemble by being observers, but also think about what they are seeing.

No technical elements actually lead to "Europe" as a setting for the production (e.g. flags or architectural references). The answer of "Europe" is the simple answer and may be the answer for those not willing to decide on one location. This question is simply script based and does not necessarily correlate to this production. This may indicate another flaw with the survey. The question was phrased as "where is this principal setting of the play?" which may have lead the audience to only think about the story. With the phrasing of the question as "where is the principal setting of this production?" then the results may have leaned more

towards “the Mind” or “a laboratory”. The play itself has many settings, but the production did aim to invoke an atmosphere of a science laboratory. The large percentage of those who responded with the answer “Europe” probably reflects the ambiguity of the question.

Those audience members who immersed themselves in the play’s analytical nature were more likely to be the ones who responded with the answer “the Mind” or “Memory.” This more abstract response fits very neatly with the title of the show and a setting that would be familiar to a show of this style. This inspired questions about how people treated the survey and their responses. It showed that of those who responded with the answer “Europe” only about 53% (33 respondents) filled out the free response questions with more than 2 sentences and/or commented on the back of the form. In contrast, those who said “lab” commented at a rate of 63% (12 respondents) and mind at 71% (26 respondents). This shows the people who answered the non-text identified answer showed a bit more thought in their answers.

The audience, during the talk back sessions, identified the neuronal pattern on the curtains of the set as a key feature in making the mind a location. Another interesting comment came from an audience member who claimed that the lighting aided in drawing this conclusion. He said the lights “popping around” from scene to scene “like the mind can pop around picture to picture.” The idea of “the mind” as a setting may help support the concept that the technical elements of the play should reflect the science as well.

This should be considered a successful portion of the experiment since a fairly substantial group named the lab as a primary location and if one were to consider the mind “scientific” then a majority of people named a “scientific” setting. It may have been a more popular choice if the choices were available on the sheet it may have seemed like a more plausible conclusion to some people. Also, if the table had been completely metal, stools used instead of chairs and more “lab” like set dressings (e.g. Computer, microscope etc.) then the set may have been even more reminiscent of lab setting. If the lab had been even more apparent then even more people may have agreed that the technical elements reflected the scientific nature of the play, then it may help to support the concept that technical elements can help quantify a “science play.”

The fourth hypothesis stated that if the play integrated the two fields well, then a majority of people would agree that the fields are compatible. A very overwhelming portion of the audience agreed that science and theatre are compatible fields, therefore the hypothesis was fulfilled. One could deduce that the play integrated them successfully, but a question on the survey would have been a better approach to validating this. The responses ranged from “sure” to intricately crafted paragraphs that leaked onto the back of the form. Of those that said they were not compatible fields, two main concerns were voiced. These two concerns were based in the misconceptions of science’s indifferent approach to subjects, and what is being investigated and argued for in this thesis.

The first concern supported the misconception that the fundamental difference between science and theatre lies in the way they quantify what they

explore. Some respondents claimed that those observing science are subjectively doing so and science is observed objectively. In actuality though, neither of these are the complete case. Brecht believed that by alienation effect in theatre, the audience could objectively view a play and come to the same conclusions as the person sitting next to them. Science, on the other hand, is not free of personal views. A perfect example lies in today's debate about global warming. Science has shown that there has been an increase in worldwide temperatures and that cfc's have created a greenhouse effect in our atmosphere. Science has also shown that the world goes through natural fluctuations of average temperatures. Those who want to believe in global warming being caused by human activity believe it and those who do not believe it choose to do so. Science, even with its goals of objectivity, is not free from the subjective human mind.

The second major argument for the incompatibility of science and theatre claimed that there is very little reciprocity between science and theatre. They believed that theatre can obviously present science, as in *Mnemonic*, but did not understand how science could address theatre. Recent research, though, suggests that this is not true. According to Sharon Carnicke in her book *Stanislavsky in Focus* multiple situations where people are using science to study acting, specifically link Stanislavsky's "Method" to studies on Post-Traumatic Stress Disorder. Susana Bloch, as another example, did research at the *Institute de Neuroscience* on breathing patterns and emotional expressions to develop her acting training program called

“Alba Emoting” which uses six basic emotions to train the actors and the different degrees of each that make up another emotion.²⁸

The overwhelming number of people who agreed with the compatibility of science and theatre had a wide range of reasons for believing so. Many surveys said that science can connect to any subject, and included theatre in that. Yet, the most universal theme of the surveys was that about 2/3's of those who replied yes and expanded on their answer used the word (or some derivation of) “exploration.” They said that both explored the human condition, questions that need to be answered and the world.

