

ABSTRACT

CROWDUS, CYNTHIA MARIE. *Copenhagen: A Brechtian Play*. (Under the direction of Patricia Lynn.)

The purpose of the essay is to indicate the Brechtian elements of Michael Frayn's *Copenhagen*. *Copenhagen*, thus far, has been considered in relation to an emerging genre of the science play. This essay departs from other scholarship in that it shows the ways that *Copenhagen* works in the Brechtian mode, which is far from new. This essay offers an examination of Frayn's methodology in relation to Brecht's. Frayn's play is both episodic and non-cathartic. It also uses stage design and acting techniques to further the themes of the play. It uses the technique of integrating form and content. Furthermore, it employs the alienation technique. This essay also shows the ways in which the goals of Brechtian theatre were accomplished through *Copenhagen*. Frayn's play is didactic. It offers a moral and intends to create an actively engaged and critically aware audience. It teaches in the way Brecht would have the theatre instruct. In addition, this essay offers evidence of accomplishing results. It notes the reactions from literary scholars, scientists, historians, and others.

COPENHAGEN: A BRECHTIAN PLAY

By
CYNTHIA MARIE CROWDUS

A Master's thesis submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements of the Degree of
Master of English

ENGLISH

Raleigh

2003

APPROVED BY:

Dr. Christopher Cobb

Dr. Nick Halpern

Dr. Patricia Lynne

Chair of Advisory Committee

Biography

Cynthia Crowdus was born in Pensacola, Florida. She received her Bachelor's of Arts in English from the University of North Carolina at Charlotte in 1997. She has obtained her Master's of Arts in English from North Carolina State University. She may set out to travel the globe briefly before attempting to conquer the world. She may not.

Acknowledgements

The inspiration for this paper came from the enthusiasm and scholarship of Dr. Shepherd-Barr who introduced me to the genre of the science play and to *Copenhagen*.

I would like to thank Dr. Patricia Lynn for all of her guidance, patience, advice, and moral support. Patricia, you have been wonderful. Thank you.

I would also like to thank my parents, Jerry and Karen Crowdus, for their constant support and encouragement. They are the foundation of all of my accomplishments.

Finally, I would like to thank my friends Mary Dowd, Ashley Pinkston, and Michael Reily for being my family here in Raleigh, NC.

TABLE OF CONTENTS

INTRODUCTION.....	1
OVERVIEW OF BRECHT.....	9
SUMMARY OF COPENHAGEN.....	23
ROLE OF THE SPECTATOR.....	26
COPENHAGEN EMPLOYS BRECHTIAN METHODS.....	28
COPENHAGEN IS DIDACTIC.....	33
THEMES USED TO TEACH MORALS.....	42
EVIDENCE.....	52
WORKS CITED.....	59
WORKS CONSULTED.....	61

Copenhagen: A Brechtian Play

The first stages of this essay and its underpinning thoughts began shortly after attending a production of *Copenhagen* at the Royale Theatre in New York, 2000. As many of its reviewers and critics have been, I was struck by the complexity and implications of this play. Subsequent graduate seminars with Professor Kirsten Shepherd-Barr of NC State University, who also shared her research and manuscripts with me, introduced me to scholarship about an entire genre or subset of ‘science plays’¹. The following year she taught a graduate seminar “Science on the Stage” in which we took a closer look at *Copenhagen* and other plays that concerned science. We took under consideration the fact that, in the past decade or so excepting a couple of isolated earlier plays, such as Bertolt Brecht’s *Galileo*, there has been an emergence of plays related to science. This phenomenon fascinated me, and I found myself endlessly curious about this new trend. My questions mostly centered around two main inquiries: “Why are these science plays emerging now, and what does that say about Western culture today?” Due to the extraordinarily large scope of these questions, I found myself needing to take pause and began by assessing one of the most successful plays in this genre. This turn took me to the play that, for me, inspired it all, Michael Frayn’s *Copenhagen*.

In the theatre, a *mélange* of science, epic drama, and epistemology has created what is being heralded as a new dramatic mode of playwriting and performance. Much thought and critical attention has been given to a consideration of what are being called “science plays”. To name a few, these plays include such works as Tom Stoppard’s *Arcadia*, Fredrick Durrenmätt’s *The Physicist*, Brian Friel’s *Molly Sweeny*, and Michael Frayn’s *Copenhagen*—the central focus of this essay. Scholars have deliberated over

these plays both as individual plays and as a group, attempting to classify or pin down a subset or new genre of plays. In this vein, Shepherd-Barr, who offers a definition of the mode of playwriting that is the science play, notes:

... what emerges as the singular contribution of science plays is, I think, that the best ones successfully employ a particular scientific idea or concept as an extended theatrical metaphor. They literally *enact* the idea that they engage... The extraordinarily thorough integration of real science into the texture of the play is one of the defining characteristics of good science plays—successfully harnessing a theatrical language to a scientific one... A final characteristic that I think is worth noting about science plays in general is their unusually wide formal spectrum; the sheer range of styles and structures is truly amazing. (Sigma Xi Conference 2-3)

She and other scholars pursuing this niche of dramaturgy for study have noted that the successful science plays integrate the scientific ideas as metaphors and as a structural backbone.ⁱⁱ The integration works on two levels: on one, the science is the driving theme in the play; on the other, the science is represented through the very structure of the play. On the first level, the playwrights stitch the science into the fabric of the text and into the thematic considerations of the works. The play really engages the ideas behind the applied scientific theories or principles. The dialogues then consider not only the facts of science but also the ways in which science is an integral part of everyday lives and thus of the themes and discussions within the play. In other words, the science acts as metaphor for themes in the plays.

The second level is one explored by most observers of *Copenhagen*. The integration of form and content drives the play because it visually represents the scientific ideas and scientific inquiry and thus illustrates those ideas in a way that mere dialogue cannot. It creates another dimension through which it can teach the scientific idea, to make clear the principles by illustration. In addition to Frayn's work in *Copenhagen*, playwrights such as Durrenmatt and Stoppard employ this technique

In addition to this particular definitional interpretation of science in the theatre and other commentary that notes theme and structure, there are also works that take particular scientific themes that potentially tie these plays together. *Dramatists and the Bomb* by Charles Carpenter is one such work that sets out to classify and understand science in the theatre by locating scientific commonalities. For example, Carpenter analyzes plays such as Hallie Flanagan Davis's $E=mc^2$, Dorris Lessing's *Each his own Wilderness*, and Lorraine Hansberry's *What Use are Flowers?* However, Carpenter locates often-obscure works that, while concerned with science (the atomic bomb), have not had the impact that plays such as Frayn's *Copenhagen* have had. Thus, his findings do not fully account for this new wave of successful plays.

Approximately half a century after the atomic bomb, in this new millennium, playwrights are able to write plays that concern not only the repercussions of the bomb but also the possibilities of both old and new sciences and the effects of science in society as a whole. In addition to works that concern a particular crux in history, some science plays relate key concerns, such as the possibilities allowed by scientific advancement, scientific accountability, political involvement with scientific advancements and technologies, and so forth. These plays include Friel's *Molly Sweeney* and Timberlake

Wertenbaker's *After Darwin*. Among all of these science plays, Frayn's *Copenhagen* has received, by far, the most public attention.

Within the past several years, there have been conferences, symposia, and published, scholarly deliberation over *Copenhagen* and the emergence of other plays that are concerned with and reflect on the role of science in society. Published and produced in 1998, *Copenhagen* has attracted the attention of many and diverse audiences, from historians to literary scholars to scientists.

There are two published articles concerning this play and its place in historical criticism: "Copenhagen' Plays Well, at History's Expense" by Paul Lawrence Rose and "A Historical Perspective on Copenhagen" by David Cassidy. Rose's main contributions to the debate are these points: the facts are clear though Frayn is refusing to acknowledge them, and Heisenberg should have never been in any way compared to Bohr in moral standing. Rose is one who believes that, first of all, there is such a thing as precise historical accuracy; second, that that accuracy should come first and foremost on a playwright's agenda.

Cassidy offers a similar stance on *Copenhagen*. He criticizes the lack of historical scope in *Copenhagen* and emphasizes his assurances that an inclusion of more historical indicators would have given the play the certainty it lacks. Cassidy argues that, with proper scrutiny of preceding behavior and actions, one could deduce from those events the probable occurrences in *Copenhagen*. He contends that Frayn has made the error of too narrow a scope of history. But in his role as historian, he narrows his own vision of this play and fails to fully consider that Frayn did not intend to settle the historical debate; instead, he wrote this play about the indeterminacy of the situation. He was not writing

history; he was writing a dramatic work. Regarding this sentiment, Frayn addresses the historians in his “Post-postscript: “The play turns on the difficulty of determining why Heisenberg made his trip. For a number of commentators there was no problem at all—they knew the correct explanation for certain; though what that explanation was varied from one to another” (1). It is precisely this kind of uncertainty that sets up this play and that helps to fuel the ongoing discussion of it. .

In addition to the published historical responses, there have been numerous symposia held, the most noted being the London and Danish symposia of 1998, the New York symposium of 2000 and the recent Washington D.C. symposium held March, 2002. There are also numerous symposia springing up in smaller cities such as the one organized by Kirsten Shepherd-Barr held in March 2002 in Raleigh, NC. The subjects of these symposia concern the merging of science and literature. At the symposia, literary scholars, historians, and scientists have come together to discuss the implications of this play. They have each approached the analysis of *Copenhagen* with the influence of their own fields. *Copenhagen* has also been considered at literary conferences, such as the Vancouver Convention of 2001 and the Southern Comparative Literature Association conference of 2001. In fact, this play has received so much public interest that Frayn has written a post-postscript in response to the response *Copenhagen* has received.

Yet despite this widespread interest, there are only six published literary scholarly articles—Victoria Stewart’s, “A Theatre of Uncertainties: Science and History in Michael Frayn’s ‘Copenhagen’”; Robert King’s “The Play of Uncertain Ideas”; August Staub’s “The Scientist as Byronic Hero: Michael Frayn’s *Copenhagen*”; Nick Ruddick’s “The Search for a Quantum Ethics: Michael Frayn’s *Copenhagen* and Other Recent British

Science Plays;” Kirsten Shepherd-Barr’s “Science as Theater;” and Christopher Innes’ “Science on Stage” —and two forthcoming articles, Shepherd-Barr’s “*Copenhagen* and Beyond: The ‘Rich and Mentally Nourishing’ Interplay of Science and Theatre” and “*Copenhagen*, Infinity, and Beyond: Science Meets Literature on the Stage.”

In the first published article on *Copenhagen*, Stewart posits the claim that the function of the science play is to contribute to a dialogue between the sciences and the theatre. She discusses the scientific metaphors and explains that Frayn uses these metaphors in order to make an analogy between scientific discovery and the theatre. She remarks on the ways *Copenhagen* has succeeded in playing out its own thematic elements by making the parallel between the uncertainty of a scientific experiment and the uncertainty involved in the “experiment” of the theatre. She points out the link between science and theatre that Frayn makes by use of enacted metaphor. This is precisely the idea noted by many others who take *Copenhagen* under consideration: the use of enacted metaphor is one of the traits of this play that has contributed to its success.ⁱⁱⁱ

In this same line of thought, Christopher Innes notes the “merging of form and content” and the use of “the scientific principles at the core of the discussion as a structure for the scenes” (102). He discusses the ways in which Frayn integrates the scientific principles throughout the play. This kind of integration is perhaps the part of the allure of *Copenhagen*. In fact, it is one of the criteria set up by Shepherd-Barr to define “successful” science play (Sigma Xi Conference 2-3).

In an earlier endeavor, I had looked into establishing these criteria for science plays and used *Copenhagen* as the model play. What emerged from this research was the realization that many of the elements that constituted the science plays were also

elements of the Brechtian mode of playwriting. Bertolt Brecht strove for a theatre that could present key issues that would affect society. He felt that the idea of a play should reflect in dialogue, blocking, staging, sound, and so on. While there is, of course, some variance between these new plays and Brecht's own, some of the plays work toward his goals. Some of these science plays fulfill the goals of Brechtian theatre. With this thought, I re-examined my research. Though this wave of new plays is indeed novel in the theatre, the repeated use of science as a central theme and the attempt in a few plays to mirror form and content are the only true elements of newness.

Copenhagen fulfills Brecht's earlier calling for epic theatre because it is the type of drama that instructs and that calls for critical engagement. Moreover, it also takes into account the theatre as a whole, manipulating the stage, sound, and acting to create a holistic, dramatic work. Most literary critics have looked at the way science works in this play or have considered its place in the new genre or subset of plays.^{iv} What has not been offered to this discourse is analysis of the ways in which this play reflects Brecht's ideas on epic theatre. I contend that it is a new means to an old end: Brecht aspired to this kind of a theatre, one that instructed and called to action.

There are some who argue this point differently. In his article, "The Play of Uncertain Ideas," King also considers *Copenhagen* in relation to Brecht; however, he concludes that Frayn's play moves beyond Brecht's goals. He does situate *Copenhagen* in the tradition of the revolutionary theatre that both incited change and rejected the well-made play, and he calls upon several influential playwrights, such as Shaw, Brecht, Ibsen, and Beckett. However, while he makes minor comparisons, his argument is that Frayn takes this play "well beyond the theoretical limits set by Shaw and Brecht" (166). His

essay indicates that most attention to this play has been given to the interdependent structure and content. It is his opinion that, while that kind of theatrical device is interesting and effective, *Copenhagen*'s primary achievement is the way that it pursues uncertainty in the human endeavor in relation to epistemology.

