

A Study in Uncertainty – Frayn and *Copenhagen*

Saket Vora  
September 20, 2003  
HON 201/002  
Dr. David Greene

## A Study in Uncertainty – Frayn and *Copenhagen*

In the fall of 1941, the head of the German atom bomb project Werner Heisenberg travels to Nazi-occupied Copenhagen to visit his old friend and mentor, Niels Bohr. It was a night that forever changed their long time relationship and one that has perplexed historians ever since. What happened that night? Why did Heisenberg come to Copenhagen? Michael Frayn tackles this puzzling question in his play *Copenhagen* and demonstrates his genius by incorporating the theories of Heisenberg's Uncertainty Principle and Bohr's Complimentarity Principle within the dialogue and the structure of the work itself. As *Copenhagen* transitions to a film version, Frayn's writing actually lessens the impact of the play in film form, lending to the fact that he wrote this play truly for the theater.

The Heisenberg Uncertainty Principle stands as a keystone in quantum physics. Its statement, that no one can ever know the exact position and exact momentum of a particle simultaneously, is a scientific theory that can be applied to several other broad subjects in the form of a metaphor. The Uncertainty Principle has often been interpreted as the more one knows about one thing, the less is known about another. In science, the more accurate one's measurement of position is, the less accurate the measurement of momentum is. It is this metaphor that extends itself to *Copenhagen* in grand fashion. The question brought up again and again is why did Heisenberg come to Copenhagen? In order to answer this, the three characters reach back into their memories and search for the reasons within. They attempt this in three iterations, one in Act One and two in Act Two, of their famous visit with Heisenberg's feet crunching over the familiar gravel and Bohr's heartfelt welcome "Come in, come in"(13). In

each of these three iterations, they find a different reason, prompting them to return to the drawing board. The more Heisenberg, Bohr, and Margrethe understand more about a certain factor, the less they are sure it is the real factor that made Heisenberg visit. Another key theme running through the play is the battle between logical sense and emotional sense. While they try to find a logical explanation for why Heisenberg came to Copenhagen, they cannot ignore the emotional context of events either. Margrethe exudes the latter extreme, crying out “everything is personal!”(73) while Heisenberg embodies the former, believing that “as long as the mathematics work out, the sense doesn’t matter”(65). Bohr displays a bit of both, understanding the mathematics behind concepts while always yearning for communicating them in plain language. As Ben Wilde observed in class, “an inverse relationship often exists between mathematical and emotional understanding.” Logic is often impersonal and cold, while emotions rarely ever are based on logic. Heisenberg aptly observes that “mathematics becomes very odd when you apply it to people. One plus one can add up to so many different sums”(29). Once again, the metaphor for uncertainty arises.

Sometimes overlooked in the analysis of *Copenhagen* is the use of Bohr’s Complementarity principle. The principle, which resolved the great feud between the particle and wave theories of light, states that light is in fact *both* a particle and a wave, and that one must choose one or the other when making specific conclusions on the subject. Frayn artfully incorporates this in the characterization and relationship of Bohr and Heisenberg, the most apparent example occurring in Act Two as the two physicists reminisce about their heyday in the 1920s. They fondly remember how together they worked out physics hardest problems, how together they solved Uncertainty and together they solved Complimentarity. One can consider this mutual feeling of accomplishment as a whole like a beam of light. However, when

Margrethe begins to exactly break down the formation of Uncertainty or Complimentarity, the outcome quickly becomes polarized. She points out that Heisenberg first worked out Uncertainty by himself in Heligoland while Bohr arrived at Complimentarity by himself in Norway. Thus, as one gets more specific, one finds it is either Bohr or Heisenberg, a particle or a wave. This duality extends to an even subtler use of quantum mechanics integrated within *Copenhagen*: the quanta versus continuous basis of nature. From the way the play is structured around rapid jumps and translocations in time and space made by the characters, it can be argued that the play is based on the quanta, which are distinct packets. Frayn breaks up the time continuum so that the narrative is not linear, or continuous, in time or space. However, the character's actions act as waves, rippling across the time and space in *Copenhagen* and continuing to affect emotions and judgments to the very end of the novel. The characters point of view too defies the particle as well, because of instead of being in a definite position Bohr, Heisenberg, and Margrethe are free to move about anywhere they wish, to exist in several places at once, much like a wave. Understanding all the physics-related subtext and its intricate interaction with the characters themselves is critical to experiencing the play, and this experience greatly differs from its theatrical form and its film form.

*Copenhagen* is a milestone in modern drama. The play focuses on the abstract and dwells in the shadowy realm of memory and history. As the audience member immediately observes, it is utterly devoid of stage direction or setting description. It breaks up the time continuum in a way that is both intriguing and suspenseful. The three characters simultaneously occupy the same stage yet are present in very different locations. All these are weapons at which Frayn strikes at the heart of the play – uncertainty. Much of the genius behind *Copenhagen* is that the audience is thrown into the same dilemma with the characters; they are uncertain of what is going on,

uncertain of which direction the play is going, uncertain about the conclusion. However, the medium of film obeys different rules than that of theater. In theater, there exists a crucial interaction with the audience that the actors feed on to perform. Lacking this element, film must find other ways to capture the audience's attention, a consequence that results in a more linear and more descriptive interpretation of the play. The nondescript stage is replaced with a furnished mansion. Instead of jumping between 1941 and 1924 and the present, the film has the characters moving about inside and outside Bohr's mansion. The film achieves the time shifts between 1941 and present by fading out the elaborate furnishings, and handles the reiterations by replaying the same segment of footage. As David Greene observed, these changes introduces an aspect to the story that undermines the impact of uncertainty – visual clarity. Inherent to human nature is the need for visual evidence or proof. Though it is more comforting to the viewer, it detracts from the dramatic tension. Frayn's intentional absence of descriptive setting forces the audience to focus on the characters, and the metaphorical inverse relationship of Uncertainty Principle enters again.

The application of the Heisenberg Uncertainty Principle and other scientific theories to the structure of the play increases the depth and subtext to bring out a more powerful drama. Frayn's writing style enhances the feelings of uncertainty, and through the form of theater this impacts the audience in a way far more meaningful than in the play's film representation.

Work Cited –

Frayn, Michael. *Copenhagen*. Anchor Books : New York © 1998.

Honors 201 section 002 seminars. Dates: 9/2, 9/4, 9/9, 9/11, 9/16, 9/18, year 2003.