The fifth question was multiple parts and hypothesized if the audience believed that the tenets of a science play were present, then a majority of people would agree that *Mnemonic* belonged in the science play genre. The tenet of the “science” that was most present, according to the audience survey, was that the science in the play acted as more than “a plot device.” As mentioned by Shepherd-Barr and inquired about in the survey, the science in the play is not simply a plot device. It may be that science may play a “character” within the play. The plastic nature of science, especially within plays that explore it, make the science within the play dynamic like a character, like the point that was raised about the Iceman changing the most. This “character” is obviously not a traditional character, but could act like an allegory as a character within a play. Ultimately, theatre is a humanity, like sociology, literature and philosophy, and leads to the greater understanding of humans which seemed to be a requirement of the audience

²⁸ Sharon Carnicke, *Stanislawski in Focus*. (New York: Routledge, 1998) 164-166.

because they felt it important to connect with both the Iceman and Spindler on a human level, so by making science a “character” this humanizes the science within the play.

The second most prominent characteristic of a science play was that the science within the play informs the performances of the actors. Many people believed this because one of the most memorable and highly complimented moments of the play was the repetition of what is referred to as the “neuron” movement. This, though, could also have been where the play failed the most to truly display this element of a science play. The role of memory within the play, although questionable, should have been better defined by the actors. It would have been better to repeat a motif of the “neuron movement” every time a memory happened. An example of this was during the story of the BBC man there are two distinct scenes each being viewed in the memory of a different person, one from Virgil (which includes sex) and one from Alice, which includes giving away a gift from Virgil. If the “neuron movement” had been performed between Virgil and the BBC man and then Alice and the BBC man the audience would have seen the characters in the different frames of mind from the different characters and it may have emphasized the few, but important memory moments within the play. There were also moments when the “scientists” could have been scientists and were not simply for the ease and flow of the show. Had there not been any moments where the actors were not a scientist or a character then the number of people who agreed with this may have been higher.

The third most agreed upon present characteristic was the non-ambivalence of the main scientist character. As aforementioned, the human characteristics that Spindler showed were those that made the audience not ambivalent towards him or him towards the rest of the play.

The most controversial and least obvious element of the characteristics was whether the technical elements reflected the scientific elements of the play. The audience was split in about two perfect halves on this subject. The reasons behind this may have been due to confusion about the role of the curtain. The curtain was open and shut at specific times that represented particular memories, but owing to logistics the curtain use was not optimal. Also, the sound could have been more effectively used to convey the sounds of a laboratory when establishing the location pre-show and used to initiate memories of different locations like the bar and train. It is well known that sound can greatly aid in recall and it would have helped to start the sounds before technical rehearsals began. Unfortunately, this production of *Mnemonic* struggled with maintaining lighting and sound designers, so other elements besides the set were difficult to integrate into the scientific nature.

The final question of the survey was unfortunately the least responded to even though its intent was to serve as a culmination point for the rest of the survey. This may have been because it was a difficult question to see on the survey, owing to its location at the bottom of the page and at the end of a sentence. It was also accused of being a poorly formatted question since the audience was not “familiar with the genre.” Support for the question though is that some elements of a science play were the only thing that was asked to be considered as the “definition.” With

more than three times as many responders believing that this is a science play, then one must conclude that it is one. It was interesting to see the different qualifiers that people chose to use when answering the questions. Some people only checked one element as being present and believed that it was a science play and some people checked three and chose not to respond. This question may have been inherently flawed because it may have lead the majority of those surveyed to answer in a certain way. It is impossible to really get people to answer a question about fitting into a category if the category is not well defined.

The survey was a fairly successful way of collecting data on this research project. In general people were eager to give well thought-out responses and put time into the survey. The easier part to use though, in helping to form these ideas was the talk back session it is much easier to discuss theatre than too quantify it. On one of the surveys a respondent wrote: "Science and theatre are not compatible. Some things, like theatre, need not be quantified. " Yet, how can we attempt to characterize something without at least attempting to quantify it? It may be impossible to define a genre such as a "science play" because there are always exceptions. Even in science a lot of exceptions exist like fish with lungs, mutant strains of bacteria and inert gases that do not react, but it does not mean that quantifying the others was a waste of time.

Conclusion

Antonin Artaud said in his canonical work *The Theatre and Its Double* that "there is enough chance magic, enough poetry which has no science to back it up. In

the theater, poetry and science must henceforth be identical.”²⁹ He claims that theatre is contrived and that emotion, having an organic basis allows for particular stimuli that an actor can do to stir up that emotion, as opposed to haphazardly trying to summon it. He, like Brecht, Meyerhold and Zola, have all expressed interest in where the intersection between science and theatre lies.

This thesis concludes with the search for this intersection still not completely discovered or defined. The idea of science is an intriguing one, and gives many different disciplines and concepts a sense of validity, so of course many theatre theorists have been attracted to it. Plenty is theorized on and is only “pseudo-science,” but there some approaches truly begin to verge on the side of true science (or as much as a humanity can include science). The concept of a “science play” may be one of the steps that needs truly to be taken in finding this intersection.

The use of the survey lead to many conclusions, mostly only significant for this particular project, but the research does speak to the nature of the connection between science and theatre. Unfortunately, like any modern genre no steadfast rules prove definitive. The attempt then is to help to characterize the plays that are “science plays” and not simply “plays about science.” The survey and talk back sessions, along with historical research came to two main conclusions.