King explains that Frayn's consideration and integration of the themes of indeterminacy and uncertainty through the course of the play work toward achieving a play that does teach the audience to be guarded against both the chimera of a capital-T Truth and a false sense of learning. In his view, *Copenhagen*, therefore, promotes real intellectual engagement of the spectators whereas Brecht's plays do not. He explains that Frayn's use of the scientific ideas, as a parallel to humanity, is key to understanding the brilliance of this play. While I, too, see Frayn's play as an important work in the field of theatre, my argument departs from King's in that I do not agree that Frayn moves this play beyond Brecht's goal of the critically engaged spectator; rather, it does just what Brecht has intended for the theatre to do.

While most scholars and reviewers comment from varying perspectives, the consensus is that *Copenhagen* is a successful science play.^v However, what has been most interesting to me is the ways in which this "new" genre really does recall much of what Bertolt Brecht initiated. Not only does this science play, *Copenhagen*, adhere to Brecht's theory, it works toward the same end and employs some of the same tactics.

This essay will explore the relationship between Frayn's *Copenhagen* and the Brechtian notion of a didactic and social theatre. Over the course of his career, Brecht established various stances on how to best utilize the theatre for the benefit of society. He spent much effort revisiting and revising his theories in order to set a clear goal for the

theatre and the responsibilities that he felt the theatre should have. In the meantime, he employed many methods that moved toward achieving epic theatre, such as using conventions that challenged the Aristotelian, cathartic theatre and taking into account the structure of the plays, the actors' roles, and use of the alienation effect.

Frayn's methodology in *Copenhagen* is akin to Brecht's; however, what is more important about this play is that it achieves the *goals* of epic theatre, both utilizing Brechtian methods and using Frayn's own devices. While some of Brecht's methods are employed, to follow prescribed methods is not the only way to accomplish the goals of epic theatre. Brecht even notes about his productions, "So is this new style of production *the* new style; is it a complete and comprehensible technique, the final result of every experiment? Answer: no. It is *a* way, the one that *we* have followed. The effort must be continued"(Brecht 135).

The effort is continued in *Copenhagen*. Brecht inspired a theatre that could incite change, and, in this new trend of science on stage, the theatre is also promoting stimulation for ideas and action and discouraging a social constituency of ambivalence. It considers the implications of science and asks the audience to actively, intellectually engage in the ideas of the play. He notes, "In the old days, there was no more need for the artist to bother about science than for science to concern itself with him. But now he has to, for science has progressed so much further [...]. People have acquired new motives for their actions; science has found new dimensions by which to measure them; it's time for art to find new expressions" (Brecht 67). Indeed, in this trend of the science play, art has found a new mode of expression. It takes the dramatic mode and utilizes all aspects

of it (dialogue, stage, sound, blocking, etc.) and joins them into a working metaphor in order to present a central message.

In *Copenhagen*, Frayn takes into consideration science and its relationship with society, which is a source of both the general concern and latent anxiety ubiquitous in our present culture, and he explores those concerns and thoughts about science on the stage. He brings current social issues into the theatre. Though his play is about the sciences that spawned the atomic age, the apprehension about a potentially volatile and precarious science still rings true in present day science and society. In fact, as a result of the time period associated with *Copenhagen*, the views toward science had not only changed but also, arguably, caused a paradigm shift in the perception of science as a benign study. Frayn uses the stage in order to bring current social issues to the forefront of discussion and consideration, much like Brecht did during his career.

Overview of Brecht

In the early part of the twentieth century, Bertolt Brecht began his efforts to redirect and reshape the theatre, and he worked throughout his career to establish a radical evolution in the theatre. Involved in the political world and a Marxist in beliefs, he sought to bring to the people a theatre that would incite a desire to actively engage in their worlds and to claim their own roles in the shaping of society. He created a theatre that could present the puzzles of the world on the stage so that the audience could have the opportunity to critically engage in considering resolutions. He understood individuals as socially constructed. That being so, he viewed individuals as needing to play a larger

part in their living up to their responsibilities to society and to give themselves agency and accountability.

Brecht envisioned a theatre that could bring about the awareness necessary to make social changes. He viewed the mode of Aristotelian theatre as outdated and insufficient. It was around 1926 that Brecht began his theories with an idea for what he called an “epic” theatre. This theatre negated much of the characteristics and methods of Aristotelian drama. Over the course of time, Brecht continuously changed his terminology, calling the theatre “epic” (which in some ways incorporated “paedagogic” and “scientific” theatre) and eventually “dialectic” which sought to incorporate art, music, and politics into the theatre and in accordance with Marxist dialectical materialism.

As early as 1929, in “A Short Organum,” he also uses the term “scientific” to describe his theatre and refers both to the theatre and audience of the scientific age:

For when we look about us for an entertainment whose impact is immediate, for a comprehensive and penetrating pleasure such as our theatre could give us by representations of men’s lives together, we have to think of ourselves as children of a scientific age. Our life as human beings in society—i.e. our life—is determined by the sciences to a new extent. (*Brecht* 183)

Brecht was interested in the effects that science had on society and also in the parallels between the sciences and human lives. He saw a world that was evolving, and every day was more affected by the sciences. He wanted a theatre that reflected this. He says in a 1934 interview, “In the old days there was no more need for the artist to bother about

sciences than for science to concern itself with him. But now he has to, for science had progressed so much further [...]. People have acquired new motives for their actions; science has found new dimensions by which to measure them; it's time for art to find new expressions" (*Brecht 67*). He carried this interest in the sciences through his career. Though he did replace the old ideas of epic theatre with new ones of a dialectical theatre, his main focus on the relationship between the stage and the audience remained intact.

As early as 1933, Brecht used the term "dialectical" in an essay entitled "On a Dialectical Drama," though this term did not get used again until later in his career at which point it took on a slightly different meaning. In "Dialectics in Theatre" (1956), he goes over the reasons for his changes in terminology:

[...] "epic theatre" is too formal a term for the kind of theatre aimed at (and to some extent practiced). Epic theatre is a prerequisite for these contributions, but it does not of itself imply that productivity and mutability of society from which they derive their main element of pleasure. The term must therefore be reckoned inadequate, although no new one can be put forward. (*Brecht 282*)

The changes Brecht made resulted mostly from what he felt was narrowness of terminology and of thought. He did not want to impose limitations on his vision for the theatre. It is important to note that his ideas grew into and overlapped one another in many ways. They did not linearly progress in such a manner as to move away from old theories but rather used the old theories to move beyond and into a continuously innovate theatre. He did not reject the ideas of his past so much as he did the constraints of the viewpoints that he felt inhibited a fuller picture of what he was trying to accomplish. As

Peter Brooker points out, “Brecht’s artistic categories overlapped and changed, not because of any lack of rigour or principle on his part, but because these ideas were intimately connected to a changing practice [...]. This body of work, itself conditioned by and responsive to historical conditions, was expressly political” (*Cambridge Companion to Brecht* 86).

Some of the key ideas or terms associated with early Brechtian theatre are his non-Aristotelian, episodic, and non-cathartic methods. In his later years, there was much work done with developing a Brechtian method of staging and acting. One of his main devices was *Verfremdung*, or the alienation effect, by which the audience could participate as active observers rather than as subsumed receptacles of a play’s content. Over the course of his work, though, there were revisions to his theories, Brecht continuously strove for a theatre of change.

Established upon the tradition of the Greek tragedies, Aristotelian theatre was aimed at appeasing the intellect and emotions of the audience with problem, resolution, and catharsis. In the Aristotelian mode, character identification and narrative drive a dramatic work. The audience of such plays would be given a story through which they could empathize with the actors and vicariously experience and be emotionally moved.

In Brecht’s view, Aristotelian theatre set the mark too low for the potential of the theatre. In “The German Drama: Pre-Hitler” (1935), he claims, “Briefly, the aristotelian [sic] play is essentially static; its task is to show the world as it is. The learning-play is essentially dynamic; its task is to show the world as it changes” (*Brecht* 79). He rejected the idea of a theatre that fostered mental inertia in the spectator and that unwittingly condoned the lack of intellectual vigor. In a slightly later essay, “On the Use of Music in

an Epic Theatre” (written in 1935, but not published until 1957), Brecht lays out the Aristotelian principles he sets out to change in his theatre. He notes,

In aristotelian [sic] drama the plot leads the hero into situations where he reveals his innermost being. All the incidents shown have the object of driving the hero into spiritual conflicts [...]. The individual whose innermost being is this driven into the open then of course comes to stand for Man with a capital M. Everyone (including every spectator) is then carried away by the momentum of the events portrayed.” (*Brecht* 87)

For Brecht, this mode of playwriting was unacceptable. It did not influence or provoke the audience in such a way that could lead to a sparked interest in political and personal involvement or to an active awareness, an awakening of sorts.

Brecht sought to replace the standard of Aristotelian drama with a social and influential theatre, a theatre that could and should incite change. He wanted his audience to see that they could actively participate in and change the world around them if they would realize their own abilities to do so. Toward this aim, he created epic theatre. Brecht wrote in “The Epic Theatre and Its Difficulties” that epic theatre included: “representation by the actor, stage technique, dramaturgy, stage music, use of film, and so on. The essential point of epic theatre is perhaps that it appeals less to the feelings than to the spectator’s reason. Instead of sharing an experience, the spectator must come to grip with things” (*Brecht* 23). The goal of Brechtian techniques was to engage the audience member in the text of the drama and consider the implications and the “moral” of the performance. He intended for the theatre to make a move away from mere entertainment and toward a place for discovery.

He intended for his theatre to be a place for that kind of instruction. He posits, “Non-aristotelian [sic] drama would at all costs avoid bundling together the events portrayed and presenting them as an inexorable fate, to which the human being is handed over helpless despite the beauty and significance of his reaction; on the contrary, it is precisely this fate that it would study closely, showing it up as of human contriving” (*Brecht 87*). He wanted individuals to assume responsibility for their own fates. For the theatre to relay his message, there would need to be marked changes.

Brecht laid out the following table in “The Modern Theatre is the Epic Theatre” (1930) to show intended changes in the theatre of the time:

DRAMATIC THEATRE	EPIC THEATRE
plot	narrative
implicates the spectator in a stage situation	turns the spectator into an observer, but
wears down his capacity for action	arouses his capacity for action
provides him with sensations	forces him to make decisions
experience	picture of the world
the spectator is involved in something	he is made to face something
suggestion	argument
instinctive feelings are preserved	brought to the point of recognition
the spectator is in the thick of it, shares the experience	the spectator stands outside, studies
the human being is taken for granted	the human being is the object of the inquiry
he is unalterable	he is alterable and able to alter
eyes on the finish	eyes on the course

one scene makes another	each scene for itself
growth	montage
linear development	in curves
evolutionary determinism	jumps
man as a fixed point	man as a process
thought determines being	social being determines thought
feeling	reason

(Brecht 37)

The comparisons in the table are not antithetical, but rather indicate what he viewed as a necessary shift from the dramatic to the epic mode. Brecht proposed a more active theatre-and-audience relationship. Rather than a theatre that was set up as a place for the spectators to passively immerse themselves in an emotionally involved story that was geared toward the climax and catharsis that plot promises and delivers, Brecht desired and established a theatre that challenged the spectators to think for themselves and respond to the social issues that were brought to light by the performance.

He indicated through his works his belief that individuals are capable of change and should involve themselves in the bettering of their own societies by giving themselves agency as potentially active members of society. He intended for the theatre to teach the audience. Since the “task is to show the world as it changes (and also how it may be changed),” Brecht worked on the creation of epic theatre (Brecht 79). He devised a complex theatre of many dramatic devices that worked toward its goals.

Two of Brecht’s central devices were the employment of episodic and non-cathartic theatre. Since an epic play did not set out to simply entertain the spectators, the

plays then would not rely on a format by which each scene led up to the one following, thereby providing the spectator with inevitable outcome and post-climactic release. This being so, Brecht's plays consisted of scenes or "episodes" that could be independent of the others. This is not to say there was no coherence, but rather that the episodes did not need linearity nor to rely on the previous or next for explication. Each scene stood for its own purpose. As he explains in his "Appendices to the Short Organum" (1948-1956),

The story does not just correspond to an incident from men's life together as it might actually have taken place, but is composed of episodes rearranged so as to allow the story-teller's ideas about men's life to find expression. In the same ways, the characters are not simply portraits of living people, but are rearranged and formed in accordance with ideas.

(Brecht 278)

Every element of the play should represent something crucial and should add to the overall effect and interpretation of the play. Each episode is to convey its own contribution to the sum total of the play.

Another element and method that is related to the episodic nature of Brechtian theatre is the notion of a non-cathartic theatre. Not only did Brecht's theatre not fulfill the Aristotelian, linear development of plot, but also it did not provide resolution. Brecht had visions of a theatre that continued to affect its audience after the play ended; he did not offer a clear ending but insisted on the spectator coming to terms with his/her own resolution and interpretation, to take the parts and make them whole him/herself. Brecht says about this non-cathartic theatre:

The story then unreels in a contradictory manner; the individual scenes retain their own meaning; they yield (and stimulate) a wealth of ideas; and their sum, the story, unfolds authentically without any cheap all-pervading idealization (one word leading to another) or directing of subordinate, purely fictional component parts to an ending in which everything is resolved. (*Brecht 279*)

This type of theatre is to create an aware and intellectually engaged and participatory audience. It should present information for the spectator to consider and work through. The real aim is the influence it has on the audience.

As Brecht's career progressed, he began to also incorporate other devices in order to better achieve his goals. He used music and film, worked with stage design, and established his own acting method. He also took into more consideration the relationship between the actors and audience and worked on ways to best employ *Verfremdung*.

Brecht worked with stage design to produce a coherent style and performance. He felt that all the separate pieces of the theatrical presentation should cohesively represent the driving ideas of the plays. Brecht admired the work of Erwin Piscator, a playwright/director also interested in altering the standard conventions of the theatre, and collaborated with him at the Theatre am Nollendorfplatz. They worked on incorporating the stage design, as well as all other aspects of the play, into the total performance. The stage was to contribute to the storytelling of the play; it had to also contribute to the overall purpose of the play. Brecht tells about a production with Piscator, "We built places at various levels on the stage, and often made them move up or down. Piscator liked to include a kind of broad treadmill in the stage, with another rotating in the

opposite direction; these would bring on his characters” (*Brecht 66*). This kind of manipulation of the stage would act to draw attention to characters when necessary and also added to the element of *Verfremdung*, or alienation. The scenes were not set up to be believable in the Aristotelian sense. The theatre departed from the old modes of dramatic production and challenged the audience to come to their own conclusions.

The stage design was just one of the reworked elements of the play. Brecht tells in an interview with Otto Luth (1934), “We wrote our own texts—and I also wrote plays—or sliced up other people’s in all directions, then stuck them together quite differently till they were unrecognizable. We introduced music and film and turned everything top to bottom; we made comedy out of what had originally been tragic, and vice versa. We had our characters bursting into song at the most uncalled-for moments. In short, we thoroughly muddled up people’s idea of the drama” (*Brecht 65*). By turning the theatre on its head, so to speak, the spectator is then in a position to have to interpret every aspect of the play in order to make sense of what is being presented. S/he is forced then to come to some decision and to quite actively engage in the text and interpret the theatrical devices of the play. The spectator is given neither choice nor opportunity to be passive observers.

Brecht had uncompromising ideas about the methodology of creating dramatic works. Though most of his intense focus on acting occurred in this later stage of his career, Brecht did have early thoughts about the responsibilities of the actor. All along, his actors’ abilities to master techniques that helped to create epic theatre were seen as key and essential pieces to his theatre. He spent extensive time considering just how the actors should act. He eventually worked with an established group of actors trained in

acting in the Brechtian mode, and they took in and trained new actors to act in this type of theatre.

In his notes to members of the troupes of actors and producers working with him, Brecht was specific in the requirements and directives he gave. He would often instruct his actors so that they worked toward his endeavor and did not fall back into the Aristotelian mode but rather worked toward epic or dialectic theatre. One example of this kind of instruction is evident in his notes on the phases of a production of a play from “Theatrearbeit: an Editorial note” in 1951-1952; he lays out a clear plan for his theatre. Some of these steps include:

Analysis of the Play: Find out what socially valuable insights and impulses the play offers. Boil the story down to half a sheet of paper. Then divide it into separate episodes, establishing the nodal points, i.e. the important events that carry the story a stage further. Then examine the relationship of the episodes, their construction. Think of ways and means to make the story easily narrated and to bring out its social significance [...].

Positioning Rehearsal: The main episodes are roughly and provisionally translated into positions and movements.... (Brecht 241)

Brecht wanted to ensure that the play was epic or dialectic, down to each essential part of the theatre experience. Brecht integrated work with producers, actors, text, stage design, and his philosophy on the theatre. The episodic nature of his plays was to be carried through even in the movements and blocking of the actors. The important thing was for the play to represent major issues or events, not take on linear development. Brooker writes, “The direct and indirect use of narrator, the conspicuous use of songs, masks,

placards and images set in a montaged narrative sequence would help maintain this level of wonder and alert self-criticism” (191). These details would help to further the moral of the play rather than the story line, and in Brecht’s theatre, what one learned or took away from the play was the important issue.

The alienation effect was used to induce a critical alertness in the audience. It was derived from a technique used by the Chinese that found favor with Brecht. He writes in “Alienation Effects in Chinese Acting” in 1936: “Acceptance or rejection of [... the actors’] actions and utterances was meant to take place on a conscious plane, instead of, as hitherto, in the audience’s subconscious” (*Brecht* 91). The audience was meant to be acutely aware of the theatrics and not give way to immersion in plot or characters. In the essay, “Key Words in Brecht’s Theory and Practice,” Brooker writes about this technique:

Verfremdung would [...] produce a jolt of surprise and illumination, as the familiar and predictable were not only historicized and seen afresh but ‘seen through’; judged with the eyes of a suspicious, quizzically naïve spectator. The dialectical movement of events would therefore be temporarily suspended [...] until, as a particular attitude, action or event was revolved to expose the shadow of its alternative, the taken-for-granted would be negated under the impetus of a new understanding and grasp of social alternatives. (192)

This device has otherwise been described a tearing down of the “fourth wall.” The spectators, as a result of *Verfremdung*, would not feel as though they were hidden in the darkness of the theatre and merely watching events take place that were encased and

separate from them. This idea was of key interest to Brecht. This technique was used to help the spectators be aware of their participation in the theatrical experience. Brecht indicates, “What is involved here is, briefly, a technique of taking the human social incidents to be portrayed and labeling them as something striking, something that calls for explanation, is not to be taken for granted, not just natural. The object of this ‘effect’ is to allow the spectator to criticize constructively from a social point of view” (*Brecht* 125).

In short, the alienation effect was used in order to place the spectators in a position that would be most productive for Brecht’s efforts. He would not allow them to merely sit comfortably and idly by, watching and not deciphering his performances. In the 1951 essay, “Short Description of a New Technique of Acting,” he notes,

Characters and incidents from ordinary life, from our immediate surroundings, being familiar, strike us as more or less natural. Alienating them helps to make them seem remarkable to us. Science has carefully developed a technique of getting irritated with the everyday, ‘self-evident’, [sic] universally accepted occurrence, and there is no reason why this infinitely useful attitude should not be taken over by art [...]. It is an attitude which arose in science as a result of the growth in human productive powers. In art, the same motive applies. (*Brecht* 140)

Brecht thought that, with a changing world, the theatre too should incorporate and reflect changes. This particular device of *Verfremdung*, as well as the others, works toward Brecht goal of the learning play.

Despite the attention paid to Brecht's methodology, it is his goals for the evolution of the theatre that are the driving force of epic or dialectic theatre. The goal to enlighten or influence the spectator is the most crucial and significant element of the Brechtian philosophy on theatre. Brecht explains in 1930, in "The Modern Theatre is the Epic Theatre," "once the spectator, instead of being enabled to have an experience, is forced as it were to cast his vote; then a change has been launched which goes far beyond formal matters and begins for the first time to affect the theatre's social function" (*Brecht* 39). He was concerned with having a theatre that did not spoon-feed, so to speak. He expected a more intellectually aware audience who did not need the incidents of a play pieced together or strung along in a systematic narrative but rather could navigate their ways through the happenings of the episodes of a play. He indicates in "The German Drama: Pre-Hitler," in 1935, that his dramaturgy

does not make the hero the victim of an inevitable fate, nor does it wish to make the spectator the victim, so to speak, of a hypnotic experience in the theatre. In fact, it has as a purpose the "teaching" of the spectator a certain quite practical attitude; we have to make it possible for him to take a critical attitude while he is in the theatre (as opposed to a subjective attitude of becoming completely "entangled" in what is going on). (*Brecht* 78)

Brecht imagined a theatre that worked on both sides of the curtain; he saw the need for a new instrument, that is the theatre, to help teach people to take into account their own active roles in the shaping of society and the continuous writing of historical and political narratives. He thought that entertainment could and, furthermore, should involve learning

and productive betterment of society. He wanted an actively sentient and involved society. His idea for theatre was to arouse and stir the intellect and passions of his audience. Brecht wanted a theatre that worked with an end in mind: the effect on the people.

He envisioned a theatre that “reports” and informs as much as it entertains; he notes in 1959 in “On Experimental Theatre”:

The development [of epic theatre] tended towards a fusion of the two functions, instruction and entertainment. If such preoccupations were to have any social meaning, then they must eventually enable the theatre to project a picture of the world by artistic means: models of men’s life together such as could help the spectator to understand his social environment and both rationally and emotionally master it. (*Brecht 133*)

Brecht felt that if the audience could see a rearrangement of the commonplace or a play that otherwise called the everyday into scrutiny or retold their grand narratives, they would be less apt to sit and languidly absorb information. He wanted to see a change in society as a result of the theatre experience. He saw epic theatre as a means toward this end. As we will later see, *Copenhagen* has produced quite striking results of this kind.

Summary of *Copenhagen*

Copenhagen, based on an historical event, concerns the visit to Niels Bohr by Werner Heisenberg in 1941. However, the historical re-telling stops there. The rest is Frayn’s navigation through the many possibilities concerning that mysterious meeting.

Frayn presents three characters—Niels and Margrethe Bohr and Werner Heisenberg—who meet beyond their lives to hash over a meeting that was too delicate and emotionally charged to sort through during their lives. Frayn offers three drafts of what may have happened in Copenhagen on that evening in 1941. Each draft is in the process of a revision/revisioning; they are attempts made by the characters to determine the underlying intentions regarding Heisenberg's visit and what had actually occurred.

During the drafting process, in which all three hash out the possibilities, the audience comes to the realization that the uncertainty of the situation is perhaps the only real certainty. Though there are only three drafts that the characters go through, there are many possibilities offered within each. Some of the explanations are as follows:

In one case, Heisenberg's visit was friendly and innocent. Heisenberg went to Copenhagen to give a lecture with his German colleague, Carl von Weizsacker, at a German Institute and so was required to travel to Copenhagen (6). He went to talk to Bohr, his long time confidant and mentor, about physics (10, 32). Or, he intended to invite Bohr to come to Germany to attend lectures or discussion groups under the protection of the German embassy (20).

Another possibility is that he needed to see and talk with Bohr for personal, not political, reasons. He went for the need to return as Bohr's long lost child, to return to a more stable and uncomplicated time and be with his mentor and father figure (54, 61). Or, perhaps he went to show off as a successful and powerful scientist (74-75). He may have gone to obtain absolution from the "Pope" of nuclear physics, as Bohr was sometimes called by his colleagues (39).

Another possibility is that he went to aid Germany in the race to create the bomb. He wanted to perhaps learn more about Bohr's cyclotron or to probe Bohr for information on what the scientists outside of Germany were producing and to learn more about the Allied nuclear program (17, 19, 41). He went to use Bohr's contacts with the Americans or to persuade the Allied forces to give up because he fears that they may know more than Germany (41, 45).

In a more redeeming scenario, Heisenberg went heroically. He wanted to ask Bohr, his father figure and mentor, if he thought that a physicist has the moral right to work on a "practical exploitation of atomic energy" and to inform Bohr that if they could build reactors they could also build bombs (36-37). He wanted to tell Bohr about his position in the German program and to persuade him to commit with other scientists to not allowing the building of the bomb, to refuse to submit to the wartime race for the bomb for the good of the entirety of mankind (40-41, 43-44).

Or, he went simply because he thought of it and for no other pre-meditated reason (77). The multitude of varying possibilities is all explored. The spectators are then left to consider the offered accounts; they are left with conflicting representations of historical events and individuals. They must come to terms with the inevitable lack of any capital-T Truth and thus consider what that means in terms of their own beliefs. It should, consequently, force the spectators to work their own ways through the given information in order to find meaning.

The play itself reflects the uncertainty that surrounds the historical 1941 visit. In fact, in 1947, Heisenberg traveled back to meet with Bohr to discuss the meeting; they could not come to a common interpretation and left it eternally unsettled and uncertain.

Copenhagen is, in a sense, a continuation of the debate over what occurred then and what Heisenberg's intentions were.

Important to a critical analysis of this play is some understanding of the scientific ideas themselves. The uncertainty principle,

as introduced by Heisenberg into quantum mechanics was precise and technical. It didn't suggest that everything about the behavior of particles was unknowable, or hazy. What it limited was the simultaneous measurement of 'canonically conjugate variables', [sic] such as position and momentum, or energy and time. The more precisely you measure one variable, it said, the less precise your measurement of the related variable can be; and this ratio, the uncertainty relationship, is itself precisely formulable. (*Copenhagen* 98)

Complementary, articulated by Niels Bohr, indicates that light can and does exist as both particle and wave, that there are natural conflated binaries. What Frayn does is take these ideas and apply them to morality, memory, knowledge, and scientific accountability.

Furthermore, he formulates the uncertainty in life by looking at the contradictory pressures put on Heisenberg, just as each person works under contradictory pressures, and sets up these pressures as the "canonically conjugate variables." While each contradictory pressure in life is not in necessary opposition to the next, the principle can still be applied in order to uncover the scientific order underlying the seeming unknowability of things.

Role of the Spectator

Copenhagen works towards creating the Brechtian spectator. Since Brecht saw the theatre as a place that should be not merely entertaining but also work as an agent in motivation or change within the audience, Brecht's vision of a non-passive and critically engaged spectator is crucial to the design of epic theatre. The devices he employed worked toward both creating and engaging alert and active spectators. He intended for these devices to encourage the already active and to inspire the previously inactive members of society to become more involved in their own lives and in the world at large. The use of episodic and non-cathartic devices and the alienation technique worked toward achieving this end.

The dialogue-driven *Copenhagen* calls for the audience to really engage in a non-passive role. Primarily due to the episodic nature of the play and any lack of real 'action', the spectators cannot merely consume; they must be alert in order to grasp the science, the thematics, the relationships, and the episodes or drafts. In addition, there is no setting: three chairs sit on a sparse circular stage; there are no spectacles. The spectator cannot anticipate any scenes with the familiar and expected. It is not a window into the home of the characters; thus, the spectator cannot obtain a sense of looking in from without. The stage lacks a setting that would place the audience in a moment in time: the characters merely circle a bare stage and deliver fragments of interconnected dialogue—moving from memories to commentary to speculation. Because of the absence of any real setting, the action or thrust of the play lies only in words and repetition of ideas. The science is explained, the scenario is explained—three times—and the rest is up for interpretation.