First, the science within the play must inform the majority of the decisions made within the play Those decisions are made not only by the playwright, but also by the actors, the director, the designers and the audience. . Questions about plot, character, theme and design choices on the survey helped to lead to the conclusion

²⁹ Antonin Artaud, Trans. Mary Caroline Richards. The Theatre and Its Double, (New York: Grove Widened, 1958.) 72.

that science simply cannot serve solely as a plot device. The science itself is a living character within the world of the play. The science is a dynamic character, changing, receiving focus by other characters and helping to give focus to others. This is particularly important if a scientist character is present. That character cannot simply play the stereotypical, inhuman scientist. Instead the audience need to see the human side of the scientist as well. In order for the a “humanity” such as theatre to integrate science, the “science” also needs to integrate the “humanity” into itself. Finally, there needs to be more inclusion on the role that the design elements play into all of this. They are an important part of theatre and, especially if present, they also need to help support the science within the play. This may be by giving the set a scientific location, or the lights or sound emulating a particular theory that is being explored. To summarize, the science in the play is essential, and the play cannot stand on its own without science integrated structurally, thematically, character-wise or design-wise.

These two seemingly opposite fields have weaved in and out of each other for decades, but why do they work well together? At the basis of many pieces of theatre is a good story, but a good story is also at the basis of science as well. Both historically and actually within science are emotions, reactions, conflict and consequences. The story of Isaac Newton and the apple falling on his head could make a good play, but a great play could be written about it taking into consideration the forces that that are opposing each other when that apple fell, and the metaphor it could establish about opposing forces of science and common

thought. “Gravity” could act as a character in the play as he discovers the weight of what he is hypothesizing. Science is made up of uncertainties and so is a good play.

Film and television portray science as science fiction more readily than theatre does. The capabilities of special effects in film are of course much greater and may be what lead to this trend. Even television’s *House*, which has been hailed for its integration of the medicine into the show relies on high tech computer graphics and the narrative is primarily a medical mystery story, while the science gets barely fifteen seconds at a time. Yet, another basic argument of this is that popular film and television reach very different audiences and do so in very different ways. Audiences, in general, who attend plays are looking to be engaged and stimulated by a cultural experience, whereas people flick on the television to relax or kill time. Theatre is more expensive than film, and calls for a deeper vein of thought. Theatre takes the time to really delve into the science and integrate it more deeply into the story. This is possible because a dialogue that happens between the audience from theatre and actors in theatre does not happen in these other media. This makes it easier to specifically convey particular concepts to the audience.³⁰

In 1959, Charles Percy Snow, a well-known physicist and novelist gave a lecture at Cambridge University entitled *The Two Cultures*. He spoke on the cultural divide that he has noticed between “intellectuals” (literary experts) and scientists. His experience in both fields made him feel as though “[he] was constantly moving between two groups—comparable in intelligence, identical in race, not grossly different in social origin, earning about the same income, who had almost ceased to

³⁰ Shepherd-Barr 95

communicate...who had so little in common, one might have crossed an ocean."³¹

He assigns the "fatal" problem to the increasing amount of specialization in education. He warns the audience, fearing it is too late for his generation:

At the heart of thought and creation we are letting some of our best chances go by default. The clashing point of two subjects, two disciplines, two cultures—two galaxies, as far as that goes—ought to produce creative chances. In the history of mental activity that has been where some of the breakthroughs came. The chances are there now. It is strange how little of twentieth-century science has been incorporated into twentieth century art...[Science] has got to be assimilated into the whole of our mental experience.³²

In the proposal for this project, one of the major goals was to really complete a liberal arts education at a school of Arts and Sciences. To be completely educated, though, neither arts nor sciences can stand on their own. They may go together, but at their best they are complementary. They do stand on its own, but are most interesting when they are combined. The goal of this project was to produce a play that could hopefully combine these two subjects, and I believe *Mnemonic* did.

³¹ C.P. Snow, *The Two Cultures. The Two Cultures: and A Second Look.* (London: Cambridge University Press) 2.

³² C.P. Snow 16.

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Appendix A

1. Who is the main character of the play?
 - a. Virgil
 - b. Spindler
 - c. Alice
 - d. Iceman
2. Please rank the themes in order of importance within the play. (1 most important 4 Least important)

_____Science	_____Origins
_____Memory	_____Relationships/Love
3. Where is this principal setting of the play?
4. Are theatre and science two compatible fields? If so what are do they have in common? If not what are the major differences?
5. Characteristics of a science play are:
 - a. The science within the play informs the performances of the actors_____
 - b. The mains scientist character is not ambivalent_____
 - c. Technical elements in the show should reflect the scientific themes_____
 - d. Science is not just a plot device_____

Please check which element(s), if any, are present in this production of Mnemonic. With this description in mind, is this production a “science play”?

Please feel free to include any comments on the back of this form.