Frayn's play utilizes the alienation device and makes the audience aware of the characters as representations. There is no comfort zone of familiarity, so to speak. In addition, the characters refer time and again to themselves from outside of the conversation of the play; they move from participant to commentator. Though Margrethe is continuously Margrethe, she moves from the past to the present to seeming ubiquitousness, as do each of the characters. This movement between time lines further promotes *Verfremdung*. These kinds of methods are what help Frayn to achieve Brechtian theatre and the type of spectator that that fosters.

This play not only asks for the audience to come to terms with the characters in this play, it also puts forth the question determining the intentions and actions of the historical figures upon which Frayn's characters are based. In this way, it moves toward reaching the goals of Brechtian theatre. By consequence of questioning their own versions of history, the spectators leave more critically aware of their own complacency in understanding history.

Copenhagen Employs Brechtian Methods

Copenhagen meets the Brechtian criteria for drama in several ways. First of all, Frayn employs theatrical devices that are resonant of Brecht's own. *Copenhagen* is episodic and non-cathartic. In addition, the text and stage work toward the *Verfremdungseffekt*. Beyond these similarities, I find that *Copenhagen* lives up to the goals of epic theatre. It is a play that calls for Brecht's ideal, critically engaged spectator. Furthermore, with this play, Frayn has created a stir both among scholars in the fields of literature, history, and science, and among a wider audience of people.

Consider one of Brecht's early criteria for epic theatre: an episodic and non-linear mode. Echoing a methodology that strays from the Aristotelian mode, Frayn presents three drafts of a possible truth. For further discussion of Frayn's use of indeterminacy, see the works of Kirsten Shepherd-Barr cited in footnote #1. Yet even within these drafts, the audience is not offered a clear or accurate representation of what occurred. There is a multitude of explanations given even within a single draft. The continuity of a linearly developed plot is abandoned as Frayn repeatedly revises the potential answers to his characters' unanswerable question. Notably, what is accomplished is a unified collage of ideas that represents Frayn's central theme of uncertainty. As Arrigo Subiotto writes about this kind of Brechtian technique,

Brecht created a dramatic form to match this view of the hero by breaking down the "evolutionary inevitability" of the classical play. Instead of the inextricable interrelation of scenes where none could be omitted—a sort of organic absolute entirely enclosed in itself—Brecht allowed each scene or episode to stand independently as evidence of a process taking place rather than a psychic revelation of the character. (199)

In *Copenhagen*, each episode works independently toward explaining a possible truth behind the mysterious 1941 meeting.

In the first draft, the spectator is given claims that Heisenberg went to Copenhagen to give a lecture and wanted, with best of intentions, to talk to Bohr about physics. The audience hears that he intended to invite Bohr to attend lectures in Germany under the protection of the German embassy and that he wanted to ask Bohr about the physicist's moral rights. He, in this account, may have wanted to persuade Bohr to join

other scientists in the commitment to cease all work on the atomic bomb for the good of humankind.

However, in this same draft, Frayn adjusts the lens and suggests that perhaps Heisenberg wanted to probe Bohr for information about the Allied nuclear program, to use Bohr's contacts with the Americans, and to persuade the Allied forces to give up not for the good of mankind but because he feared that they may know more than Germany. In this draft, seen through either lens, Heisenberg is clearly there to obtain needed information, though for what intents it is not revealed.

In the second draft, mostly from Margrethe's suggestions, Heisenberg returned as Bohr's long lost child, to be with his mentor and father figure. In this case, his visit is less about the race for the lead in their scientific endeavors and more for the need to return to his past, whether consciously or not, in order to cope with the position to which the turns in life led him. She suggests that perhaps in some way he came as the ostentatious son to show off as a successful and powerful scientist, or that he wanted the approval of Bohr.

In each draft, the audience is given a particular set of interpretations that represent its own set of reasons that do not correlate with the reasons posited in the previous or later draft. The episodes ultimately work together to create a fuller picture of Frayn's conceived possibilities for the reasons behind the visit. They also work to elucidate the overall focus on the inherent uncertainty in life's situations. In other words, each version, while contradictory, builds on the other to form a complete representation of Frayn's themes. *Copenhagen* is, as Brecht would have it, "composed of episodes rearranged so as to allow the story-teller's ideas about men's life to find expression" (Brecht 278).

Frayn has taken one key, historical event and arranged the drafts so that *Copenhagen* fully enacts his metaphor of uncertainty. By offering these separate drafts and by leaving the audience with no set interpretation, Frayn has broken with the Aristotelian mode of playwriting and established *Copenhagen* in the Brechtian mode of epic theatre.

In addition, *Copenhagen* does not offer catharsis. Instead, it leaves the audience with no choice but to determine their own interpretation based on the possibilities that Frayn presents. The three conflicting drafts leave the spectator with no clear understanding of the “resolution” because there simply is no resolution. It is up to the spectator to decide what s/he determines to be the final truth of the situation. In the final lines of the play, Heisenberg utters,

But in the meanwhile, in this most precious meanwhile, there it is. The trees in Faelled Park. Gammertingen and Biberach and Mindelheim. Our children and our children’s children. Preserved, just possibly, by that one short moment in Copenhagen. By some event that will never quite be located or defined. By that final core of uncertainty at the heart of things.
(94)

There are two major points that need to be noted about this passage—first, Frayn leaves this play with a glaringly non-conclusive ending. He does not finally promote an isolated version for the audience to accept as the primarily valid position. Secondly, Frayn furthers the idea (and the play even ends with this sentiment) that the decisions individuals make do effect the word at large and that they cannot and do not have the moral right to sit idly, passively, and indeterminately. This is precisely the type of theatre that Brecht describes in his works. He plainly states, “Catharsis is not the main object of

this dramaturgy” (*Brecht 78*). The idea is for the audience to act as observer and participant and to become less complacent and more active in their own lives and the world around them.

In addition to the episodic and non-cathartic devices, *Copenhagen* also promotes the alienation effect. Though the characters do not necessarily act in the Brechtian style, the characters do accomplish this effect by the ways they move between the “action” of the play and their commentary of it. They are in continuous flux between the past (re-enactment) and the present (the commentary). On stage, the separation between the “real time” of the play and the rehashing of the past is even more evident than the text alone: the actors freeze when not a part of the immediate dialogue. The three characters each come and go in time and move in and out of the forefront. This happens throughout the course of the play. Take the following exchange for example,

MARGRETHE. Me he scarcely notices. I watch him discreetly from
behind my expression of polite interest as he struggles on.

HEISENBERG. Have things here been difficult?

BOHR. Difficult?

MARGRETHE. Of course. He has to ask. He has to get it out of the way.

[...]

HEISENBERG. I’ve been anxious about you.

BOHR. Kind of you. No call for sleepless nights in Leipzig so far,
though.

MARGRETHE. Another silence. He’s done his duty. Now he can begin
to steer the conversation round to pleasanter subjects.

HEISENBERG. Are you still sailing?

BOHR. Sailing?

MARGRETHE. Not a good start. (15)

In many instances, the characters work within this type of dynamic. Two will be engaged in conversation while the other either freezes in time or looks on with the spectators in the audience and comments on the interactions. Each character contributes to the play as both participant and observer. At some moments, they all step out of the role of participant and look on from the outside of the action, as in the following example:

MARGRETHE. Look at him. He's lost. He's like a lost child. He's been out in the woods all day, running here, running there. He's shown off, he's been brave, he's been cowardly. He's done wrong, he's done right. And now the evening's come, and all he wants is to go home, and he's lost.

HEISENBERG. Silence.

BOHR. Silence.

MARGRETHE. Silence. (53)

This kind of shuttling between roles contributes to the alienation effect. The audience is made aware of the characters as actors and representations of ideas. They break the linear progression of action with each shift between roles. They take on the position of a meta-theatrical observer.

However, despite the correlation between Brecht's methods and Frayn's, what are more important are the goals of Brechtian theatre. Frayn worked toward accomplishing

these goals. Whether or not he intended to produce a Brechtian play, Frayn worked closely with Brechtian ideas to produce *Copenhagen*.

Copenhagen is Didactic

One of the key purposes behind Brechtian theatre is didacticism; the stage and the audience should not be separate, one set up to entertain the other. When Brecht discusses the development of his theatre, he explains that it

tended towards a fusion of the two functions, instruction and entertainment. If such preoccupations [the development of the theatre] were to have any social meaning, then they must eventually enable the theatre to project a picture of the world by artistic means: models of men's life together such as could help the spectator to understand his social environment and both rationally and emotionally master it. (*Brecht* 133)

By using episodic and non-cathartic theatre, Frayn already has his audience on alert and thus they are more prone to grasping his lesson or moral. The lack of a central, driving Aristotelian plot as well as the alienation technique displaces the process of both identification and submersion into the narrative of a play. Consequently, the spectator is set up for acceptance of an interpretative process.

One interpretation of *Copenhagen*'s staging suggests that the production at the Royale Theater in New York was akin to a "lecture room." This is indicative of the response *Copenhagen* received: it is a play that teaches. Reviewers have noted that the theatre looked a lot like a university lecture hall (Feingold 71, Gamerman 4). This interpretation is relevant not so much because of the "lesson" in science and history that

the audience receives but because it suggests that the characters are offering moral lessons: the real lesson is not the science but rather what lies behind the metaphor.

The dialogue and the staging both play a part in what the viewer experiences or learns. This play is concerned with the larger ideas of science and how they are interrelated with the human experience. In Karen Blakemore's words, Frayn's "tendency is to do exactly what Bohr did which is to take the physics and look for the greater implications." In addition to using Brechtian methods, Frayn, more importantly, works toward Brechtian goals. *Copenhagen* is a play that teaches. It offers a moral lesson to the spectator who in turn leaves the theatre having to "come to grips" with the play and its themes (*Brecht 23*).

To see how Frayn "teaches" the ideas of his play, consider the ways in which learning is ascertained. In a classroom, for example, instructors will employ varying teaching methods. In some circumstances, when information seems esoteric, they use language that is understandable to the students in order to relay the message in a way that the students can comprehend, and then they build on that new knowledge. Sometimes the use of analogy or metaphor is beneficial. In other ways, they sometimes will provide visual examples or other representations to support an idea. *Copenhagen* applies these kinds of teaching methods.

Frayn maneuvers the text of *Copenhagen* for the edification of the spectator by using Margrethe as a stand-in for the audience. On more than one occasion, the scientists are obligated to use "plain language" so that Margrethe—or the audience—can understand what it is that the scientists are discussing. In order to make the connections between the scientific ideas and the themes of the play, one must first understand the

general concepts of the science. Frayn's Heisenberg and Bohr continually keep the language on a level that is understandable for the non-scientist. Bohr says, "But in the end, in the end, we have to be able to explain it all to Margrethe!" (65). For example, Frayn has Margrethe relay information by questioning the validity of her assertions:

MARGRETHE. Complementarity again, yes?

BOHR. Yes, yes.

MARGRETHE. I've typed it out often enough. If you're doing something you have to concentrate on you can't also be thinking about doing it, and if you're thinking about doing it then you can't actually be doing it. Yes? (72)

Not only do Heisenberg and Bohr use "plain language" to explain concepts to her, but Margrethe also restates the ideas by clarifying her questions—questions the audience may also have about the scientific ideas. For example,

HEISENBERG. Plain language, plain language!

BOHR. This is plain language.

HEISENBERG. Listen...

BOHR. The language of classical mechanics.

HEISENBERG. Listen! Copenhagen is an atom. Margrethe is its nucleus. About right, the scale? Ten thousand to one?

BOHR. Yes, Yes.

HEISENBERG. Now, Bohr's an electron. He's wandering about the city somewhere [...] (68-69).

At this moment in the play, Heisenberg explains his ideas by a physical metaphor. He places Margrethe center stage and has Bohr orbit the stage. Here and throughout the text, the science is made clear by way of explanation to Margrethe. Frayn's Heisenberg and Bohr continually and carefully express scientific jargon in everyday language, made consequently understandable to the audience members. The use of Margrethe as a vehicle carries through the essential facts of the scientific principles.

Much of the science in *Copenhagen* is explained through use of metaphor, even without Margrethe's input. In this way, Frayn still teaches the audience about the science involved, but shifts to the real lessons or morals behind the metaphors. In other words, he must first make the science clear so that the metaphors will be understandable and so that the audience is enabled to make the necessary connections between the science and their own lives.

The use of analogy and metaphor is intentionally didactic. For example, there are numerous references to skiing throughout the play. In one, Bohr says to Heisenberg, "At the speed you were going you were up against the uncertainty relationship. If you knew where you were when you were down you didn't know how fast you'd got there. If you knew how fast you'd been going you didn't know you were down" (24). By using this analogy, the audience can better understand the concept behind the Copenhagen Interpretation and also the relationship that that principle has to life and the human endeavor. At one moment in the play, Frayn has Heisenberg explain,

HEISENBERG. [...] Complementarity, once again. I'm your enemy;
I'm also your friend. I'm a danger to mankind; I'm also your guest.
I'm a particle; I'm also a wave. We have one set of obligations to the

world in general, and we have other sets, never to be reconciled, to our fellow-countrymen, to our neighbors, to our friends, to our family, to our children. We have to go through not two slits at the same time but twenty-two. All we can do is to look afterward and see what happened.

(78)

Through the use of scientific metaphor, Frayn points out the intricate layers that make up each person and every society of people. In this way, he intends to encourage a more aware and reflective spectator.

Another didactic tool is the use of visual representation. Brecht had very specific ideas for the use of staging: he suggests, “Plays can only be understood when performed” (*Brecht* 15). The visual and structural representation of science also serves as a method for accomplishing epic theatre. When moving from the text to the actual staging of *Copenhagen*, one can see how Frayn worked with director, Michael Blakemore, to create a stage that would lend itself to the interpretative creation.

The stage at the Royale Theatre in New York in 2000 for *Copenhagen* was particularly crafted for interpretative effect. Its stage-as-atom format was used to represent how all matter and elements react according to universal laws of science. Brecht’s thoughts about staging almost foretell Blakemore and Frayn’s efforts. He contends, “Concern with subject and concern with form are complementary. Seen from inside the theatre it appears that progress in theatrical technique is only progress when it helps to realize the material; and the same with progress in play writing” (*Brecht* 24). In *Copenhagen*, the stage design enacts the ideas under discussion; thus, subject and form are complementary. The staging is a visual representation, and consequently it helps to

“realize the material.” Brecht took stage design into consideration when designing epic theatre. He comments,

The so-called *epic* style of production which we developed as the Schiffbauerdamm Theatre proved its artistic merits relatively soon [...]. A complete revolution took place in stage design. By a free manipulation of Piscator’s principles it became possible to design a setting that was both instructive and beautiful [...]. The playwright could work out his experiments in uninterrupted collaboration with actor and stage designer; he could influence and be influenced. (*Brecht* 134)

In *Copenhagen*, Frayn’s experiment with the stage was to mirror action and dialogue in order to further set up the relationship between the sciences and the human endeavor; he created a visual metaphor. The ideas of the play come across to Margrethe—or more precisely to the audience for whom this exchange is truly intended—by way of this physical and metaphorical enactment, through visual representation that instructs. The theory moves from the regions of inaccessible science to the general public through the theatrical mode. Frayn’s technique helps *Copenhagen* to achieve the Brechtian goal of a critically engaged spectator.

Contrary to this line of thinking, King claims that the “technical achievement” of *Copenhagen* has “diverted attention from a greater artistic one” (*The Play of Uncertain Ideas* 166). He indicates that, while the technical achievements are interesting and effective, they are not what contribute to the success of the play. However, the technical achievements *do* contribute to the success of the play^{vi}. In this play, there are elements of both Brechtian and Frayn’s own devices that work toward creating the response called for

by Brechtian theatre. In much the same way as Brecht utilized the stage in order to bring the themes to the forefront, Frayn also manipulates the stage as part of his text.

At the production I attended, Frayn and Blakemore's stage was orbicular and encased by the observers, the audience. The seating in the theatre had been maneuvered so that the audience was seated in full circle around the stage, the center spectacle. The stage was bare but for three chairs. On stage, the actors moved about, enacting the behavior of atoms.^{vii} Take for example the previous instance in which Heisenberg explains his theory using Margrethe and the orbicular stage as props: Margrethe was located in the center of the stage, seated. Bohr, at Heisenberg's prompt, wandered the stage as an electron. Heisenberg, acting as a ray of light, intercepts Bohr. The actors continue throughout the performance—not merely at moments when the text designated movement—to circle the stage. At various points in the play, while discussing or contemplating their irresolvable pasts, Bohr and Heisenberg continue to circle the stage. Blansfield in her analysis of *Copenhagen* comments,

The circling pattern of inquiry is reflected in the play's movement, as the characters retrace the same psychic and moral ground in their quest for truth. The central question of the play—why Heisenberg came to Copenhagen—is reiterated in tonal variations throughout, providing the philosophical refrain around which all other discussion revolves. It is, in essence, the nucleus of the play [...]. (5)

More than a sheer historical revisiting though, Frayn suggests the parallel between the atom and human life, between particles and people. All of these actions are indicated or suggested in the text and dialogue itself, but the materialized idea illuminates the

metaphor in its entirety. The primary example of this comes when Frayn has his characters overtly explain and enact the integration science with life:

BOHR. [...] Because to understand how people see you we have to treat you not just as a particle, but as a wave.... Particles are things, complete in themselves. Waves are disturbances in something else.... They're either one thing or the other. They can't be both. We have to choose one way of seeing them or the other. But as soon as we do we can't know everything about them.

HEISENBERG. And off he goes into orbit again [...]. (68-69)

In this passage, Frayn further sets up the analogy of the relationship between people and the ways in which they understand science.

Like the viewing of either particle or wave, the choice to perceive a person in one way inevitably contradicts other valid viewpoints. The use of this metaphor is didactic. In contrast to my claims, King contends that the use of scientific principles is not as important to the play as the characters. On more than one occasion, he reminds his reader that the “theoretical physics is subordinated to character” (*The Play of Uncertain Ideas* 168). However, to me, something seems to be missing if one can so easily brush aside the intricacies of this play in order to focus on character and, hence, over-value the role of identification with character. While King does indicate the influences of Brechtian theatre on Frayn's work, his primary claim is that the parallel between the inconclusiveness of the play and the inconclusiveness of each person's own life (an analogy he feels escaped Brecht) is what makes this play such a success. However, the sum of all the techniques that Frayn employs contributes to the success of his play. By using varied methods to

teach and not merely focusing on character, Frayn accomplishes the primary goal of Brecht's didactic theatre.

To further indicate the didactic nature of *Copenhagen*, there are other moments in the play that set up the relationship between the Copenhagen Interpretation and the human condition. In this play, the teaching is really twofold. *Copenhagen* instructs on these two levels: it teaches the science, and, by doing so, it teaches the "moral" of the play. In other words, the science of the play is "taught" to the audience; then the audience, knowing the science, begins to assess the implications of the thematics of the play that revolve around the scientific idea as fact and metaphor.^{viii}

Again, in contrast to my claims, King insists that the lessons of *Copenhagen* are beyond Brecht's scope. He qualifies his stance on Frayn surpassing the efforts of earlier playwrights by indicating that *Copenhagen* presents "the intellectual excitement and emotional burden of uncertain or incomplete knowledge, and it does so without taking moral refuge in an indeterminacy with no practical aim" (*The Play of Uncertain Ideas* 166). But to suggest that Brecht's theatre had no practical aim is to have misread the theories of Brecht. Any indeterminacy in Brechtian theatre was geared precisely at fostering critical engagement and potential action from the audience. By not offering catharsis or resolution, Brecht hoped that his spectators would come to their own conclusions.

It is King's opinion that, while Brecht intended for a theatre that fostered an intellectually engaged audience, he instead unwittingly pressed his own views into the theatre and manipulated the spectator's view to coincide with his vision of a political society. However to claim that Frayn or any playwright can write a play that does not

have his/her own intentions embedded in it is giving playwrights too much credit. Furthermore, Brecht's politics involved active and responsible members of society. He felt that people could bring about the changes they saw necessary to better their societies. Frayn's theatre does not provoke, by the analogy of uncertainty, a response "well beyond" this kind of result.

Brechtian theatre put the spectator in an active role. In the case of *Copenhagen*, the audience learns about the Copenhagen Interpretation through dialogue and through explanations given to Margrethe, as just noted. In addition, they learn through the visual representation of blocking and formatting. Once the spectator learns about the science, s/he can move on to make assessment of the implications of the principles. By having to reconsider the accepted historical perspective of Heisenberg and Bohr, the audience member must then call into question his/ her own culpability in acquiescent unquestioning of the truths concerning history and concerning their own lives. *Copenhagen*, as a didactic dramatic work, takes on this responsibility of epic theatre.

Themes Used to Teach Morals

Another way that Frayn uses this play to instruct is through the use of themes to teach the lesson of the play. He works with the themes of perception and intention to encourage the spectators to re-think their own places in and understanding of their world. The integration of theme and scientific principle serves as a means to Frayn's pedagogic end. The way in which he juxtaposes the Copenhagen Interpretation and the primary themes of his play works to illustrate the implications of both the scientific and the

humanistic concerns in the play. It asks both about scientific accountability and about personal accountability.

By presenting characters that continuously re-examine their pasts, the audience is shown the inconstancy of perception and of being. In this same line of thinking, Brecht asserts, “Even when a character behaves by contradictions that’s only because nobody can be identically the same at two unidentical moments. Changes in his exterior continually lead to an inner reshuffling. The continuity of the ego is a myth. A man is an atom that perpetually breaks up and forms anew. We have to show things as they are” (*Brecht* 15). This thought resonates through *Copenhagen*. In order to understand how Frayn undertakes the issue of accountability through the consideration of perception and intention, I will first establish the two primary themes by textual examples and then set up those themes in relation to the applied principles. The ideas of perception and intention course through *Copenhagen*.

Frayn explores the uncertainty related to any shift in perspective. In various instances Frayn makes it clear that there is an inevitable divide between differing ways in which any person, situation, or idea is perceived or understood. Opinions held on any given circumstance change invariably with an even slight change in perspective. For example, in a passage at the beginning of the play, Margrethe and Bohr discuss Heisenberg’s impending arrival:

MARGRETHE. You’re not really thinking of inviting him to the house?

BOHR. That’s obviously what he’s hoping.

MARGRETHE. Niels! They’ve occupied our country!

BOHR. He’s not they.

MARGRETHE. He's one of them. (7)

This passage depicts one quandary with perception. In Margrethe's mind, Heisenberg exists as a part of the Third Reich; in Bohr's, Heisenberg remains—aside from being German—a friend. Based on this as a starting point for the meeting, whatever Heisenberg does or says from this point will be interpreted in different ways. Margrethe will understand his words and behavior in one way while Bohr will in another. From the onset of the meeting, many shifts take place between “friend” and “enemy,” depending simply upon the listener's current state of mind.

Throughout the play, Frayn slides his characters between culpability and innocence, each shift resulting from a shift in perspective not of actual events. This constant shift calls for the spectator to constantly re-evaluate judgment and assessment of the play, and act in accordance to Brecht's role of the spectator in epic theatre. Changes in the political situations deem Heisenberg both enemy and friend and force him to assess his role in both positions. The audience, seeing his position and seeing that they too must inevitably find themselves in similar divided positions, may realize their own irreconcilable roles.

In another example, Frayn offers a small reminder of how individuals navigate through their lives with only their perceptions and perspective of the world around them. Heisenberg tries, with the intent to establish an old amicability, to ease into a conversation with Bohr.

HEISENBERG. Are you still sailing?

BOHR. Sailing?

MARGRETHE. Not a good start.

BOHR. No, no sailing.

HEISENBERG. The Sound is ...?

HEISENBERG. Of course.

BOHR. Mined.

MARGRETHE. I assume he won't ask if Niels has been ski-ing.

HEISENBERG. You've managed to get some ski-ing?

BOHR. Ski-ing? In Denmark?

HEISENBERG. In Norway. You used to go to Norway.

BOHR. I did, yes.

HEISENBERG. But since Norway is also... well...

BOHR. Also occupied? Yes, that might make it easier. In fact I suppose
we could now holiday almost anywhere in Europe.

HEISENBERG. I'm sorry. I hadn't thought of it quite in those terms.

(15)

Despite his knowledge of the crucial importance of establishing good standing in order to proceed with his intended purpose, he still cannot displace himself enough from his German situation to let his intentions be accepted or even heard. In the same way, neither can the spectators navigate through this existence without their own sets of classifications (American, teacher, mother, father...) and situations. This being so, Frayn asks his spectators to consider the inherent difficulty in casting any precise judgment and to perhaps re-evaluate prejudices and general assumptions. This idea is also the driving one behind the science in the play. The Uncertainty Principle and Complementarity show the

multiplicity evident in things, from the larger issues of the play even down to the most elemental levels.

To focus at this point on intention, let us turn to a key moment in which Frayn challenges the accepted portrayal of the two historical scientists:

BOHR. My dear, good Heisenberg, we weren't supplying the bomb to
Hitler!

HEISENBERG. You weren't dropping it on Hitler, either. You were
dropping it on anyone who was in reach. And on men and women in
the street, on mothers and their children. And if you'd produced it in
time they would have been my fellow-countrymen. My wife. My
children. That was the intention. Yes?

BOHR. That was the intention. (43)

If judgment is based on actions, Bohr is accountable for many deaths, and Heisenberg has no blood on his hands. Does that necessarily implicate one and exonerate the other? Does then association with a country implicate a person? There, of course, is no easy answer to this line of questioning though it is of key interest to Frayn. It is this kind of thinking that Frayn inspires in his audience. Again,

HEISENBERG. [...] We sit up half the night, talking about it, trying to
take it in. We're all literally in shock.

MARGRETHE. Because it had been done or because it wasn't you
who'd done it?

HEISENBERG. Both. Both. Otto Hahn wants to kill himself, because it
was he who discovered fission, and he can see the blood on his hands.

Gerlach, our old Nazi co-ordinator, also wants to die, because his hands are so shamefully clean. You've done it though. You've built the bomb.

BOHR. Yes.

HEISENBERG. And you've used it on a living target.

BOHR. On a living target.

MARGRETHE. You're not suggesting that Niels did anything wrong in working at Los Alamos?

HEISENBERG. Of course not. Bohr has never done anything wrong.

MARGRETHE. The decision had been taken long before Niels arrived.

The bomb would have been built whether Niels had gone or not. (46-47)

But he was still there and working on the project. Again, this absence of a set of standard guidelines for judgment does not allow for a dichotomous relationship between right and wrong or moral and immoral.

In addition to establishing these two as primary themes, Frayn applies them to the scientific metaphors of the play; he looks at perspective and intention through the duality or multiplicity evident in the characters and compares that with the principles of the Copenhagen Interpretation. Frayn calls the reliability of perception into question and thus indicates that there is a problem with maintaining one fundamental truth, and therefore an acceptable, universal response to situations at hand. An extension of this quandary with perception suggests that there is inevitable divide over issues such as building a weapon of mass destruction during war times and such as furthering science at the potential risk

of misuse and threatening use of the applied science. It is this instability of accuracy that Frayn refers to time and again as he sets up issues with perception as a key focus in *Copenhagen*. He uses this repeated reference to the instability and unreliability of perception and intention in order to question larger issues of scientific and even personal accountability on the part of the spectator.

Frayn intersperses the dialogue with references to the scientific principles and ties them in with the thought process as well as with circumstantial situations (such as one's birthplace and the onset of war). So it functions on the levels of science (in theory and in practice) and concerns the thought processes of understanding and decision-making. In the following example, Frayn skillfully touches on each of these ideas:

HEISENBERG. [...] Decisions make themselves when you're coming downhill at seventy kilometers an hour. Suddenly there's the edge of nothingness in front of you. Swerve left? Swerve right? Or think about it and die. In your head you swerve both ways...

MARGRETHE. Like that particle.

HEISENBERG. What particle?

MARGRETHE. The one you said goes through two different slits at the same time.

HEISENBERG. Oh, in our old thought-experiment. Yes. Yes!

MARGRETHE. Or Schrodinger's wretched cat.

HEISENBERG. That's alive and dead at the same time....

So the particle's here, the particle's there....

BOHR. The cat's alive, the cat's dead....

MARGRETHE. You've swerved left, you've swerved right...

HEISENBERG. Until the experiment's over... (25-26)

Frayn successfully distorts what the audience perceives as truth by suggesting that if what one knows is based on only perception—and that there are always differing perspectives—then one cannot truly claim to understand history, motives, truth. This idea sets up the actions in the play, or rather the historical and fictional actions referred to in dialogue. Frayn explores the dilemma of casting judgment about moral responsibility based on the idea that perception is limited by a debilitating incompatibility of conflicting dualities and explains this idea by applying science as a metaphor.

Copenhagen's representation of contradictions in its playing out of action from differing perspectives profoundly influences the audience's perception of the themes in the dialogue. Frayn's consideration of the play's design and the technique of reviewing events from more than one perspective is another of his techniques that directly correlates with Brecht's technique of alienation. The themes of *Copenhagen* are brought to light in order to question the ways in which accountability is assumed or appointed. In this way, they call into question the audience's culpability in the writing of history. Frayn suggests that the audience members become jurors, thus Brecht's active spectators, and consequently reconsider their own roles in history.

In addition to the complications of perception, *Copenhagen* is also concerned with the issue of how individuals account for judgments and culpability in light of the fact that one cannot ever really know intention. Can one, in fact, judge on intention, or does one base assessment purely on actions or reactions to things? Frayn, in response to some of

the criticism of his play, asserts his intentions with the play (even adding an emphatic exclamation mark) in his “Post-postscript”:

Let me make it unambiguous: my Heisenberg is saying that we do have to make assessments of intention in judging people’s actions. (The epistemology of intention is what the play is about!) He is saying that Bohr will continue to inspire respect and love, in spite of his involvement in the building of the Hiroshima and Nagasaki bombs; and that he himself will continue to be regarded with distrust in spite of his failure to kill anyone. (2)

Judgment of others is based on two grounds, one being the actions of individuals and the other the intentions of a person. So even in the assessment of people, there is duality, there is conflict. Which then is more important? This is one point Frayn asks his audience as jurors to consider. How do we hold fast to any moral system if the grounding remains in continuous flux? It asks in some ways what we do about new sciences in light of how moral systems change and how we deal with personal accountability as well. These kinds of questions and ideas that the spectators are asked to consider call for intellectual engagement. *Copenhagen* is a play that incites the Brechtian notion of an accountable and aware audience and society.

Another way Frayn gets his message across is again through use of staging. One interpretation of the stage, related to Brecht’s stance on the participatory role of the spectator, is that the audience members behind the stage represent jurors of the trial of the twentieth-century. Reviewers have commented on the similarities of the staging and a trial of sorts; one notes the “jury-box seats around the stage” (Carnegy 43). This “trial of

the century” interpretation can be easily supported given the context of the play and the concern with science, morality, and guilt.

Moving momentarily from the fictional character, it is interesting to note that Werner Heisenberg stated in his personal memoir, *Physics and Beyond*,

When we tried to reconstruct what had been said during our conversation in the autumn of 1941, we noticed that both our memories had become blurred. I was convinced that I had broached the critical subject during a nocturnal walk in Pileallé [...], while Niels seemed certain that I had done so in his study at Carlsberg. [Both incorrect if my Danish informants have it right.]... After a while, we both came to feel that it would be better to stop disturbing the spirits of the past.” (quoted in Pais 189)

As noted in Pais’ bracketed comments, even both of their perceptions are possibly inaccurate. Years before Frayn ever attempted to portray these issues, the historical figures, Bohr and Heisenberg, try in vain to reconstruct the pasts. Frayn has them attempt it one more time, this time letting the spectators decide what may have occurred. However, what they come to realize is the impossibility and futility of that understanding. The audience is put in a position in which they must come to terms with the varying elements and drafts of the play. The design of the play correlates with both the uncertainty of the history behind the play and the theory of uncertainty it discusses, and the multiple drafts indicate to the audience that there is an inherent problem with appointing blame.

Through the design of the play, and in line with Brecht’s ideas for a didactic theatre, *Copenhagen* calls for a historical re-evaluation to achieve its purpose. Through

this play, Frayn asks his audience, most of whom come to the play with preconceived biases toward the “historical” characters of Heisenberg and Bohr, to reconsider those biases. In the mode of Brechtian theatre, these prejudices and biases concerning this moment in history are called into question. By the end of *Copenhagen*, spectators are asked to reconsider their previously acquiescent or unquestioned acceptance of a version of history, a history that is suddenly less black and white in terms of culpability.

Like the Brechtian play, *Copenhagen* asks that people reconsider their versions of truth in light of perspective, accountability based on perceived truths and necessities (such as aiding one’s country in war times), and responsibility for actions taken. While many have seen this jury-accused relationship with the audience and the actors, one must be careful to avoid the mistaken assumption that accountability can be so easily placed, as Frayn demonstrates.

From one perspective, we have responsibilities to self; from another, to family; and again, to church or state, to country. With each set of obligations, there can be no clear distinction, and there is inevitable overlap, a place in which one set of obligations stands contrary to another. We see Heisenberg and Bohr battling with these incompatible sets of responsibilities. In the same way that they had to choose to see light as either particle or wave, they had to attempt to understand their roles as sometimes irreconcilable. So too must Frayn’s spectators take into account their irreconcilable roles. One of Frayn’s ideas was to show that accountability is not dichotomous and that there is an element of uncertainty to all things:

What people say about their own motives and intentions, even when they are not caught in the traps that entangled Heisenberg, is always subject to

question—as subject to question as what anybody else says about them. Thoughts and intentions, even one’s own—perhaps one’s own most of all—remain shifting and elusive. There is not one single thought or intention of any sort that can ever be precisely established. What the uncertainty of thoughts does have in common with the uncertainty of particles is that the difficulty is not just a practical one, but a systematic limitation which cannot even in theory be circumvented. (*Copenhagen* 99)

Frayn reveals his interest with these themes in relation to science. He uses the themes of perception and intention to elucidate his message of accountability. He makes his audience both consider the idea of accountability and make themselves accountable citizens. Frayn remarked that this play is about epistemology and that the real lesson is a moral one. Brecht’s main aim was to reach his audience and make them a more involved and active part of their societies. He wanted the kind of intellectual engagement that Frayn has accomplished through this play. *Copenhagen* is Brechtian drama.

Evidence

Copenhagen is representative of the type of theatre that Brecht envisioned in that it meets the demands for a coalesced and mutually dependent stage and audience. That is to say, both the production and the audience are held accountable for their contribution and their reciprocity to the theatrical experience. At the end of *Copenhagen*, the audience is left to “cast his vote” and resolve the dilemma of the play, apply it to his/her own sociological circumstances, and learn something in this process. By encouraging this sort of intellectual stimulation, this science play does both entertain and instruct.

Moreover, *Copenhagen* recalls a series of circumstances that led to the catastrophic events spawning the atomic age. Not only does it recall these events, it calls into question the narrative the western world tells about the history as written and the directions toward which they have been moving in appointing culpability. It asks the audience to not cast judgment hastily but to observe and come to recognize the root of the rationale that can permit such events and carry this insight to new circumstances that shape decisions that affect the future of societies. It does ask for a moral judgment; but, more importantly, it indicates the significance of the process of coming to any moral stance, on the act of observation and intellectual engagement. This directly relates to Brecht's idea of epic theatre. As Brecht claims, "The epic theatre was [...] often objected to as moralizing too much. Yet in the epic theatre moral arguments only took second place. Its aim was less to moralize than to observe. That is to say it observed, and then the thick end of the wedge followed: the story's moral" (*Brecht* 75). The moral is arrived at only after consideration of the play and its content.

Frayn has presented a play that takes on the traits of an epic play; he intends to inspire critical intellectual engagement with the material presented on stage. In this, he has succeeded. In fact, at the 2000 production at the Royale Theatre in New York, I noted how eager and engrossed the audience was both during intermission and after the play. Everyone I overheard was conferring over the topics play presents. The spectators created a vibrant buzz, discussing the implications of the play and the metaphorical representation of the scientific ideas. Spectators stood immersed in conversation about history, science, their versions of the period of history portrayed, their thoughts on the implications of scientific advancement, and so on.^{ix}

This interest is evident not only in the theatre but also in the widespread attention this play has received. Frayn challenged old notions of history and asks his audience to reconsider history as they know it. David Roberts writes about Brecht that he set out to do much the same,

When Brecht declares that the contemporary world can be viewed historically, i.e. historized, he means by this that it is delivered over to the realm of causality, the realm of freedom. From this scientific perspective past and present are equally material for study [...]. The relativization of the present as the past does not serve a genetic function – Brecht is not setting out to understand the present in terms of its history – but the “historical” function of alienating and relativizing the standpoint of the audience. (Roberts 53)

So too, Frayn sets out to relativize the standpoint of his audience. Frayn takes a piece of history and calls it into question; by presenting three versions of a history, he thus calls for a re-visiting and a revisioning. He asks the audience to consider the larger issue of scientific accountability by giving one example of an impossible and unethical situation that called for responsibility and moral judgment.

Copenhagen has accomplished epic theatre’s purpose to critically engage the audience. Theatergoers, as an integral and active part of the theatre experience, should and do not merely consume; they themselves—through their interpretations—become a part of the play and its purpose. Though seemingly omnipotent in their viewing of all three drafts of *Copenhagen*, the audience finds that they do not walk away with a complete picture of the text. It is set up so that they *must* consider their position if they

want to make any sense of what they observed. In this way, *Copenhagen* has managed to create the kind of interaction and participatory theatre for which Brecht strove.

In addition to the spectators' reactions, there has been much outside attention given to this play. In fact, one of the most remarkable things about *Copenhagen*, aside from its purely literary merits, is all of the wider attention it has received. In February of 2002, the Bohr family released unsent drafts of letters from Bohr to Heisenberg. This is in direct response to *Copenhagen*. Not only did this play elicit critical engagement, it also elicited action and further consideration of the ideas of the text.

In the introduction to the release of the letters, Finn Aaserud writes in the immediate first two lines of the text, "A visit by the German physicist Werner Heisenberg to Niels Bohr in Nazi-occupied Denmark in September 1941 has recently become the subject of keen interest, not only among historians but also in the public domain. The interest has been spurred in particular by the drama 'Copenhagen' [...]." In late February, 2002, in response to the ongoing debate over his play and to the letters being made public, Frayn comments, "The most surprising result of the debate set off by the production of the play [...] has been the release of the Bohr documents" (1).

The idea behind releasing the letters was, as it was put, to "avoid undue speculation" and show what it was that Bohr actually said. In these letters, we are given varying accounts of what took place that evening in Copenhagen, 1941 (Aaserud). According to Heisenberg, who gives a couple of versions, they either spoke at Bohr's institute or they walked along Faelled Park. Bohr holds a different recollection. In the introduction to the release of the letters, Aaserud warns,

[...] the contents of the materials should be viewed with caution. All documents were written sixteen years or more after the event they seek to describe...Finally even though the documents show a genuine concern on the part of Bohr to formulate his own recollection of what transpired in 1941, most—if not all—of them were written as reactions to the writings or questions of others and do not reflect Bohr’s main interests and activities at the time.”

It is almost a comical warning, this note to proceed with caution. But the fact of the matter is that the “truth” of Bohr’s account does lie subject to current situations and the unreliability of memory. The same is true of not only memories of over sixteen years but also those immediately surrounding situations. As Frayn points out in his play, the situation and mental state of an individual colors memory and interpretation of any given moment. In this case, the “reality” of the Copenhagen situation merges with Frayn’s characters’.

In these drafts, all from Bohr to Heisenberg concerning the one primary event, we see the instability of memory and recollection. We are left with the real Heisenberg and Bohr never having settled on one version of that day in Copenhagen, and we have Frayn’s characters doing the same. In one of Bohr’s drafted letters to Heisenberg, he writes,

Dear Heisenberg,

I have seen a book, [...] “Brighter than a Thousand Suns” by Robert Jungk, recently published in Danish, and *I think that I owe it to you to tell you that I am greatly amazed to see how much your memory has*

deceived you [...]. Personally, I remember every word of our conversations, which took place on a background of extreme sorrow and tension for us here in Denmark [...]. That my silence and gravity, as you write in your letter, could be taken as an expression of shock at your reports that it was possible to make an atomic bomb is a quite peculiar misunderstanding, which must be due to the great tension in your own mind. (Aaserud, italics mine)

Bohr clearly indicates that he holds an entirely different version of the meeting and even goes so far as to suggest that Heisenberg's mental state clouded his perception thus clouding the reality of the situation. Though these letters were released to clear up the facts, what we end up with is simply another perspective on the "truth" of the matter. There are Heisenberg's memoirs and notes, Bohr's letters, and numerous critics who have looked on and made second-hand revisions of the facts of history. We are left with each person's own account of what happened that day.

What is most notable about the letters that have just recently been released is their seeming adherence to Frayn's intentions with the play.^x Rather than taking away from the play, as some critics have suggested, or even changing it in any significant way, these letters seem to further relay the idea that truths are evanescent and variable even for each individual. This idea is of key concern in *Copenhagen*. A curious thing about these letters is that they seem to be almost an addendum to the play; they support Frayn's notion that the truth of any given situation lies in the teller's point of view, a point of view which in itself cannot be certain. For years, both Heisenberg and Bohr attempted to recreate that moment in history. But given that one can only perceive from one's own point of view at

any given time and due to the nature of memory, those truths remain ever elusive. In the letters there is a continuation of the uncertainty we see in the play itself.

Critics have noted the extent of reaction to the science plays, yielding symposia and other literary and intellectual gatherings and so forth. The spectators have taken an active role in their theatre experiences; they listened and learned from the plays and then acted on that new information. Even if the “understanding” of the scientific principles is illusory, still interest has been stimulated and has brought on debate and interest in both science and history. This idea is set within the framework of Brecht’s design for an epic theatre. It is remarkable that a play has caused such a stir in the non-literary realm.

In fact, critics have noted that this play has brought C.P. Snow’s “two cultures,” the world of science and the world of humanities, together to consider the implications of events on our lives^{xi}. I am reminded of a remark made by Bertolt Brecht. As Brecht contends,

science and art meet on this ground, that both are there to make men’s life easier, the one setting out to maintain, the other to entertain us. In the age to come art will create entertainment from that new productivity which can so greatly improve our maintenance, and in itself, if only it is left unshackled, may prove to be the greatest pleasure of them all. (*Brecht* 185)

This accuracy in foresight is verified by *Copenhagen*. Frayn has written a play that merges the ideas of science with those of the humanities. He provides a play that is both instructive and entertaining. In his endeavor, Frayn has succeeded in writing a play accomplishes the goals of Brechtian theatre.

Works Cited

- Aaserud, Finn. "Release of Documents Relating to 1941 Bohr-Heisenberg Meeting." *Niels Bohr Archive*. Feb. 2002. 20 Feb. 2002
<<http://www.nbi.dk/NBA/papers/introduction.htm>>.
- Aaserud, Finn. "1. Translation." *Niels Bohr Archive*. Feb. 2002. 20 Feb. 2002
<<http://www.nbi.dk/NBA/papers/docs/d01tra.htm>>.
- Blansfield, Karen. "Science and Numbers on Stage: Fission, Fusion, and Chaos in Contemporary Drama." Vancouver Convention. Vancouver. 2001.
- Brecht, Bertolt. *Galileo*. New York: Grove P, 1962.
- . *Brecht on Theatre: The Development of an Aesthetic*. Trans. John Willett. New York: Hill and Wang, 1992.
- Brooker, Peter. "Key Words in Brecht's Theory and Practice of Theatre" *The Cambridge Companion to Brecht*. Eds. Peter Thomson and Glendyr Sacks. Cambridge: Cambridge UP, 1994.
- Carnegy, Patrick. "Arresting Insight" *The Spectator* 282 (2000): 43.
- Carpenter, Charles A. *Dramatists and the Bomb: American and British Playwrights Confront the Nuclear Age, 1945-1964*. Westport: Greenwood P, 1999.
- Cassidy, David. "A Historical Perspective on Copenhagen" *Physics Today* 53:7 (July 2000): 28-33.
- Davis, Hallie Flannigan. *E=mc²: A Living Newspaper about the Atomic Age*. New York: Samuel French, 1948.
- Durrenmatt, Friedrich. *The Physicist*. New York: Grove P, 1964.
- Feingold, Michael. "Not-right Angles." *The Village Voice* 45.15 (2000): 71.
- Frayn, Michael. *Copenhagen*. New York: Anchor Books, 1998.
- . "Post-Postscript to *Copenhagen*." *Copenhagen Interpretation: Science and History on Stage*. Washington, D.C. March 2002. 13-21.
- Friel, Brian. *Molly Sweeny*. New York: Plume P, 1994.

- Gamerman, Amy. "Theatre: You Do Have to be a Rocket Scientist--in 'Copenhagen,'" Michael Frayn Imagines a Secret Wartime Meeting of Atomic-Age Minds." *Wall Street Journal* 12 April 2000: A24.
- Ibsen, Henrik. *An Enemy of the People*. New York: Dover Publications, Inc., 1999.
- Innes, Christopher. "Science on Stage" *Anglistik und Englischunterricht*. 64 (2002) 95-105.
- King, Robert. "The Play of Ideas" *The North American Review* 283.6 (1998): 38-42.
- . "The Play of Uncertain Ideas" *The Massachusetts Review*. 42.1 (2001): 165-75.
- Pais, Abraham. "What Happened in Copenhagen?: A Physicist's View and the Playwright's Response" *The Hudson Review* 53:2 (2000): 182-191.
- Roberts, David. "Brecht and the Idea of a Scientific Theatre" *The Brecht Yearbook* 13 (1984): 41-60.
- Rose, Paul Lawrence. "Frayn's *Copenhagen* Plays Well, at History's Expense." *The Chronicle of Higher Education* 5 May 2000: B4.
- Ruddick, Nick. "The Search for Quantum Ethics: Michael Frayn's *Copenhagen* and Other Recent British Science Plays." *Journal of the Fantastic in the Arts* 2.4 (2001): 415-431.
- Shepherd-Barr, Kirsten. "Combray and *Copenhagen*: A Comparative Study of Memory," Southern Comparative Literature Association conference, University of North Carolina. Chapel Hill, North Carolina. Sept. 14, 2001.
- Ibid. "*Copenhagen* and Beyond: The 'Rich and Mentally Nourishing' Interplay of Science and Theatre," *Gamma: Journal of Theory and Criticism*. 10 (2003): 171-82.
- Ibid. "*Copenhagen*, Infinity, and Beyond: Science Meets Literature on the Stage," *Interdisciplinary Science Reviews* 28.3 (2003): in press.
- Ibid. Eng582. *Studies in Literature: Science on Stage*. Graduate course North Carolina State University (2001).

- Ibid. Eng572. *Modern British Drama*. Graduate course. North Carolina State University (2000).
- Ibid. "Physics on Stage: *Copenhagen* and the Intersection of Theatre and Science in Contemporary Drama." Symposium on Michael Frayn's *Copenhagen*. Raleigh, North Carolina. 16 March 2002.
- Ibid. "Plays about Science," Panel about Theatre and Science, "The Two Cultures": Sigma Xi Annual Conference. Raleigh, North Carolina. Nov. 8, 2001.
- Shepherd-Barr, Kirsten, and Harry Lustig. "Science as Theater" *The American Scientist* . 90 (2002): 550-55.
- Staub, August. "The Scientist as Byronic Hero: Michael Frayn's *Copenhagen*" *Journal of Dramatic Theory and Criticism* 16.2 (2002): 133-41.
- Stewart, Victoria. "A Theatre of Uncertainties: Science and History in Michael Frayn's 'Copenhagen'" *New World Theatre Quarterly* 15.4 (1999): 301-308.
- Stoppard, Tom. *Arcadia*. Boston: Faber and Faber, 1993.
- Subbianto, Arrigo. "Epic Theatre: A Theatre for the Scientific Age." *Critical Essays on Bertolt Brecht*. Boston: Hall, 1989. 287+.
- Thomson, Peter, and Glendyr Sacks, eds. *The Cambridge Companion to Brecht*. Cambridge: Cambridge UP, 1994.
- Wertenbaker, Timberlake. *After Darwin*. New York: Faber and Faber, 1998.

Works Consulted

- Aaserud, Finn. "Release of Documents Relating to 1941 Bohr-Heisenberg Meeting." *Niels Bohr Archive*. Feb. 2002. 20 Feb. 2002
<<http://www.nbi.dk/NBA/papers/introduction.htm>>.
- Aaserud, Finn. "1. Translation." *Niels Bohr Archive*. Feb. 2002. 20 Feb. 2002
<<http://www.nbi.dk/NBA/papers/docs/d01tra.htm>>.
- Barthes, Roland. *Writing Degree Zero and the Elements of Semiology*.
Trans. Annette Lavers and Colin Smith. Boston: Beacon P, 1967.
- Bennett, Susan. *Theatre Audiences: A Theory of Production Reception*. 2nd ed.
New York: Routledge, 1997.
- Berry, Michael. "Enigma Variations on the Nuclear Stage." *Nature* 20 Aug. 1998:
735.
- Blansfield, Karen. *Science and Numbers on Stage: Fission, Fusion, and Chaos in Contemporary Drama*. Vancouver: Vancouver Convention, 2001.
- Brantley, Ben. "A Fiery Power in the Behavior of Particles and Humans." *The New York Times* 12 April 2000, late ed.: E1.
- Brecht, Bertolt. *Galileo*. New York: Grove P, 1962.
- . *Brecht on Theatre: The Development of an Aesthetic*. Trans. John Willett.
New York: Hill and Wang, 1992.
- Brooker, Peter. "Key Words in Brecht's Theory and Practice of Theatre" *The Cambridge Companion to Brecht*. Eds. Peter Thomson and Glendyr Sacks. Cambridge: Cambridge UP, 1994.
- Brown, T. Allston. *History of the American Stage*. New York: Benjamin Bloom, 1969.
- Campbell, Patrick, ed. *Analyzing Performance: A Critical Reader*. New York: Manchester UP, 1996.
- Canaday, John. *The Nuclear Muse: Literature, Physics, and The First Atomic Bombs*. Madison: U of Wisconsin P, 2000.
- Carlson, Marvin. *Performance: A Critical Introduction*. New York: Routledge, 1996.

- . "Theatre and Performance at a Time of Shifting Disciplines" *Theatre Research International* 26.2 (2001): 137-144.
- Carnegy, Patrick. "Arresting Insight" *The Spectator* 282 (2000): 43.
- Carpenter, Charles A. *Dramatists and the Bomb: American and British playwrights Confront the Nuclear Age, 1945-1964*. Connecticut: Greenwood P, 1999.
- Cassidy, David. "A Historical Perspective on Copenhagen" *Physics Today* 53:7 (2000): 28-33.
- Counsell, Colin. *Signs of Performance: An Introduction to Twentieth-century Theatre*. New York: Routledge, 1996.
- Davis, Hallie Flannigan. *E=mc²: A Living Newspaper about the Atomic Age*. New York: Samuel French, 1948.
- DiGaetani, John. "Michael Frayn." *A Search for Postmodern Theatre: Interviews with Contemporary Playwrights*. New York: Greenwood, 1991. 73-85.
- Djerassi, Carl and Roald Hoffman. *Oxygen*. New York: Wiley-VCH, 2001.
- Dolan, Jill. "Producing Knowledges that Matter: Practicing Performance Studies through Theater Studies" *TDR* 40:4 (1996): 9-19.
- Drain, Richard. *Twentieth-Century Theatre: A Source Book*. New York: Routledge, 1995.
- Durrenmatt, Friedrich. *The Physicist*. New York: Grove P, 1964.
- Edson, Margaret. *Wit*. New York: Ann Faber, 1993.
- Feingold, Michael. "Not-right Angles." *The Village Voice* 45.15 (2000): 71.
- Finkle, David. "Mission UK" *The Village Voice* 43.34 (1998): 143.
- Fischer, Ernst Peter. *Beauty and the Beast: The Aesthetic Moment in Science*. Trans. Elizabeth Oehlkers. New York: Plenum Trade, 1999.
- Frayn, Michael. *Copenhagen*. New York: Anchor Books, 1998.
- . "Post-Postscript to *Copenhagen*" *Copenhagen Interpretation: Science and History on Stage*. Washington, D.C. March 2002. 13-21.

- Freedman, Samuel G. "Copenhagen Commits Sin Against History." *USA Today* 18 July 2000: 11A.
- Friel, Brian. *Molly Sweeny*. New York: Plume, 1994.
- "From Physics to Metaphysics and the Bomb." *The New York Times* 9 April 2000: A2+.
- Flynn, Michael, and Linda Rothstein. "The Real Mystery Science Theatre" *Bulletin of the Atomic Scientists* 54.6 (1998): 9-11.
- Gamerman, Amy. "Theatre: You do Have to be a Rocket Scientist--in 'Copenhagen,'" Michael Frayn Imagines a Secret Wartime Meeting of Atomic-Age Minds." *Wall Street Journal* 12 April 2000: A24.
- Gardner, Elysa. "Powerful Fusion of Fissioned Physicists." *USA Today* 12 April 2000: D5.
- Gates, Anita. "Curtain Up on a London Weekend." *The New York Times* 28 Mar. 1999: E1.
- Glanz, James. "Of Physics, Friendship and the Atomic Bomb." *The New York Times* 21 March 2000: F1.
- . "Long-Secret Letters Bear on Frayn's Play." *The New York Times* 9 Feb. 2002: A15+.
- Haberman, Clyde. "Unleashing the Fizz in Physics." *New York Times* 11 April 2000: B1.
- Hampton, Wilborn. "Yep, You Can Sing that in X, Y, and Z." *The New York Times* 13 Dec. 2000: E3.
- Hartigan, Karelisa, ed. *To Hold a Mirror to Nature: Dramatic Images and Reflections*. vol. 1. Gainesville: UP of America, 1982.
- Haynes, Roslynn. *From Faust to Strangelove: Representations of the Scientist in Western Literature*. Baltimore: John Hopkins UP, 1994.
- "Heisenberg's Message to Bohr: Who Knows?" *Physics Today* Apr. 2001: 14, 92-93.
- Holderness. Graham ed. *The Politics of Theatre and Drama*. New York: St. Martin's P, 1992.

- Ibsen, Henrik. *An Enemy of the People*. New York: Dover Publications, Inc., 1999, reprinted.
- Innes, Christopher. "Science on Stage" *Anglistik und Englischunterricht*. 64 (2002) 95-105.
- Isherwood, Charles. "Copenhagen." *Variety* 17 April 2000: 32.
- Jacobson, Lynn. "What is Performance Studies?" *American Theatre* 11:1 (1994): 20-22.
- Johnson, Trevor. "Science, Politics, and Morality" *World Socialist Web Site*. 10 July 1998. International Committee of the Fourth International (ICFI). 16 Nov. 2000 <<http://www.wsws.org/arts/1998/july1998/fray-j10.shtml>>
- Jonas, Susan, Geoff Proehl, and Michael Lupu, eds. *Dramaturgy in American Theater: A Source Book*. New York: Harcourt Brace College P, 1997.
- King, Robert. "The Play of Ideas" *The North American Review* 283:6 (1998):38-42.
- . "The Play of Uncertain Ideas" *The Massachusetts Review*. 42:1 (2001): 165-75.
- Kinzer, Craig. "Brecht and Theatre Pedagogy." *The Brecht Yearbook*. Ed. Maarten van Dijk et al. Waterloo: The International Brecht Society, 1997. 205-213.
- Kroll, Jack. "An Atomic Encounter." *Newsweek* 4 April 2000:17+.
- Kuchwara, Michael. "Spring is Prime Time on Broadway." *News and Observer* 20 Feb. 2000: G3.
- Kuhn, Thomas. "The Nature and Necessity of Scientific Revolutions." *From Modernism to Postmodernism*. Ed. Lawrence Cahoon. Oxford: Blackwell, 1996. 309-324.
- Logan, Jonathan. "A Strange New Quantum Ethics" *American Scientist* 88.4 (2000): 356-400.
- Lukacs, John. "The Conversation." *Los Angeles Times* 21 May 2000: 6.
- Lyall, Sarah. "Ambiguity Fires a Novelist and Playwright." *The New York Times* 25 Oct. 1999: E1.

- Marin, Rick. "Enjoy the Show. Test Will Follow." *The New York Times* 14 May 2000: 4:2
- Marlowe, Christopher. *Doctor Faustus*. New York: Signit Classic, 1969.
- Mason, Jeffrey D. and J. Ellen Gainor, eds. *Performing America: Cultural Nationalism in American Theater*. Ann Arbor: U of Michigan P, 1999.
- Medawar, Sir Peter, ed. *Structure in Science and Art*. Amsterdam: Excerpta Medica, 1980.
- Meyers, Robert. "Science, Infiltrating the Stage, Puts Life under the Microscope" *New York Times* 5 Dec. 1999: 2.7.
- Milling, Jane and Graham Ley. *Modern Theories of Performance*. New York: Palgrave, 2001.
- Morley, Sheridan. "Absolute Uncertainty." *The Spectator* 7 June 1998:42-43.
- Nightingale, Benedict. "Speculating on Science, Hitler and the Bomb." *New York Times* 19 July 1998: 2.4.
- Oppenheimer, J. Robert. *Atom and Void: Essays on Science and Community*. Princeton: Princeton UP, 1989.
- Pais, Abraham. *Niels Bohr's Times: in Physics, Philosophy, and Polity*. Oxford: Clarendon P, 1991.
- . "What Happened in Copenhagen?: A Physicist's View and the Playwright's Response" *The Hudson Review* 53:2 (2000): 182-191.
- Pavis, Patrice. "Theatre Studies and Interdisciplinarity" *Theatre Research International* 26:2 (2001): 153-163.
- Peierls, Rudolf E. *Atomic Histories*. New York: American Institute of Physics, 1997.
- Polanyi, Michael. *Science, Faith and Society*. Chicago: U of Chicago P, 1946.
- Postlewait, Thomas and Bruce A. McConachie, eds. *Interpreting the Theatrical Past*. Iowa City: U of Iowa P, 1989.
- Powell, Corey S. "Science Acts Out." *Discover* Aug. 2000:18+.
- Powers, Thomas. "The Unanswered Question." *The New York Review of Books* 25 May 2000: 4-6.

- Reinelt, Janelle. "A Feminist Reconsideration of the Brecht/Lukacs Debates." *Women and Performance: A Journal of Feminist Theory* 7.1 (1994): 122-139.
- Reinelt, Janelle G., and Joseph R. Roach, eds. *Critical Theory and Performance*. Ann Arbor: U of Michigan P, 1992.
- Roberts, David. "Brecht and the Idea of a Scientific Theatre" *The Brecht Yearbook* 13 (1984): 41-60.
- Rocamora, Carol. "Scientific Dramaturgy" *The Nation* 270.22 (2000): 49-51.
- Rose, Paul Lawrence. "Frayn's 'Copenhagen' Plays Well, at History's Expense." *The Chronicle of Higher Education*. 5 May 2000: B4.
- Ruddick, Nick. "The Search for Quantum Ethics: Michael Frayn's *Copenhagen* and Other Recent British Science Plays." *Journal of the Fantastic in the Arts* 2.4(2001): 415-431.
- Russell, Bertrand. *The Impact of Science on Society*. New York: Columbia UP, 1951.
- Scholem, Richard. "A Riveting Copenhagen Tackles A-Bomb Ethics." *Long Island Business News* 19 May 2000: 49A.
- Schrag, Peter. "History's Heisenberg Principle." *The American Prospect* 31 July 2000: 40.
- Schweber, S.S. *In the Shadow of the Bomb: Bethe, Oppenheimer, and the Moral Responsibility of the Scientist*. Princeton: Princeton UP, 2000.
- Shepherd-Barr, Kirsten. "Combray and *Copenhagen*: A Comparative Study of Memory," Southern Comparative Literature Association conference, University of North Carolina. Chapel Hill, North Carolina. Sept. 14, 2001.
- Ibid. "*Copenhagen* and Beyond: The 'Rich and Mentally Nourishing' Interplay of Science and Theatre," *Gamma: Journal of Theory and Criticism*. 10 (2003): 171-82.
- Ibid. "*Copenhagen*, Infinity, and Beyond: Science Meets Literature on the Stage," *Interdisciplinary Science Reviews* 28.3 (2003): in press.
- Ibid. Eng582. *Studies in Literature: Science on Stage*. Graduate course North Carolina State University (2001).

- Ibid. Eng572. *Modern British Drama*. Graduate course. North Carolina State University (2000).
- Ibid. "Physics on Stage: *Copenhagen* and the Intersection of Theatre and Science in Contemporary Drama." Symposium on Michael Frayn's *Copenhagen*. Raleigh, North Carolina. 16 March 2002.
- Ibid. "Plays about Science," Panel about Theatre and Science, "The Two Cultures": Sigma Xi Annual Conference. Raleigh, North Carolina. Nov. 8, 2001.
- Shepherd-Barr, Kirsten, and Harry Lustig. "Science as Theater" *The American Scientist*. 90 (2002): 550-55.
- Shevtsova, Maria. "Social Practice, Interdisciplinary Perspective" *Theatre Research International* 26.2 (2001):129- 136.
- Sierz, Aleks. "Uncertainties." *The Independent*. 5 August 2001: 9.
- Snow, C.P. *The Two Cultures*. Cambridge: Cambridge UP, 1998.
- Staub, August. "The Scientist as Byronic Hero: Michael Frayn's *Copenhagen*" *Journal of Dramatic Theory and Criticism* 16.2 (2002): 133-41.
- Stewart, Victoria. "A Theatre of Uncertainties: Science and History in Michael Frayn's 'Copenhagen'" *New World Theatre Quarterly* 15.4 (1999): 301-308.
- Steyn, Mark. "Period Decadence, Emotional Truths." *New Criterion* 18.9 (2000): 45-50.
- Strobel, Warren P. "Absence of A-bomb." *U.S. News & World Report* 24 July 2000: 4.
- Stoppard, Tom. *Arcadia*. Boston: Faber and Faber, 1993.
- Subbiotto, Arrigo. "Epic Theatre: A Theatre for the Scientific Age." *Critical Essays on Bertolt Brecht*. Boston: Hall, 1989. 287.
- Suvin, Darko. "Brecht: Bearing, Pedagogy, Productivity" *Gestos* 10 Nov. 1990: 84-97.
- Thomas, Inigo. "Neutrons over Broadway." *George* June 2000: 30.

- Thomson, Peter, and Glendyr Sacks, eds. *The Cambridge Companion to Brecht*. Cambridge: Cambridge UP, 1994.
- Tollini, Frederick P. "Blessed Uncertainty: Some Summer Shows on Broadway." *America* 23 Sept. 2000: 8, 24.
- Voss, David. "A Friendship's Fission." *New York Times* 12 Apr. 2000: E1.
- Weber, Bruce. "Science Finding a Home Onstage." *The New York Times* 2 June 2000: E1.
- Welsh, Anne Marie. "Actor's Chemistry Positively Charged in 'Copenhagen.'" *The San Diego Union-Tribune* 8 May 2000: E1.
- Wertenbaker, Timberlake. *After Darwin*. New York: Faber and Faber, 1998.
- Wren, Celia. "The Idea's the Thing." *Commonweal* 16 June 2000: 17-19.
- Young, Peter B. "Copenhagen" *Theatre Journal* 51:2 (1999): 218-219.
- Zoglin, Richard. "Uncertain Equations" *Time Canada* 4 April 2000:16+.

ⁱ This discussion of the structural integration of the scientific ideas began, for me, in a seminar offered by Shepherd-Barr at North Carolina State University. Christopher Innes has also taken note of the "merging of form and content" (p.102) in both the works of Michael Frayn and Tom Stoppard in his article, "Science on Stage" *Anglistik und Englischunterricht* 64 (2002): 95-105. Others such as Stewart and Blansfield, in "A Theatre of Uncertainties: Science and History in Michael Frayn's 'Copenhagen'" *New Theatre Quarterly* 15.4 (1999): 301-308; and *Science and Numbers on Stage: Fission, Fusion, and Chaos in Contemporary Drama*. Vancouver: Vancouver Convention, 2001, respectively, consider this interplay between the science and the format and metaphors of the play (though not as a central focus of their arguments). For a more in-depth consideration of the integration of science in *Copenhagen*, see Shepherd-Barr's "Science as Theatre" (co-written with Harry Lustig) *American Scientist* 90(2002): 550-555; "Plays about Science," presentation at the "The Two Cultures": Sigma Xi Annual Conference, Raleigh, North Carolina, 8 Nov. 2001; and "Physics on Stage: *Copenhagen* and the Intersection of Theatre and Science in Contemporary Drama." Symposium on Michael Frayn's *Copenhagen*. Raleigh, North Carolina. 16 March 2002. She also has forthcoming works entitled "*Copenhagen* and Beyond: The 'Rich and Mentally Nourishing' Interplay of Science and Theatre," *Gamma: Journal of Theory and Criticism* 10 (2003), in press; and "*Copenhagen*, Infinity, and Beyond: Science Meet Literature on the Stage" to publish in *Interdisciplinary Science Reviews* 28.3 (2003): in press. For the following notes, refer to the references listed here unless otherwise noted.

ⁱⁱ See Shepherd-Barr, Innes, Blansfield, and Stewart.

ⁱⁱⁱ See Shepherd-Barr, Innes, Blansfield, and Stewart.

^{iv} See Shepherd-Barr, Innes, Blansfield, and Stewart.

^v See King's "The Play of Uncertain Ideas" *The Massachusetts Review: A Quarterly of Literature, the Arts, and Public Affairs*, 42.1 (2001): 165-175; Also see Innes and Shepherd-Barr.

^{vi} See Shepherd-Barr, Innes, Blansfield, and Stewart.

^{vii} See Shepherd-Barr and Innes.

^{viii} In the seminars, "Modern British Drama" and "Science on Stage" led by Shepherd-Barr at North Carolina State University, the graduate class discussed these kinds of ideas concerning the learning and 'teaching' of science within the science play.

^{ix} In the seminars, “Modern British Drama” and “Science on Stage,” there was much discussion of this reaction to the play. A few of us had seen the play, myself included, and we all brought those experiences into the seminar.

^x Both in Shepherd-Barr’s seminar and in my conversations with her, we discussed the released documents and the ways that we saw their seeming extension of the play. For more on these documents, see Shepherd-Barr’s “Physics on Stage: *Copenhagen* and the Intersection of Theatre and Science in Contemporary Drama,” Symposium on Michael Frayn’s *Copenhagen*, Raleigh, North Carolina, 16 March, 2002.

^{xi} See Shepherd-Barr and Innes.